

University of Strathclyde
Department of Civil and Environmental Engineering

Towards a soft path for water in the food and drink industry

by

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Declaration of authenticity

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Abstract

Water is vital for all human and environmental activities. Climate change, population growth and consuming trends pose major uncertainties to the future availability of this resource. The soft path for water concept was first proposed as a paradigm shift in water management. This idea focuses on the sustainable delivery and use of water-related services matched to the needs of end users, rather than seeking sources of new supply. The concept was initially conceived as a way for governments and societies to embed water sustainability principles in their policies. Food is considered one of the most water intensive areas in the society and businesses from this sector need to strive for reducing their impact on water resources. However, a proposition of a soft path for water for the food industry has not been done so far.

The objective of this research was to investigate a way in which corporations in the food sector can embed soft path principles. Based on a consultation with experts along with the review of literature, a framework consisting of five principles and 21 indicators was developed to evaluate the adoption of the soft path for water in the food sector. These principles are grounded on the three aspects of sustainability that involve the environment, society and economy. The proposed framework was used to assess the water strategies of a sample of 67 companies in the food sector who are already committed to the reduction of water impacts through the Federation House Commitment. This entailed the content analysis of 89 publicly available documents, 12 questionnaires and eight interviews.

The obtained results indicate some level of implementation of the five principles as evidence of their adoption was found in the minority of the evaluated sample. The majority of the sample presented a lack of implementation or an absence of evidence in the gathered data. Companies' efforts appear to be mostly centred on their internal efficiency spectrum. Aspects related to the reduction of water impacts in their supply chains, the understanding of water environmental limits or the engagement with society for protecting the human right to water are not yet a common practice. Results suggest that there is still a long way to go towards a soft path for water in the food sector. It was also highlighted the need for better reporting and data disclosure from businesses.

Resumen en español

Hacia una vía alternativa para la gestión sostenible del agua en el sector alimenticio

El agua es un elemento vital para todas las actividades humanas y medioambientales. Fenómenos como el cambio climático, el crecimiento poblacional y las tendencias de consumo plantean mayores incertidumbres sobre la futura disponibilidad de este recurso. La filosofía de ‘una vía alternativa hacia la gestión sostenible del agua’ (‘soft path for water’ en inglés), representa un cambio de paradigma en el área de gestión de recursos hídricos. Ésta noción se enfoca en el abastecimiento y uso sostenible de los servicios proveídos por el agua. En vez de buscar nuevas fuentes de agua, aquellos servicios deben ser emparejados con las necesidades de los consumidores finales. El concepto fue inicialmente concebido como una manera en la que los gobiernos y sociedades pudiesen incorporar principios de sostenibilidad en sus políticas. El sector alimenticio es considerado como el área de mayor intensidad hídrica en la sociedad, por lo tanto las compañías pertenecientes a éste sector deben esforzarse en la reducción de sus impactos (directos e indirectos) en los recursos hídricos. Sin embargo, una proposición formal de la filosofía ‘soft path for water’ para la industria alimenticia no ha sido realizada aún.

El objetivo de esta investigación se centró en indagar una manera en la que corporaciones del sector alimenticio puedan integrar principios de la gestión sostenible del agua en sus estrategias. Por esta razón, con base en una consulta con expertos en el área y en el análisis de la bibliografía relevante, se desarrolló un marco basado en cinco principios y 21 indicadores con el propósito de evaluar la adopción de la filosofía ‘soft path for water’ en el sector alimenticio. Los cinco principios están fundamentados en los tres aspectos del concepto de sostenibilidad los cuales incluyen al medioambiente, la sociedad y la economía. El marco propuesto fue luego usado para evaluar las estrategias ambientales de una muestra de 67 compañías pertenecientes al sector alimenticio, las cuales tenían un compromiso existente hacia la reducción de sus impactos ambientales en los recursos hídricos. Ésta evaluación implicó el análisis de contenido de 89 documentos disponibles al público, 12 cuestionarios y ocho entrevistas.

Los resultados obtenidos en esta investigación indican que hay cierto nivel de implementación de los cinco principios propuestos ya que evidencia de su adopción fue encontrada en la minoría de las compañías evaluadas. La mayoría de la muestra presentó ya sea una falta de implementación o una ausencia de evidencia en los datos recolectados. Los esfuerzos de las compañías examinadas parecen estar mayormente centrados en el espectro de eficiencia interna. Aquellos aspectos relacionados con la reducción de los impactos en las cadenas de suministro, con el entendimiento de los límites ambientales del agua ó con el trabajo conjunto con la sociedad para proteger el derecho humano al agua no parecen ser aún una práctica común. En resumen, los resultados sugieren que hay todavía un largo camino por recorrer para la gestión sostenible del agua en el sector alimenticio. Adicionalmente, cabe resaltar que hay una necesidad de mejora en la manera en la que las corporaciones reportan y revelan su desempeño ambiental.

In memory of: / En memoria de:
José Antonio Silva Espinosa (1917-1991)
Rebeca Camargo Corzo (1930-2014)

*Think left and think right and think low
and think high. Oh, the thinks you can
think up if only you try!*

- *Dr. Seuss*

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Selected research outputs

- Prior, K., Graves, P., Silva-Plata, C., and Booth, P., 2012. *The role of competition in Scotland to facilitate the sustainable use of water*. In: IWA (International Water Association) World congress on Water, Climate and Energy. Dublin, Republic of Ireland, 13-18 May 2012. Dublin: IWA. (See Appendix 1)
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- Silva-Plata, C., and João, E., 2015. *In the quest of a soft path for water in the food industry*. In: World Water Congress XV, International Water Resources Association (IWRA). Edinburgh, Scotland, 25-29 May 2015. Edinburgh: IWRA. (See Appendix 3)

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List of abbreviations

AWS	Alliance for Water Stewardship
CA	Comprehensive Assessment of Water Management in Agriculture
CDP	Carbon Disclosure Project
CMA	Central Market Agency
CSR	Corporate Social Responsibility
DEFRA	Department for the Environment, Food and Rural Affairs, UK
EC	European Commission
FDF	Food and Drink Federation
FHC	Federation House Commitment
GC	United Nations Global Compact
GWP	Global Water Partnership
ICWE	International Conference on Water and the Environment
ISO	International Organization for Standardization
IWRM	Integrated Water Resource Management
LP	Water Licensed Provider in Scotland
MA	Millennium Ecosystem Assessment
OECD	Organization for Economic Co-operation and Development
SEDEX	Supplier Ethical Data Exchange
SEPA	Scottish Environmental Protection Agency
UN	United Nations
UN WWAP	World Water Assessment Programme
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNHR	United Nations Human Rights Council

UNWCED	United Nations World Commission on Environment and Development
USGS	United States of America Geological Survey
WFD	Water Framework Directive
WIC	Water Industry Commission Scotland
WWF	World Wide Fund for Nature (formerly known as World Wildlife Fund)

Chapter 1

Introduction

*Somewhere, something incredible is
waiting to be known
- Carl Sagan*

Water is a vital natural resource on which all human and environmental activities depend. The sustainable use and consumption of water is considered as an important need for society. The Earth is a planet covered by water and this condition has given place to the common misconception of it being a virtually inexhaustible resource. The total amount of water on our planet is practically fixed but constantly moving around from one place to the other through the water cycle (Begon et al., 2006). It is estimated that only one per cent of the entire planet's water is available for human and natural processes (Shiklomanov, 1993, p. 13). Population has been projected to grow from 6.9 billion in 2010 to 8.3 billion in 2030 and 9.1 billion in 2050 (UNDESA, 2013, p. xv). A growing population, along with higher consumption rates and a changing climate mean that the future availability of water resources is at risk.

Food is the area with the higher water needs worldwide, therefore it is crucial to implement measures for making a more sustainable use and consumption of this resource in the sector. The water consumed for growing food (agriculture) accounts for 70% of all the water withdrawn for human activities (UN WWAP, 2012, p. 46). Additionally, industry requires approximately 20% of the world's freshwater withdrawals (UN WWAP, 2012, p. 59). The rest 10% accounts for the water used by human settlements for drinking, cooking, hygiene and cleaning (UN WWAP, 2012, p. 45). A sustainable use and consumption of water is something that needs to be addressed by all actors in the society. Businesses in the food sector hold a

responsibility for embracing and implementing water sustainability principles in their strategies and practices. This thesis proposes and evaluates a framework for embedding water sustainability in the food corporate sector.

1.1 Thesis background

Water is life in every sense of the word and it is indispensable for sustaining all activities on the planet. It is a crucial component for all ecological cycles and human activities and development. The latter, depend on it to run their industries, for domestic use and for food and energy production (Gleick, 1993). It is considered that since the industrial revolution in the 1800s, the Earth has entered a new geological epoch called the Anthropocene, which means that we are in an era where human activities are the main driver of change in the planetary systems (Crutzen 2002; Steffen et al., 2007). As a result, the growth of human activities at all levels constitute a pressure that can lead to irreversible environmental changes that would have an impact on human well-being (Rockström et al., 2009). There are several planetary boundaries that have been proposed for humanity’s sustainability on Earth, some of which have already been transgressed (Rockström et al., 2009). Figure 1.1 presents these boundaries, their safe operating space and their current status.

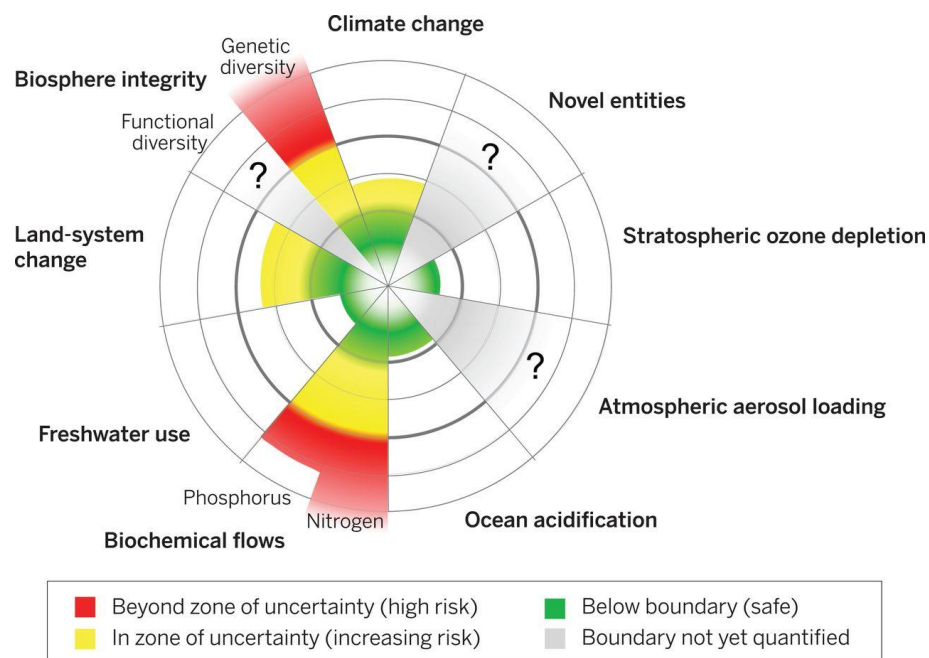


Figure 1.1: Planetary boundaries proposed for human sustainability on Earth
Source: Steffen et al. (2015, p. 736)

The global freshwater consumption is still under the safe thresholds of sustainability according to the calculations shown in Figure 1.1. However, as shown in Figure 1.2, this safe status is not the case in all places around the world. Planetary boundaries are not linear and transgressing them will lead to abrupt changes that jeopardise the safe operating system of humanity (Rockström et al., 2009; Steffen et al., 2015). It is considered that the global water cycle has entered the Anthropocene because of human activity and it is imperative to take measures for staying within safe boundaries. Initiatives need to be undertaken by all sectors in the society and businesses have a key role to play. Stockholm Resilience Centre (n.d) calls for all businesses to act on the minimisation of their impact on water resources in order to contribute for society to remain within the adequate water boundaries to avoid abrupt changes.

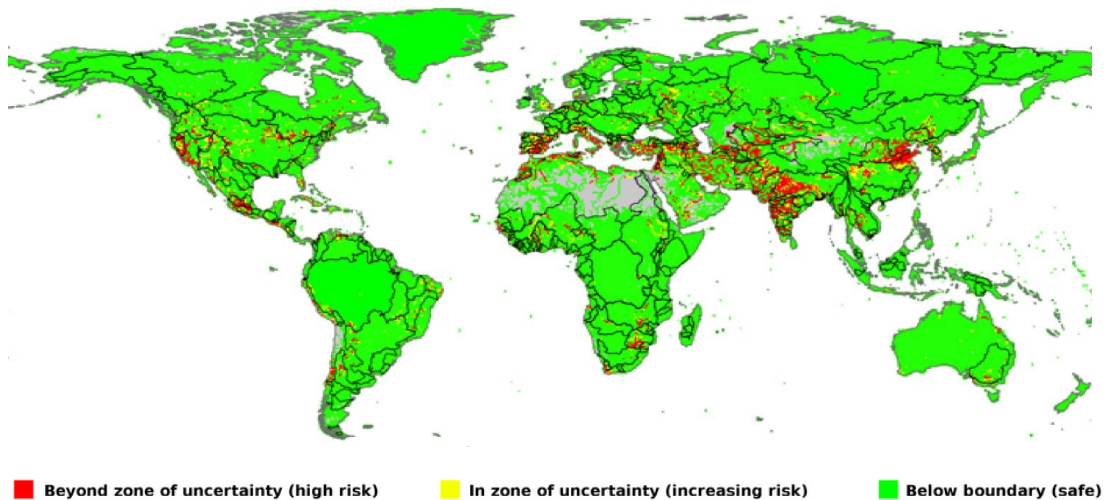


Figure 1.2: Current status of the freshwater use boundary across the globe (as of 2015)
Source: Steffen et al. (2015, p. 739)

Societal demands for water can be divided into four categories: food and agriculture, energy, industry and domestic use. The first category accounts for the vast majority of water demands (UN WWAP, 2012, p. 45). The water-food nexus is simple to grasp: plants use the sun's energy to combine water and carbon dioxide to form carbohydrates, and this conversion creates the world's food supply that supports life (Postel, 1992). In other words, crops and consequently livestock need water to grow and therefore this resource is the key to food security. On the other side, industrial activities are also dependant on water but surprisingly, little data is available on how

much water is essentially withdrawn by industry for its manufacturing processes (UN WWAP, 2012).

The food manufacturing sector is an interesting area that joins both agriculture and industry into one. Food needs first to be grown and this refers to the agricultural sector. Our modern society and diets require this raw food to be processed and that is when the food and drink industry enters to play a role. Each company belonging to this industry has then a long list of suppliers, which could be located in different places of the planet, and take part of the value chain of their end products.

The total amount of water embedded in each step of the value chain of a product is defined as water footprint or virtual water (Allan, 2003; Hoekstra, 2008a). Since agriculture accounts for 70% of all freshwater withdrawals and the overall industrial sector for 20%, it is then expected the general water footprint or virtual water of the food and drink industry to be high. Allan et al. (2015, p.308) discuss that for the production of food, the water consumed in agriculture accounts for 92% of the overall water footprint (also known as green water) while the one used for processing (also known as blue water) accounts for 8%¹. This points out the need for a better understanding and managing water so as to promote sustainability in the sector.

Traditionally, the management of water has been centralised on building large infrastructures for water supply (Brooks et al., 2009a). This process has a linear fashion in which water is abstracted from the Earth and distributed around according to the demand. In addition to this, consumers² have had the notion of water being an inexhaustible ‘cheap’ resource and have therefore had little incentive for adopting more sustainable practices. Adam Smith coined this perception in 1776 as the diamond-water paradox:

¹ It is important to make a distinction between the verbs **use** and **consume** when talking about water management in the food sector. On one side, green water is ‘consumed’ because once it has been ‘used’ it cannot be ‘reused’ again, it gets lost in the environment through processes such as evaporation or run-off. On the other hand, blue water, or the water we can actually see and touch such as the water on lakes and rivers, is ‘used’ because it can be ‘reused’ again in any process if treated. This thesis makes a distinction between these two throughout the different chapters.

² In this case consumers refer to all sectors that demand water for human activities: agriculture, industry and individuals.

“Nothing is more useful than water: but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any use-value; but a very great quantity of other goods may frequently be had in exchange for it.” Smith (1776, p. 48)

However, times have changed and the current world is facing an unprecedented situation and a perfectly linear process with current demand patterns cannot be sustained over the long-term with increasing population rates and a changing climate. As a response to this need, in 1998 the soft path for water philosophy was introduced (Gleick, 1998). This approach “seeks to improve the overall productivity of water use and deliver water services matched to the needs of end users, rather than seeking sources of new supply” Gleick (2002, p. 373). In other words, it is a paradigm focused in the conservation and efficiency of water. People do not want to use water itself, they need the services it provides like food growth and goods production. There are two paths for meeting these fundamental needs: the hard and the soft path (Wolff and Gleick, 2002). The hard path for water management is based on the traditional supplied and centralised infrastructure engineering approach (Gleick, 2002). Such approach manages assets (watersheds) rather than people. In contrast, the soft path for water manages people as its main priority and it is a complement to the traditional management of water.

A formal adoption of soft path for water approaches has been attempted at regional scales and in planning processes in the past (Brooks and Holtz, 2009a; Brooks and Holtz, 2009b; Brooks et al., 2015). Nevertheless, the soft path for water philosophy has not yet been formally investigated in the food sector. However, several efforts have been carried out for embedding water sustainability principles in the corporate strategies with special emphasis in the food area. Such initiatives like the virtual water, water footprint and water stewardship concepts share the same philosophy with the soft path for water notion (see section 2.2). This commonality is the acknowledgement of the finite nature of water and the impacts on water resources that arise from each of the steps of the products we consume. More importantly, they all recognise that water needs to be managed holistically and taking into consideration environmental and social aspects.

The food sector is an area that urges the implementation of improved practices and strategies that embrace water conservation in its core. The aim of this thesis is to

investigate how existing initiatives for water sustainability can be integrated in one framework that companies can implement in their corporate strategies.

1.2 Research aim and objectives

The purpose of this research is twofold: to investigate a framework in which soft path for water principles can be integrated into the corporate strategies of the food sector; and to explore if there is any evidence of these principles being applied in this industry. As a way for approaching this goal, this thesis has the following objectives:

1. To define, through a framework proposition, what a soft path for water means for the food industry (see chapter 4).
2. To evaluate the proposed framework in existing companies of the food sector in order to seek for evidence of a soft path for water adoption in this area (see chapters 5, 6, 7 and 8).

In order to achieve the aim and objectives of this research, a three-step methodology is utilised and it is thoroughly discussed in chapter 3. Due to the fact that a soft path approach had not yet formally been proposed for the business sector, a first step entailed an initial exploratory study for investigating whether a soft path for water had been adopted in the corporate sector in Scotland. The results from the initial step confirmed the lack of adoption of a soft path for water approach in the corporate sector. The second step entailed a consultation with experts in the water sustainability area, with the use of a questionnaire and interviews, in order to define the elements of a soft path for water in the food sector. The third stage used the findings from the previous steps, along with previous work carried out by WWF (2013) and Oxfam (2013a), as the stepping stones for the design of a framework for measuring a soft path for water adoption in companies from the food sector. The developed framework was then tested with a sample of companies belonging to the UK's food and drink industry. The data gathered in the final stage derived from questionnaires, interviews, and publicly available information such as environmental reports and websites.

The expected contribution to knowledge of this research is the proposal of a soft path for water framework for the food sector. In addition, it aims to evaluate if there is evidence of adoption of the proposed soft path elements in the UK food sector scenario.

1.3 Thesis structure

This thesis is organised in nine chapters. Following this chapter, Chapter 2 expands the theoretical background presented in section 1.1 and reviews relevant literature for elaborating the scope of this study. A review of the soft path for water theory is carried out along with existing initiatives of water sustainability in the corporate sector such as the water footprint, virtual water and water stewardship concepts. Through this review process, it is recognised the need for proposing a framework that integrates all the identified initiatives into one for the promotion of water sustainability in the food sector.

Chapter 3 discusses the research methodology of this thesis, which entailed a three-step process. First, an exploratory study was carried out in order to corroborate the gap found through the review of literature, which is the need for corporations to adopt a soft path for water approach. Second, a set of experts were consulted for identifying the elements of a soft path for water in the food sector. Third, a framework consisting of five themes and 21 indicators was constructed and evaluated in a sample of 67 companies belonging to the food sector in the UK.

Chapter 4 analyses the data gathered through questionnaires and interviews from a set of water sustainability experts. Findings from this analysis suggest five areas for the adoption of a soft path for water in the food sector. These findings, combined with the review of literature, provided the basis for the proposition of a multi-criteria framework for the evaluation of a soft path for water in the food business area. The proposed framework was then used for evaluating a sample of companies from the UK's food industry committed to the reduction of water.

Chapter 5 presents an overview of the findings obtained through the proposed evaluation process. It describes the overall way in which the definition and evaluation of the soft path for water was carried out. A bird's eye view of the soft path adoption in the sample of the evaluated companies is also provided.

Chapter 6 makes a detailed analysis of the first area proposed for the soft path adoption, which entails the companies' awareness of general water debates in the water management context. Moreover, the evaluation of the extent to which water services are re-evaluated in the companies' policies and operations is carried out.

Chapter 7 examines two areas of the proposed framework. It first evaluates the companies' understanding of their water environmental impacts as well as the environmental limits in which they can operate. Second, it assesses the internal action taken by the companies. In other words, the adoption of demand management (technological) solutions that seek for increased efficiencies as well as internal staff engagement.

Chapter 8 analyses the external areas proposed in the framework. It first evaluates the external engagement companies have with communities and their supply chain. In addition, it examines the extent to which companies seek to influence on water governance at both national and international levels.

Chapter 9 presents a synthesis of the contribution to knowledge that this research has achieved, it provides a series of recommendations for business practice and future avenues for research are discussed.

Chapter 2

Literature Review

Water is the driving force in nature
- Leonardo da Vinci

Water is indispensable for all types of life. Contrary to common perceptions on water availability, this resource is finite and only one per cent of the planet's water is fresh and renewable. Most of water resources (97%) are salty and the remaining two per cent is locked in ice (UN WWAP, 2012; USGS, 2013). There is a growing concern of water becoming one of the main challenges in the 21st century as climate change, increasing population growth and consumption trends pose major uncertainties on the future availability of this resource (UNESCO, 2009). It has also been recognised that existing water management practices are not sustainable and not able to provide the “benefits they have in the past” (Brandes et al., 2009, p. 4). Such benefits refer to the pillars in which civilisation was built upon, since the beginning of agriculture to date.

Gleick (1998) proposed the soft path for water concept as a way for embedding water sustainability principles in the society. This idea offers an alternate way in water management focusing on the sustainable delivery, use and consumption of water-related services matched to the needs of end users, rather than seeking sources of new supply. To date, the contributions to the soft path for water debate have focused mostly on ways for influencing policy and planning processes.

This research aims to provide a different perspective to the area and argues that a soft path for water, or an alternate road for water management, is also important to be understood and implemented in the corporate sector. Specifically, in the food sector due to the large water quantities involved in it.

This chapter reviews what has been covered in the literature of soft path for water management and, equally important, identifies the gaps in knowledge that exist to date in this area. It also provides a critical review of the work carried out in the sustainable use and consumption of water in the corporate sector and reinforces the importance of carrying out initiatives that seek to protect water resources in the food sector.

2.1 A soft path for water

The way in which we have managed water can be summarised in three perspectives (Brandes et al., 2005). Supply-side management, demand management and soft path. Supply-side assumes that water is abundant in supply and thus focuses on increasing the supply of water through the building of large infrastructure such as dams and reservoirs. This paradigm focuses on finding engineering ways for meeting future water demands regardless of environmental limits.

On the other hand, demand management seeks to put into practice innovative technological solutions for meeting economic and environmental targets. Demand management aims to increase efficiency or, in other words, to keep doing the same but with less water. Although efficiency is in principle a good approach, it often leads to “keeping only those things that are directly and immediately beneficial” (Walker and Salt, 2006, p. 7). Optimisation and efficiency promote the simplification of values in the society (such as the market value of water) and often obviate unquantifiable values that nature provides (such as the services water provides) (Walker and Salt, 2006).

The soft path for water emerged as an approach embedded in sustainability principles that, in addition to efficiency, also recognises the value of ecosystems as such, as well as the engagement with stakeholders (Brooks, 2005). The objective of a soft path for water is to meet the demand for water services rather than the demand for water itself. Table 2.1 summarises the three paradigms in water management and presents the philosophical differences between each of them.

Table 2.1: Water management paradigms

	<i>Supply-side approach</i>	<i>Demand-Management</i>	<i>Soft path</i>
<i>Philosophy</i>	Water virtually limitless. Storing larger volumes	Water finite. Conservation. Efficiency	Water is finite and driven by ecological processes. Fundamental re-evaluation of the way we meet the services that water currently provides
<i>Approach</i>	Reactive	Short-term and temporary	Proactive - long term change focused on attitudinal change
<i>Fundamental Question</i>	How can we meet the future projected needs, given current trends and population Growth	How can we reduce needs for water to conserve the resource, save money and reduce environmental impacts	How can we deliver the services we currently provided by water in new ways that recognise the need for long-term systematic changes to achieve sustainability?
<i>Primary Focus</i>	Built infrastructure	Efficiency	Conservation
<i>Tools - disciplines</i>	Large scale - centralised engineering Solutions. E.g. Dams, reservoirs, distribution systems	Innovative engineering and market based solutions. E.g. Low-flow technologies. Drop irrigation	Full suite of social sciences, relies on decentralised distribution. E.g. Grey water re-use. Dry sanitation. Industrial innovation

Source: Adapted from Brandes et al. (2005 p. 7)

The soft path term was first coined in the energy sector by Lovins (1976) which argued that ‘hard’ energy technologies, such as centralised oil, gas and coal power generation, need to give way to ‘soft’ technologies such as small scale renewable sources. In other words, Lovins (1976) defined two paths to the future of energy generation and consumption: the hard path which entailed the use of big centralised non-renewables, or the soft path that involved the use of decentralised approaches to resource management.

More than 20 years later and using a similar rationale, Gleick (1998) put forward a soft path for water as a proposition for focusing more on the reduction of the demand rather than focusing on the supply (hard path) of this resource. This proposition aimed to provide an alternate paradigm that embraces the finite nature of water resources. In Gleick’s own words:

“A transition is under way to a ‘soft path’ that complements centralized physical infrastructure with lower cost community-scale systems, decentralized and open decision-making, water markets and equitable pricing, application of efficient technology, and environmental protection.” (Gleick, 2003, p. 1524)

In summary, three paths or routes to water management have been proposed to date (see Figure 2.1). The soft path for water is an alternate way to supply-side and demand management that embraces the benefits of these two paradigms but also takes into account environmental limits and social aspects of water (Gleick, 1998; Brooks, 2005; Brooks et al., 2015). The soft path for water is an alternative proposal that leads to sustainability.

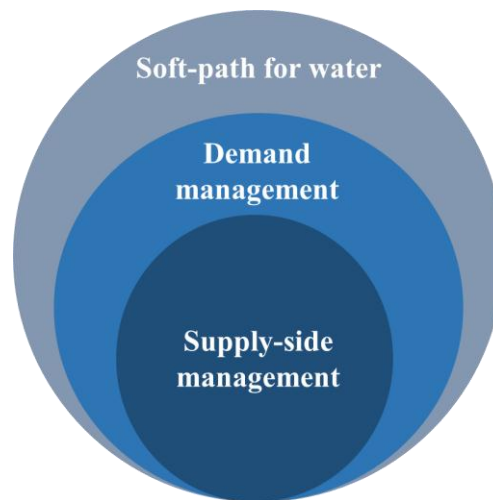


Figure 2.1: Water management approaches

The United Nations World Commission on Environment and Development (UNWCED, 1987, p. 41) defines sustainable development as the “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. Following this rationale, water sustainability can be defined as the present and future access to water resources in order to meet both human and ecological needs (Jones, 2010). The soft path is the route that leads to water sustainability as it acknowledges that water is not only a key resource for human development but also to the environment.

Integrated Water Resources Management (IWRM) is a philosophy formally introduced in 1992 in the International Conference on Water and Environment (ICWE, 1992). IWRM supposes water as an integral part of ecological, social and economic systems (Hassing et al., 2009). The Global Water Partnership (GWP, 2000, p. 22)

defines IWRM as a “process which promotes the co-ordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems”. In other words, it can be argued that IWRM and the soft path for water share the same ethos and recognise the importance on factoring the protection of water ecosystems and social aspects when managing water. In this thesis, both terms (soft path for water and IWRM) will be referred as the soft path for water.

There are six ways in which the hard path for water and the soft path for water differ (Wolff and Gleick, 2002). First, instead of continuously searching for new supplies of water, the soft path thinking advises individuals, companies and governments to work together for looking for new ways to meet their water needs. Second, a soft path implies the use of different qualities of water for different purposes, as the highest quality of this resource may not be required for all the activities that use water. For example, the same quality of water is not needed for drinking and for flushing the toilet. Third, investments in decentralised alternatives are as cost effective as those in centralised solutions. Fourth, a soft path means that environmental agencies and water companies need to work closely with water users. Fifth, the soft path take into account that ecological processes and, all the activities that depend on them, are services demanded by their customers, not just third parties. Sixth, the soft path for water recognises the complexity and importance of water economics.

The soft path for water philosophy is based on four principles (Brandes et al., 2009). First, water is treated as a service rather than an end, which means that water should be seen as the specific tasks it provides such as enabling plant growth, for the production of goods or for carrying away wastes. The only task in which water is seen as an end itself is drinking water. Second, in a soft path for water ecological sustainability is a priority. In this paradigm, nature is regarded as a user and consumer of freshwater and this is critical due to the ecosystem services³ it provides. Another principle is that water quality should match the requirements of the end use, a high

³ “Ecosystem services are the benefits people obtain from ecosystems. These include **provisioning services** such as food, water, timber, and fiber; **regulating services** that affect climate, floods, disease, wastes, and water quality; **cultural services** that provide recreational, aesthetic, and spiritual benefits; and **supporting services** such as soil formation, photosynthesis, and nutrient cycling” (MA, 2005, p. V)

quality of water is not required for all uses, and gives scope for initiatives like water re-use and recycling. Finally, a soft path requires planning back from the future to present also known as ‘backcasting’, which means that first a sustainable future status for society should be defined and then work backwards to connect present activities with future outcomes.

2.1.1 From theory to practice

The soft path for water is, in essence, a philosophy that envisages the sustainability of water resources. A soft path for water is a different way of thinking for embracing sustainability. In order to put principles in action, Brandes et al. (2009) argue that this philosophy can be put into practice both as an analytical method and a planning tool:

- As an analytical method in which a series of steps for putting the philosophy into practice are proposed.
- As a planning tool that can design steps for communities and organisations towards the route of a desired sustainable future.

An analytical method for a soft path analysis in the energy sector was first proposed by Lovins (1976). Based on this framework, Brooks and Holtz (2009a) and Brooks et al. (2009b) provided an outline for carrying out water soft path analyses following a nine-step methodology that could be applied at community, regional or watershed levels (see Figure 2.2)

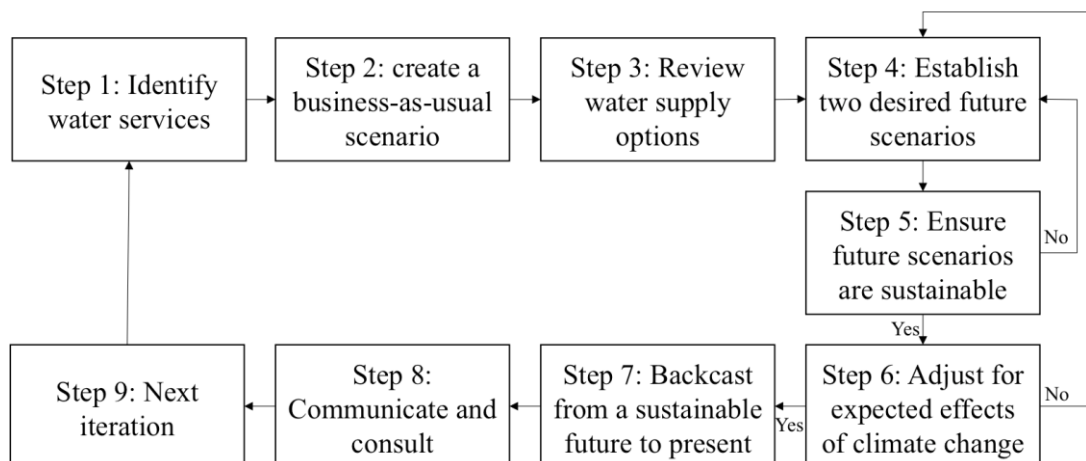


Figure 2.2: Soft path analysis steps

Source: Adapted from Brooks and Holtz (2009a, p. 162) and Brooks et al. (2009b, p. 265)

Step 1 in Figure 2.2 is the identification of all the services water provides and refers to the detection of the minimum quality of water required for each service. This step is based on the principle of water being treated as a service rather than an end.

Step 2 entails the creation of a business-as-usual scenario and target projections to a set year. Authors suggest carrying out this exercise using a minimum of 20 years ahead as they argue that soft path models are appropriate in a long-term vision. These projections also need to take into account future population, consuming and living patterns.

Step 3 is the review of water supply options, which implies the identification of all current sources of water and determine their current status (i.e. are they overused or degraded). This step implies the identification of thresholds of all water resources.

Step 4 implies the creation of two desired future scenarios in the year set in step 2. The first scenario is based mainly on efficiency (or demand management), in other words the implementation of water efficient technologies and processes. The second scenario introduces a blue sky element and the demand-management scenario is complemented with conservational measures such as behavioural change, changes in growth rates and economic structure.

Step 5 involves the evaluation of the desired future scenarios and ensures they are sustainable. The fundamental questions in this step involve: can water demands in both scenarios be met without negative impacts on the environment? Can they be met in low and average rainfall years? Can they be met without inter-basin transfers? Can they be met largely from renewable sources? If answers to these questions are 'no' then demands set in step 4 should be revised and cut down.

Step 6 is the adjustment of the desired scenarios for forecasted effects of climate change. These effects should include not only environmental effects on water availability but also on behaviour patterns such as the need for irrigation of crops for longer periods of time. If the supply and demand balance of such scenarios is not resilient against climate change effects, then reassess step 4 and demands.

Step 7 is to 'backcast' from a sustainable water future to present date, which means to define different paths or action plans to achieve the future designed in the scenarios of step 4.

Step 8 is the communication aspect of the process, is to seek for input from all stakeholders of the analysed community or region. It implies a consultation process that may alter the defined scenarios.

Step 9 is a re-iteration. The world and society are changing constantly, thus the process of soft path analyses should not be seen as a static exercise but rather as a framework based on adaptive management.

The methodology presented above has been applied to seven different case studies in urban regions in Canada and, to date, it appears to be the only country where such exercise has been formally carried out (Brooks et al., 2015; Brooks and Holtz, 2009a). In addition, other initiatives that share the same soft path philosophy, but that are not necessarily called soft path approaches, have been identified in other sites in the developed world. For example, in the US, Gleick et al. (1995) made a quantitative assessment of a water soft path development in California.

In addition, elements of a soft path approach have been found in places like England, the European Union and Australia. In 1989 in England⁴, the provision of water services was privatised and opened to competition and it is often cited as an example for the privatisation of this resource as it “is effective in providing an initial surge in capital investment, followed by an increased efficiency in management and service provision” (Walker, 2009, p. 208). However, although such competition in the market can encourage efficiency in supply and consumption, privatisation in England has not been successful on capturing the environmental and social values of water (Bakker, 2005).

In Europe, the Water Framework Directive (WFD) is a legal instrument set up in 2000 for “promoting the use of economic principles, tools and methods to enhance sustainable water management and enforce respective policy development in the European Union (EU) member countries” (Klawitter, 2009, p. 213). The WFD aims to protect and improve aquatic environments, promote a sustainable and equitable water use and meet the objectives of international agreements (EC, 2000). It can be argued that the WFD is a soft path approach as it goes beyond the conventional hard path and efficiency approaches and takes into account environmental and social

⁴ The analysis carried out in this study was done only in England. Northern Ireland, Scotland and Wales were not covered in this paper.

aspects. So far it has been proven to be adequate for promoting efficiency however, further efforts are needed for ensuring the fulfilment with “principles of integration, proportionality, policy relevance, gradualism, public participation and transparency” (Klawitter, 2009, p. 220).

In Australia, which is characterised as one of the driest areas in the world, soft path elements have been introduced in their water policy over the last decades. This has resulted in a paradigm shift from supply to demand management and planning processes have been designed for determining the amount of water for environmental services before the determination of what is left for consumption (Bjornlund and Kuehne, 2009).

Contributors to the soft path approach to water management have also found some elements of this philosophy in developing economies like South Africa, India and the Middle East and North Africa. However, they concluded that although the soft path approach is in principle applicable to all countries, developing regions need to centre their efforts on enhancing water governance and bridging the gap between policy and practice (Ahmed, 2009; Brooks, 2009; Jacobs and Turton, 2009; Brooks et al., 2015).

As it has been presented in this section, the soft path for water philosophy has been applied in different places at a regional scale across the world. There are however many areas in which further work and research are needed.

2.1.2 What is yet to be done?

Much research has been undertaken in the soft path for water philosophy and applicability areas. One of the most important lessons learnt through this process is that it is possible to think holistically about water. However, change is an inherent part of nature and society and several gaps need to be bridged for enhancing resilience and adapting soft path approaches to a changing world.

Brooks and Holtz (2009b) identify some limitations in soft path for water analyses. First, these exercises are data intensive, as they all need information on water consumption per region, by sector and by major end-uses. Such detailed data are often non-existent and this introduces a complexity in the process. This inherent nature of soft path studies means that such studies are time consuming, expensive and need a

team of researchers to engage with a range of areas such as policy makers and regulatory bodies.

Soft path analyses and tools were initially conceived to look inward at a particular community, this means that they do not take into consideration the import and export of water in a given society (Brooks and Holtz, 2009b). This water trade does not only account for the physical water exchanged (such as bottled water) but more importantly to the embedded water in goods and services also known as ‘virtual water’. This concept was proposed in a seminar in 1993 by J. A. Allan as a substitute to the ‘embedded water’ term (Allan, 2003). Virtual water is all the water needed throughout the whole cycle of a product, this includes for example the water consumed to grow agricultural goods and the one involved in their later processing (this concept is further expanded in section 2.2.1). As a result, in the processes of imports and exports of goods, societies are not only trading water in a physical way but also in a virtual way which in simple terms means that water environmental impacts are not only created in the community that is being evaluated but also in other geographical regions. To date, soft path approaches do not offer options for water conservation once water (either direct or virtual) crosses the borders of the analysed region (Brooks and Holtz, 2009b).

Brooks et al. (2009c, p. 263) clearly indicate that the challenge for future soft path thinkers and practitioners is less the technical concerns and “more the collective decision making that enables it”. The challenge is: “How can we turn ideas into action?” So far, soft path thinking and analysis seem to have been centred mainly at policy scales. A sustainable water management cannot be achieved without the engagement with all sectors in the society that use and consume water (which are virtually all). Studies like the one carried out by Wutich et al. (2014) aimed to evaluate how development and water scarcity levels influence people’s perceptions of hard path and soft path approaches. However, to date, only one study by Hendriks (2007) has aimed to evaluate the applicability of the water soft path concept in an industry (the Canadian pulp packaging sector). This study found that most of the scope for a soft path approach in the pulp industry was in the demand management area for gaining efficiencies in the internal processes.

Agriculture is the most water-intensive sector in the society as it accounts for 70% of the world's water withdrawals, while industry accounts for 20% and domestic use for 10% (CA, 2007; UN WWAP, 2012). Food is a sector that is directly related to agriculture and in a changing world with a growing population, increasing consumption trends and a changing climate, the world needs to find solutions for maintaining ecological services and growing food with less water. The food industry is an interesting case that joins both the agricultural and industrial sector into one; hence it results crucial to carry out initiatives for a sustainable water management in it. However, it was found that no formal soft path for water initiatives as such have been investigated in the food corporate sector. As indicated by Brooks et al. (2009c, p. 261) "clearly, soft paths still have much to learn about the food-water-environment nexus".

This research aims to contribute to the soft path for water debate and makes a proposition (or rather an interpretation) of the applicability of such philosophy in the food sector. For this reason, this review chapter discusses in the next section initiatives and concepts that have been proposed for a sustainable use and consumption of water in the corporate sector with special emphasis on the food area, all of which follow a similar rationale to the soft path for water philosophy.

2.2 Sustainable water management in the corporate sector

Water is a shared resource in the society and it is important to have public policies and regulations for its use, consumption and management. This process is also known as water governance which is the group of systems in place for managing water resources in the society (Rogers and Hall, 2003). As discussed in Section 2.1, this is the area in which soft path for water initiatives and debates have mainly focused on. Water specialists have mainly centred their efforts on research and analysis of public institutions and are less familiar with the corporate sector (Newborne and Mason, 2012). This highlights the importance on researching and examining ways in which the private sector can contribute to a sustainable water management whilst implementing a soft path for water in their strategies, which is the purpose of this thesis.

Companies require water to be able to produce their goods and services so, in effect, have an impact on these resources. The private sector should be particularly interested in the sustainability of water as it poses a risk to their businesses in four ways (Hoekstra, 2008a; Gleick et al., 2012). First, water is a physical risk to their operations and supply chains⁵ as water scarcity may have an impact on the freshwater available for the production of their goods. There is also a reputational risk (or “social licence”) as stated by Gouldson and Bebbington (2007, p.7) as companies’ image can be affected (either positively or negatively) when the public poses questions about their sustainable policies around water. In addition, there is also a regulatory risk as it is expected that governments’ policies in the water area will increase. In monetary terms, all of the aforementioned risks can impact on businesses’ revenues. Figure 2.3 provides a representation of how does water poses a risk to businesses.

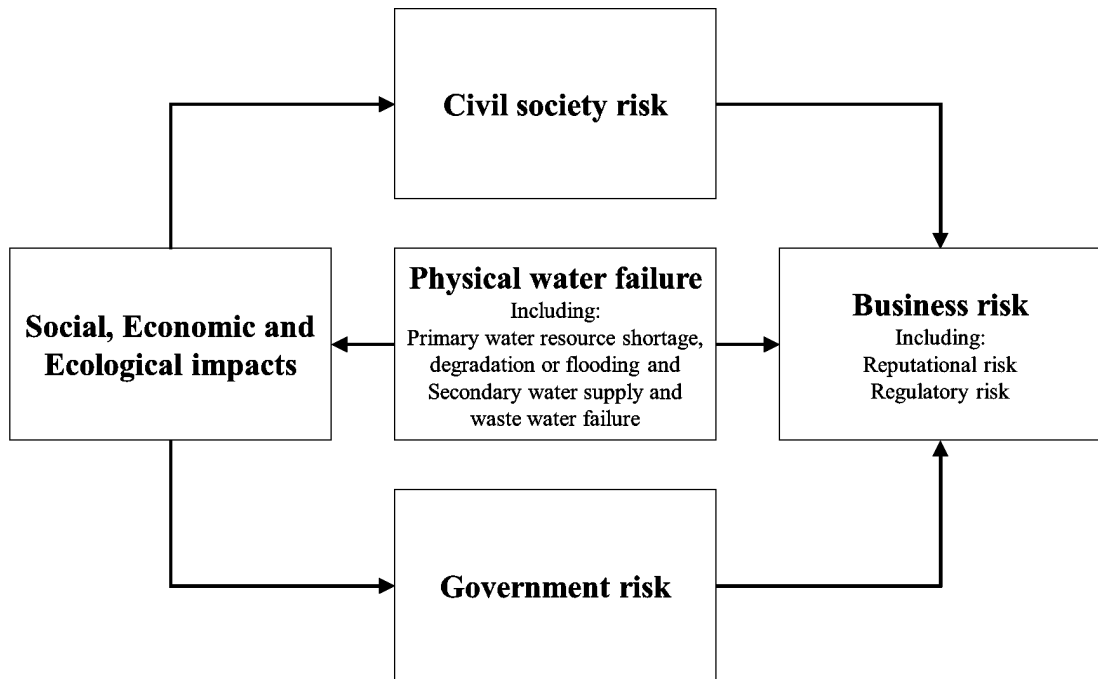


Figure 2.3: Water as a shared risk
Source: Adapted from Morrison et al. (2010, p. 30)

There are, however, initiatives that have started to tackle the issue and have provided advice and research in the corporate water consumption area. This section

⁵ “The supply chain is the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer.” (Christopher, 2011, p.15)

provides an overview of the on-going efforts for incorporating soft path thinking elements in the business sector. Paradigm shifting proposals are discussed in section 2.2.1. Moreover, efforts carried out in the corporate strategies area are presented in section 2.2.2.

2.2.1 Virtual water and Water footprint concepts

Virtual water⁶, first introduced by Allan (1998)⁷, is defined as the embedded water “used to produce a product or service, including water consumed in production and not physically present in the product” (Ridoutt et al., 2009, p. 1228). In other words, virtual water is then all the water consumed in the life cycle of a product (Hoekstra and Chapagain, 2008; Brown et al., 2009; Allan, 2011). Water can be colour coded in two categories: blue and green (Chapagain and Orr, 2008). Virtual water accounts for two types of water – terminology that was first introduced by Falkenmark (1995) – blue refers to what we normally think of water, this is the water available in rivers, lakes and aquifers. On the other hand, green water is the water that does not flow to recharge groundwater bodies but stays stored in the soil for plant growth and functioning. The distinction between these two ‘types’ of water is of special interest for this study as for the production of food, green water accounts for 92% of the water consumed whilst blue water for 8% (Allan et al., 2015, p. 308). It is important to make a distinction between the verbs ‘consume’ and ‘use’ when talking about the two types of water. Green water is ‘consumed’ because it cannot be reused, whilst blue water is ‘used’ because it can be reused if treated (see section 1.1). As a result, companies from the food sector need to pay special attention to the water consumed at the farm level, as there is where most of the impact on water resources is being done.

The world is constantly changing, not only in socio-environmental terms but also in production and trade patterns, which has resulted in the globalised reality we have today. Globalisation can be seen from different perspectives, but for the purpose of this research it refers to the international trade of products as well as the complex

⁶ Prior to Allan (1998), water sustainability researchers used the term ‘embedded water’ but such term seemed to have not gained momentum. The term virtual water has proven to have an immediate impact and people seem to accept it as a valid metaphor (Allan, 2003).

⁷ Although the virtual water concept was only published by J. A. Allan in 1998, the idea was first coined in 1993 by the same author (Allan, 2003, p. 4).

supply chains that businesses have. In all of these global processes, virtual water is transferred constantly not only between nations but also between regions. For example, food and textile products are imported and exported all the time throughout the world. In other words, through consumption people are effectively creating environmental impacts on water resources that are not necessarily in a near geographical proximity (Hoekstra, 2013). In an effort to calculate such impacts, Arjen Hoekstra and his team have dedicated the last decade to the assessment and calculation of the content of virtual water in different products (Water Footprint Network, 2014). In order to illustrate this, Figure 2.4 presents an example of the virtual water content of some common products. (For an online interactive platform see Rausch and Kekeritz, 2015)

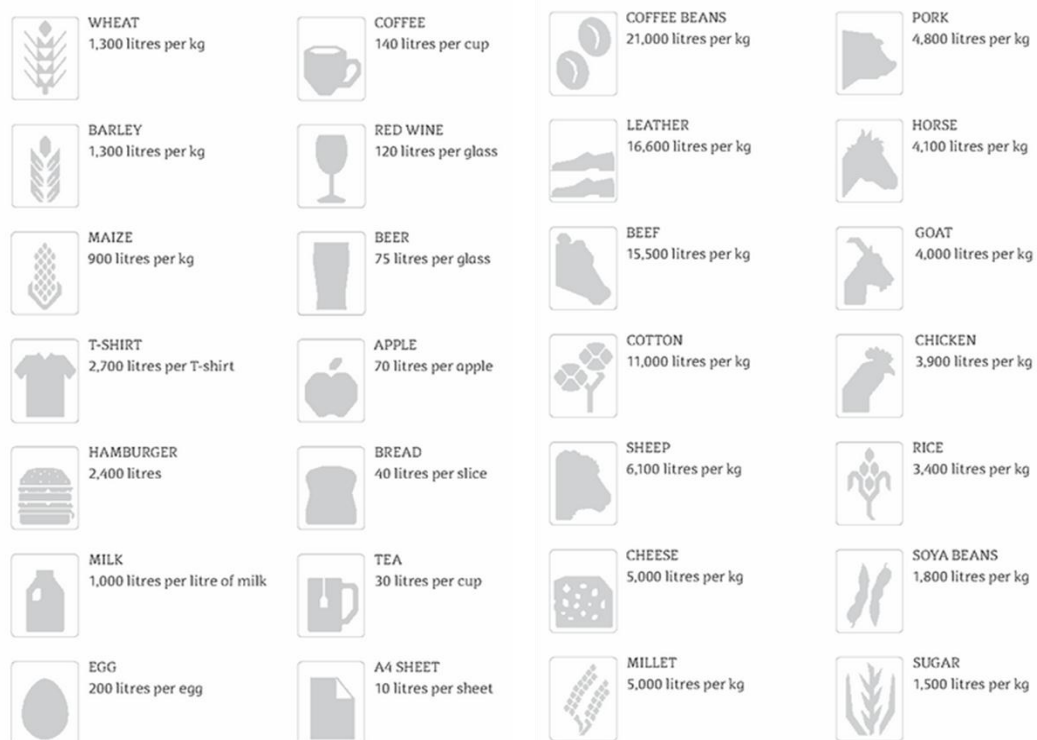


Figure 2.4: Virtual water of products
Source: Allan (2011, p. ‘The Virtual Water Gallery’)

As discussed in section 2.1, so far studies in the soft path for water area have not taken into consideration the virtual water transferred between regions and nations. The soft path for water philosophy, however, is grounded in the viewpoint of embracing an alternate way to water management for promoting conservation of this resource in the society. Virtual water and accounting provide an interesting concept

and tool for considering the impact on water resources generated in other geographical locations.

In 2003, Arjen Hoekstra introduced the concept of water footprint (Hoekstra, 2003). Similar to the carbon footprint rationale, the water footprint is an indicator that refers to the total amount of water used and consumed, directly and indirectly, by consumers or producers (Hoekstra and Chapagain, 2007; Hoekstra, 2013). The concept can be applied at different levels such as individuals, communities and businesses. The virtual water and water footprint concepts are closely interrelated, their only difference is that water footprint is also applied at the consumer level and provides more information on when and where water is used and consumed (Velásquez et al., 2011; Water Footprint Network, 2014).

The water footprint is an indicator that shows, geographically and temporally, all the water consumption of the analysed entity in terms of volumes by source and pollution (Chapagain and Hoekstra, 2008; Hoekstra, 2013). The water footprint is divided into three components: blue, green and grey water footprints. Blue is the consumption of blue water resources, such as water from lakes, rivers and ground water, throughout all the steps of a product. The blue water footprint excludes the blue water that is returned to the source from which it was extracted. Green, is the rain water that does not run off and stays in the soil and plants. Furthermore, grey is the volume of water that has been polluted through the process.

The water footprint is a holistic approach that goes beyond the traditional water management practices, which focused only on the direct use of blue water. In contrast, the water footprint looks not only at the direct water use but also at its indirect water consumption. This feature gives potential to the water footprint to contribute to the water sustainability and the accountability of impacts debate (Hoekstra, 2013). A thorough water footprint methodology has been developed for this purpose and further information can be found in Hoekstra et al. (2011).

Water is a public common resource and its sustainable management and governance is a responsibility for all sectors in society. These processes have often been tackled separately. The direct water consumed by individual is frequently seen solely as the individual's responsibility, in the same way direct water consumed by companies is seen only as businesses' responsibility. The water footprint

philosophy and methodology provide an opportunity for starting to think and act on the cumulative impacts of daily consumption on the water environment.

Individual consumers should have more informed choices on the products they buy and use and the water footprints associated with them. Businesses should centre their corporate social responsibility strategies towards the sustainable management of water in their supply chains, as it has been proven that here is where most of water withdrawals take place, especially for the companies that rely on agriculture such as the food industry. Additionally, governments need to guide consumers and producers in this journey and establish policies and regulations that integrate all the principles discussed in this section not only in their water policies but also in the agricultural, energy and trade domains (Hoekstra 2013).

This research is focused on the businesses sector and aims to investigate ways in which this area can incorporate soft path for water principles in their policies. Special attention is given to the food industry because, as it has been discussed, it accounts for large water withdrawals and impacts, especially in their supply chains. An area this thesis aims to investigate is the extent to which businesses embed in their corporate strategies the understanding of the overall water footprints their products account for, and the actions taken in order to reduce such impacts. The next section provides a review of initiatives that have focused on the sustainable water management in the corporate social responsibility field.

2.2.2 Corporate social responsibility and water stewardship

The reasons for businesses' responsibilities on evaluating and minimising their impact on water resources have already been discussed. Nowadays, it could be argued that there is an increased awareness of the importance on businesses working towards this direction⁸. The concept of corporate social responsibility (CSR) is not recent as it can be tracked back to the early 30s (Whitehouse, 2003), and yet there is not a general consensus on the specific meaning and methods of this term (Whitehouse, 2003; Gouldson, 2006; Baden and Harwood, 2013; Jones et al., 2014). This variety of

⁸ This has not always been the case, Friedman (1970) is well-known for stating that companies have no further responsibilities apart from complying with law and regulation as well as maximising returns for their shareholders.

definitions can range from simply philanthropy to a way companies have for addressing their social and environmental impacts (Whitehouse 2003; Baden and Harwood, 2013). This research shares the same philosophy with the latter and for this reason the European Commissions' definition of CSR is used:

[CSR is] *“The responsibility of enterprises for their impacts on society. Respect for applicable legislation, and for collective agreements between social partners, is a prerequisite for meeting that responsibility. To fully meet their corporate social responsibility, enterprises should have in place a process to integrate social, environmental, ethical, human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders, with the aim of: – maximising the creation of shared value for their owners/shareholders and for their other stakeholders and society at large; – identifying, preventing and mitigating their possible adverse impacts”*. (EC, 2011, p. 6)

Within those who agree with the meaning of CSR as a concept that involves a shared responsibility on social and environmental impacts, as the definition stated by the European Commission (EC, 2011), there is also disagreement of what does it actually imply (Whitehouse, 2003; Baden and Harwood, 2013; Jones et al., 2014). Baden and Harwood (2013) attribute this, partially, to the ambiguity involved in the term, and more broadly on the sustainable development concept. As a result, when businesses mention sustainability and/or CSR there is little certainty on whether everyone is referring to the same thing. This points towards the need for working on a framework for businesses to embed principles and actions to mitigate their impact on society and on the natural environment. This research aims to propose a framework for doing so in the water management area.

Water and its adequate management pose different risks to companies, which include among others: reputation, physical access to water and regulatory risk. As a result, companies have started to include water as a key part of their CSR policies. Lambooy (2011) summarises a series of guidelines and tools that have been created for this purpose. A widely used family of standards is ISO 14000, which “addresses various aspects of environmental management” and “provides practical tools for companies and organisations looking to identify and control their environmental impact and constantly improve their environmental performance” (ISO, 2014a, website). It is worth noting that since 2014 the ISO 14000 group of standards include the ISO 14046:2014 which specifies “guidelines related to water footprint assessment of products, processes and organisations based on life cycle assessment” (ISO, 2014b,

website). This research aims to only assess if there is an overall understanding of the water footprint companies account for, without explicitly evaluating their ISO's implementation given that the specific standard on water footprint is fairly recent.

There are other initiatives like the OECD guidelines for multinational enterprises that “provide voluntary principles and standards for responsible business conduct consistent with applicable laws” (OECD, 2008, p. 9). Although the OECD guidelines cover the environment in section V of the document, water is not explicitly addressed (OECD, 2008, p. 19). The UN Global compact “works with businesses in the realms of human rights, labour, environment and anti-corruption” (GC, 2014, p. 3). In the UN initiative, water is a core aspect. There is also a water-dedicated framework proposed by the UN called the CEO Water Mandate, which aims “to assist companies in the development, implementation and disclosure of water sustainability policies and practices” (GC, 2013, p. 1). This research aims to investigate if there is evidence of companies implementing the guidance given by these international organisations.

All of these initiatives share common values in which the protection of the environment and society are addressed. However, it should be noted that all CSR efforts, guidelines and initiatives remain so far voluntary in nature but with the increasing risk that water and other socio-environmental aspects pose to businesses these are likely to become regulation in the future (Baden and Harwood, 2013).

There is a particular scheme called the Alliance for Water Stewardship that combines many of the initiatives discussed in this section. In 2008, three worldwide-recognised organisations founded this scheme: the Nature Conservancy, the Pacific Institute and Water Stewardship Australia. Since then, they were joined by the Carbon Disclosure Project, European Water Partnership, WWF, UN Global Compact's CEO Water Mandate, Water Witness International and UNEP (AWS, 2013).

The water stewardship concept is defined as “the use of water that is socially equitable, environmentally sustainable and economically beneficial, achieved through a stake-holder inclusive process that involves site and catchment based actions” (AWS, 2013, p. 3). The key term in this definition is ‘catchment’. This means that the framework is mainly focused on the local environmental impacts and does not directly address the impacts derived from the supply chain.

The Alliance for Water Stewardship has developed a standard organised in six steps (see Figure 2.5) with the following outcomes (AWS, 2013):

- Good water governance: governance in this aspect refers to both internal and external governance. The first refers to the internal procedures and policies adopted for managing water. The second one is the mechanisms in place to ensure that water is managed equitably for all.
- Sustainable water balance: the standard aims to be implemented collectively with all the water users on a given catchment and aims to address the water quantity thresholds in such area.
- Good water quality status: the standard aims to address quality-related impacts on water to maintain healthy ecosystems.
- Healthy status of important water-related areas: it addresses the specific “areas of a catchment that if impaired or lost, would adversely impact the environmental, social, cultural or economic benefits derived from the catchment in a significant or disproportionate manner and whether those areas are in a state of good health” (AWS, 2014, p. 9)



Figure 2.5: Steps for the Alliance for Water Stewardship standard
Source: AWS (2014, p. 6)⁹

⁹ For more information about the criteria and indicators refer to AWS (2013)

The six steps for the Alliance for Water Stewardship standard are organised in a continuous improvement model (see Figure 2.5). Step 1 is the commitment for being a water steward, which means the establishment of leadership commitment from top managerial members, the development of a water stewardship policy and the commitment to other water-related activities. Step 2 entails the gathering of data to understand water risks and impacts. Step 3 is the development of a water stewardship plan on how to improve the catchment area status and the company's performance. Step 4 is the implementation of the plan developed in step 3. Step 5 is the evaluation of performance whereas step 6 entails the communication of the companies' water aspects and the disclosure of water stewardship efforts (AWS, 2013).

The Alliance for Water Stewardship standard addresses only the water impacts of a specific catchment area. In contrast, WWF (2013, p. 1) define water stewardship for businesses in a broader sense as the "progression of increased improvement of water use and reduction in the water-related impacts of internal and value chain operations". This distinction is key because it combines the principles of the soft path philosophy as well as those embedded on the virtual water and water footprint concepts.

WWF (2013) state that for businesses to become water stewards they need to conceive water as an integrated resource that has connections with all areas in the society such as health, energy and agriculture. Specifically, they propose five steps for adopting water stewardship in a company's water strategy (see Figure 2.6). All these steps aim for companies to understand all the activities they can engage in, in order to reduce their water-related impacts and strive for a sustainable water management.

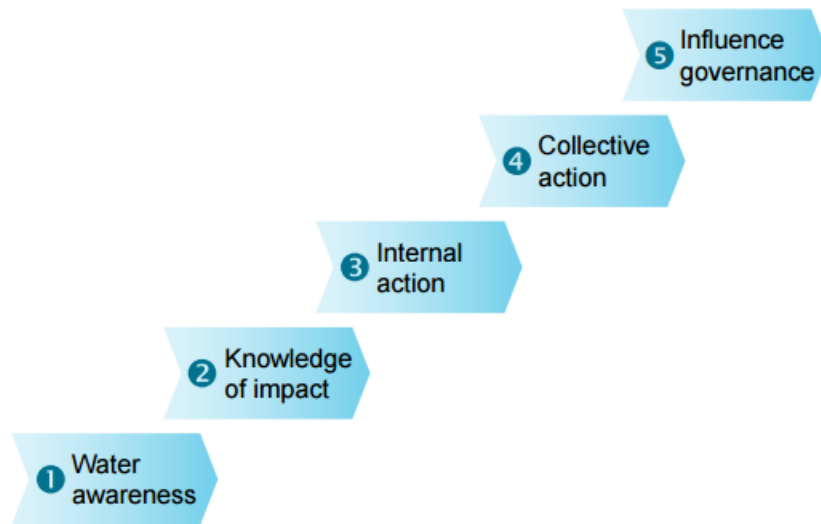


Figure 2.6: Steps for the water stewardship for businesses
Source: WWF (2013, p. 14)

The five steps for businesses water stewardship should not be seen in isolation or in a sequential fashion. They all can be undertaken in parallel or in a different order and will often overlap. In a similar way to the soft path for water philosophy, the water stewardship concept acknowledges that a sustainable water management needs to be done in an integrated way that goes beyond the simple adoption of efficiency. Following is the description of the five steps for a better understanding of what activities companies can do for implementing water stewardship (WWF, 2013):

1. *Water awareness:* companies need to have an awareness of general water sustainability issues and debates in social, environmental and economic terms and, more importantly, the roles they play in such debates. All levels in the company (from CEOs to plant managers and suppliers) should have an awareness of the water situation both globally and locally.
2. *Knowledge of impact:* this refers to the understanding of where the companies' impact on water resources are, where are suppliers located and what are their dependencies on water in terms of quality and quantity. The impact of the companies' operations on water and how does this affect people and ecosystems is key.

3. *Internal action:* this means an engagement with employees, buyers and suppliers to establish potential opportunities as well as risks for the company with regards of water.
4. *Collective action:* this implies an engagement with external stakeholders such as customers, communities, NGOs and other companies. The forms of water stewardship partnerships can vary from place to place which will depend on the presence of appropriate partners, the degree of development and the willingness to engage
5. *Influence on governance:* water governance refers to the political, social and economic and administrative systems in place to manage water resources and the delivery of water services at different levels of the society (GWP, 2002). A successful engagement needs businesses to be aligned with the broader public interest. This can be done with the collaboration of NGOs, business coalitions and also acting as individuals.

The water stewardship concept provides guidelines for the responsible management and planning of water resources grounded in the philosophy that all water users have the responsibility for managing them sustainably (Jones et al., 2014; Orr and Pegram, 2014). However, although AWS (2013) and WWF (2013) provide guidance on how to become water stewards, there are “no clear, agreed or definitive international standards for water stewardship disclosure” (Jones et al., 2015, p. 122). This results in little evidence of independent external evaluation of water stewardship being implemented in the corporate sector (Jones et al., 2015). As stated by WWF (2013, p. 22) “there is an urgent need for informed, pragmatic watchdogs on company actions”. This research aims to propose a way for assessing the implementation of soft path for water, water footprint and water stewardship principles in the strategies of companies from the food sector.

Throughout this chapter several gaps in knowledge across all the discussed initiatives have been identified. First, the soft path for water philosophy has been proposed as a way for embedding sustainability principles in the way we manage water as it recognises the value of ecosystem services as well as the importance of engaging with stakeholders. This philosophy has so far been implemented at regional levels and no formal initiatives have been investigated for the corporate sector, specifically the

food sector, which is the focus of this research. However, initiatives for implementing sustainable use of water principles in the corporate sector have been identified. This is the case of concepts like virtual water and water footprint that aim to account for the impact on water resources in each step of the value chain of a product; or the efforts carried out through the water stewardship framework to embed water sustainability in corporate social responsibility strategies.

All the initiatives presented in this chapter have provided a positive discussion on ways in which water can be managed more sustainably with special emphasis on the corporate sector. However, what has been found is the need for a framework that enables the evaluation of the implementation of all of these initiatives in the companies. This is the reason why this research aims to contribute to this discussion and proposes a framework in which this can be done. This study is specifically centred on the food sector, as it is where most of the world's water withdrawals take place. The next section provides an overview of the issues companies from this sector need to face.

2.3 Responsibility for companies in the food sector

Water is a stressed resource in which we all are dependent on. Currently agriculture accounts for 70% of the blue water¹⁰ used in the world, while 20% is used by industry and 10% for domestic use (CA, 2007, p. 5). Moreover, the water footprint of products that depend on agriculture is comprised by 92% green water¹¹ and 8% blue water (Allan et al., 2015). Products like food and clothes rely on agriculture, and thus on water, for their production. Food demand is estimated to nearly double in the coming 50 years (CA, 2007). The two causes for these projections are likely to be population growth and a change in diets (CA, 2007). The current stress on water resources is likely to increase due to factors like climate change and population and economic growths. In a 'business as usual' scenario, it is estimated that the amount of water consumed by "agriculture will increase by 70%-90% by 2050" (CA, 2007, p. 14). It is probable that if today's food production and environmental trends continue, food and water crises will arise in many parts of the world (CA, 2007). The current

¹⁰ For the definition of blue water please refer to section 2.2.1

¹¹ For the definition of green water water please refer to section 2.2.1

and future strains on water resources highlight the importance of finding ways in which water can be better managed in the food sector.

Water is a main resource in the food industry, in both direct and indirect ways. In a direct way, water is used for processes like cooling, boiling, cleaning and pasteurisation. As discussed in section 2.2, indirect water consumption for this industry involves all the water used for growing food in agriculture. As a result, companies that belong to this sector need to address the risks that water pose to their businesses and seek for holistic strategies for the reduction of their impact on water resources.

This research examines UK-based companies as a case study for evaluating ways in which soft path for water principles can be adopted in the food sector. The UK is a nation that consumes a wide range of products. Chapagain and Orr (2008) calculated the UK's water footprint with specific emphasis on the impact of the nation's food and fibre consumption on global water resources. As discussed in section 2.2.1, the water footprint, of a nation in this case, is the sum of both direct and indirect uses and consumption of water. Figure 2.7 provides a schematic of the way in which the UK's water footprint was calculated.

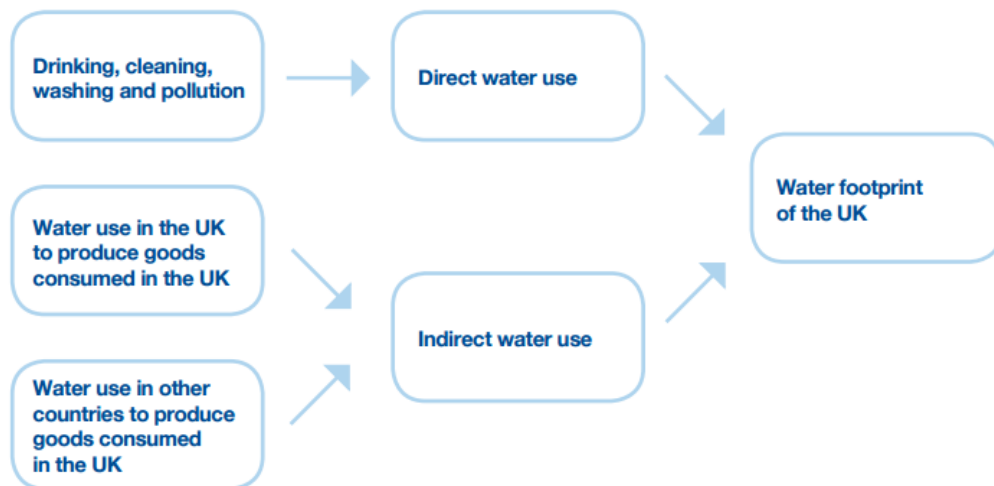


Figure 2.7: UK's water footprint calculation
Source: Chapagain and Orr (2008, p. 12)

In the UK's water footprint calculation, Chapagain and Orr indicate that it is equal to 102 billion cubic metres per year, which is the equivalent of 4,645 litres per

person on a day (Chapagain and Orr, 2008, p. 13). To put these figures on perspective, the total water footprint of a person in a day is equivalent to 50 bathtubs. The agricultural water footprint of the nation equates to 73% of its total water footprint, most of which is water abstracted outside the UK. As Figure 2.7 points out, these numbers account for not only the direct use of water but also for the indirect consumption (or virtual water) of goods produced outside the UK. This virtual water comes mostly from the water that has been used in agriculture for growing food and cotton for the nations' consumption.

The UK's water footprint is high, and it is therefore crucial for all sectors in the society to address this issue. As it has been shown, food consumption patterns in the UK account for much of the country's water footprint. As a result, UK-based food businesses need to look for ways of managing water more sustainably both in their internal processes and across their value chains. Chapagain and Orr (2008) propose ways in which this can be done, and this research aims to evaluate if businesses are carrying out the following:

- Companies need to better understand water and its related issues in social, economic and environmental terms.
- Businesses need to calculate their water footprints and strive for the reduction of impacts in areas where water is scarce.
- Similarly, they need to examine the volumes and impact of water throughout their supply chain.
- Companies can also press for a sustainable water management in conjunction with other businesses, NGOs and academia.
- Businesses need to communicate their water management achievements.
- It is very important for businesses to think and act beyond their own water footprints.

Ingram et al. (2013) have also identified the need for a better management of water in a study in which priority research questions for the UK's food system are proposed. This study, funded by the UK Global Food security Programme, gathered opinions from a wide range of academics, policy makers, NGOs and companies that aimed to identify key research questions that need to be addressed for warranting a future food security. Two of the questions proposed by Ingram et al. (2013) are of

special interest for the research carried out for this thesis: “how can water resources be better managed to improve water-use efficiency for food production?” ... “How can the sustainability of UK primary production be improved without expanding our social and environmental footprint overseas?” (Ingram et al., 2013, p. 625).

Throughout this chapter the need for shifting the paradigm in the water management area has been discussed. The soft path for water concept provides a philosophy that embraces this and addresses water-related issues in a holistic way that take into consideration social and environmental aspects. A research gap was identified in the soft path for water field for the application of its principles in the corporate sector. In addition, efforts in the business sector for managing water more sustainably were also identified and the concepts of virtual water, water footprint and the addressing of water in corporate social responsibility strategies were discussed. However, it was found that there is a need for a framework that translates all these ideas into action and proposes specific steps that companies can adopt for moving towards a soft path for water in the sector.

The food sector worldwide accounts for much of the global water withdrawals. Water issues are global, however each country and sector needs to strive for its better management. This research centres its efforts in the UK scenario as it was found that the impact on water resources (both internal and external) derived from the consumption of food is high. As a result, this research aims to investigate how all the initiatives and efforts discussed in this chapter could be integrated into one framework that promotes the sustainable use and consumption of water in the food corporate sector, and specifically the UK food sector is used as a case study. The next chapter discusses the methodology followed to address this question.

Chapter 3

Methodology

*The real voyage of discovery consists not
in seeking new landscapes but in having
new eyes*
- Marcel Proust

This chapter describes the method used to evaluate the extent of adoption of a soft path for water in the food corporate sector. Chapter 2 offered a review on the relevant literature and the existing gaps in knowledge with regards of a sustainable use and consumption of water in the food industry sector. This research is a first attempt to explore a proposition of a soft path for water for the corporate sector. For this reason, an investigation of what a soft path for water entails for businesses was needed.

This was done in a three-step fashion. First, an initial exploratory study was carried out in order to investigate whether the soft path for water had been adopted in the corporate sector in Scotland (section 3.1). Results obtained from this initial study indicated what had been found through the review of literature (chapter 2), which is a lack of adoption of a soft path for water approach in the corporate sector. Second, a consultation with experts in the water sustainability area was carried out in order to define the elements a soft path for water would have when applied to the food and drink industry (section 3.2). Food is the sector that withdraws the highest amount of water across the globe and thus it was chosen as part of this research. Step three the design of a framework for measuring a soft path for water adoption by companies in the food and drink sector (section 3.3). The designed framework was then tested with a sample of 67 companies belonging to the UK's food and drink industry (section 3.4)

3.1 Exploratory study – ‘Strathlinks’

Through the review of literature it was found the lack of a clear criteria, model or framework for adopting soft path for water principles in the corporate sector. This is the reason why an exploratory study was carried out in order to investigate if soft path for water techniques had been adopted across different sectors in Scotland.

A research project was carried out for a period of 24 weeks (4th July 2011 - 16th December 2011) in order to investigate the business opportunity to develop a management protocol using soft path techniques to assist business users. The work was carried out between the former David Livingstone Centre for Sustainability (DLCS)¹² of the University of Strathclyde and CookPrior Associates Ltd¹³. The study was assigned under the ‘Strathlinks’ name and four researchers were involved in the project, Table 3.1 presents their profiles.

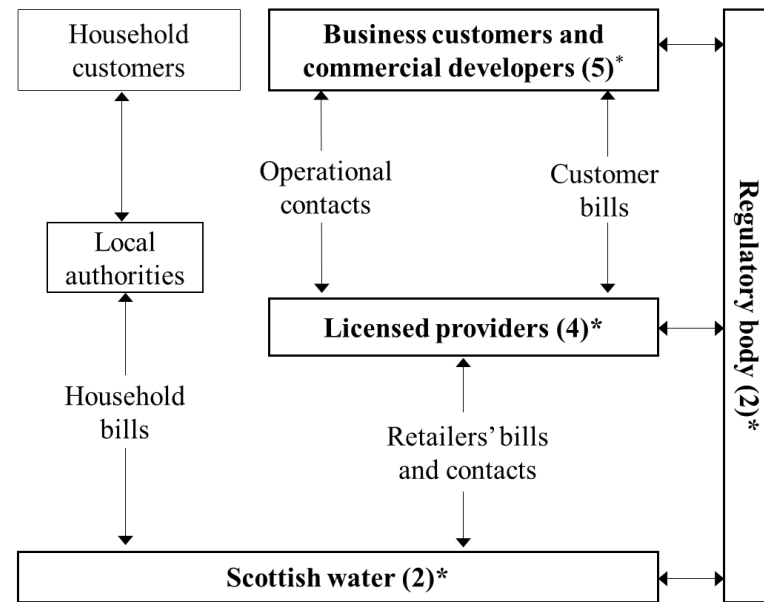
Table 3.1: Strathlinks exploratory project researchers

<i>Name</i>	<i>Strathlinks role</i>	<i>Profile</i>
Peter Booth	Principal investigator	Former Lecturer and Director of the David Livingstone Centre for Sustainability in the University of Strathclyde.
Kevin Prior	Company partner	Director of CookPrior Associates Ltd, a regionally based environment and water consultancy located in the Scottish Borders. Process chemist with more than 35 years of experience in the water sector. His experience covers a vast range of areas including operational science, trade effluent management and the implementation of regulatory policies in the UK. He has been involved in the development of organisational strategies for the sustainable use of water. In addition, he has been an honorary lecturer at the Universities of Strathclyde and Manchester. Currently he is the Chair of the Water Science Forum of the Royal Society of Chemistry. (Royal society of Chemistry, 2015)
Philip Graves	Researcher	SEPA (Scottish Environmental Protection Agency) Business consultant and alumnus of the MSc in Environmental Studies from the University of Strathclyde.
Catalina Silva-Plata	Researcher	Alumna of the MSc in Environmental Entrepreneurship from the University of Strathclyde. PhD researcher from the Department of Civil and Environmental Engineering (Former David Livingstone Centre for Sustainability), University of Strathclyde

¹² The University of Strathclyde David Livingstone Centre for Sustainability DLCS was fully merged in 2014 with the Department of Civil Engineering. The new department it is now known as the Department of Civil and Environmental Engineering.

¹³ CookPrior Associates Ltd is a consultancy whose mission is to help organisations become more environmentally and economically sustainable. They carry out assessments of strategy, policy and implementation challenges and have experience in water, chemical, food, drink and process industries.

The opening to competition of the water industry in 2008 in the non-domestic sector in Scotland was a consequence of a long “process of industrial and regulatory restructuring in a country renowned for its attachment to exclusive public sector provision of utility services” (Sawkins, 2012, p22). As a result, the market split into two main sectors: domestic and non-domestic (see Figure 3.1). Since the opening to competition, licensed water providers (LPs) were created to be the retailers in the non-domestic market. Up to 2011, five LPs were registered in the market: LP1 (license since Jan 2008); LP2 (license since Apr 2009); LP3 (license since Apr 2008); LP4 (license since Aug 2007) and LP5 (license since Oct 2009) (Sawkins, 2012, p. 28). The Strathlinks project aimed to analyse whether the introduction of retail competition has encouraged licensed providers to compete much more on service such as offering advice on water efficiency and other demand management measures.



Key: * Number of interviews carried out for each group

Figure 3.1: Structure of the water industry in Scotland
 Source: Silva-Plata and Graves (2011, p. 2) and Silva-Plata (2012, p. 6)

The purpose of Strathlinks was to evaluate whether the opening to competition in the water market in Scotland has facilitated the sustainable use of water. Ultimately, this was done with the aim of setting a starting point to analyse the possibility for adopting a soft path approach in the country. This section will first describe the methodology used for the exploratory study used as part of this research and will then

present the preliminary results that informed this thesis methodology for proposing a soft path for water approach for the food industry.

3.1.1 Exploratory study methodology

The research in this thesis is an effort of proposing a soft path for water approach for the corporate sector. In other words, it attempts to build a new approach from observations, which is the basis for inductive research (Silverman, 2005; Bryman, 2012). In inductive studies, qualitative research provides a suitable strategy as it is grounded in a constructivism ontological position. This means that phenomena are not only produced through social interactions but they are in a constant state of revision (Bryman, 2012). Semi-structured interviews were employed to capture the interviewees' views of the role of competition in Scotland and its contribution in facilitating the sustainable use of water. Participants were chosen according to their roles in the water sector (see Figure 3.1). In total thirteen interviews averaging an hour were carried out by two researchers: Philip Graves and Catalina Silva-Plata. Audio recordings were avoided so as to encourage more forthright views.

The methodology set out to cover all levels of the non-domestic industry in Scotland. Figure 3.2 shows in detail the type and date of the interviews. There were two levels at which the research focused. First, a macro level comprising the regulators WIC (Water Industry Commission for Scotland) and CMA (Central Market Agency), and the domestic water supplier in Scotland: Scottish Water. In addition, the micro level comprised interviews with four out of five LPs, who provide a retail service directly to business customers, and a sample of customers.

Interviews		
Regulator	Date	Type
Central Market Agency	28-Sep-11	M
Water Industry Commission - Scotland	28-Sep-11	M

Scottish Water	Date	Type
Scottish Water Horizons	19-Jul-11	M
Water Wholesaler	4-Aug-11	M

Licensed Providers (LPs)	Date	Type
LP1	13-Oct-2011	M
LP2	9-Nov-2011	P
LP3	10-Oct-2011	E
LP4	4-Oct-2011	M
LP5	n/a	n/a

Non-domestic customers	Date	Type
Recommended customers by LPs		
A (City council)	9-Nov-2011	M
B (Hospital)	17-Nov-2011	P
C (Food retailer)	17-Nov-2011	P
Customers approached independently		
D (Dairy)	8-Nov-2011	M
E (Drinks)	7-Nov-2011	P

Key: M – meeting, P – phonecall, E – email

Figure 3.2: Exploratory study interviews
Source: Silva-Plata and Graves (2011, p. 3) and Silva-Plata (2012, p. 7)

The first interview was Scottish Water Horizons, a Scottish Water subsidiary focused on the renewable sector, which provided a useful access point to the industry and a source of important contacts. Following this, a series of interviews were carried out with representatives from each stakeholder group.

Meetings with both regulators (WIC and CMA) followed. Interviews with four LPs were then arranged according to availability. From a methodological perspective, it was important to capture the opinions from business customers to determine if they had implemented soft path for water techniques. As a result, a small sample of consumers was selected. LPs recommended three of their customers (named A, B and C for confidentiality purposes). In addition, two more customers (D and E) were approached independently.

Questions were designed to provide a framework for the interviews. Their purpose was to explore whether competition had encouraged the implementation of sustainable measures such as water efficiency and demand management and ultimately encouraged the adoption of a soft path for water. All participants received a copy of the questions for the semi-structured interviews in advance. The questions were:

- What and how have reductions in water usage been achieved in recent years?
- Why have you sought these savings?
- What are the drivers and who initiated them?

- Has the opening up of retail competition in Scotland made any difference?

The study used semi-structured interviews, a recognised tool for data collection when carrying out qualitative research (Francfort-Nachmias and Nachmias, 1992). In the interviews, the two researchers in charge of data collection took notes. Grounded theory was used to analyse the gathered data (Silverman, 2011). The results obtained from this study were presented as a poster in the International Water Association Congress on Water, Climate and Energy held in Dublin in May 2012 (see Appendix 1). The next section discusses the findings derived from the data analysis of the exploratory study.

3.1.2 Exploratory study preliminary results

The interviews described in section 3.1.1 revealed a wide degree of agreement between LPs and customers alike that opening the retail market to competition had improved service levels, reduced prices and in some instances produced some significant volume savings. The regulators believed it was too early to expect these savings to appear in the national consumption figures due to the poor quality of historic data, though competition itself seemed to be driving improvements in the quality of data.

Whilst the main LP still retained the vast majority of the market, the arrival of new entrants in 2008 had forced them to defend its customer base by matching the value-added services and price reductions offered by the competition. Initial emphasis seems to have been on reducing effluent costs, and introducing more extensive metering so as to tackle leakage levels. From the customers' point of view these measures were generally not introduced with sustainability in mind, but the consequences, such as reduced demand and increased recycling is an indirect by-product of a cost-cutting agenda, in much the same way reducing energy costs reduces carbon emissions.

Throughout the discussions the word 'sustainability' was hardly used, with a preference for 'innovation' and 'water efficiency'. There was no mention either of the concept of soft path by any of the interviewees. These results pointed out what was found through the review of literature, and this is the lack of proposition of a soft path for water approach for the corporate sector. Agriculture accounts for 70% of all water

withdrawn for human activities (UN WWAP, 2012, p. 46), this is the water used and consumed for crops and livestock. Additionally, industry requires approximately 20% of the world's freshwater withdrawals (UN WWAP, 2012, p. 59). Food is a sector that joins both agriculture and industry, which is why this research focuses on the proposition of a soft path for water for the food sector. For this reason, a tool for capturing experts' opinions on what does a soft path for water mean for the food sector was developed.

3.2 Experts opinions

The results from the preliminary study discussed in section 3.1 evidenced the need for determining the soft path for water elements for the corporate sector. Given that the food and beverages sector is the largest global water consumer, this research centred its efforts on proposing a soft path for water for this sector. Considering that it is the first time that the extent of a soft path for water adoption is being researched for the food industry, opinions and insights from experts in the field were crucial. In addition, expert consultation offers an adequate methodology for the initial phases of a project as it results more efficient and concentrated than participatory observation or systematic quantitative surveys (Bogner et al., 2009).

Consultation with knowledgeable people in the water sustainability field was carried out in order to determine the elements that a soft path for water would have in the food industry. In the first instance, a short online questionnaire was used for data gathering. Once data was recorded, a small sample of participants was chosen for semi-structured interviews in order to get more in depth data. Section 3.2.1 describes and justifies the methodology used for data gathering from questionnaires. Furthermore, section 3.2.2 presents the design process for the semi-structured interviews that were carried out.

3.2.1 Experts Questionnaire

An online questionnaire was designed in order to capture experts' opinions on the applicability of a soft path for water approach in the food industry. This tool was constructed with the purpose of extrapolating what are the elements of a soft path for water in the food industry. Section 3.2.1.1 describes the process carried out for the

questionnaire design and section 3.2.1.2 presents and justifies the sample of respondents for this questionnaire.

3.2.1.1 Experts questionnaire design

This research constitutes the first attempt of evaluating what a soft path for water approach would be for the food industry. For this reason, an online tool was designed in order to capture an overview of experts' opinions around the elements for a soft path for water in the food sector. A short online questionnaire was designed using the Qualtrics platform for data collection. The questionnaire was designed in five sections described in Table 3.2.

Table 3.2: Experts' questionnaire sections and questions
(For the original format please refer to Appendix 4¹⁴)

<i>Section</i>	<i>Description</i>
Participant information sheet and Consent form	Research information for participants
1. General information	Designed for getting general contact information from the respondent such as name, email, affiliation and telephone number.
2. Soft path for water	
2.1 Are you familiar with the soft path for water management terminology?	Yes or No answer
- If 2.1 was answered with 'yes', these questions prompted:	
2.1.1 What does the soft path for water imply?	Open questions for those participants who answered 'yes' in 2.1. For those who answered 'no', the system automatically directed them to question 2.2
2.1.2 Do you think there is scope for its application in the food industry? - Why?	
- If 2.1 was answered with 'no', go directly to 2.2	
2.2 Demand Management is frequently used as the way for improving efficiency and reducing water use in the industry. Do you think this approach could be improved? How?	Open question designed for capturing participants' opinions on scope for improvement for existing water management techniques
3. Improvements	
3.1 Do you think there is scope for improving the way water is managed in the food industry in general?	Designed to capture the expert's opinions on what are the plausible improvements that can be adopted in the food and drink industry in general. Three possible answers: 'yes', 'no' or 'I don't know' and a box of comments for participants to expand their ideas
4. Expert nomination	
Yes or No answer. - If 'yes' a contact information for the nominee window prompted	Used in order to get further participants nominated.
- If 'no', go to 5	
5. Comments	Open question designed to capture additional comments and feedback from the participants

¹⁴Online version at: https://strath.eu.qualtrics.com/SE/?SID=SV_5AOePAPQNgIpggt Password: water1234

As shown in Table 3.2, the questions were designed first to determine the familiarity of participants with the soft path for water terminology (section 2 of the experts' questionnaire). In the case respondents indicated their awareness of the concept in question 2.1 they were then asked to explain in their own words what they understand by a soft path for water (question 2.1.1) and also their opinion about its applicability in the food sector (question 2.1.2). Furthermore, question 2.2 aimed to explore the respondents' opinions around the scope for improvement of existing technical water management techniques. In addition, question 3.1 was designed to capture the participants' opinions with regards to improvements that can be done in the way water is managed in the food sector. Moreover section 4 of the questionnaire was set up for respondents to nominate further participants and section 5 for any further comments they may want to share.

Once the questionnaire was designed, a sample of experts was chosen for taking part in the interviews. In addition, the link for the questionnaire was published in a recognised online platform for water professionals. The next section discusses the sampling methodology used for this research.

3.2.1.2 Experts questionnaire sample

The sample for the experts' questionnaire was designed using purposive sampling, which is a nonprobability sampling method. In this form of sampling "the researcher does not seek to sample participants on a random basis" (Bryman, 2012, p. 418). In other words, in this method participants are chosen due to their relevance to the research question proposed (Bryman, 2012; Silverman, 2005; Frankfort-Nachmias and Nachmias, 1996).

The purpose of this research is to propose and evaluate a soft path for water approach for the food industry. For this reason, the questionnaire was designed to capture experts' opinions on a soft path for water framework for the food sector. The questionnaire was first distributed to a sample of 47 experts identified in two different ways: while carrying out the review literature and through conferences and networking events (Appendix 5). From these 47 people that were approached, 26 completed the questionnaire.

In a purposive sample, participants are chosen using the researcher's judgement on their suitability for taking part in the research (Bryman, 2012). This is why, in addition to individual emails sent to the initial sample, it was considered important to capture experts' opinions that had not been identified through the review of literature or networking events. For this reason, a participation invitation was published in June 2013 in an online platform called 'The Water Network' (see Figure 3.3). This platform is the largest knowledge network for water professionals whose aim is to drive solutions to the world's water crisis by connecting professionals from across the globe (The Water Network, 2013).



Figure 3.3: Experts' questionnaire online invitation
Source: The Water Network (2013)

As it can be seen in Figure 3.3, the published post had 237 views. From these views, 6 people participated in the questionnaire (see their profiles in Appendix 5). In total, 32 participants answered the questionnaire and data analysis was carried out using grounded theory. The analysis for this data is discussed in chapter 4 .

In order to gather more in-depth data, semi-structured interviews took place with a sample of eight questionnaire participants. The next section describes the method followed for this purpose.

3.2.2 Experts semi-structured interviews

Semi structured interviews are a tool in qualitative research used for gathering in-depth data from the topic being investigated (Bryman, 2012). The objective for carrying out these interviews was to explore from a sample of experts the possible elements a soft path for water would have if applied to the food sector. Section 3.2.2.1

describes the selected sample of participants that took part in the interviews while section 3.2.2.2 discusses the interviews' design.

3.2.2.1 Experts interviews sample

The questionnaire was answered in total by 32 respondents. Purposive sampling was used for selecting participants for the semi-structured interviews. From the 32 respondents, 15 participants were approached to take part in the interviews and eight agreed to take part. Table 3.3 presents the profile for the interviews respondents and the selection criteria used (all participants were assigned with a code to protect their identities). As shown in Table 3.3, the geographical location of participants varied across the globe and, due to location constraints, six interviews were conducted through Skype. From these, all were video calls except for one because the participant agreed to be interviewed while commuting. Additionally, the remaining two interviews took place face-to-face in Glasgow.

Table 3.3: Experts' semi-structured interviews participants

<i>Interview date</i>	<i>Name (code)</i>	<i>Affiliation</i>	<i>Geographical location</i>	<i>Selection criteria</i>	<i>Interview Format</i>
10 Sept 2013	Exp03	Director of TouchStone Resources	South Africa	Contributor to the soft path for water theory	Skype video call
10 Sept 2013	Exp13	International Institute for Sustainable Development	Canada	Contributor to the soft path for water theory	Skype video call
11 Sept 2013	Exp32	Emeritus Professor, University of Waterloo	Canada	Contributor to the soft path for water theory	Skype video call
13 Sept 2013	Exp12	Senior Visiting Research Associate, University of Oxford	Glasgow, UK	Expertise in water and waste water	Face to face
13 Sept 2013	Exp26	Consultant for the Sustainable Consumption and Production Branch - UNEP	Spain	Expertise in the water-footprint concept	Skype video call
16 Sept 2013	Exp41	Lecturer, University of St Andrews	Glasgow, UK	Freshwater management expertise in Scotland	Face to face
13 Sept 2013	Exp53	Palestinian Water Authority	Palestine	Expertise in sustainable water management in water-stressed areas	Skype video call
8 Oct 2013	Exp52	Water Footprint Network	Netherlands	Expertise in the water-footprint concept	Skype phone call

The average time for the interviews ranged between 30-60 minutes. All participants agreed to have the audio of their interviews recorded and transcripts were done with the use of NVIVO, which is a qualitative data analysis software. The next section discusses the interviews design process.

3.2.2.2 Experts interviews design

Qualitative research has a range of different tools available for data collection such as naturalistic observation, unstructured interviews and semi-structured interviews (Bryman, 2004). The latter, in which an interview guide is utilised for guiding the conversation, was chosen as the methodological tool for data gathering in this step for several reasons. First, semi-structured interviewing provides flexibility, which is particularly important for capturing the perception of reality of the participant (Burns, 2000). Furthermore, it provided practical advantages for gathering data from participants located in many different places across the globe.

An interview guide was developed and distributed to the participants in advance to the interview (see Appendix 6). Questions were designed for an in-depth capture of the expert's opinion and knowledge with regards of water sustainability in the food sector (see Box 3.1).

Box 3.1: Experts' semi-structured interviews questions

1. Water is often one of the topics that have less attention in the global sustainability agenda – why do you think this is happening?
2. In your opinion, what are the key areas where policy and governments should work on in order to achieve a better water management?
3. What does the soft path for water imply and how would you imagine a soft path for water applied in an industry?
4. What about the water-energy nexus?
5. Water-footprint is a methodology commonly used for identifying the water flows and quantities in the production of a specific good or service. What do you think are the flaws, if any, of this approach?
6. Many of our environmental problems have an origin on wasteful behaviours. How do you think we can push behavioural change in the society?
7. Do you advocate for the use of technology or for pushing behavioural change as a way to solve environmental issues? (For both?)
8. Any additional comments or insights?

After data was collected from the eight participants, it was then analysed using grounded theory. In grounded theory, coding is used for reviewing the data collected and organising it in different categories (Bryman, 2012). In this case, the data collected was broken into components for proposing a framework for a soft path for water for the food sector. Chapter 4 discusses the results obtained from the data gathered from experts. Once the framework was developed, a tool for measuring the adoption of a soft path for water in the food sector was needed. The next section discusses the design of this tool.

3.3 Tool for measuring the soft path for water adoption in the food industry

This research constitutes the first attempt for proposing a soft path for water for the corporate sector, more specifically for the food industry. The data gathered from the consultation with experts enabled to set the criteria for a soft path for water for the food industry. There was, therefore, a need for developing an instrument for its measurement. This section discusses the design process of this tool, which was built upon two stepping-stones (sections 3.3.1 and 3.3.2). Furthermore, section 3.3.3 discusses the final design of the tool.

3.3.1 Stepping stone 1: Water stewardship framework

The former World Wildlife Fund now known as the World Wide Fund for Nature (WWF) has had, overtime, water as one of its key priorities. They have worked on the proposition of water stewardship for the business sector. As discussed in section 2.2.2, WWF (2013, p. 14) proposes five steps for a better understanding of what activities can companies do for implementing water stewardship: water awareness, knowledge of impact, internal action, collective action and influence on water governance.

The data gathered from the sample of experts (see section 3.2) intended to determine the soft path for water elements for the food industry. A thorough analysis and discussion of this can be found in chapter 4. The results obtained from this analysis

indicated commonalities with the steps for water stewardship discussed in this section. For this reason, five themes were proposed as the elements of a soft path for water for the food industry. These are briefly explained in this section and more extensive discussion can be found in section 3.3.3 and chapters 5, 6, 7 and 8.

1. *Setting the ground*: this refers to the basis for a soft path for water adoption and implies the awareness of water related issues as well as the re-evaluation of water services.
2. *Knowing the environment*: indicates the companies' knowledge of their impact on water resources as well as the water environmental limits in which they can operate without having a negative impact on the environment.
3. *Internal action*: refers to the internal measures that companies need to adopt in order to achieve a soft path for water. These include the adoption of efficient technologies, the setting of a clear target for water reduction, the promotion of water conservation awareness in their workforce and the calculation of the companies' internal water footprint.
4. *External action*: was defined as the engagement with communities and suppliers in order to reduce the impact on water resources in a collective way.
5. *Influence on water governance*: this theme refers to the extent of influence on water governance in the places where companies have operations, both at local and global scales.

The other foundation upon which the framework was developed consisted on a study by Oxfam (2013a) in which the policies of ten main global food brands were analysed.

3.3.2 Stepping stone 2: Oxfam's 'Behind the brands' study

Oxfam began in 2013 a campaign called 'Behind the Brands' to help creating a world in which people have enough to eat (Oxfam, 2013a). In this campaign, a scorecard was designed to examine the policies of ten of the world's most powerful food and drink companies¹⁵ in seven areas: women, small-scale farmers, farm

¹⁵ The 'Big 10' companies investigated in Oxfam (2013a) are: Associated British Foods (ABF), Coca-Cola, Danone, General Mills, Kellogg, Mars, Mondelez International (previously Kraft Foods), Nestlé, PepsiCo and Unilever

workers, water, land, climate change and transparency. In the area of water, the scorecard aimed to assess the commitment of the companies “to respecting the human right to water, to disclosing and reducing water use and discharges throughout its operations, and to better managing the use of water from water-stressed regions” (Oxfam, 2013a, p. 24). In this evaluation a range of indicators organised in four main areas were used (see Table 3.4).

Table 3.4: Oxfam "Behind the Brands" study indicators for Water
Source: Oxfam (2013b)

<i>Code</i>	<i>Indicator description</i>
WAT1	Awareness and projects related to access to and use of water
WAT1.1	Food security implications of access to water <i>Does the company:</i>
WAT1.1.1	- recognize the finite nature of water resources?
WAT1.1.2	- recognize that agricultural practices or processing can cause water contamination?
WAT1.2	Acknowledgment of responsibility <i>Does the company acknowledge its responsibilities for water use and access to water through:</i>
WAT1.2.1	- Acknowledgement that its operations depend on sustainable water use?
WAT1.2.2	- Aiming to reduce water use through increased efficiency?
WAT1.2.3	- Awareness of the impact of its own operations on surrounding communities?
WAT1.3	Projects <i>Does the company conduct projects in collaboration with suppliers to address access to and use of water within the supply chain, for:</i> (Projects must focus on one of the following issues: improving access to or reducing agricultural use of water. It must also include the participation or collaboration of a local community organization). - 3 commodities - 2 commodities - 1 commodity - 0 commodities
WAT1.4	Commitment to water initiatives <i>Does the company commit to at least two of the following water initiatives?</i> - UN CEO water mandate - Water Footprint Network - CDP Global Water Disclosure
WAT2	Knowledge of company impacts and disclosure
WAT2.1	Does the company provide and disclose data, whether measured or estimated, on water withdrawals within its operations?
WAT2.2	Is the company able to identify, and does it disclose, discharges of water from its operations by destination, by treatment method and by quality using standard effluent parameters?
WAT2.3	Has the company identified and disclosed water-stressed regions (by country or region within a country) and river basins where it has operations and the percentage of operations in that area?
WAT2.4	Community consultation Community consultation on water stress assessments or sustainability assessments of shared water sources
WAT2.4.1	Have surrounding communities of relevant geographies been consulted on the basis of assessments above (WAT 2.3 and 2.6) on water-stress and risk?
WAT2.4.2	Has the company demonstrated how it is using information received from communities through such processes to inform its activities?
WAT2.5	Has the company identified key inputs or raw materials (excluding water) that come from regions subject to water related risk?
WAT2.6	Impact assessments
WAT2	Knowledge of company impacts and disclosure
WAT2.6.1	Has the company undertaken human rights impact assessments and/or social and environmental impact assessments that explicitly consider water, to understand its actual and potential impacts particularly in water-stressed areas? If so, have the assessments been conducted across water scarce regions or across all facilities which would include water scarce regions?

<i>Code</i>	<i>Indicator description</i>
WAT2.6.2	Has the company consulted affected communities as part of the assessments?
WAT2.6.3	Are the impact assessments publically available?
WAT2.6.4	Does the company plan to conduct formal human rights impact assessments where problems have been identified?
WAT2.7	Has the company determined the proportion of its water consumption (“water footprint”) in its operations vs. water consumption (“water footprint”) in its supply chain?
WAT3	Commitments related to water
WAT3.1	Does the company formally recognize the human right to water as defined by the United Nations Committee on Economic, Social and Cultural Rights and General Assembly?
WAT3.2	Does the company require fair compensation and grievance mechanisms in case water rights have been violated and/or relinquished?
WAT3.3	Has the company set a specific target to reduce its water use in its direct operations?
WAT3.4	Has the company set a specific target to reduce its water use along its whole value chain?
WAT3.5	Does the company commit to consulting local communities on plans to develop water resources?
WAT4	Supply chain management
WAT4.1	Does the company have a clause on water in its supplier code or sourcing guidelines that requires suppliers to:
WAT4.1.1	- adopt specific practices to improve water management (such as measuring progress, irrigation management, techniques on crop processing, reuse and recycling, etc.) ?
WAT4.1.2	- prevent pollution and safeguard water quality?
WAT4.1.3	- take additional measures in water stressed areas to mitigate impacts of water use?
WAT4.1.4	- consult local communities on impacts of water resource usage?
WAT4.2	Does the company require its key suppliers to report on their water use, risks and management?

Shading key: First order indicator Second order indicator Third order indicator

The questions presented in Table 3.4 provided one of the starting points for the development of the tool for measuring the soft path for water adoption in the food sector. In addition, the other starting point was the proposition for achieving water stewardship in the corporate sector carried out by the WWF (2013). These studies and tools, combined with the results obtained from the analysis carried out from the data collected from experts (see chapter 4), were used for the development of the framework used as part of this research and discussed in the next section.

3.3.3 Framework proposition and indicators

A framework was built around the five themes discussed in section 3.3.1 and chapter 4: setting the ground, knowing the environment, internal action, external action and influence on water governance. A set of 21 indicators were set up for this framework and, similarly to the study carried out by Oxfam (2013b), these were written in form of a question and organised towards its five main themes. Table 3.5 presents the indicators designed as part of this research, seven of which are the same as some of those used in the ‘Behind the Brands’ study (Table 3.4). In the cases in which the indicators coincide a reference code is clearly shown.

Table 3.5: Indicators for measuring the soft path for water adoption in the food and drink industry
Adapted from: Oxfam (2013b)

<i>Code</i>	<i>Indicator description</i>	<i>Indicator in Table 3.5</i>
SP1	Setting the ground	
SP1.1	Water awareness	
SP1.1.1	Do the word count of 'water' vs. 'energy' compare or is the frequency skewed towards water? - 'Water' criteria: (water, river, lake, loch, rain, H2O, aqua, hydro) - 'Energy' criteria: (energy, electricity, gas, petrol, diesel, carbon, GHG CO2)	
SP1.1.2	Does the company recognise the finite nature of water resources?	WAT 1.1.1
SP1.1.3	Does the company recognise its dependence on water resources?	WAT 1.2.1
SP1.1.4	Does the company commit to any of the following? UN CEO water Mandate: ceowatermandate.org/about/endorsing-companies/ Water footprint network: www.waterfootprint.org/?page=files/OverviewPartners CDP Global Water Disclosure: www.cdp.net/cdpresults/cdp-water-disclosure-global-report-2012.pdf	WAT 1.4
SP1.1.5	Does the company disclose information on reduction of water in their operations?	WAT 1.2
SP1.2	Re-evaluation of water services	
SP1.2.1	Are different qualities of water used for different purposes?	
SP1.2.2	Has rainwater harvesting been implemented?	
SP1.2.3	Is any water recycling done?	
SP2	Knowing the environment	
SP2.1	Knowledge of impact (Does the company disclose data on water withdrawals in its operations?)	
SP2.2	Knowledge of water environmental limits	
SP2.2.1	Does the company know the limits in which it can operate?	
SP2.2.2	Does the company identify and disclose water-stressed regions in their operations?	WAT 2.3
SP3	Internal Action	
SP3.1	Has the company put in place efficient technologies in its operations?	
SP3.2	Has the company set a specific target to reduce water in its operations?	WAT3.3
SP3.3	Does the company promote water conservation awareness programmes to its staff members?	
SP3.4	Has the company calculated its internal water footprint?	
SP4	External Action	
SP4.1	Community engagement	
SP4.1.1	Has the company undertaken Human rights impact assessment and/or social and environmental impact assessments that explicitly consider water?	WAT 2.6.1
SP4.1.2	Does the company have community or social programmes around water?	
SP4.2	Suppliers engagement	
SP4.2.1	Does the company require suppliers to adopt specific practices to improve water management?	WAT4.1
SP4.2.2	Has the company calculated its supply chain water footprint?	
SP5	Influence on water Governance	
SP5.1	Is there any evidence of influence on water governance in the UK?	
SP5.2	Is there any evidence of influence on water governance elsewhere?	

Shading key: First order indicator Second order indicator Third order indicator

As shown in Table 3.5, each of the indicators relate to one of the five themes of the framework for a soft path for water in the industry proposed in section 3.3.1 and chapter 4. The next section discusses the meaning and purpose of each indicator.

3.3.3.1 Setting the Ground (SP1)

This theme refers to the initial stage for embarking a soft path for water in which water conservation and a sustainable use and consumption of this resource are embedded in the corporate's policy. This theme constitutes an essential part for adopting a soft path for water in the industry. It is divided into two categories: water awareness and the re-evaluation of water services.

The water awareness subtheme (SP1.1) refers to the extent to which the company is aware of the importance of water and recognise their responsibility to manage it sustainably throughout their operations. In order to measure this, five indicators are proposed, Table 3.6 presents and describes each of these indicators.

The re-evaluation of water services subtheme (SP1.2) denotes one of the key fundamentals of the soft path for water theory. It refers to a new paradigm in which water is not seen as the resource itself but rather as the services it provides (Brandes and Brooks, 2007). This change of paradigm implies that the same quality of water, or even any water at all, might not be required for different processes. In this case, three indicators were determined to measure the extent to which a re-evaluation of water services has been carried out in the companies. Table 3.7 shows and justifies the three indicators set up for this subtheme.

Table 3.6: Water awareness (SP1.1) indicators

<i>Code</i>	<i>Question</i>	<i>Description</i>
SP1.1.1	<i>Do the word count of 'water' vs. 'energy' compare or is the frequency skewed towards water?</i>	<p>Aims to compare the frequency of the terms 'water' and 'energy' in publicly available documents. The mere search for the 'water' and 'energy' terms as such is not sufficient as companies may refer to them using different words. Eight synonyms were associated to each of the terms. The criteria proposed per term for the word count is:</p> <p>'Water': water, river, lake, loch, rain, H2O, aqua, hydro 'Energy': energy, electricity, gas, petrol, diesel, carbon, GHG, CO2</p> <p>The final frequency for both terms is the sum of the occurrence of each individual criterion.</p>
SP1.1.2	<i>Does the company recognise the finite nature of water resources?</i>	<p>It was set to search for evidence about the recognition by companies that water is a limited resource that needs to be managed more sustainably.</p>
SP1.1.3	<i>Does the company recognise its dependence on water resources?</i>	<p>It was defined for finding evidence on whether the companies recognise that water is a key resource to their operations and hence the importance on adopting measures that seek for its conservation.</p>
SP1.1.4	<i>Does the company commit to any of the following?</i>	<p>It aimed to determine companies commit to any of three well-established initiatives that promote to embed sustainable water policies and practices in the industry. These initiatives were chosen as they have all liaised with companies from the food and drink sector worldwide. These commitments are:</p> <p>The UN CEO Water Mandate: “seeks to make a positive impact with respect to the emerging global water crisis by mobilizing a critical mass of business leaders to advance water sustainability solutions – in partnership with the United Nations, civil society organizations, governments, and other stakeholders.” (UN Global Compact, 2014)</p> <p>Water Footprint Network: “[its mission] is to promote the transition towards sustainable, fair and efficient use of fresh water resources worldwide by: advancing the concept of the water footprint” and “encouraging forms of water governance that reduce the negative ecological and social impacts of the water footprints of communities, countries and businesses.” (Water Footprint Network, 2014)</p> <p>CDP Global water disclosure: “[it] was formally supported by 470 investors representing US\$50 trillion in assets. 318 companies listed on the FTSE Global Equity Index Series (Global 500) were invited to respond because they operate in sectors that are water-intensive or exposed to water-related risks. Responses received provide a valuable insight for investors into how companies are operating in a water-constrained world.” (CDP and Deloitte, 2012, p. 4)</p>
SP1.1.5	<i>Does the company disclose information on reduction of water in their operations?</i>	<p>It aimed to determine if companies disclose any type of information in terms of the water that has been reduced in their operations. This, with the purpose of not only evaluating the reductions achieved but also the ways companies report them.</p>

Table 3.7: Re-evaluation of water services (SP1.2) indicators

<i>Code</i>	<i>Question</i>	<i>Description</i>
SP1.2.1	<i>Are different qualities of water used for different purposes?</i>	Depending on the service that water is providing at a particular process or stage a high quality standard of water might not always be needed. This indicator was set up to find for evidence in the data that shows if different qualities of water are being used.
SP1.2.2	<i>Has rainwater harvesting been implemented?</i>	Rainwater constitutes an alternate source of water that can be used as part of the companies' operations. This indicator sought to determine whether rain harvesting has been put in place.
SP1.2.3	<i>Is any water recycling done?</i>	Similarly to SP1.2.1 and SP1.2.2 this indicator was defined for determining if any type of water recycling is being carried out at any stage of the value chain of the food produced in the industry.

The next section presents the indicators design for the 'knowing the environment' theme, or the element that aimed to evaluate the extent to which companies are aware of their water environmental impacts and limits.

3.3.3.2 Knowing the environment (SP2)

This subtheme refers to the extent to which companies are aware of their impact of water use as part of their operations and it is divided into two indicators: knowledge of impact and knowledge of water environmental limits. Knowledge of impact (SP2.1) was designed to determine if the company is aware of the impact their operations have on the water resources. Specifically the indicator aimed to look for evidence of water withdrawals data disclosed by the companies. The question designed for this indicator was: *Does the company disclose data on water withdrawals in its operations?*

Knowledge of water environmental limits (SP2.2) aims to measure the awareness of water environmental limits, which is closely linked to the concept of 'backcasting' proposed in the soft path for water theory. Brandes and Brooks (2006) describe 'backcasting' as looking at the ecologically sustainable supply of water and then 'backcast' this level of supply to the maximum level of demand that hence can be sustained. Although a 'backcasting' exercise should be more on the competence of authorities and water suppliers, it was considered important to measure whether or not companies are aware such limits. For this, two indicators were established, which are presented in Table 3.8

Table 3.8: Knowledge of environmental limits (SP2.2) indicators

<i>Code</i>	<i>Question</i>	<i>Description</i>
SP2.1.1	<i>Does the company know the limits in which it can operate?</i>	This indicator refers directly to the awareness of limits in which each company can operate.
SP2.1.2	<i>Does the company identify and disclose water-stressed regions in their operations?</i>	It refers to the disclosure of water-stressed regions in which the companies operate. This was considered a key indicator due to the fact that, unlike energy and carbon emissions, water is a resource that entirely depends on the local environmental conditions.

The next section presents the design and description of the indicators in the ‘internal action’ theme, or the element that aimed to evaluate the internal practices and initiatives companies have for the sustainable use and consumption of water.

3.3.3.3 Internal Action (SP3)

Internal action refers to the extent to which measures for water conservation and awareness have been adopted inside the companies investigated. Four key indicators were chosen for this theme. Table 3.9 discusses and justifies the indicators designed for evaluating this area.

Table 3.9: Internal action (SP3) indicators

<i>Code</i>	<i>Question</i>	<i>Description</i>
SP3.1	<i>Has the company put in place efficient technologies in its operations?</i>	This indicator aimed to find out whether or not efficient technologies have been adopted in the companies’ processes so less water is used.
SP3.2	<i>Has the company set a specific target to reduce water in its operations?</i>	This indicator was also used in the analysis done by Oxfam (2013b), please refer to Table 3.4 indicator code WAT3.3. As all the companies investigated have committed to reduce 20% of water in their operations by 2020 this is the only indicator in which all companies had the same score.
SP3.3	<i>Does the company promote water conservation awareness programmes to its staff members?</i>	Staff engagement is one of the key features found in the proposed framework. This indicator aimed to look for evidence of members of staff being engaged in the promotion of water conservation in the companies.

<i>Code</i>	<i>Question</i>	<i>Description</i>
SP3.4	<i>Has the company calculated its internal water footprint?</i>	The total amount water embedded in each step of the value chain of a product is defined as water footprint (Hoekstra, 2013). This indicator aimed to evaluate if the footprint of their process had been measured. In other words, the water embedded in the manufacturing stage of the products they process.

The next section discussed the indicators in the ‘external action’ theme, which aim to evaluate the type of initiatives companies have with communities where they have operations and with their supply chains for a sustainable use and consumption of water resources.

3.3.3.4 External Action (SP4)

Similarly to SP3, external action refers to the extent to which measures for water conservation and awareness have been adopted across the external areas of influence of the companies. Two key subthemes were defined: community engagement and supply chain engagement.

Community engagement (SP4.1) corresponds to the extent to which companies have engaged with the local communities where they have operations as well the commitment to the protection of the human right to water. In this case two indicators were set up (see Table 3.10).

Table 3.10: Community engagement (SP4.1) indicators

<i>Code</i>	<i>Question</i>	<i>Description</i>
SP4.1.1	<i>Has the company undertaken Human rights impact assessment and/or social and environmental impact assessments that explicitly consider water?</i>	Water is life, thus it is linked to the fundamental human right of living (Collins and Woodley, 2013). The human right to water was only explicitly recognised by the United Nations Human Rights Council (UNHRC) in 2010 when the UN specifically called to integrate this right into “impact assessments throughout the process of ensuring service provision, as appropriate” (UNHRC, 2010, p. 3). Food is an area that requires large quantities of water for its growth, processing and distribution. It is therefore important that companies in the sector ensure that the human right to water is protected throughout their operations. This indicator aimed to search for evidence that shows that this recognition has been done by the companies and the protection of the human right to water has been embedded in their strategies.
SP4.1.2	<i>Does the company have community or social programmes around water?</i>	Virtually almost every activity carried out by humans has a direct or indirect impact on the environment and the society. Industries must have a commitment of not only reducing the impact resulted from their various operations but also on striving for the engagement with the local communities in which they operate. This indicator aimed to measure the extent to which companies have set up social programs that specifically address water.

Supply chain engagement (SP4.2) refers to all the steps involved the growth and processing of a product (Harland, 1996). Food is an area that has much water embedded in every step of its supply chain (Hoekstra, 2008b). Consequently, it is important that water conservation initiatives are adopted in every of the steps involved. In this subtheme two indicators were designed (see Table 3.11)

Table 3.11: Supply chain engagement (SP4.2) indicators

<i>Code</i>	<i>Question</i>	<i>Description</i>
SP4.2.1	<i>Does the company require suppliers to adopt specific practices to improve water management?</i>	Food is an area that requires vast amounts of water throughout its supply chain. In special, most of the water used in this industry is in the agricultural side (UN WWAP, 2012). In other words, there is much water needed for the growth of food. This indicator was designed in order to evaluate the commitment of the companies analysed to work horizontally across the chain and strive to conjunctively reduce the water involved in every step of their products.
SP4.2.2	<i>Has the company calculated its supply chain water footprint?</i>	Similarly to the indicator SP3.4, this indicator was designed for finding evidence of the calculation of the water footprint involved in the supply chain of their products.

3.3.3.5 Influence on water Governance (SP5)

The United Nations Development Programme defines governance as the activities carried out by political and administrative authorities to manage a country that entails mechanisms in which citizens and groups express their interests (UNDP, 1997). Water governance then refers to the way in which water affairs are managed. As industry is an important part of the society and it is also their responsibility to engage in the debate of the sustainable management of common resources. For this subtheme, two indicators were designed (see Table 3.12)

Table 3.12: Influence on water governance (SP5) indicators

<i>Code</i>	<i>Question</i>	<i>Description</i>
SP5.1	<i>Is there any evidence of influence on water governance in the UK?</i>	The sample of companies analysed for this research are all part of the UK's Food and Drink Federation. This is the reason why it was considered relevant to look for evidence of engagement from the companies in water discussions in the country.
SP5.2	<i>Is there any evidence of influence on water governance elsewhere?</i>	In our current globalised world a high interconnectivity and globalised supply chains are almost a norm in the food industry (Hoekstra and Chapagain, 2008). This global interconnectivity implies the responsibility of companies on reducing the impact of their operations at all levels. Industries as such should not have 'nationalities' as their value chains often have actors from different geographical locations. As a result, this indicator aimed to measure the engagement of the companies analysed in the water governance of the different locations in which they and/or their suppliers operate.

This section has presented and justified the framework and the indicators designed for measuring the adoption of a soft path for water for companies in the food sector. The tool was tested and an analysis was carried out with a sample of 67 companies from the UK food industry. The next section presents the methodology used for data collection and analysis for this purpose.

3.4 Using the proposed tool for evaluating the water strategies of companies in the UK food sector

A tool for measuring the adoption of a soft path for water in the corporate sector (section 3.3) was developed using the results obtained from the data gathered from the experts' opinions (section 3.2 and chapter 4) along with the framework for analysis used by Oxfam (2013b) for evaluating corporate sustainability policies (section 3.3.2) as well as the principles for water stewardship proposed by WWF (2013) (section 3.3.1). This framework was then used with 67 companies belonging to the UK's food sector. This section first presents a profile and selection criteria for these companies in section 3.4.1. Data was gathered from five different sources: questionnaires, interviews, published environmental reports, websites and online published case studies. Section 3.4.2 discusses the process followed for the questionnaire design. In addition, section 3.4.3 presents the interviews methodology. Furthermore, section

3.4.4 introduces the technique used for sourcing and analysing the companies' environmental reports. Similarly, section 3.4.5 discusses the method used for the sample's websites while section 3.4.6 does it for the online published case studies.

3.4.1 Companies sample

Results from the exploratory study described in section 3.1 confirmed what was found through the review of literature, which is a lack of adoption of a soft path for water in the corporate sector. For this reason, this research proposed a framework for a soft path for water for this sector (see section 3.3). As it has been discussed, food the most water intensive sector globally, it accounts for 70% of the water withdrawals (UN WWAP, 2012). This is why this research focused on the food sector as with the increase of the global population and consumption rates, there is a growing need for working towards the adoption of sustainable water management principles in this sector (UN WWAP, 2009).

Through the investigation carried out for this research a group of companies already committed to reduce their water consumption was found in the UK. Hence, the testing of the proposed framework was conducted with these companies as their existing commitment to water reduction suggested that it was possible that these firms had already implemented soft path elements into their policies.

The UK food and drink sector has over 6,000 companies making it its single largest manufacturing sector in the country and the Food and Drink Federation (FDF) is one the largest associations in the industry, constituted by 316 companies (as of November 2012) (FDF, 2012). A voluntary agreement in the federation for reducing water called the 'Federation House Commitment' (FHC) is constituted by 73 companies (as of February 2014) (The full list of companies can be found in Appendix 7). This agreement aims to help to reduce the overall water usage across the sector by 20% by the year 2020 (FHC, 2012a). Figure 3.4 shows a schematic representation of the sector structure.

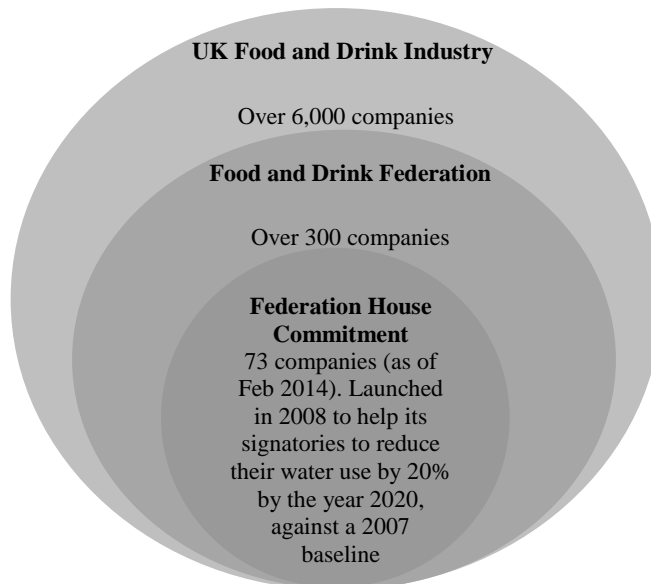


Figure 3.4: UK's Food sector structure as of Feb 2014

The FHC is a voluntary agreement set up in 2008 in order to help the food and drink sector to meet the target of water reduction of 20% by the year 2020 against a 2007 baseline. This commitment was set up after a publication by DEFRA (2006, p. 45) that indicated that the food and drink industry uses an estimated of 430 mega litres per day from the public water supply (10% of industrial use). In addition, it is also estimated to make direct abstractions of 260 mega litres of water per day (about 10% of the total abstracted). Therefore, DEFRA (2006) identified the need for reducing this figure (FHC, 2012b). The FHC offers to its signatories “free technical implementation support, opportunities to participate in peer working group meetings, access to online water resource management tools and promotion of their success to the rest of the industry and the wider public through the FHC progress report” (FHC, 2012b, p. 5).

Purposive sampling was the method used for choosing the sample for testing the tool for measuring the soft path for water adoption in the food sector (Silverman, 2005). The FHC is a commitment that encourages companies to adopt water efficiency measures and aims to achieve a reduction of 20% of water consumption in the sector by 2020. As a result, the whole set of 73 companies who had signed up for this commitment (as of February 2014) were selected as the sample for testing the proposed tool in section 3.3. All 73 companies were assigned with a code and were classified in 16 different sectors (A full profile for each company can be found in Appendix 7). Table 3.13 shows a summary of this classification.

Table 3.13: Companies sub-sector classification

<i>Food sub-sector</i>	<i>Nº of companies</i>	<i>Companies in each sub-sector</i>
1 Dairy	9	C7, C17, C21, C22, C37, C40, C41, C46, C55, C12, C23, C24, C25, C29, C42, C47, C54, C61
2 Fruits and Vegetables	9	C1, C5, C8, C20, C39, C49, C58, C62
3 Beef, pork and poultry	8	C9, C13, C16, SO3, SO4, C53, C63, C64
4 Cereals and Bakery	8	C31, C35, C36, SO1, C57, C60, C65
5 Confectionery and Snacks	7	C10, C32, C34, C50, C66, C67, C48
6 Frozen and chilled foods	7	C26, C33, C43, C52, C59, C27
7 Multiple products*	6	C4, C15, C18, C19, C56
8 Soft drinks	5	C2, C3, C28
9 Alcoholic drinks	3	C14, SO2, C51
10 Seasonings and sugar	3	C6, C11
11 Catering	2	C38, C44
12 Seafood	2	C45
13 Eggs	1	SO5
14 Honey	1	C30
15 Organic food	1	SO6 – This company belongs to C5
16 N/A (Unclassifiable)	1	

*Multiple products refers to a set of multinational corporations that manufacture a wide range of food products from confectionery to soft drinks, cereal and coffee.

As shown in Table 3.13, companies who had committed to reduce water in their operations differ on the types of food products they manufacture. As a formal sub-sector classification was not found, this research classified the set of 73 companies in 16 sectors. ‘Dairy’ and ‘Fruits and Vegetables’ are the most prevalent sectors who had signed up for the commitment, followed by ‘Beef, Pork and Poultry’, ‘Cereals and Bakery’, ‘Confectionery and Snacks’ and ‘Frozen and chilled foods’. The ‘Multiple products’ sector represents a set of multinational corporations that manufacture an extensive range of products (from confectionery to soft drinks, cereal and coffee) and were clustered in a different group. Furthermore, five companies were classified under the ‘soft drinks’ category while three fell in the ‘alcoholic drinks’ and ‘seasonings and sugar’ respectively. The sectors of ‘catering’, ‘seafood’, ‘eggs’, ‘honey’ and ‘organic food’ were the ones with less companies. Furthermore, company SO6 was unclassified as it was found that it belongs to C5.

In order to determine the methodology for gathering data from the companies who had signed up for the FHC commitment, it was important to find out the location of their headquarters. A map with the geographical distribution of these locations was

built using Digimap, an online tool for geospatial data available for academic institutions across the UK (see Figure 3.5).

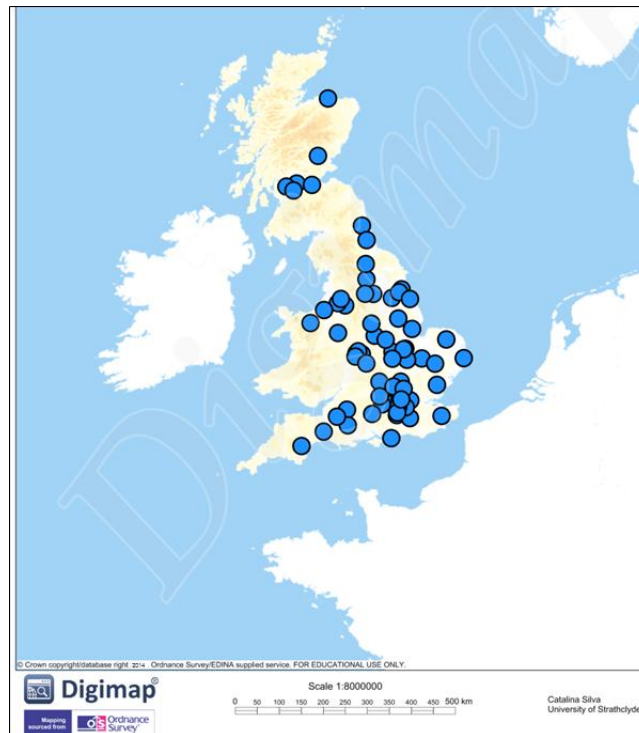


Figure 3.5: FHC Signatories headquarters geospatial distribution (as of Feb 2014)

Figure 3.5 shows that all the main offices of the 73 signatories to the FHC are distributed throughout England and Scotland. Pragmatically, it resulted unfeasible to collect face-to-face data from all the sample. For this reason, data was collected from five different sources: questionnaires, interviews, environmental reports, websites and published online case studies. This was done in order to have a more holistic approach (Bryman, 2012; Frankfort-Nachmias and Nachmias, 1996) and facilitate a complete analysis made with the tool described in section 3.3. The next section presents the methodology used for the questionnaire design.

3.4.2 Companies questionnaire

An online questionnaire was designed in order to gather data from the sample of companies selected for testing the tool for measuring the extent to which a soft path for water had been adopted in the food corporate sector. The questionnaire was designed in two phases. First, a pilot study was carried out for testing the designed

questions (section 3.4.2.1). From the feedback obtained in the pilot study a final version of the questionnaire was designed (section 3.4.2.2).

3.4.2.1 Pilot study

This section provides an overview of the pilot study carried out before the launching of the online questionnaire for the companies belonging to the Federation House Commitment (FHC) previously described in section 3.4.1. Pilot studies are used for testing the research tools used for data gathering in order to reduce risk (De Vaus, 1993). The objective of the pilot study carried out for this research was to check the relevance and clarity of the questions asked as well as the flow of the online questionnaire.

The pilot study was carried out in a three-stage framework and communication and feedback were handled online (see Figure 3.6). First, the questionnaire was sent and tested with an expert in the UK's water industry. In addition, with the feedback from stage one, an updated version of the questionnaire was tested with the Environmental Manager of the University of Strathclyde. Finally, with the second updated version the survey was tested with an Environmental Manager from a company in the dairy industry in Scotland.

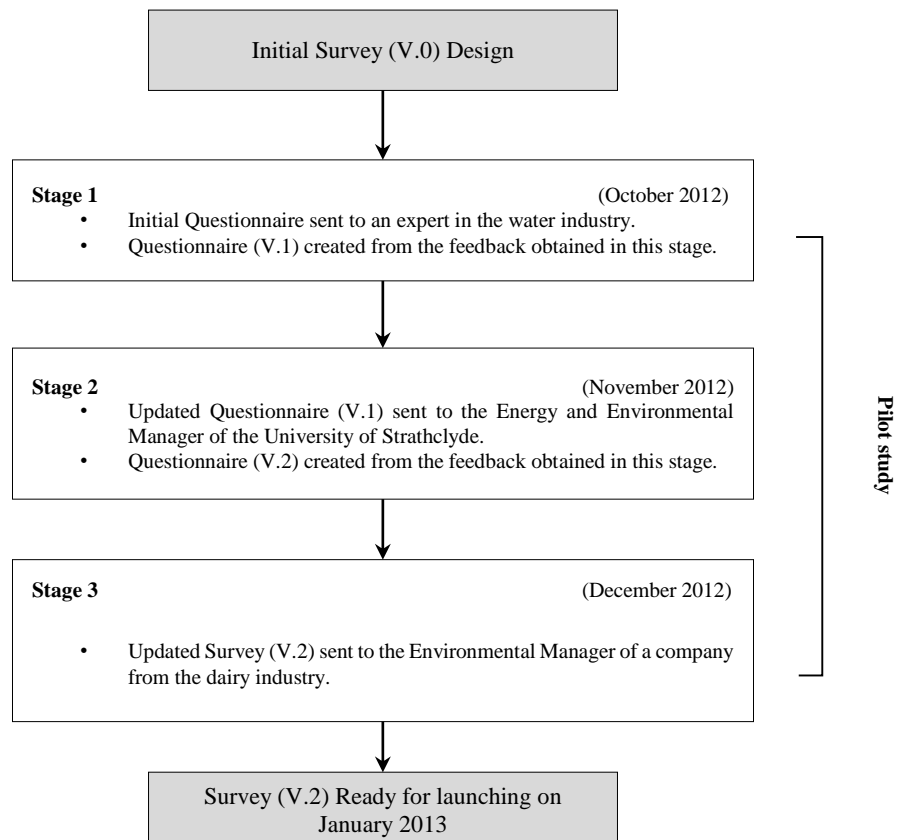


Figure 3.6: Pilot study process

Stage 1 of the pilot study involved the participation of an expert in the sustainable use of water field. The second stage aimed to check the clarity of the questions by an environmental manager outside the food and drink industry. Finally, stage three was used as the initial real test of the online survey with the environmental manager from a representative company from the dairy industry.

Stage 1 of the pilot study

The first stage of the pilot study entailed the testing of the initial survey with a water expert in the UK. The initial version V.0 of the questionnaire was sent to the participant in this stage who was after required to provide feedback on the tool. After the comments were received, V.0 of the survey was updated.

Since this research is a first attempt for proposing a soft path for water for the food industry, it was considered primordial to make an initial check with a person knowledgeable in the area. For this purpose, Kevin Prior was chosen as a participant for this stage. Mr Prior was one of the researchers involved in the exploratory study

discussed in section 3.1 and, therefore, had a prior knowledge of the soft path for water concept. He is a process chemist with more than 35 years of experience in the water sector. His experience covers a vast range of areas including operational science, trade effluent management and the implementation of regulatory policies in the UK. In addition, he has been involved in the development of organisational strategies for the sustainable use of water. Moreover, he is the co-owner of a niche consultancy with focus on water sustainability. Furthermore, he has been an honorary lecturer at the Universities of Strathclyde and Manchester. Currently he is the Chair of the Water Science Forum of the Royal Society of Chemistry.

The feedback from this stage included comments arguing that the questionnaire was effective at pointing out the drivers for companies to adopt water sustainability in their policies. Furthermore, he included suggestions with regards of asking companies about their environmental accreditations as well as their ownership model. Following is an extract from the feedback received:

“I’ve had a go at your questionnaire and found it pretty good at drawing out the drivers and priorities for an organisation. I wonder if you had considered two areas which I feel may influence the adoption of soft path in organisations particularly businesses. 1. A, Do they have an environmental management system, B, is it accredited e.g. to ISO 14001. 2 the ownership model e.g. is it a public quoted company, a wholly owned subsidiary of a multinational, or a family/owner managed business or is it a mutual (coop) or community owned business.” - (Prior, 2012)

After the revision in stage one was carried out, the missing questions were added and a second version V.1 of the questionnaire was done. This new version was the input used for the following stage of the pilot study.

Stage 2 of the pilot study

After stage one, the questionnaire was updated and amended accordingly. In stage two of the pilot study, the questionnaire was sent to the Energy and Environment Manager of the University of Strathclyde to obtain feedback. The target audience for the questionnaire was the environmental/sustainability managers of the sample of companies described in section 3.4.1. This is the reason why, it was considered relevant to get an opinion from an environmental manager external to the food and drink industry in order to check the clarity of the questions. For this purpose, Mr Dean Drobot was chosen. He has more than ten years of experience in the implementation

of sustainability strategies in businesses, local governments, the oil and gas industry and the higher education sector.

The feedback from this stage pointed out improvements for having a better user experience. One of the main comments mentioned was the difficulty on understanding the soft path for water terminology. In addition, his comments also highlighted the complexity involved in the questions related to water valuation. Following is the feedback received on stage two:

“It would be a smoother user experience if you indicate which text boxes are mandatory. Example, Q1.5 (if you only have 4 sites – all in Scotland - you must put ‘0’ in the box for England, Ireland, and International to proceed) and Q5.4. There were several instances, but I didn’t write them all down.

For the uninitiated the ‘soft path’ approach is quite difficult to grasp, despite your good explanation. I have no idea how to capture this succinctly. Good luck!

In Q4.4 you refer to the previous question. It would be helpful to re-iterate the text from the previous question to assist the user.

Q5.2. It would be helpful to explicitly define ‘Water footprint’ and ‘method’ to ensure your audience answers appropriately and does not self-define.

Q9.1 – I found this confusing. Check your example as it repeats some text I suspect you intended to modify. You are only able to rank as “more important”. I would be useful to have an ‘equal’ or ‘less important’ option. Also, I suggest you distinguish between what ‘ought’ to be important and what ‘actually’ is important in practice. For instance, I think the social and ecological value of water is ultimately more important than the financial value; in only the financial value is recognised in institutional decisions.” – Drobot (2012)

As found in the exploratory study results (section 3.1.2), the term of the soft path for water does not seem to be widely used. This was then corroborated from the comments in the feedback of stage two of the pilot study. Similarly, results from the data collected from the sample of experts (section 3.2) indicated that the soft path for water concept does not appear to be a mainstream concept (this will be expanded in chapter 4). As a result, it was decided that in order to avoid confusion and improve the clarity of the questionnaire, the soft path for water terminology would be eliminated and not mentioned in any further steps of the data collection process.

The questions exploring the way water is valued were eliminated because it was considered complex for the user to answer them online. The online questionnaire was updated based on these decisions and V.2 was created.

Stage 3 of the pilot study

The final stage of the pilot study involved the participation of an environmental manager from the food industry in the UK. Before launching the data collection tool to the wider sample, it was considered crucial to have an initial test with a company from the industry. For this reason, V.2 of the questionnaire was sent to the Environmental Manager of a main dairy company in the UK, whose identity has been protected due to confidentiality reasons. This company has a target of reducing its water use by 25% by 2015, which is higher than the 20% reduction by 2020 set by the FHC. For these reasons it was chosen for participation in the third stage of the pilot study.

The participant filled in the questionnaire with real data and a live test was carried out. From the feedback given, all questions were correctly understood and no further amendments were carried out. This final stage served for calculating the real time the user would spend by filling out the questionnaire, which was around 25 minutes. This real time was used for updating the information sheet form. The final version questionnaire design is discussed in section 3.4.2.2.

3.4.2.2 Final questionnaire design

Section 3.4.2.1 presented the pilot study carried out in order to test the questionnaire before launching the questionnaire to the sample of companies discussed in section 3.4.1. Table 3.14 provides an overview of the final questionnaire structure. The final version of the online questionnaire can be found in Appendix 8¹⁶. Due to the nature of this study and the fact that it constituted the first attempt for evaluating the scope for implementation of the soft path paradigm in the food and drink industry, the questionnaire was designed using the five themes discussed in section 3.3.3.

¹⁶ The online version of the questionnaire can be accessed at:
strath.eu.qualtrics.com/SE/?SID=SV_bvIHq2A33kizqt Password: water

Table 3.14: Structure of final online questionnaire for companies

<i>Section</i>	<i>Justification</i>	<i>Relation to the themes of the framework in section 3.3.3</i>
1. General Information	Collects basic and general information from companies	N/A
2. Cost of water	This section aims to capture whether the cost of water is representative in the company's operations and analyse the likeability for soft path adoption	SP1 – Setting the ground SP3 – Internal action
3. Efficiency and demand management	Demand management is thought to be essential for the adoption of the soft path. This section aims capture current practices of water management in the company.	SP3- Internal action
4. Staff engagement	Soft path is a holistic approach in which all the stakeholders should be involved. With the staff engaged it is likely that the company will adopt a soft path.	SP3- Internal action
5. Environment	Knowledge of environmental limits is key for analysing the company's boundaries and it is a first step for adopting the soft path.	SP2- Knowing the environment
6. Re-evaluation of water services	Water in different quantities and qualities can be used for different purposes. This section aims to capture whether the company has adopted this approach.	SP1- Setting the ground
7. Community engagement	Similar to section 4, it is a systemic and holistic approach and communities are the ones who are directly affected on how water is managed	SP4- External action SP5- Influence on water governance
8. Value chain	Similar to sections 4 and 7, the engagement of suppliers and farmers is key for adopting a soft path as here is where most of the water is consumed	SP4- External action

The online questionnaire was launched in January 2013. One of the issues encountered was the difficulty of finding the right person within each organisation for answering the questionnaire, this is their environmental/sustainability managers. For this reason, when found, the invitation was sent to the environmental/sustainability managers and to the companies' generic contact emails otherwise (see Appendix 9).

In total, 12 of the 73 companies answered the questionnaire, this is a response rate of 17%. Table 3.15 shows the companies who answered the questionnaire and the date when they did so. The dates are spread between January and September 2013 due to the difficulty on finding the environmental/sustainability managers contact details and their willingness to participate.

Table 3.15: Companies' questionnaire respondents

<i>Company</i>	<i>Role of respondent</i>	<i>Sub-sector</i>	<i>Date answered</i>
C41	Environmental manager	Dairy	17-Jan-13
C66	Sustainability director	Frozen and chilled foods	22-Jan-13
C3	Environmental manager	Alcoholic drinks	23-Jan-13
C65	Environmental officer	Confectionery and Snacks	23-Jan-13
C4	Environment officer	Soft drinks	24-Jan-13
C64	Quality and Hygiene Manager	Cereals and Bakery	30-Jan-13
C6	Sustainability manager	Catering	16-Apr-13
C29	Health and Safety Manager	Fruits and Vegetables	01-Jul-13
C45	Head of Environment	Eggs	10-Jul-13
C61	Technical Innovations Manager	Fruits and Vegetables	18-Jul-13
C46	Managing Director	Dairy	19-Sep-13
C25	Corporate Social Responsibility Manager	Fruits and Vegetables	20-Sep-13

In order to obtain more in-depth data, all the 12 questionnaire participants shown in Table 3.15 were approached and invited to take part in a semi-structure interview. The next section discusses the methodology followed for gathering data through interviews.

3.4.3 Companies interviews

Interviews are conversations with a purpose (Eyles, 1988), and in the context of this research the purpose was to explore if soft path elements had already been implemented in the sample of companies analysed. For this step of data collection, all the 12 respondents of the questionnaire were contacted to potentially take part in the interviews. From the 12 questionnaire participants, eight agreed to be interviewed. Table 3.16 shows the profile of these participants and the dates in which interviews took place.

Table 3.16: Companies' interview participants
(All interviews were carried out through Skype phone call)

<i>Company</i>	<i>Role of participant</i>	<i>Sub-sector</i>	<i>Date interviewed</i>
C29	Health and Safety Manager	Fruits and Vegetables	10-Sep-13
C66	Sustainability director	Frozen and chilled foods	11-Sep-13
C41	Environmental manager	Dairy	12-Sep-13
C6	Sustainability manager	Catering	13-Sep-13
C45	Head of Environment	Eggs	13-Sep-13
C64	Quality and Hygiene Manager	Cereals and Bakery	19-Sep-13
C3	Environmental manager	Alcoholic drinks	24-Sep-13
C4	Environment officer	Soft drinks	29-Sep-13

All interviews took place during September 2013 and all were done through a Skype phone calls (participants were called to their contact numbers through Skype). This was done in order to facilitate the audio recording of the calls. All interviewees agreed to be recorded and interviews lasted one hour on average. Transcripts were done with the use of NVIVO (software for qualitative analysis). An interview guide was designed prior to the interviews and questions were sent to participants beforehand. Table 3.17 contains the guide questions designed for the interviews, Appendix 10 has the original format distributed to the eight participants.

Table 3.17: Companies' semi-structured interviews questions

<i>Question</i>	<i>Relation with the framework proposed in section 3.3.3</i>
When did the company join the FHC? - are you aware of the drivers for joining?	SP1- Setting the ground
How much water has the company reduced since? - How has this been achieved?	SP1 – Setting the ground SP3- Internal action
Does the company have any guidance from the Environment Agency for reducing water?	SP2- Knowing the environment
Has the company evaluated the possibility of water recycling or rainwater harvesting in any of its processes? – Why?	SP3- Internal action
Does the company liaise with its suppliers and/or distributors in terms of meeting environmental targets?	SP4- External action
Are there any environmental awareness community projects put into place?	SP4- External action SP5- Influence on water governance
Are there any environmental awareness staff projects put into place?	SP3- Internal action
Any additional comments?	N/A

Primary data was collected from 12 companies in the forms of online questionnaires and interviews¹⁷. In order to get a more complete picture of the soft path for water adoption from the 73 companies belonging to the sample, four sources of published secondary data were collected and analysed. These sources are: corporate social responsibility (CSR) reports, websites and published FHC case studies. The next section discusses the methodology followed for the collection and analysis of the environmental reports.

3.4.4 Companies environmental reports

A content analysis was carried out with online publicly available information from the sample researched (Bernard and Ryan, 2010). This included environmental reports, websites containing environmental information and published FHC case studies. As of September 2013, reports from 30 companies were found online and stored for posterior analysis. Reports from the rest 42 businesses from the sample were not found. Table 3.18 shows the companies whose reports were found along with their length and year of publication.

Table 3.18: Companies' corporate social responsibility (CSR) reports sourced

<i>Company</i>	<i>Sub-sector</i>	<i>Year of publication</i>	<i>Nº of pages</i>
C21	Dairy	2013	7
C14	Seasonings and sugar	2010	8
C15	Soft drinks	2012	8
C19	Soft drinks	2012	9
C39	Beef, pork and poultry	2013	10
C60	Confectionery and snacks	2012	12
C22	Dairy	2012	12
C29	Fruits and Vegetables	2012	12
C18	Soft drinks	2012	12
C30	Organic food	2011	20
C51	Seasonings and sugar	2010	20
C58	Beef, pork and poultry	2012	22
C54	Fruits and Vegetables	2012	26
C6	Catering	2012	27
C43	Multiple products*	2012	29

¹⁷ Extracts from the data are available upon request, please e-mail: catalina.silva04@gmail.com

<i>Company</i>	<i>Sub-sector</i>	<i>Year of publication</i>	<i>Nº of pages</i>
C28	Alcoholic drinks	2013	32
C40	Dairy	2010	32
C36	Confectionery and Snacks	2012	45
C26	Multiple products*	2012	48
C27	Multiple products*	2012	48
C52	Multiple products*	2012	60
C49	Beef, pork and poultry	2013	73
C7	Dairy	2011	89
C10	Frozen and chilled foods	2012	100
C59	Multiple products*	2012	111
C35	Confectionery and Snacks	2011	118
C32	Frozen and chilled foods	2011	120
C53	Cereals and Bakery	2012	122
C64	Cereals and Bakery	2010	124
C33	Multiple products*	2012	360

Total of reports sourced: 30

*Multiple products refers to a set of multinational corporations that manufacture a wide range of food products from confectionery to soft drinks, cereal and coffee.

The 30 environmental reports sourced varied in two ways. First, the year of publication ranged between 2010 and 2013, in all cases the most updated report was downloaded. Furthermore, the length of such reports varied from 7 pages to 360. All documents were stored safely in a university-owned computer for their later analysis. As it can be seen, not all reports from the 73 companies who had signed up to the FHC were found. For this reason, relevant environmental or CSR information was sourced from the companies' websites. The next section presents the methodology followed for this purpose.

3.4.5 Companies websites

Websites were searched online for the 73 companies from the sample and relevant information was found in 58 of them. Table 3.19 presents all the companies from which websites were obtained. All websites were last accessed on September 2013 and were downloaded and stored in a university-owned computer for their later analysis.

Table 3.19: Companies' websites sourced
(All accessed in September 2013, total of websites sourced: 58)

<i>Websites</i>	<i>Sub-sector</i>
C1	Beef, pork and poultry
C2	Alcoholic drinks
C3	Alcoholic drinks
C4	Soft drinks
C5	Beef, pork and poultry
C6	Catering
C7	Dairy
C8	Beef, pork and poultry
C9	Cereals and Bakery
C10	Frozen and chilled foods
C11	Catering
C12	Fruits and Vegetables
C13	Cereals and Bakery
C14	Seasonings and sugar
C15	Soft drinks
C16	Cereals and Bakery
C17	Dairy
C18	Soft drinks
C20	Beef, pork and poultry
C21	Dairy
C22	Dairy
C23	Fruits and Vegetables
C24	Fruits and Vegetables
C25	Fruits and Vegetables
C26	Multiple products*
C28	Alcoholic drinks
C29	Fruits and Vegetables
C30	Organic food
C31	Confectionery and Snacks
C32	Frozen and chilled foods
C34	Frozen and chilled foods
C35	Confectionery and Snacks
C37	Dairy
C38	Seafood
C39	Beef, pork and poultry

<i>Websites</i>	<i>Sub-sector</i>
C40	Dairy
C41	Dairy
C42	Fruits and Vegetables
C44	Seafood
C45	Eggs
C47	Fruits and Vegetables
C50	Frozen and chilled foods
C52	Multiple products*
C53	Cereals and Bakery
C54	Fruits and Vegetables
C55	Dairy
C56	Soft drinks
C57	Confectionery and Snacks
C58	Beef, pork and poultry
C59	Multiple products*
C60	Confectionery and snacks
C61	Fruits and Vegetables
C62	Beef, pork and poultry
C63	Cereals and Bakery
C64	Cereals and Bakery
C65	Confectionery and Snacks
C66	Frozen and chilled foods
C67	Frozen and chilled foods

*Multiple products refers to a set of multinational corporations that manufacture a wide range of food products from confectionery to soft drinks, cereal and coffee.

While carrying out research it was found that the FHC publishes each year in their website case studies reports that show the advances achieved from their signatories. For this reason, all published reports were obtained. The next section discusses this process.

3.4.6 Companies online published case studies

Section 3.4.1 described in detail the sample of companies analysed for determining the extent of adoption of the soft path for water in the food industry. The unit of analysis used for this research consists of 73 companies committed to reduce water in their operations by 20% by the year 2020 (2008 baseline). This commitment,

also known as the Federation House Commitment (FHC), publishes every year on their website a series of case studies from their signatories that show their progress towards this target. All reports consist of one page with relevant information on actions undertaken in order to reduce and understand the water flows in their companies. All published 22 reports, as of March 2014, were downloaded for their later analysis. Table 3.20 presents the profile of all the obtained FHC reports.

Table 3.20: FHC reports sourced

<i>Company</i>	<i>Sub-sector</i>	<i>Year published</i>
C6	Catering	2010
C7	Dairy	2014
C11	Catering	2013
C12	Fruits and Vegetables	2012
C18	Soft drinks	2010
C19	Soft drinks	2011
C29	Fruits and Vegetables	2013
C32	Frozen and chilled foods	2013
C33	Multiple products*	2014
C36	Confectionery and Snacks	2010
C39	Beef, pork and poultry	2013
C42	Fruits and Vegetables	2014
C43	Multiple products*	2011
C47	Fruits and Vegetables	2013
C48	Frozen and chilled foods	2014
C53	Cereals and Bakery	2010
C57	Confectionery and Snacks	2012
C58	Beef, pork and poultry	2012
C60	Confectionery and snacks	2010
C63	Cereals and Bakery	2014
C65	Confectionery and Snacks	2014
C67	Frozen and chilled foods	2010

Total of FHC reports sourced: 22

*Multiple products refers to a set of multinational corporations that manufacture a wide range of food products from confectionery to soft drinks, cereal and coffee.

A total of 22 FHC reports were obtained and their publication dates ranged between 2010 and 2014. They were stored in a university-owned computer for their later analysis. The methodology followed for data gathering from companies

belonging to the food and drink sector in the UK has been discussed throughout section 3.4. Data from companies was gathered with the purpose of testing the tool for measuring the soft path for water adoption in the sector (presented in section 3.3). A sample of 73 companies that had committed to reduce water in their operations was chosen for this test. In order to get data from the majority of the sample five sources of data were used: online questionnaires, interviews, environmental reports, websites and FHC published reports. Table 3.21 shows an overview of all the data and sources collected.

Table 3.21: Summary of type of data collected for each company

<i>Company</i>	<i>Sub-sector</i>	<i>Q</i>	<i>I</i>	<i>E</i>	<i>W</i>	<i>F</i>	<i>Screened-out</i>
C1	Beef, pork and poultry				x		
C2	Alcoholic drinks				x		
C3	Alcoholic drinks	x	x		x		
C4	Soft drinks	x	x		x		
C5	Beef, pork and poultry				x		
C6	Catering	x	x	x	x	x	
C7	Dairy			x	x	x	
C8	Beef, pork and poultry				x		
C9	Cereals and Bakery				x		
C10	Frozen and chilled foods			x	x		
C11	Catering				x	x	
C12	Fruits and Vegetables				x	x	
C13	Cereals and Bakery				x		
C14	Seasonings and sugar			x	x		
C15	Soft drinks			x	x		
C16	Cereals and Bakery				x		
C17	Dairy				x		
C18	Soft drinks			x	x	x	
C19	Soft drinks			x		x	
C20	Beef, pork and poultry				x		
C21	Dairy			x	x		
C22	Dairy			x	x		
C23	Fruits and Vegetables				x		
C24	Fruits and Vegetables				x		
C25	Fruits and Vegetables	x			x		
C26	Multiple products*			x	x		

<i>Company</i>	<i>Sub-sector</i>	<i>Q</i>	<i>I</i>	<i>E</i>	<i>W</i>	<i>F</i>	<i>Screened-out</i>
C27	Multiple products*			x			
C28	Alcoholic drinks			x	x		
C29	Fruits and Vegetables	x	x	x	x	x	
C30	Organic food			x	x		
C31	Confectionery and Snacks				x		
C32	Frozen and chilled foods			x	x	x	
C33	Multiple products*			x		x	
C34	Frozen and chilled foods				x		
C35	Confectionery and Snacks			x	x		
C36	Confectionery and Snacks			x		x	
C37	Dairy				x		
SO1	Confectionery and Snacks						Subsidiary of C35
C38	Seafood				x		
C39	Beef, pork and poultry			x	x	x	
C40	Dairy			x	x		
C41	Dairy	x	x		x		
C42	Fruits and Vegetables				x	x	
C43	Multiple products*			x		x	
C44	Seafood				x		
SO2	Seasonings and sugar						No website found
C45	Eggs	x	x		x		
C46	Dairy	x					
C47	Fruits and Vegetables				x	x	
C48	Frozen and chilled foods					x	
C49	Beef, pork and poultry			x			
SO3	Cereals and Bakery						No website found
C50	Frozen and chilled foods				x		
C51	Seasonings and sugar			x			
SO4	Cereals and Bakery						No website found
C52	Multiple products*			x	x		
C53	Cereals and Bakery			x	x	x	
C54	Fruits and Vegetables			x	x		

<i>Company</i>	<i>Sub-sector</i>	<i>Q</i>	<i>I</i>	<i>E</i>	<i>W</i>	<i>F</i>	<i>Screened-out</i>
C55	Dairy				x		
C56	Soft drinks				x		
SO5	Honey						No website found
SO6	N/A						Subsidiary of C35
C57	Confectionery and Snacks				x	x	
C58	Beef, pork and poultry			x	x	x	
C59	Multiple products*			x	x		
C60	Confectionery and snacks			x	x	x	
C61	Fruits and Vegetables	x			x		
C62	Beef, pork and poultry				x		
C63	Cereals and Bakery				x	x	
C64	Cereals and Bakery	x	x	x	x		
C65	Confectionery and Snacks	x			x	x	
C66	Frozen and chilled foods	x	x		x		
C67	Frozen and chilled foods				x	x	
Total:		12	8	30	58	22	

Key: Q: questionnaires, I: interviews, E: environmental reports, W: websites, F:FHC reports

A Total of six companies were screened out from the analysis (shaded in grey)

*Multiple products refers to a set of multinational corporations that manufacture a wide range of food products from confectionery to soft drinks, cereal and coffee.

As shown in Table 3.21, six companies from the sample of 73 were screened out. This was done either because their websites were not found or because they are subsidiaries of another company (C35 in both cases). In summary, a total sample of 67 companies was used for the testing of the tool presented in section 3.3. The discussion of this analysis is presented in chapters 5, 6, 7 and 8. The next chapter will discuss the results obtained from the analysis of the data gathered from experts (as presented in section 3.2).

Chapter 4

Multi-criteria framework proposition - a soft path for water in the food and drink industry

We can't solve problems by using the same kind of thinking we used when we created them
- Albert Einstein

This chapter aims to propose a multi-criteria framework grounded in the concepts of soft path for water, sustainable water management in the corporate sector and water stewardship discussed in chapters 1 and 2. A gap in knowledge was identified with regards to a better understanding of what an applied soft path for water concept would entail for the food and drink industry.

Chapter 3 described the methodology used for this research. First, an exploratory study was carried out for defining the scope of this research. Results obtained in this preliminary study indicated a confusion about what exactly a soft path implies. This chapter aims to propose a framework for evaluating if companies that belong to the food sector are embedding soft path elements in their water strategies. For this reason, a sample of experts was consulted with the aim of finding the specific components of a soft path for water with an emphasis on the food sector.

Section 4.1 examines the understanding of the soft path for water concept of the consulted experts. Section 4.2 evaluates the sample's opinions on water demand management and its scope for improvement. Section 4.3 groups the findings obtained in sections 4.1 and 4.2 in order to define what the elements of a sustainable water

strategy are and introduces the multi-criteria framework developed as part of this research.

4.1 Awareness and understanding of the soft path for water concept

When carrying out the review of the relevant literature and after the completion of the exploratory and pilot studies, it was found that the concept of the soft path for water is not widely known (see sections 3.1.2 and 3.4.2.1). For this reason, experts and practitioners were consulted in order to get their insights and understanding about the soft path for water theory. A total of 38 participants took part in the online questionnaire and from these, eight were chosen for semi-structured interviews in order to gather richer data. This section presents the participants awareness and comprehension of the soft path for water philosophy. Section 4.1.1 discusses the results of the online questionnaire where participants were asked to answer about their familiarity with the soft path for water terminology. Additionally, Section 4.1.2 presents the insights captured in the analysis of the eight semi-structured interviews.

4.1.1 Are experts familiar with the soft path for water terminology?

Participants in the online questionnaire were first asked about their familiarity with the soft path for water terminology. From the total of 38 participants, 50% (19) answered yes, 34% (13) answered no and 16% (6) left the question unanswered (see Figure 4.1(a)). All the participants who left the question blank entered their personal contact data but did not answer any of the following questions in the questionnaire. For this reason, they were screened out of the analysis making the new total number of respondents 32. From this new total, 59% (19) of the respondents answered yes and 41% (13) answered no (see Figure 4.1(b)).

Nevertheless, from the 32 participants who answered the whole questionnaire, five are scientists who have contributed to the development of the soft path for water theory and thus are familiar with the term. In order to reduce bias in the analysis of this question, these five contributors were screened out and the percentages were recalculated (see Figure 4.1(c)). For this latter case, 52% (14) of the respondents are familiar with the soft path for water terminology and 48% (13) are not. These figures

suggest that the soft path for water is not a mainstream concept in the water management and policy arena and confirm the results prompted by the pilot and exploratory studies.

Q1: Are you familiar with the soft path for water terminology?

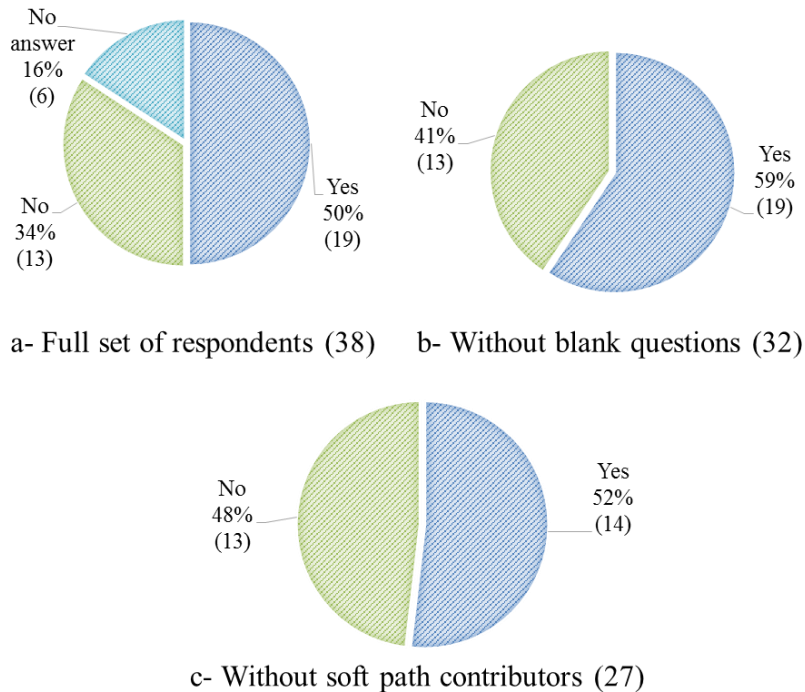


Figure 4.1: Online questionnaire expert responses for Question 1

The whole set of respondents who stated that they were familiar with the soft path for water terminology, including the five contributors, were asked to elaborate their answer and explain, in their own words, what the soft path for water implies. From the 19 respondents, four left the question blank and 15 explained their understanding of the terminology. In their responses six themes were identified. Participants marked with an asterisk are those who have contributed to the soft path concept discussion and those marked with the number 1 are the concept developers (see Table 4.1).

Table 4.1: Themes identified in the expert respondents' answers

<i>Respondent</i>	<i>Efficiency & technology adoption</i>	<i>Community & stakeholder engagement</i>	<i>Environmental impact and limits</i>	<i>Re-evaluation of water services</i>	<i>Governance</i>	<i>Fairness</i>
Exp03*		x	x			x
Exp09	x		x			
Exp10	x					
Exp11			x			
Exp13*, ¹		x	x	x	x	x
Exp14	x	x				
Exp26	x					
Exp29	x					
Exp30*	x	x	x			
Exp32*	x	x	x	x	x	x
Exp33*, ¹	x	x		x	x	
Exp41		x	x	x	x	x
Exp44		x	x			x
Exp48				x		
Exp52	x					
Total	9	8	8	5	4	5
Percentage	60%	53%	53%	33%	27%	33%

Key: *Concept contributor, ¹Concept developer

The five concept contributors were those who mentioned three or more elements for the soft path for water. These results are expected since they have a better understanding of the theory than the rest of the sample and are able to identify more elements in it. In addition, two of the non-contributors also mentioned three or more themes in their responses. Furthermore, one of the non-contributors referred to two themes. On the other hand, six of the participants indicated only one element in the soft path for water, four of which centred their answers in the adoption of efficient technology. (For the full profile of participants please refer to Appendix 5)

The coding of the responses shows that the majority of participants 60% (9) referred to the adoption of efficient technological measures so to cut the demand of water. The second most mentioned codes were community and stakeholder engagement and knowledge of environmental impacts, where 53% (8) referred to them. Furthermore, both the re-evaluation of water services and fairness were

mentioned by 33% (5) of the respondents. Finally, governance was mentioned by 27% (4) of the participants (see Figure 4.2 and Table 4.1).

Themes in responses of: What does the soft path for water imply?

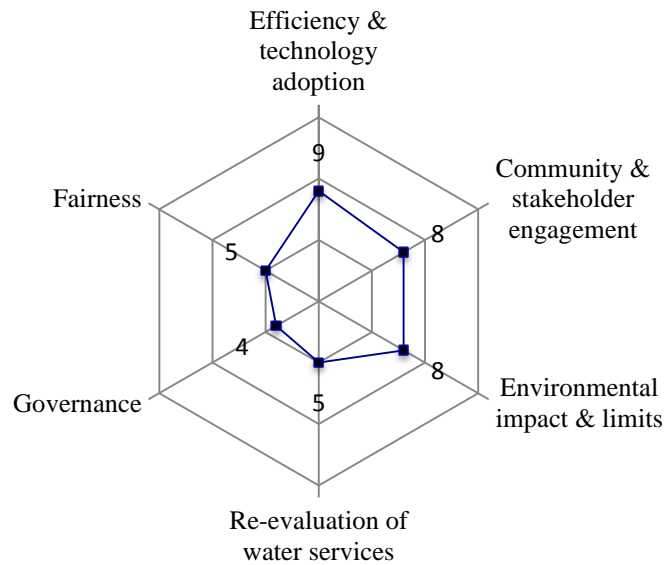


Figure 4.2: Answers for the question: What does the soft path for water imply?

Efficiency and technology adoption refers to the implementation of water efficient and improved technologies that reduce the water used for human operations. In the literature it is often referred as demand-management, which is widely understood as the build-up of technical developments for reducing the water used for the production of goods and services (Brandes et al., 2005). Results of the questionnaire show that three (out of the five) soft path for water concept developers made a specific reference to this element. Furthermore, this is the only component solely mentioned by four out of the 15 participants. In other words, four respondents made only reference to the increment of efficiencies or the adoption of different technologies as their understanding of the soft path approach. These figures show evidence for stating that often, technological solutions are sought as a way of solving water related problems. Table 4.2 presents the quotes of all respondents who mentioned the adoption of efficient processes and technologies in their questionnaire answers. In addition, a short justification of why were they categorised under this theme is shown.

Table 4.2: Expert responses that mentioned ‘efficiency and technology adoption’

<i>Participant</i>	<i>Quote</i>	<i>Justification</i>
Exp09	<i>“Making better use of existing infrastructure optimising the current processes in place”</i>	Optimisation of processes implies technological adoption
Exp10	<i>“Productivity gains without supply augmentation”</i>	Production without water augmentation implies efficiency
Exp14	<i>“Those are non-structural actions defined to build and strengthen technical knowledge...”</i>	Reference to the need to strengthen technical knowledge
Exp26	<i>“It implies a more integrated and effective water resource management, alternative to supply-side”</i>	Direct reference to efficiency
Exp29	<i>“It's a water resources management approach that incorporates both demand and supply of water”</i>	This refers to demand management which implies technology adoption
Exp30*	<i>“...emphasizing innovation to promote efficiency but in the context of local water supply”</i>	Innovation for efficiency promotion
Exp32*	<i>“Identify options (technological and managerial) that can provide for the services and can meet the sustainability goals, and choose among those options according to feasibility and desirability”</i>	Direct reference to technological options
Exp33* ¹	<i>“...transition from simple supply-oriented approaches to ones that include demand management and efficiency”</i>	Direct reference to efficiency and demand management
Exp52	<i>“Integrated and effective water resource management”</i>	Direct reference to efficiency

Key: *Concept contributor, ¹Concept developer

The second most mentioned theme in the participants’ questionnaire responses was the need to take into consideration the social/human dimension so to ensure a soft path approach to water policy and management. This element refers to the social aspect of the concept and includes behavioural change, community engagement, stakeholder orientation and innovative managerial approaches (Gleick, 2009, p. 53). The social dimension was discussed by eight out of 15 respondents and by all of the concept contributors. This shows evidence for the importance of the consideration of the social aspect when dealing to water related topics. Sustainability is only achievable if the social, environmental and economic aspects are taking equally into consideration. Table 4.3 presents the quotes abstracted from the questionnaire answers and also gives a brief justification of why each of them falls into the social theme identified in the analysis.

Table 4.3: Responses that mentioned ‘community and stakeholder engagement’

<i>Participant</i>	<i>Quote</i>	<i>Justification</i>
Exp03*	<i>“As an appropriate adaptive response, Homo Sapiens can choose an alternative - the Soft Path - which implies less direct intervention and more collaboration between Man and other species”</i>	Recognition of the social dimension
Exp13 ^{*,1}	<i>“More generally it means putting sustainability as the top priority in water policy and engaging more people in helping to develop sustainable water policies”</i>	People engagement in the water policy arena
Exp14	<i>“...capacities to raise awareness about a multi stakeholder approach in order to improve the IWRM.” (Integrated water resource management)</i>	Mention of stakeholder approach
Exp30*	<i>“A different type of management priority - based on conservation, modifying behaviour to fit local ecological limits”</i>	Reference to behavioural change
Exp32*	<i>“Identify options (technological and managerial) that can provide for the services and can meet the sustainability goals, and choose among those options according to feasibility and desirability”</i>	Managerial options include the social dimension
Exp33 ^{*,1}	<i>“The far broader use of technology, economics, innovative management strategies for addressing water problems”</i>	Innovative management requires the consideration of social aspects
Exp41	<i>“The soft path implies engagement with various disciplines with an interest in water as well as various policy makers, planners, politicians and others. Further the soft path calls for a recognition and discussion of values and visions associated with sustainability, rather than these being assumed or not discussed in the context of other approaches to water resource management”</i>	Interdisciplinary approach that engages with planners, policy makers, politicians and others
Exp44	<i>“A soft path accounts for environmental and social concerns”</i>	Direct reference to social concerns

Key: *Concept contributor, ¹Concept developer

The knowledge of environmental impact and limits was the third most mentioned theme indicated by eight of the 15 participants. This component refers to the consideration of the effects on the environment that the use and discharge of water will account for (Brandes et al., 2009). Responses show that four out of the five concept contributors explicitly referred to this element in their questionnaires. Table 4.4 presents the quotes of all respondents who denoted this component in addition to the justification of their selection as part of the environmental impact and limits theme.

Table 4.4: Responses that mentioned ‘environmental impact and limits’

<i>Participant</i>	<i>Quote</i>	<i>Justification</i>
Exp03*	<i>“In essence it is about working with Nature rather than against Nature”</i>	Working with nature implies the knowledge of impact and limits
Exp09	<i>“...avoiding unnecessary pressures on the water environment”</i>	Reduction of pressure in the environment
Exp11	<i>“...discusses [the soft path] the potential for this innovative approach to develop water ecological sustainability”</i>	Ecological sustainability refers to reduction of environmental impacts and knowledge of limits
Exp13* ¹	<i>“...soft paths represent [water policy] macro-economics, ...[and] ecological economics”</i>	Ecological economics should take into account environmental limits
Exp30*	<i>“A different type of management priority - based on conservation, modifying behaviour to fit local ecological limits...”</i>	A management focused on conservation and ecological limits
Exp32*	<i>“Begin by positing what a sustainable future looks like, vis-a-vis water resources”</i>	Beginning with the end in mind implies the knowledge of environmental limits
Exp41	<i>“It also implies adaptability in the ways water is managed in the short and long term to suit the particular contexts (e.g. homes, factories, farms, catchments, river basins) with an emphasis on ecological sustainability”</i>	Ecological sustainability refers to reduction of environmental impacts and knowledge of limits
Exp44	<i>“A soft path accounts for environmental and social concerns”</i>	Consideration of environmental concerns

Key: *Concept contributor, ¹Concept developer

Five out of 15 participants mentioned the re-evaluation of water services. This component is essential in the soft path for water arena as it is proposed as a fundamental step for achieving a paradigm shift in which water is seen as the services it provides rather than the resource itself (Brandes et al., 2009; Gleick, 2009; Gleick 2012). From the concept contributors, three out of five explicitly mentioned this element in their responses. Table 4.5 shows the quotes of the respondents who mentioned the re-evaluation of water as an element of the soft path approach as well as the justification of why the quote refers to the theme.

Table 4.5: Responses that mentioned ‘re-evaluation of water services’

<i>Participant</i>	<i>Quote</i>	<i>Justification</i>
Exp13 ^{*.1}	<i>“It implies most specifically dealing with water supply-demand problems from the demand side -- cutting demand rather than increasing supply”</i>	Cutting demand instead of increasing supply implies the re-evaluation of water
Exp32 [*]	<i>“...then examine all services, asking how much water is needed (or even if the service can be met without water use) and what quality of water is needed for the services”</i>	Ask if the service can be met without water use
Exp33 ^{*.1}	<i>“...innovative management strategies for addressing water problems”</i>	Innovation requires the re-evaluation of water services
Exp41	<i>“It focuses on changing practices of water use, with an emphasis on asking why water is used for certain tasks”</i>	The services that water provide can often be replaced by innovative solutions
Exp48	<i>“... having a better understanding of what the water will actually be used for (e.g. grey water recycling for toilets rather than using potable water)”</i>	The different qualities of water used for different purposes implies the re-evaluation of water services

Key: ^{*}Concept contributor, ¹Concept developer

Fairness is equity, which is closely linked to social justice (Pawar, 2014). The soft path for water philosophy aims to achieve sustainability of water resources. Fairness in the water policy and management areas refers to an equitable access to water resources by the different users of water so to meet societal needs (Pawar, 2014). Fairness was extrapolated from five of the 15 questionnaire responses. Table 4.6 shows the abstracted quotes from each response along with a brief justification of why do they fall into the fairness theme.

Table 4.6: Responses that mentioned the ‘fairness’

<i>Participant</i>	<i>Quote</i>	<i>Justification</i>
Exp13 ^{*.1}	<i>“More generally it means putting sustainability as the top priority in water policy and engaging more people in helping to develop sustainable water policies”</i>	Engaging with people to deliver sustainability should have a fairness element when done properly
Exp32 [*]	<i>“Identify options (technological and managerial) that can provide services and can meet the sustainability goals, and choose among those options according to feasibility and desirability”</i>	Desirable sustainable goals must be fair
Exp44	<i>“A soft path accounts for social and environmental concerns”</i>	Social concerns are closely linked with fairness
Exp41	<i>“The soft path calls for a recognition and discussion of values and visions associated with sustainability, rather than these being assumed or not discussed in the context of other approaches to water resource management”</i>	The values and visions associated with sustainability should raise fairness concerns
Exp03 [*]	<i>“The soft path implies less intervention and more collaboration)”</i>	Collaboration should be done with fairness

Key: ^{*}Concept contributor, ¹Concept developer

Governance was mentioned in four out of the 16 responses. This theme refers to the decision making process in the water arena where governance systems are those who have the power to control the flow and allocation of water for different purposes (GWP, 2002). One of the key components in the soft path for water theory is the notion of ‘backcasting’ of water resources. ‘Backcast’ is the process of planning from the future back to the present (Brandes et al., 2009). In other words, is to forecast for the future water resources in a given region or space and from then to start reversing and allocating amounts of water resources for different activities. In order to ensure an effective ‘backcasting’ it is essential to have robust governance processes in place so present and future water thresholds are not surpassed. Table 4.7 summarises the quotes abstracted from the participants’ responses that refer to the notion of governance or ‘backcasting’.

Table 4.7: Responses that mentioned the ‘governance’

<i>Participant</i>	<i>Quote</i>	<i>Justification</i>
Exp13*. ¹	<i>“More generally, it means putting sustainability as the top priority in water policy and engaging more with people in helping to develop sustainable water policies”</i>	Sustainability in the water policy has embedded a proper governance where thresholds are not crossed
Exp32*	<i>“Begin by positing what a sustainable future looks like, vis-à-vis water resources”</i>	This is the first step for carrying out ‘backcasting’ of water resources
Exp33*. ¹	<i>“The far broader use of technology, economics, innovative management strategies for addressing water problems”</i>	This implies an adequate water governance
Exp41	<i>“The soft path implies engagement with various disciplines with an interest in water as well as various policy makers”</i>	Engagement with policy makers is a key step in water governance

Key: *Concept contributor, ¹Concept developer

In summary, the responses of the 15 participants who explained in their own words their understanding of the soft path for water concept were analysed. This was done in order to identify key elements of the concept for the proposition of a multi-criteria framework for a soft path for water for the corporate sector. Data was analysed using grounded theory for identifying themes or nodes in the participants’ responses (see section 3.2). A total of six categories were identified: (1) efficiency and technology adoption, (2) community and stakeholder engagement, (3) knowledge of environmental impacts and limits, (4) re-evaluation of water services (5) fairness and (6) governance.

The adoption of efficiency measures and technology as a way of adopting a soft path approach was the most frequent element mentioned in the sample (nine out of 15). Furthermore, the social dimension (community and stakeholder engagement) and the knowledge of environmental impacts and limits was mentioned in eight of the responses. The re-evaluation of water services and the fairness dimensions were identified by five of the 15 participants. Finally, four of the respondents made reference to governance. All the identified themes fall into the concept of sustainability, which takes into consideration the intersection between the environment, society and economy dimensions (UNWCED, 1987). Figure 4.3 shows a schematic representation of the themes within the sustainability framework.

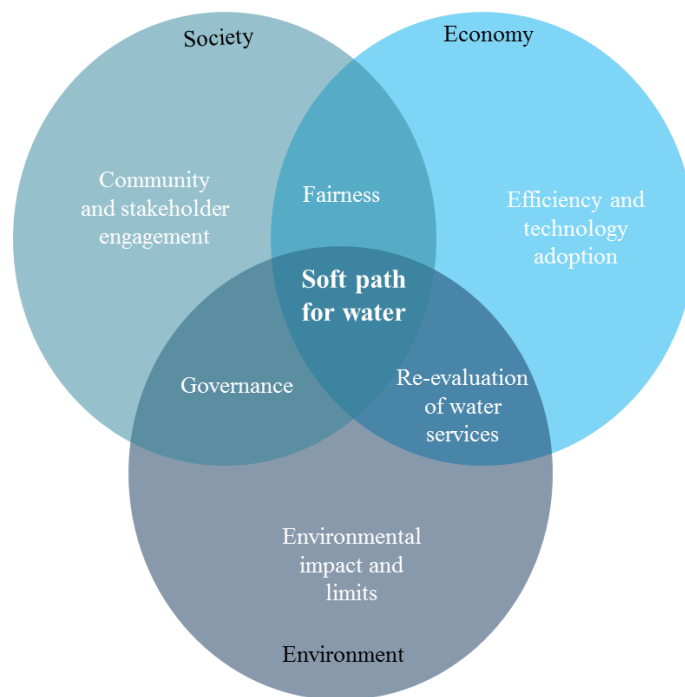


Figure 4.3: Soft path for water themes in the sustainability framework

In order to get richer insights and data from the participants, eight were chosen to take part in semi-structured interviews. Three were key contributors to the soft path for water concept, three were respondents that although did not contribute to the development of the theory stated in the questionnaire that they were familiar with the term and two were respondents who stated their unfamiliarity with the theory. The next section presents the insights captured in the interviews around the understanding of soft path for water.

4.1.2 Interviews results - What is the soft path for water?

Interviews were carried out with the purpose of having a more in-depth exploration of the meaning of the soft path for water concept and the understanding experts have around it. This section presents results and quotes abstracted from the semi-structured interviews carried out.

A total of eight people from different backgrounds were interviewed in order to get heterogenic data that showed diverse perspectives. A total of three university associates, two sustainability organisations' affiliates, two water footprint network members and one practitioner were interviewed. From these, three are contributors to the soft path approach. Furthermore, from the five non-contributors, three were familiar with the soft path for water terminology and two were not (see Figure 4.4 and Table 4.8).

Background of participants in the experts' semi-structured interviews

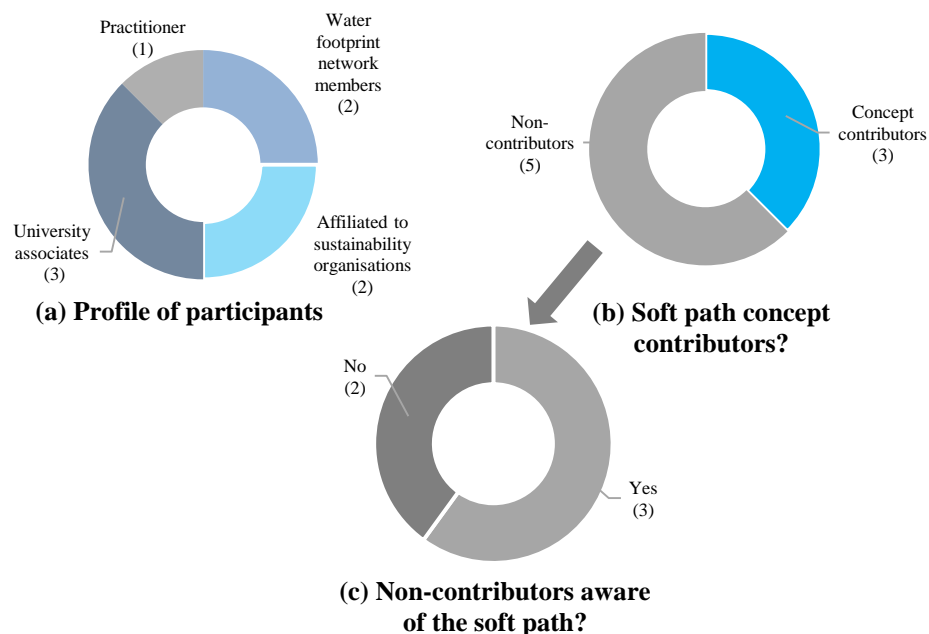


Figure 4.4: Background of participants in the experts' semi-structured interviews

Table 4.8: Interviews expert participant’s selected roles and expertise¹⁸

<i>Participant</i>	<i>Role</i>	<i>Expertise</i>	<i>Familiarity with concept</i>
Exp03*	Senior Associate Water Institute of South Africa and Director of Touchstone Consultancy, South Africa	Contributor to the soft path concept	Yes
Exp12	Senior visiting researcher University of Oxford, England	Waste water expert	No
Exp13*. ¹	Senior Associate, International institute for Sustainable Development, Canada	Concept developer	Yes
Exp26	Associate, Water Footprint Network, Spain	Water footprint	Yes
Exp32*	Associate professor, University of Waterloo, Canada	Contributor to the soft path concept	Yes
Exp41	Lecturer, University of St Andrews, Scotland	Governance and freshwater resources	Yes
Exp52	Knowledge exchange officer, Water footprint network, Netherlands	Water footprint	Yes
Exp53	Associate, Water Authority, Palestine	Water environmental & social impact assessment	No

Key: *Concept contributor, ¹Concept developer

When experts were asked about their understanding of the soft path for water concept, several answers were provided and some themes were identified. First, there seems to be confusion under the soft path for water realm, three of the participants manifested that it is not clear to them what does the soft path for water mean. As expected, the two non-contributors not aware about the concept before this study (Figure 4.4 (c)) expressed their confusion. This can be inferred by some of their responses presented below:

“When you use the term of soft path you have to clarify what you actually mean by that. Demand management is a key issue in the soft approach, putting my academic hat on for a moment, I can see the benefits of a good demand management, putting a practical hat on it, and it depends exactly where we are in the world, demand management is not. If I was still back in the industry [that is the water and waste water sector] and my future water resources that I had to supply to the community were dependent on changing the habits of the society to reduce water, I would be very concerned, because I think in practice there is only one way to do it and that is economically by making sure that the price of water actually reflects the true value of water”- Exp12 (Sep 2013)

“To be honest, I was not aware of this term, but I do have a little idea about it. I think is about finding water resources, we are facing water problems so depending on the conventional water resources is not enough” – Exp53 (Sep 2013)

¹⁸ For the full profile of participants please refer to Appendix 5

The first quote by Exp12 shows that the participant did not clearly understand what the soft path for water meant. In addition, the respondent mentioned that demand management is a key aspect in the soft path. This demand management notion seems to be centred on changing the habits of the society to reduce water consumption. Nevertheless, in literature, water demand management is defined as the group of technical developments for reducing the water used for the production of goods (Brandes and Brooks, 2005). A discrepancy is found in both definitions and it is therefore important to define what water demand management means depending on the context.

Furthermore, Exp53 understands the soft path as an innovative way of finding new water resources for solving water related issues. In addition, it is worth noting that one of the concept contributors indicated that, although s/he has worked in this area and is therefore familiar with the terminology, the actual meaning of the soft path is not yet clear in his mind. This can be deduced from the following response:

“What the soft path means is an open question because it is not clearly defined, at least in my mind” – Exp03 (Sep 2013)

The latter response shows evidence for the need of a clear definition of the soft path context in order to achieve an improved water policy and management. Some participants provided their understanding and definitions of the soft path approach as follows:

“One of the key features of the soft path thinking is to define for ourselves what we think what sustainability is, what we want our future to be, and then to back up from there to say where are we and how are we going to get where we want to be” – Exp32 (Sep 2013)

“The soft path, I guess, promotes more the long term view on the environmental issues and the socio-economic aspects. I think the corporate sector should focus on the whole supply chain, and not only this, to try to improve efficiency at in the supply chain and this is a difficult issue but should also consider the local context” –Exp26 (Sep 2013)

“Changes often accompany confusion because the paradigm that we have had in the past is no longer applicable to the future. And re-inventing that paradigm for the future, this is where people call it different things for example like the soft path” –Exp03 (Sep 2013)

Exp32 clearly mentions that an important aspect of the soft path for water is to begin with the end in mind and then ‘backcast’ to plan and define the roadmap for sustainability in the water resources area. This idea is also discussed by Exp26 who

acknowledges the importance of the long-term view on sustainability aspects, which has embedded the notion of ‘backcasting’ in it. Furthermore, Exp26 touches on the globalisation aspect, which means that systems are interconnected. This, in the corporate sector is done through their global supply chains. Moreover, the participant emphasises the importance of taking the local context into account while embracing a global system.

Exp03 makes reference to the confusion around the definition of the soft path approach and attributes it to the paradigm shift that society is currently facing. This is happening because the systems we currently have in place need to adapt to the new socio-environmental changes. The explanation given by the participant has also embedded the notion of ‘backcast’, because this shift implies the definition of the future, in this context of water resources, as we want it to be. Some of the expert contributors to the concept also recognised the areas in which the soft path thinking should be improved, below some of their responses:

“The work that I have done with my colleagues to develop the concept has been more from the academic side, as an analytical tool to try to understand what sustainability means and what are the options to getting there... a lot of work in soft path needs to be done, to move it out of this academic exercise and this conceptual idea and make it a real mechanism that gets incorporated into the actual operation of governance and management” – Exp32 (Sep 2013)

“From the soft path perspective the thing that is going to most influence industry is the cost and that's what I think could also promote some friendly competition among the industry to see who is using less water and get them doing what some of the energy companies do and the forestry companies. I think where the behavioural change has to come is in the minds of the plan managers and the operators of the industry it is not quite behavioural change, it is a soft path vision on how are they going to operate”– Exp13 (Sep 2013)

The soft path for water concept appears to not be clearly defined. As a result, for its actual application in the corporate water strategy and management a more structured definition and approach needs to be developed. Exp32 recognises this and denotes that the concept needs to move from the theoretical area to its real implementation. Similarly, Exp13 mentions that the concept could potentially be implemented in the industry by the proposal of a good business model in which cost and behavioural change should come hand by hand.

In the quest of finding elements for a multi-criteria framework proposition for an improved corporate water strategy, experts were asked about their opinions around the way in which water demand management could be improved. The next section

discusses the results found from the experts' responses in both the online questionnaire and semi-structured interviews around the topic of demand water management.

4.2 Water demand management and its scope for improvement

Demand management considered as a key element for the soft path for water approach (Brandes and Brooks, 2005; Brandes et al., 2009; Gleick 2009). Participants were asked about their insights around water demand management and its scope for improvement. This was done in order to identify key elements for the proposal of a multi-criteria framework for an improved water policy in the corporate sector.

The 32 respondents of the online questionnaire were asked about their insights on how demand management could be improved. A total of 20 participants provided their responses and 12 left the question unanswered (see Figure 4.5). Four themes were identified in the 20 participants' answers. The most mentioned theme (in 16 responses) was the category that encapsulates the ways in which water demand management could be more efficient. The second most frequent category (in seven answers) was the importance of the collection of good data and its quality; demand management can be used as a tool for facilitating this. Furthermore, the relevance of using different qualities of water for different purposes was identified in four responses. The last category identified (in three responses) falls into the realm of having improved water pricing in order to provide a better use. Table 4.9 provides a summary of the categories identified in the respondents' answers.

Table 4.9: Themes identified in the answers with regards of demand water management improvement

<i>Participant</i>	<i>Water efficiency</i>	<i>Data across the supply chain</i>	<i>Different water qualities for different needs</i>	<i>Regulation & governance</i>
Exp03*	x	x		
Exp06		x	x	
Exp09	x			
Exp10	x	x		
Exp12	x			
Exp13* ¹	x			x
Exp14	x			
Exp22		x		
Exp26	x			
Exp29	x			
Exp30*	x			x
Exp32*	x		x	
Exp33* ¹	x	x	x	
Exp35		x		
Exp41	x			x
Exp44	x		x	
Exp46	x			
Exp48		x		
Exp52	x			
Exp53	x			
Total	16	7	4	3
Percentage	80%	35%	20%	15%

Key: *Contributors to the soft path for water concept - ¹ Concept developer

Water efficiency was the most frequent theme identified in the 20 responses analysed, it was found in 16 (70%) of the answers. The recognition of the need for better water data across the supply chain of products was found in seven (35%) of the responses. The use of different qualities of water for different purposes was extracted from four (20%) of the responses. The acknowledgement of the importance of governance was identified in three (15%) of the answers. For the proposition of a multi-criteria approach, it is important to categorise the quotes from the themes identified in Table 4.9 into subcategories that relate to those shown in Figure 4.2. Table 4.10 shows this sub-categorisation.

Table 4.10: Sub-categorisation of the demand management efficiency improvements responses

<i>Participant</i>	<i>Quote</i>	<i>Subcategories</i>
Exp03*	<i>“DM [Demand Management] is a first step in getting one’s proverbial house in order. This drives efficiencies, and thus comparative advantages, but can only yield so much before becoming redundant”</i>	(1), (2), (3)
Exp09	<i>“There should be two approaches: making the most of the water as a raw material and reduce demand”</i>	(3), (4)
Exp10	<i>“It might also be important to consider end user practices (i.e. supermarkets and waste management) and introduce policies to induce behavioral changes. I am thinking of longer expiration dates or secondary markets in order to reduce food (and water) waste”</i>	(1), (2)
Exp12	<i>“Considerably but don’t be over optimistic in the ability of DM to solve major water sector problems”</i>	(1)
Exp13*. ¹	<i>“The soft path could be invoked to go beyond the strict limits of cost effectiveness, and as part of the whole complement of representing any part of the industry as a ‘green’ producer”</i>	(1), (3)
Exp14	<i>“I think that the water footprint as a complementary view of the demand management could improve results, in order to obtain an approach, not only in-house, but at basin level as well ... the water footprint and consumption along the supply chain”</i>	(1), (2), (3)
Exp26	<i>“Yes, by clearly defining water efficiency, which would include not only technical efficiency but also management efficiency and allocative efficiency”</i>	(2), (3)
Exp29	<i>“It can be improved in ways that defer depending on the industry, the production line, and the technology used”</i>	(3)
Exp30*	<i>“Many ways to improve efficiency. Many technological applications exist from low flow toilets, to rainwater and recycled water systems”</i>	(1), (4)
Exp32*	<i>“Soft paths utilize the full panoply of demand management approaches. However, soft paths go beyond by asking the fundamental question, is water necessary (and, what sort of water) for a particular service”</i>	(1), (3), (4), (5)
Exp33*. ¹	<i>“Yes, in the sense of expanded and made more effective at identifying and capturing water efficiency potential”</i>	(1)
Exp41	<i>“Technology and economic incentives may be one step to improve efficiency and reducing water use. Thereafter, other innovations may emerge from redesign of processes and products or perhaps even questioning whether certain industrial activities are required, and if use can be reduced or eliminated from the activities”</i>	(1), (4)
Exp44	<i>“Efficiency is often a misnomer as it too often fails to take into account social and hydrologic realities. Efficiencies (scientific literature) too often result in pragmatic approaches by farmers, like using ‘saved’ water to grow more, making crops and water more valuable and therefore less likely to return them”</i>	(1), (2), (3), (5)
Exp46	<i>“Users of the water have to become even more aware of their own responsibility and that it’s water availability is not only a supply driven mechanism”</i>	(2)
Exp52	<i>“Yes, by The Four Steps of the Water Footprint Assessment Methodology and an integrated water demand approach in production chain”</i>	(1), (2)
Exp53	<i>“Demand Management as an approach in water sector could be improved. This could be achieved by focusing on marketing alternative water recourse (non-conventional water resources) for the domestic, agriculture and industrial uses”</i>	(3)

Subcategories: (1) efficiency & technology adoption, (2) community & stakeholder engagement, (3) environmental impact and limits, (4) re-evaluation of water services, (5) fairness

Key: *Concept contributor, ¹ Concept developer

In addition, the second area identified corresponds to the acknowledgement by experts of the collection of high quality data through the water demand management approach. In this case, seven participants referred to this. Table 4.11 shows the quotes taken from the participants' responses along with the sub-categorisation of each citation in terms of the themes identified in Figure 4.2.

Table 4.11: Responses that mentioned the importance of water measurement and better pricing

<i>Participant</i>	<i>Quote</i>	<i>Subcategories</i>
Exp03*	<i>“It is DM (demand management) that starts the drive to measure all process variables, and this enables optimization to commence. The Soft Path is a journey that is undertaken triggered by the data yielded from DM activities. If you cannot measure you cannot manage, so DM sets the foundation for that which needs to be measured in future as optimization is commenced”</i>	(1)
Exp06	<i>“The key management variable is to quantify water available to industry (after allocating water for all civic uses first) such that industrial water use (by all enterprises operating in the watershed) remains well within the bounds of water availability”</i>	(1), (3), (5), (6)
Exp10	<i>“On one side some industries/users are very sensitive to water prices and a small change in price/charging could strongly influence their water use choices... I suppose demand management, but specifically pricing, could have an effect on improving efficiency in the food production industry (though I have not studied any elasticity curve for the sector)”</i>	(1), (6)
Exp22	<i>“Better pricing of water. More transparency of details of water users; i.e. disclosure of who large water users are, what water is being used for, how efficiently it is being used”</i>	(1), (2), (5)
Exp33*. ¹	<i>“A key is improving the collection and dissemination of water use data... Another is improved pricing to encourage more efficient use.”</i>	(1), (6)
Exp35	<i>“Pricing is the best general way. Higher prices drive behaviour and investment”</i>	(1), (6)
Exp48	<i>“Better marketing of the benefits of water efficiency and the knowledge on impact of reduced energy consumption. Currently water costs for Business Users (in the UK) are a fraction (say 15%-20%) of the annual costs of electricity or gas and therefore often seen as the 'poor relation' and not worth the focus for the returns”</i>	(1), (6)

Subcategories: (1) efficiency & technology adoption, (2) community & stakeholder engagement, (3) environmental impact and limits, (4) re-evaluation of water services, (5) fairness, (6) governance (see Figure 4.2)

Key: *Concept contributor, ¹ Concept developer

The third theme identified was the re-evaluation of water services, in other words, using different qualities of water for different purposes. In this case, four experts gave their insights on this topic. Table 4.12 presents the quotes that made reference to this group as well of their sub-categorisation according to the one shown in Figure 4.2

Table 4.12: Responses that mentioned the use of different qualities of water for different purposes

<i>Participant</i>	<i>Quote</i>	<i>Subcategories</i>
Exp06	<i>“The most important variable is water availability, sufficiency, and quality for legitimate uses by all stakeholders in a watershed or aquifer region.”</i>	(2), (3), (4), (5)
Exp32*	<i>“With respect to beverages, the service ‘hydration’ obviously requires water; the services ‘taste’, ‘nutrition’, ‘status’ however might be satisfied in many different ways with different demands for water content.”</i>	(4)
Exp33*, ¹	<i>“Another is separating out water demands by the quality of water needed in order to identify where reused and recycled water can be used”</i>	(4)
Exp44	<i>“Efficiency also does not mean using less - but using what you do to create higher yields. This is in contradiction with water returning for nature or assumptions that efficient use of water means more water for people and nature. Not true.”</i>	(1), (3), (4), (5)

Subcategories: (1) efficiency & technology adoption, (2) community & stakeholder engagement, (3) environmental impact and limits, (4) re-evaluation of water services, (5) fairness (see Figure 4.2)

Key: *Concept contributor, ¹ Concept developer

The last category identified when analysing the responses around the scope for the water demand management was the importance of governance and regulation. In this case, three answers were classified under this theme. Table 4.13 presents the quotes extracted from the questionnaire.

Table 4.13: Responses that mentioned the need for better water governance

<i>Participant</i>	<i>Quote</i>	<i>Subcategories</i>
Exp13*, ¹	<i>“I have a hard time dealing with things such as potato chips and candied this or that or soft drinks. One can hardly expect the industry to urge people to eat less of its product. Demand management is about all that one can expect for these products”</i>	(5), (6)
Exp30*	<i>“Governance/incentive based options including volume based pricing and increasing water unit pricing”</i>	(6)
Exp41	<i>“Demand management could lead to certain water management agencies from supporting industrial development in certain areas which are aligned to areas where water is available for industrial activities”</i>	(5), (6)

Subcategories: (5) fairness, (6) governance (see Figure 4.2)

Key: *Concept contributor, ¹ Concept developer

In summary, in the analysis of the 20 questionnaire responses around the scope for improvement in the demand water management area, four main themes were identified. Water efficiency and its improvement was extracted from 16 responses. Furthermore, seven participants mentioned the importance of collecting of good quality data across the value chain of products. In addition, the notion of using different qualities of data for different purposes was identified in four answers. Finally,

the importance of an appropriate governance and regulation was discussed in three of the respondents' answers.

4.3 What are the elements for a sustainable corporate water strategy?

As discussed throughout sections 4.1 and 4.2, six elements were identified for a soft path for water in the corporate water strategy arena: (1) efficiency & technology adoption, (2) community & stakeholder engagement, (3) environmental impact & limits, (4) re-evaluation of water services, (5) fairness and (6) governance.

Participants recognise the value of technological advances in the process of achieving a better water management. Exp13 considers that in the corporate sector technology has a main role to play. However, it is emphasised the importance of changing processes rather than relying solely on more efficient technologies. An extract from this interview can be found as follows:

“I think there are gains in most industries, 10-20% you can get just by tightening the valves, not pumping more water than you need and things like these would give you a 10-20% absolute reduction of water. But thereafter I think is going to be mainly technology so it is where and when. In industry it would be technology and ideally, it would be process changed, not just slightly more efficient technology but finding a different technology to deal with things differently” – Exp13 (September 2013)

In addition, it was found that the definition of technology for the improvement of water management has various meanings for different people. This was pointed out by Exp26 who mentions that technologies are not only the ones used for increasing of water efficiency. They are also those communication technologies that bridge the gap between technological approaches and behavioural changes and that increase awareness in the society (see quote below).

“I think you can improve a lot of water management with the new technologies, and by that I mean for example water accounting technologies, water efficiency technologies, but also information technologies, like social networks and so on and these make a link between technology and behavioural change”- Exp26 (September 2013)

An interesting outcome of the interviews analysis was that most of the participants recognised that although technological approaches are important, they should not be considered as the only approach for the improvement of water

management and policy. Efficient technologies may lead to an increase in production, which may effectively result in an increase of the net water use. It is important to take social and behavioural aspects into consideration when pursuing a sustainable water management and policy, this is something identified in the quotes shown in Box 4.1.

Box 4.1: Technology is not the only element for an improved water management and policy

“For example the case of the Guadalquivir river basin in the south of Spain we have had this modernisation of irrigation like improving their technology, moving to drip irrigation in agriculture, and so on. And this has of course, improved the efficiency at the product level however there has been an increase of the irrigated area so in total terms there hasn't been a decrease on the water use at all. So you need to combine both [technology and behavioural aspects], and then increase awareness on the users so not to use more water”- Exp26 (September 2013)

“I have noticed over my years and it is that the technical people, the engineers, tend to be boys playing with their toys, they could be girls playing with their toys as well, and very often they don't see beyond the engineering, they don't venture into the social science or the policy issues and this is one of the reasons why for many years, after working all over the world I came to the conclusion that technology is not going to solve any of the water issues at all”- Exp12 (September 2013)

“We cannot continue operating the way that we do and think that we will always have the technologies that will let us ignore the issues and that really is a behavioural change” ... “So we can become technologically efficient in terms of our use of water in agriculture, our use of water in manufacturing, food products for example but is that enough or do we really need to think about behavioural change so what we expect, what we want water for?”- Exp32 (September 2013)

“So we did get to this whole idea of efficiency, what is efficiency? if efficiency is optimising your inputs and outputs in a westernised modern world then you are actually going to lose your resilience and you are going to lose all of these other things so ultimately I started questioning the very notion of efficiency because while the developing countries systems are not efficient, they are probably far more resilient. So which of these two is the model to follow? I have no idea... So again the solution is not to compete between Cornucopian or Malthusian, Socialist or Capitalist but ultimately to try understand where the synthesis of the two comes in” -Exp03 (September 2013)

Technological solutions are identified as an important aspect of a good corporate water management and policy. Nevertheless it was recognised by all participants that it should not be adopted in isolation but rather in an interconnected approach that takes into consideration social, environmental and economic aspects.

Through the review carried out in the literature, the water stewardship concept was identified as an initiative for promoting the use of water that is “socially equitable, environmentally sustainable and economically beneficial, achieved through a

stakeholder-inclusive process” (AWS, 2014, p. 4). The World Wide Fund for Nature (WWF) introduced the term water stewardship specifically for the business sector. This approach, applied for corporations, is based on the continuous improvement of internal and value chain business operations for a commitment to the sustainable management of water resources (WWF, 2013). The WWF in its 2013 Brief: ‘Water Stewardship- perspectives on businesses risks and responses to water challenges’ proposes five steps for businesses to become water stewards: water awareness, knowledge of impact, internal action, collective action and influence on governance (WWF, 2013, p. 14).

This thesis proposes a corporate soft path for water framework, which encapsulates the elements identified throughout this chapter and those proposed in the water stewardship literature. Figure 4.5 presents a summary of the themes for the proposed framework. The setting of the ground element covers the water awareness and re-evaluation of water services components. Second, knowledge of the environment involves the knowledge about impact and environmental limits. Third, internal action is comprised by the adoption of efficient technologies and the importance of staff engagement in the corporate sector. Fourth, the external action element refers to the community and supply chain engagement. Finally, the influence on water governance comprises the influence on governance at both macro and micro levels.

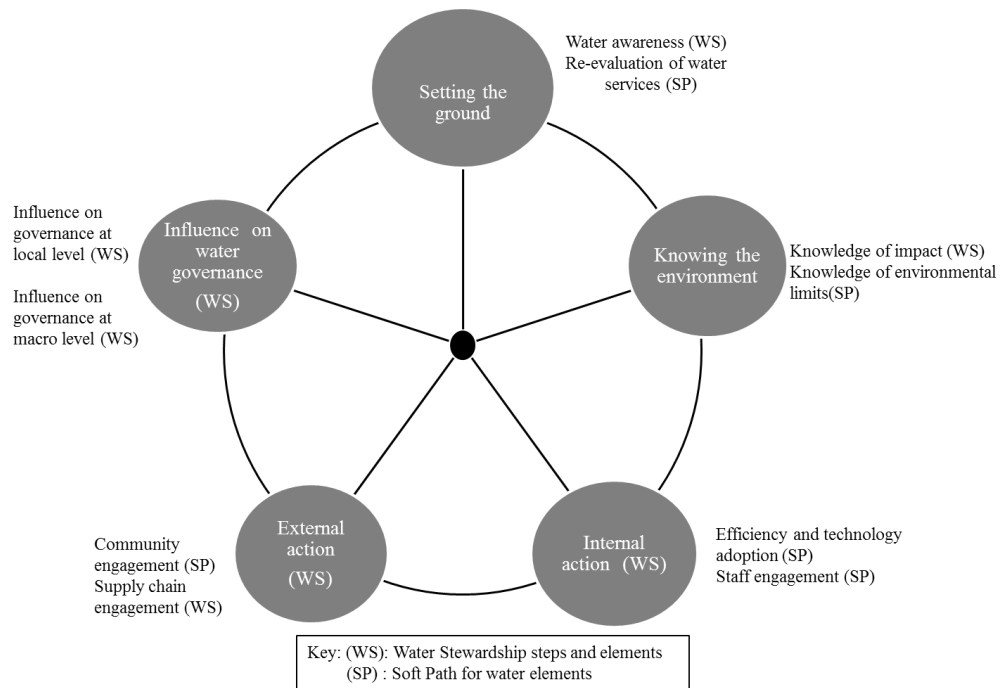


Figure 4.5: Schematic of the multi-criteria framework proposed

Setting of the ground is the starting point for adoption of a soft path for water in the corporate sector. Water awareness refers to the degree of understanding of water-related issues by the companies. In addition, the re-evaluation of water services is the “differentiation of waters with different qualities and match the quality needed with the quality that is available” (Gleick, 2009. p. 53).

Knowing the environment is the companies’ understanding of the impact and dependence of their activities on water resources. Knowledge of impact refers to the awareness of the impact water used in their operations has on the environment. In addition, water environmental limits refer to the amount of water that can be withdrawn from a given ecosystem without altering its resilience.

Internal action refers to the actions undertaken by companies as part of the soft path for water adoption in their activities and policies. Efficiency and technology adoption are a good way for reducing water use in the companies’ operations but should not be the only action adopted. Staff engagement is the involvement of the internal workforce in the companies’ water sustainability area.

External action is the initiatives undertaken by the businesses that have an outside influence or impact. Community engagement is the companies’ engagement

with the communities where they operate with the aim of reducing their socio-ecological impact. Food is a sector where the total impact on water resources is greatly linked to the activities in the whole supply chain of each product. Therefore, supply chain engagement in the framework is the actions undertaken with the supply chain in order to reduce the overall impact on water resources.

Water governance refers to the political, administrative and socio-economic systems in place that influence the development, management and delivery of water resources in the society (GWP, 2002). Companies have the responsibility for engaging (directly or indirectly) in the water governance debate for ensuring water sustainability in all geographical places where they operate.

The framework presented in this chapter served as a basis for the development of a framework for evaluating the extent to which a soft path for water has been adopted in the food sector (see section 3.3). This framework consists of the five main themes and 10 subthemes shown in Figure 4.5. A sample of companies from the UK food sector was analysed following this framework, the next chapters of this thesis present the findings obtained through this analysis. Chapter 5 gives an overview of the overall results obtained for the analysis and chapter 6 presents a more in-depth discussion of the theme ‘setting the ground’. Similarly, chapter 7 discusses the detailed findings for the themes ‘knowing the environment’ and ‘internal action’. Chapter 8 presents a comprehensive examination of the ‘external action’ and ‘influence on water governance’ results.

Chapter 5

An overview of the soft path for water adoption in the UK food and drinks sector

*Water is life's matter and matrix, mother
and medium. There is no life without
water*
- Albert Szent-Gyorgyi

In order to evaluate what a soft path for water means for the food and drink industry, a series of analyses were carried out with the data gathered from a sample of 67 companies committed to the reduction of water in their operations. As noted in chapters 1 and 2, the purpose of is to set out a framework for the adoption of a sustainable water strategy in the sector that goes beyond the mere implementation of efficient technologies. Water is a shared resource in our society and the way it is managed needs multi-disciplinary solutions that take into consideration the environmental, social and economic aspects associated to it. These solutions should work towards a sustainable future in which larger water quantities of water will be needed for the growth and processing of food.

Chapter 3 discussed the methodology followed as part of this research, data was gathered from two different sets: experts and a sample of companies in the food and drink industry in the UK. To propose a definition for a soft path for water in the food and drink industry, chapter 4 presented the analysis of the data gathered from different experts. The outcome of this analysis was the proposal of a five-element framework for evaluating corporate water policy based on this definition. These

constituent elements are: setting the ground, knowing the environment, internal action, external action and influence on water governance. This framework is being used for the further analyses carried out in this research.

This chapter is structured in two main sections following the multi-criteria framework proposed in chapter 4 (see Figure 4.5). Section 5.1 discusses the overall context and the way in which the definition and evaluation of the soft path for water was carried out. In addition, section 5.2 presents a birds' eye view of the results obtained through this analysis.

5.1 Analysis matrix for the assessment of the adoption of the soft path for water in the food and drink industry

This research sought to determine what does a soft path for water mean for the food and drink industry. For this, the review of literature as well as opinions from experts helped to propose a multi-criteria framework to address this question. This framework is based on five areas: setting the ground, knowing the environment, internal action, external action and influence on water governance. In order to evaluate the extent to which a soft path for water has been embedded in the corporate water policies of the sector a series of indicators were designed. In total 21 indicators were proposed (see section 3.3) and each of them is related to the criteria of the framework introduced in chapter 4. This outline was used for the analysis of the data collected from the signatories to a UK voluntary initiative¹⁹ that aims to reduce the “water usage across the Food and Drink sector by 20% by the year 2020” (FHC, 2012a, website).

The signatories to this commitment were selected for this research as the voluntary nature of their participation in the FHC suggests that some actions towards the sustainable use of water in their operations have been adopted. Data was collected from 67 companies from four sources: questionnaires, interviews, environmental reports, websites and published FHC case studies. Appendix 11 presents all the type and quantity of data collected from each company, in total 12 questionnaires were collected, eight interviews were carried out, 32 environmental reports were sourced, relevant website information was downloaded from 58 companies and all 22 FHC case

¹⁹ This initiative is known as the Federation House Commitment (FHC)

studies published as of May 2014 were analysed. Furthermore Table 5.2 presents a summary of the possible data sources combinations and the number of companies for each case.

Table 5.1: Possible combinations of data sources collected

<i>Case</i>	<i>Sources</i>	<i>Total # of companies</i>
1	Q, I, ER, W, FHC	2
2	Q, I, ER, W	1
3	Q, I, W	5
4	Q, W, FHC	1
5	ER, W, FHC	8
6	Q, W	2
7	ER, W	13
8	ER, FHC	4
9	W, FHC	6
10	Q	1
11	ER	3
12	W	20
13	FHC	1

Key: Q: questionnaire, I: interview, ER: environmental report, W: website, FHC: Federation House Commitment published case study

All the data collected from the 67 companies was analysed following the indicators discussed in section 3.3. The number and type of data collected from each company varied and this depended entirely on the availability per source. Five different sources of data were collected: questionnaires, interviews, environmental reports, environmental information on the websites and published FHC case studies. These sources were selected in order to make data triangulation and increase the amount of evidence for analysing all the 21 indicators. As all the indicators were designed in form of a question, each of them had four possible answers:

- Yes: there is evidence to affirm that the indicator has been carried out.
- No: there is evidence to affirm that the indicator has not been carried out.
- Difficult to assess: there is evidence that relates to the indicator but it is difficult to assess whether or not the indicator has been carried out.
- No evidence (Don't know): there is no evidence to affirm whether or not the indicator has been carried out.

In order to obtain a graphical representation of the answers obtained for each indicator in each company, all indicator answers were then assigned with a colour: green, red, yellow and light red respectively. For the analysis carried out as part of this thesis, a matrix of 31 rows and 198 columns was designed (a total of 6138 cells with information). Each row corresponds to each of the indicators and themes presented in section 3.3, whereas each column corresponds to each of the data sources collected for the sample of companies as well as the data interpretation analysis done for each of the 67 signatories. Two types of analyses were carried out: a scoring system and a colour coded qualitative analysis. This section first presents the methodology followed for the scoring system and it then explains how the qualitative analysis was carried out.

5.1.1 Scoring system outline

In order to have quantifiable data that could be used for the analysis of the extent to which a soft path for water has been adopted in the sample of the food and drink companies analysed, a scoring system was designed (see Table 5.2). The framework used for this analysis has three indicator orders. The five main themes are all first order, reason why each was assigned with a score of 10 points. Each main theme has a different number of second order indicators; this is the reason why the scores for these indicators vary. For example, Table 5.2 shows that indicator SP1 has two sub indicators: SP1.1 and SP1.2 in contrast to SP3 who has four: SP3.1, SP3.2, SP3.3 and SP3.4. In the first case, each of the second order indicators was assigned with an equal score of 5 ($10/2$) whereas in the second case each of the sub indicators has score of 2.5 ($10/4$). Furthermore, the same methodology was used for the assignment of the scores for the third order indicators. To illustrate this, SP1.1 has a set of five third level indicators and each was assigned with a score of 1 ($5/5$). In contrast, SP4.1 has a set of two sub indicators and each has a score of 2.5 ($5/2$). In total, the maximum score that can be achieved following this analysis is 50 points, which corresponds to the sum of all the scores for the five themes.

The assignation of the scores for each of the indicators was only done for the overall summary analysis presented in section 5.2.1. The score of 10 points given to each of the themes was done in a tentative way. As a result, the scores given to the

indicators presented in Table 5.2 should not be interpreted as ‘weights’. In other words, it is considered that all indicators are equally important for the adoption of a soft path for water in the food sector, scores were assigned only for carrying out a bird’s eye view analysis. This approach has of course its limitations, however this research primary focus is not the scoring system but rather the qualitative analyses carried out in section 5.2.2 and in the consequent chapters of this thesis.

Table 5.2: Multi-criteria framework indicators scores

<i>Code</i>	<i>Indicator description</i>	<i>Score</i>
SP1	Setting the ground	10
SP1.1	Water awareness	5
SP1.1.1	Do the word count of 'water' vs. 'energy' compare or is the frequency skewed towards water? 'Water' criteria: (water, river, lake, loch, rain, H2O, aqua, hydro) - 'Energy' criteria: (energy, electricity, gas, petrol, diesel, carbon, GHG CO2)	1
SP1.1.2	Does the company recognise the finite nature of water resources?	1
SP1.1.3	Does the company recognise its dependence on water resources?	1
SP1.1.4	Does the company commit to any of the following? UN CEO water Mandate: ceowatermandate.org/about/endorsing-companies/ Water footprint network: www.waterfootprint.org/?page=files/OverviewPartners CDP Global Water Disclosure: www.cdp.net/cdpresults/cdp-water-disclosure-global-report-2012.pdf	1
SP1.1.5	Does the company disclose information on reduction of water in their operations?	1
SP1.2	Re-evaluation of water services	5
SP1.2.1	Are different qualities of water used for different purposes?	1.7
SP1.2.2	Has rainwater harvesting been implemented?	1.7
SP1.2.3	Is any water recycling done?	1.7
SP2	Knowing the environment	10
SP2.1	Knowledge of impact ('Does the company disclose data on water withdrawals in its operations?')	5
SP2.2	Knowledge of water environmental limits	5
SP2.2.1	Does the company know the limits in which it can operate?	2.5
SP2.2.2	Does the company identify and disclose water-stressed regions in their operations?	2.5
SP3	Internal Action	10
SP3.1	Has the company put in place efficient technologies in its operations?	2.5
SP3.2	Has the company set a specific target to reduce water in its operations?	2.5
SP3.3	Does the company promote water conservation awareness programmes to its staff members?	2.5
SP3.4	Has the company calculated its internal water footprint?	2.5
SP4	External Action	10
SP4.1	Community engagement	5
SP4.1.1	Has the company undertaken Human rights impact assessment and/or social and environmental impact assessments that explicitly consider water?	2.5
SP4.1.2	Does the company have community or social programmes around water?	2.5
SP4.2	Suppliers engagement	5
SP4.2.1	Does the company require suppliers to adopt specific practices to improve water management?	2.5
SP4.2.2	Has the company calculated its supply chain water footprint?	2.5
SP5	Influence on water Governance	10
SP5.1	Is there any evidence of influence on water governance in the UK?	5
SP5.2	Is there any evidence of influence on water governance elsewhere?	5
Maximum total score:		50

Shading key: First order indicator Second order indicator Third order indicator

Each of the scores described in Table 5.2 were assigned only if the answer for the question for each indicator was ‘yes’. As a result, each source of data per company might have a different score. In addition, a colour-coded analysis was carried out per company, this is something that will be presented in detail in section 5.1.2. In order to illustrate this, an extract from the analysis matrix is shown in Table 5.3.

Table 5.3: Example Company from the analysis matrix

	<i>Column 1</i>			<i>Column 2</i>			<i>Column 3</i>
	<i>Company 61</i>						
	<i>Questionnaire Recorded response: Oct 2013</i>			<i>Website Last accessed: Sep 2013</i>			<i>Data interpretation and analysis</i>
Code	Y/N		Quotes	Y/N		Quotes	Data interpretation and analysis
SP1	4.3			1			
SP1.1	1			1			
SP1.1.1	N/A			Yes	1		In both the questionnaire and website the word count of both ‘water’ and ‘energy’ terms compare. It is slightly higher for energy. (W)
Word count water						3	
Word count energy						4	
SP1.1.2	No	0	<i>No evidence</i>	No	0	<i>No evidence</i>	Not mentioned (W)
SP1.1.3	No	0	<i>No evidence</i>	No	0	<i>No evidence</i>	Not mentioned (W)
SP1.1.4	No	0		No	0		It does not commit to any
			<i>No</i>			<i>No</i>	
			<i>No</i>			<i>No</i>	
SP1.1.5	Yes	1	<i>"More than 50%water reduction due to technology adoption"</i>	No	0	<i>No evidence</i>	The questionnaire respondent discloses that the company has reduced its water consumption by more than 50% due to technology adoption. (Q)
SP1.2	3.3			0			
SP1.2.1	Yes	1.7	<i>"Yes, Growing washing cleaning cooking, toilets, drinking"</i>	No	0	<i>No evidence</i>	The respondent indicates that different qualities of water are being used for different processes in the companies like growing, washing, cleaning. (Q)
SP1.2.2	No	0	<i>"Infrastructure currently. It is considered in all new projects"</i>	No	0	<i>No evidence</i>	It has not been implemented but the respondent indicates that it is considered for new projects. (Q)
SP1.2.3	Yes	1.7	<i>"From factory to farm"</i>	No	0	<i>No evidence</i>	The respondent indicates that water is being recycled from the factory to the farm, no further information is disclosed. (Q)

		Column 1		Column 2			Column 3
		Company 61					
		Questionnaire Recorded response: Oct 2013		Website Last accessed: Sep 2013			Data interpretation and analysis
Code	Y/N		Quotes	Y/N		Quotes	Data interpretation and analysis
SP2	2.5			0			
SP2.1	No	0	"depends on how you assess use - millions of litres pass through the business daily"	No	0	No evidence	The respondent indicates that millions of litres of water are involved in the company's operations daily but no further information is given. (Q)
SP2.2	2.5			0			
SP2.2.1	Yes	2.5	"Abstraction licences on farms and for factory. Discharge consents"	No	0	No evidence	The respondent indicates that the company is aware of the environmental limits in the abstraction licenses they hold and well as the discharge consents. (Q)
SP2.2.2	No	0	No evidence	No	0	No evidence	Not mentioned (Q, W)
SP3	7.5			2.5			
SP3.1	Yes	2.5	"Recycling of water from factory to farm. since 2006"	No	0	No evidence	The respondent indicated that water has been recycled from factory to farm since 2006 and this has been done with the use of efficient technologies. (Q)
SP3.2	Yes	2.5	Reduce water consumption by 20% by 2020.	Yes	2.5	Reduce water consumption by 20% by 2020.	All companies have committed to make water reductions through the FHC.
SP3.3	Yes	2.5	"Employees are encouraged to engage in a better water management by competitions and promotions in posters and periodic emails."	No	0	No evidence	The respondent indicates that encouragement to employees to manage water better is being done through posters, emails and competitions but no further information is disclosed. It is difficult to assess the extent to which this engagement is being done. (Q)
SP3.4	No	0	"Is there a standard method?"	No	0	No evidence	The water footprint in the company's operations has not been calculated. The respondent indicates evidence of the unawareness of a standard methodology for the water footprint calculation. (Q)
SP4	2.5			0			
SP4.1	2.5			0			

		<i>Column 1</i>		<i>Column 2</i>			<i>Column 3</i>
		<i>Company 61</i>					
		<i>Questionnaire Recorded response: Oct 2013</i>		<i>Website Last accessed: Sep 2013</i>			<i>Data interpretation and analysis</i>
<i>Code</i>	<i>Y/N</i>		<i>Quotes</i>	<i>Y/N</i>		<i>Quotes</i>	<i>Data interpretation and analysis</i>
SP4.1.1	No	0	<i>No evidence</i>	No	0	<i>No evidence</i>	Not mentioned (Q, W)
SP4.1.2	Yes	2.5	<i>“To an extent - we support local events”</i>	No	0	<i>No evidence</i>	The respondent indicates that the company engages to local events that promote the sustainable use of water. Nevertheless, it is difficult to assess the extent to which this is being done. (Q)
SP4.2	0			0			
SP4.2.1	No	0	<i>“[Engagement with customers for the promotion and assistance of better water management done] through sharing of best practice”</i>	No	0	<i>No evidence</i>	The respondent indicates that they engage stakeholders to improve water use (not consumption) in the supply chain with customers through the sharing of best practice. This corresponds to a generic answer and no further information is shared. (Q)
SP4.2.2	No	0	<i>“Is there a standard method?”</i>	No	0	<i>No evidence</i>	The water footprint in the company's operations has not been calculated. The respondent indicates evidence of the unawareness of a standard methodology for the water footprint calculation. (Q)
SP5	0			0			
SP5.1	No	0	<i>No evidence</i>	No	0	<i>No evidence</i>	Not mentioned (Q, W)
SP5.2	No	0	<i>No evidence</i>	No	0	<i>No evidence</i>	Not mentioned (Q, W)
Total		16.8			3.5		
Key: Does the data gathered evidence the adoption of the indicator?: ■ Green: Yes, ■ Red: No, ■ Yellow: Difficult to assess or ambiguous, ■ Light red: No evidence							

The analysis matrix²⁰ has the analysis for all the data set of companies and sources for each of them vary as shown in Table 5.1. Table 5.3 shows the analysis for company 61, this company was chosen because it has more than one source of data and has all of the four colours used for the qualitative analysis. As it can be seen, the

²⁰ Extracts from the matrix are available upon request, please e-mail: catalina.silva04@gmail.com

rows correspond to the indicators as shown in Table 5.2. In the example, two sources of data were collected for the company and are presented in columns 1 and 2.

A scoring system was used per each source individually; this was done in order to assess the quality of data collected per source. For example, the overall score the company obtained for indicator SP1 with the questionnaire data was 4.3, while 1 with the information abstracted from the website. Each of the columns 1 and 2²¹ present the evidence extracted from each source in order to answer the indicator questions, in case no evidence was found for answering the questions a ‘No evidence’ text is presented. In order to bring robustness to the analysis it was considered important to carry out data triangulation, this is the reason why a data interpretation and analysis column was added for each of the companies analysed (see Column 3 in Table 5.3). The next section presents the rationale for this analysis.

5.1.2 Colour coded qualitative analysis outline

Column 3 in Table 5.3 presents the qualitative analysis carried out in which a traffic light colour system was used as part of the analysis of the data collected from the 67 signatories to the FHC. This was chosen in order to provide a visual representation of the extent to which a soft path for water has been adopted in the policies and operations of the sample of companies analysed. All the indicators constructed for the analysis of this research were designed in form of a question that can be answered in four possible ways, each of which was assigned a different colour:

- (Green): Yes
- (Red): No
- (Yellow): Difficult to assess or ambiguous
- (Light Red): No evidence

The analysis presented in column 3 of the example is constructed based on the evidence presented in both columns 1 and 2. In other words, the qualitative traffic light colour analysis triangulates all the evidence gathered for each company regardless of the number of sources. In the example, cells in column 3 are marked with either (Q), (W) or both. This indicates that the analysis carried out in each cell for each indicator

²¹ In the example, no evidence was found in the website for any of the indicators presented (column 2). Please note this will vary from company to company and source to source and it is one of the reasons why data triangulation was carried out in this research.

was done with the evidence (or lack of evidence) found in all of the data sources, in the case of this example corresponds to the questionnaire (Q), website (W) or both (Q, W). Similarly, for the companies that have data sourced from interviews, environmental reports and/or FHC case studies the cells in this latter column were marked with: (I), (ER) and/or (FHC) in the analysis matrix.

In order to clarify the assignation of colours done for the ‘data interpretation and analysis column’ (column 3 in Table 5.3) used for every company in the analysis, the next sections discuss the rationale behind it.

5.1.2.1 Green

In the case of SP1.1.1 the question for the indicator corresponds to ‘Do the word count of ‘water’ vs. ‘energy’ compare or is the frequency skewed towards water?’ For this indicator a word count was carried out only for the information sourced from websites and environmental reports. The data from questionnaires, interviews and FHC reports was screened out for this indicator due to the fact that they all are focused on the water topic and the word count comparison will be therefore skewed towards ‘water’. In the case of the example found in Table 5.4 only data from the website was sourced and word counts of both terms are similar, for this reason the cell is highlighted in green. As another illustrative example, indicator SP2.2.1 aimed to find out if the company is aware of the environmental (water) limits in which it can operate. In the example a quote from the questionnaire was extracted:

“Abstraction licences on farms and for factory. Discharge consents”-
(Questionnaire C61, Oct 2013)

In this case, the respondent indicated that the company is aware of [water] abstraction licenses and discharge consents for their farms and factory. As a result, the cell in column three for this indicator was coloured in green as the evidence from the questionnaire indicates that the company is aware of the environmental limits in the abstraction licenses they hold as well as the discharge consents. The cell is marked with (Q) as only evidence in the questionnaire was found for this indicator.

5.1.2.2 Red

For indicator SP1.1.4 of the example, the cell in column 3 is coloured in red as the company does not commit to any of the following initiatives: UN CEO water mandate, water footprint network or the CDP global water disclosure. Furthermore, indicator SP1.2.2 aimed to evaluate whether or not rainwater harvesting had been implemented. For the example presented, evidence found in the questionnaire the participant answers stated:

“Infrastructure currently. It is considered in all new projects” - (Questionnaire C61, Oct 2013)

For indicator SP1.2.2 the cell was then coloured in red as the respondent indicated that rainwater harvesting has not been implemented but it is considered for new projects.

5.1.2.3 Yellow

SP2.1 aimed to determine if the company discloses any data about water withdrawals in their operations. For the example presented in Table 5.4, only evidence in the respondent’s answer in the online question was found, the quote from the respondent is presented below:

“Depends on how you assess use - millions of litres pass through the business daily”-(Questionnaire C61, Oct 2013)

For indicator SP2.1 the cell was coloured in yellow as the respondent indicated that millions of litres of water are involved in the company's operations daily but no further information or precise data was given. In other words, the answer might imply either that the company knows the exact amount of water withdrawals incurred as part of their operations and it does not disclose the data or that it does not know. Since the answer is ambiguous the cell was assigned with yellow.

5.1.2.4 Light red

In the example presented in Table 5.4, cells in column 3 for indicators SP1.1.2, SP1.1.3 and SP2.2.2 are coloured in light red. In the cases in which no evidence in the

data gathered from any of the sources was found the cells are marked with this colour. This colour is particularly important as it shows the lack of data for a specific indicator and, as it will be discussed later on this chapter, it is a prevalent colour found in the analysis of the data gathered for the 67 FHC signatories. The next section presents a bird's eye view analysis for the overall results found for the entire sample researched.

5.2 A bird's eye view of the soft path for water adoption

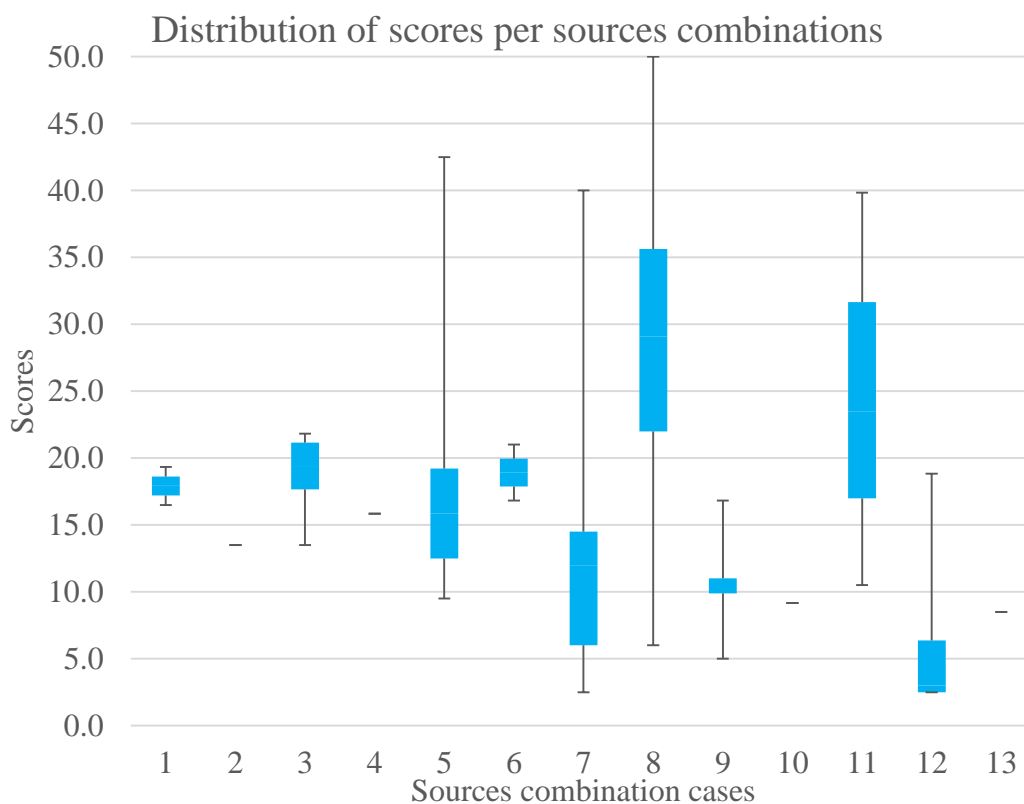
Section 5.1 presented the scoring system and colour coded methods used as part of the analysis of the data gathered from the sample of 67 companies belonging to the food and drink industry. This section presents a bird's eye view analysis for both evaluation systems utilised. First, a summary of the overall scores per companies will be presented in section 5.2.1. Furthermore, a summary colour coded matrix will be discussed in section 5.2.2.

5.2.1 Overall scores summary

Section 5.1.1 discussed the scoring method designed for the evaluation made for this research. This system was constructed in order to obtain indicative data for the assessment of the extent to which a soft path for water has been adopted in the sample of companies analysed. As discussed in section 5.1.1, scores were assigned to the data extracted from the different sources presented in Table 5.1. Consequently, depending on the number of sources, each signatory can have one or more overall scores. First, a birds' eye view of the results is presented in this section. For providing a findings summary, the scores obtained in each of the 13 possible sources combinations are presented in a boxplot in Figure 5.1

From the data presented in Figure 5.1 some inferences can be made. Most of the source combination cases present a wide variation on the overall scores. Groups with the highest median scores (from 25 to 30 points) correspond to cases 8 and 11 respectively. Furthermore, groups with the lowest median scores (from 6 to 10) were cases 7, 9 and 12. In addition, cases 1, 3 and 5 presented median scores between 15 and 20 points. On the other hand, four cases (2, 4, 10 and 13) had only one company, thus box plots for them were not developed but rather they appear as a hyphen in the graph. Overall scores varied widely from 6 to 50 points, this is mainly due to the fact

that in many cases evidence was not found for the evaluation of the 21 indicators which might not necessarily mean that companies have not worked on a specific aspect but rather that there is no data to assess whether or not this is the case.



Type of sources and number of companies per case:

Case	Source	# comp.	Case	Source	# comp.	Case	Source	# comp.
Case1	Q, I, ER, W, FHC	2	Case6	Q, W	2	Case11	ER	3
Case2	Q, I, ER, W	1	Case7	ER, W	13	Case12	W	20
Case3	Q, I, W	5	Case8	ER, FHC	4	Case13	FHC	1
Case4	Q, W, FHC	1	Case9	W, FHC	6			
Case5	ER, W, FHC	8	Case10	Q	1			

Key: Q: questionnaire, I: interview, ER: environmental report, W: website, FHC: Federation House Commitment published case study

Figure 5.1: Summary of overall scores per company (grouped per combination of collected sources)

A low score does not necessarily mean an underperformance or that the company has not adopted soft path for water principles in their operations, it rather means that there is a lack of data to assess whether or not this is the case. For this, it was considered that a colour-coded qualitative analysis was needed in order capture the degree of uncertainty in the data collected. The next section presents a birds' eye view of the results obtained in this analysis.

5.2.2 Colour coded matrix

Section 5.2.1 presented an overview of the total scores each company obtained in the quest of evaluating the extent to which a soft path for water and its elements had been adopted in the sample of companies analysed. A main theme that emerged from this analysis was that the lack of evidence embedded in the data, which in many cases did not make possible to evaluate whether or not an indicator had been adopted by a company. In other words, to some extent, there is uncertainty on the evaluation of whether or not the soft path for water principles had been adopted in the companies analysed. To get a sense of the overall results, the complete analysis matrix presented in section 5.1 was synthetized into a colour coded matrix of 21 rows (indicators) by 67 columns (companies) (see Table 5.4). This section presents an overall analysis of this matrix.

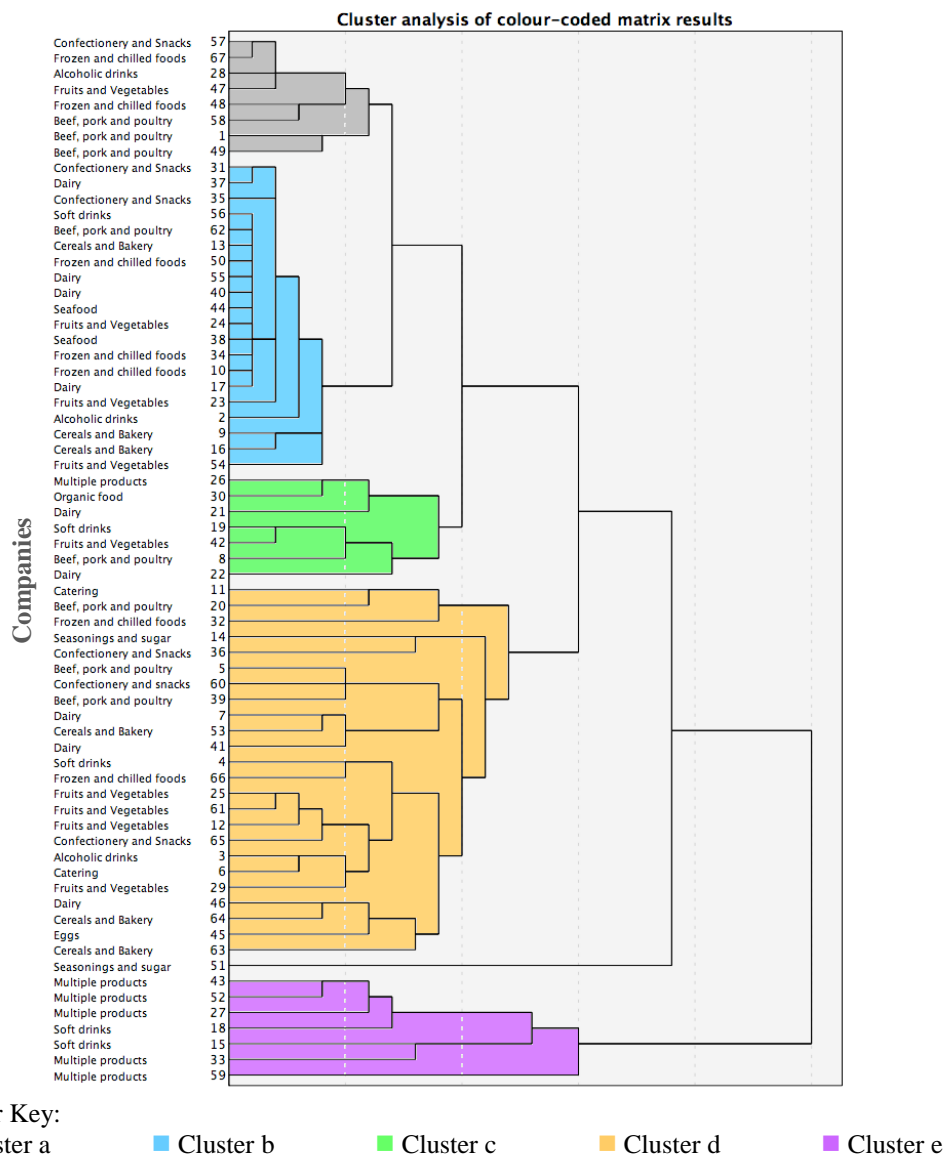
The analysis of the synthetized matrix can be done in several ways, horizontally, vertically per theme, subtheme or overall (see Tables 5.5 and 5.6). Vertically, it is seen that the distribution of colours varies widely depending on the company analysed. A cluster analysis was carried out in SPSS (a statistical software package), in order to group companies according to the results obtained in the analysis presented in Table 5.4 (see Figure 5.2), these results take into account the results per colour. For the statistical analysis in SPSS each colour was assigned with an arbitrary number²² in order to convert the matrix in Table 5.4 from qualitative to quantitative. In total five clusters were identified, these clusters represent the groups in which companies had similar results, please note that one company (C51) does not belong to any cluster, as it appears that no other companies had similar results.

²² Number assignation: green = 1, yellow = 2, red = 3 and light red = 4

Table 5.4: Traffic lights summary results per indicator

		Companies																																																																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67
SP1		Setting the ground																																																																		
SP1.1	Water awareness																																																																			
SP1.1.1																																																																				
SP1.1.2																																																																				
SP1.1.3																																																																				
SP1.1.4																																																																				
SP1.1.5																																																																				
SP1.2	Re-evaluation of water services																																																																			
SP1.2.1																																																																				
SP1.2.2																																																																				
SP1.2.3																																																																				
SP2		Knowing the environment																																																																		
SP2.1	Knowledge of impact																																																																			
SP2.1.1																																																																				
SP2.2	Knowledge of water environmental limits																																																																			
SP2.2.1																																																																				
SP2.2.2																																																																				
SP3		Internal Action																																																																		
SP3.1	Efficient technologies in its operations																																																																			
SP3.1.1																																																																				
SP3.2	Specific target to reduce water																																																																			
SP3.2.1																																																																				
SP3.3	Water conservation awareness to their staff																																																																			
SP3.3.1																																																																				
SP3.4	Calculation of company's internal water footprint																																																																			
SP3.4.1																																																																				
SP4		External Action																																																																		
SP4.1	Community engagement																																																																			
SP4.1.1																																																																				
SP4.1.2																																																																				
SP4.2	Stakeholder engagement																																																																			
SP4.2.1																																																																				
SP4.2.2																																																																				
SP5		Water Governance																																																																		
SP5.1	Water Governance influence in the UK																																																																			
SP5.1.1																																																																				
SP5.2	Water Governance influence elsewhere																																																																			
SP5.2.1																																																																				

Does the data gathered evidence the adoption of the indicator?: ■ Green: Yes, ■ Yellow: Difficult to assess or ambiguous, ■ Red: No, ■ Light red: No evidence



Total number of companies per cluster:
 Cluster a: 8 Cluster b: 20 Cluster c: 7 Cluster d: 24 Cluster e: 7

Company without cluster: C51

Figure 5.2: Cluster analysis for colour-coded results of the matrix in Table 5.4

Table 5.5 presents a summary of the vertical results presented in the matrix in Table 5.4. Companies were grouped according to the clusters presented in Figure 5.2. As it can be seen, each cluster has a variation per percentage of colour-coded answers (Figure 5.3).

Table 5.5: Vertical summary of colour coded matrix in Table 5.4

Cluster	Company	Sub-sector	Yes	Difficult to assess	No	No evidence
a	C57	Confectionery and Snacks	14%	5%	10%	71%
a	C67	Frozen and chilled foods	14%	5%	10%	71%
a	C28	Alcoholic drinks	10%	14%	5%	71%
a	C47	Fruits and Vegetables	14%	0%	10%	76%
a	C48	Frozen and chilled foods	19%	0%	5%	76%
a	C58	Beef, pork and poultry	24%	0%	5%	71%
a	C1	Beef, pork and poultry	14%	14%	5%	67%
a	C49	Beef, pork and poultry	10%	24%	10%	57%
b	C31	Confectionery and Snacks	10%	0%	5%	86%
b	C37	Dairy	10%	0%	5%	86%
b	C35	Confectionery and Snacks	10%	5%	5%	81%
b	C56	Soft drinks	5%	0%	10%	86%
b	C62	Beef, pork and poultry	5%	0%	10%	86%
b	C13	Cereals and Bakery	5%	0%	10%	86%
b	C50	Frozen and chilled foods	5%	0%	10%	86%
b	C55	Dairy	5%	0%	10%	86%
b	C40	Dairy	5%	0%	10%	86%
b	C44	Seafood	5%	0%	10%	86%
b	C24	Fruits and Vegetables	5%	0%	10%	86%
b	C38	Seafood	5%	0%	10%	86%
b	C34	Frozen and chilled foods	5%	5%	5%	86%
b	C10	Frozen and chilled foods	5%	5%	10%	81%
b	C17	Dairy	5%	0%	14%	81%
b	C23	Fruits and Vegetables	5%	5%	10%	81%
b	C2	Alcoholic drinks	10%	0%	10%	81%
b	C9	Cereals and Bakery	14%	5%	5%	76%
b	C16	Cereals and Bakery	10%	5%	5%	81%
b	C54	Fruits and Vegetables	14%	5%	5%	76%
c	C26	Multiple products	19%	14%	5%	62%
c	C30	Organic food	19%	0%	10%	71%
c	C21	Dairy	19%	14%	10%	57%
c	C19	Soft drinks	19%	19%	5%	57%
c	C42	Fruits and Vegetables	33%	0%	5%	62%
c	C8	Beef, pork and poultry	19%	14%	5%	62%
c	C22	Dairy	33%	0%	5%	62%
d	C11	Catering	24%	14%	10%	52%
d	C20	Beef, pork and poultry	19%	19%	14%	48%
d	C32	Frozen and chilled foods	38%	10%	5%	48%
d	C14	Seasonings and sugar	38%	24%	5%	33%
d	C36	Confectionery and Snacks	43%	24%	5%	29%
d	C5	Beef, pork and poultry	33%	10%	5%	52%
d	C60	Confectionery and snacks	24%	5%	10%	62%
d	C39	Beef, pork and poultry	33%	5%	10%	52%
d	C7	Dairy	43%	5%	10%	43%
d	C53	Cereals and Bakery	38%	10%	5%	48%
d	C41	Dairy	48%	0%	29%	24%
d	C4	Soft drinks	38%	19%	29%	14%
d	C66	Frozen and chilled foods	38%	33%	10%	19%
d	C25	Fruits and Vegetables	43%	5%	24%	29%
d	C61	Fruits and Vegetables	33%	19%	19%	29%
d	C12	Fruits and Vegetables	38%	10%	5%	48%
d	C65	Confectionery and Snacks	33%	24%	19%	24%
d	C3	Alcoholic drinks	38%	10%	33%	19%
d	C6	Catering	29%	29%	29%	14%
d	C29	Fruits and Vegetables	38%	10%	14%	38%
d	C46	Dairy	10%	5%	48%	38%
d	C64	Cereals and Bakery	19%	5%	48%	29%
d	C45	Eggs	29%	24%	19%	29%
d	C63	Cereals and Bakery	24%	19%	10%	48%
-	C51	Seasonings and sugar	43%	5%	10%	43%
e	C43	Multiple products	100%	0%	0%	0%
e	C52	Multiple products	81%	14%	0%	5%
e	C27	Multiple products	81%	5%	5%	10%
e	C18	Soft drinks	81%	10%	5%	5%
e	C15	Soft drinks	48%	24%	5%	24%
e	C33	Multiple products	71%	0%	0%	29%
e	C59	Multiple products	52%	14%	0%	33%



Figure 5.3: Distribution of horizontal results in the matrix in Table 5.4

From Table 5.5 and Figure 5.3 some inferences can be made. The highest percentages of green (yes) are found in companies from cluster e, followed by clusters d, c, a and b. In all clusters, the yellow distribution (difficult to assess) range between 0% and 35%. Cluster d presents the highest percentages of red (no) while cluster c the lowest. In all clusters but e and d the absence of evidence (light red) was above 50% of the indicators.

Figure 5.4 shows the overall horizontal colour distribution. The minimum percentage of green indicators was 5%, which means that all companies had at least one indicator marked with green. On the other hand, the maximum percentage for the green indicator was 100%, this corresponds to C43, a company that scored green in all the indicators. In addition, the indicators marked with yellow varied between 0% and 33%, while those marked with red ranged between 0% and 48%. In addition, companies that had indicators marked with light red (lack of evidence) ranged between 0% and 86%.

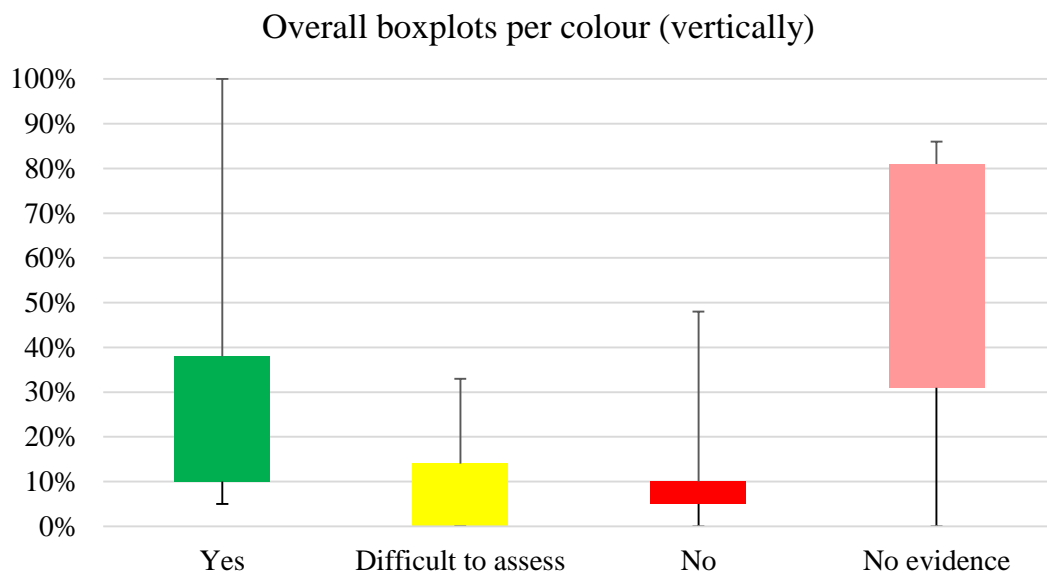


Figure 5.4: Distribution of vertical results in the matrix in Table 5.4

When the matrix in Table 5.5 is read horizontally, some remarks can be found. Table 5.6 presents the summary of percentages for the four possible responses (yes, difficult to assess, no and no evidence) per indicators. There is only one indicator (SP3.2) with all the cells coloured in green. This indicator aimed to investigate whether or not the companies had specific targets to reduce water. Since the analysed companies have all committed to reduce water in their operations by 20% by 2020 through the FHC, then by default all of them had their cells coloured in green (yes). The only indicator dominated by red (no) is SP1.1.4. This corresponds to the evaluation of whether the company has signed for any of these three water sustainability initiatives: UN CEO Water mandate, Water Footprint network or CDP Global Water disclosure (section 3.3). In this case, the vast majority (88%) do not

commit to any of the initiatives, while seven do and for one it was difficult to determine whether or not this was the case.

Table 5.6: Horizontal summary of colour coded matrix in Table 5.4

<i>Indicators</i>	<i>Yes</i>	<i>Difficult to assess</i>	<i>No</i>	<i>No evidence</i>
SP1.1.1	39%	9%	49%	3%
SP1.1.2	15%	21%	0%	64%
SP1.1.3	28%	12%	0%	60%
SP1.1.4	10%	1%	88%	0%
SP1.1.5	63%	4%	0%	33%
SP1.2.1	30%	1%	7%	61%
SP1.2.2	19%	1%	15%	64%
SP1.2.3	34%	7%	1%	57%
SP2.1	31%	27%	0%	42%
SP2.2.1	18%	13%	4%	64%
SP2.2.2	13%	4%	0%	82%
SP3.1	61%	6%	1%	31%
SP3.2	100%	0%	0%	0%
SP3.3	25%	12%	3%	60%
SP3.4	9%	9%	10%	72%
SP4.1.1	4%	6%	0%	90%
SP4.1.2	15%	4%	12%	69%
SP4.2.1	18%	25%	12%	45%
SP4.2.2	7%	9%	12%	72%
SP5.1	3%	0%	0%	97%
SP5.2	10%	1%	0%	88%

An interesting finding from Table 5.6 is the prevalence of unknowns (light red) in the influence on water governance theme (SP5). This indicates that the extent to which the companies have somehow influenced the water governance of the places in which they have operations is unknown. First, this influence might be carried out through different mechanisms rather than direct intervention and therefore it is less likely that information of such influence would appear in the sources of data collected. In addition, trying to influence on water governance might be perceived as not a direct responsibility of the company.

Figure 5.4 presents the overall distribution of colours per theme. This was done in order to facilitate the evaluation of the extent to which the five proposed themes for a soft path for water have been applied in the sample evaluated.

To what extent have the soft path for water principles been adopted?

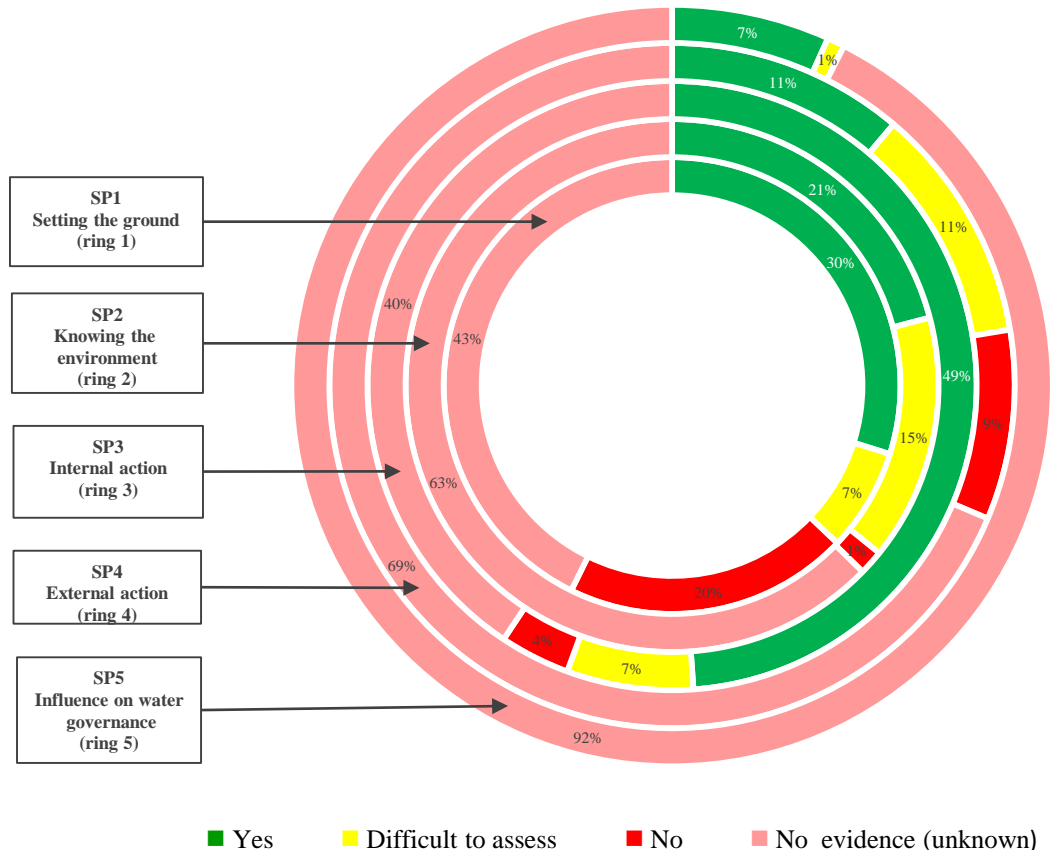


Figure 5.5: Summary of Table 5.4 per soft path for water theme

Figure 5.4 is comprised by five rings, each of which corresponds to each of the soft path for water main elements. This figure presents some interesting results that emerge from the analysis of the data. The element of the soft path for water that appears to have been adopted at a larger extent is SP3: Internal action (49%). This outcome is expected for two reasons. On the first place, the sample of the evaluated companies is all committed to reduce water in their internal operations through efficiency. In other words, the companies are already working towards improving their internal operations in terms of water use. The other reason is due to the fact, that technology and efficiency adoption is something that goes hand-by-hand with water demand management

SP1: Setting the ground, is the element with a higher percentage of ‘No’ (red). This element refers to an essential step in the soft path for water adoption in which the

extent to which the companies are aware of the water implications in the food industry as well as the re-evaluation of water is being done. These results might relate to the fact that most companies do not commit to any of the three water initiatives specified or to the unawareness of water-related issues or to a lack of re-evaluation of water services.

The degree of uncertainty (light red) involved in each of the elements becomes clear from Figure 5.4. In all of the elements (rings) the percentage of unknowns varied from a minimum of 40% (in SP3: Internal action) to 92% (in SP5: influence on water governance). This degree of uncertainty indicates the need for a better reporting from the companies.

This chapter presented an overview of the results obtained for the evaluation of the proposed principles for a soft path approach in the UK food sector. Overall results suggest that there is some evidence of implementation in each of the proposed themes. However, findings indicate that there is yet a long way towards a full adoption of a soft path for water in the evaluated sample. The next analysis chapters provide and in-depth qualitative analysis of each of the themes as follows: chapter 6 – ‘setting the ground’, chapter 7 – ‘knowing the environment’ and ‘internal action’ and chapter 8 – ‘external action’ and ‘influence on water governance’.

Chapter 6

To what extent has the ‘setting the ground’ (SP1) theme been adopted?

*In order to carry a positive action we
must develop here a positive vision
- Dalai Lama*

This thesis developed a five-themed framework for evaluating the adoption of a soft path for water philosophy in the food sector. This framework was used for assessing a sample of 67 companies from the UK scenario that are committed to the reduction of water. Chapter 5 discussed an overview of the overall findings in the evaluation of a soft path approach in the sample. Overall results indicate some evidence of implementation of each of the proposed themes. Nevertheless, findings suggest that there is yet a long way towards a full adoption of a soft path for water in the evaluated sample.

This chapter discusses in detail the results for the first theme: ‘setting the ground’. This area refers to the baseline for adoption of the soft path for water. This chapter will first discuss in section 6.1 the degree of awareness of water-related issues in the companies analysed. Furthermore, section 6.2 presents the level to which the re-evaluation of water services has been carried out.

6.1 Water awareness (SP1.1)

This sub-theme aimed to evaluate the level of awareness of water issues in the sample of analysed companies. In order to do this, five indicators were defined. The first one (SP1.1.1) aimed to find out the frequency to which the term ‘water’ appears

in the sourced environmental reports and websites and how does it compare to ‘energy’. Second, SP1.1.2 aimed to determine the recognition of the companies of the finite nature of water resources. Moreover, the indicator SP1.1.3 meant to explore whether or not the companies recognise their dependence on water resources. In addition, indicator SP1.1.4 was set up to find out if the companies commit to any of the three main water initiatives for the business sector in the global scenario. Finally, SP1.1.5 researched the disclosure (or not) of the reduction of water in the companies’ operations.

Figure 6.1 presents the summary of the colour distribution of the ‘water awareness’ theme indicators, and few interpretations can be made. First, the indicator with the least uncertainty (or unknowns) was SP1.1.1. This is due to the nature of the indicator in which the frequencies of both ‘water’ and ‘energy’ were compared. Second, it is worth noting that the recognition of the finite nature of water resources (SP1.1.2) seems to be done at a lesser extent than the recognition of their dependence on water resources (SP1.1.3). Furthermore, it can be seen that only 10% of the analysed companies commit to the global water initiatives (SP1.1.4). Nevertheless, more than 60% of the sample discloses data on the reduction of water use in their operations.

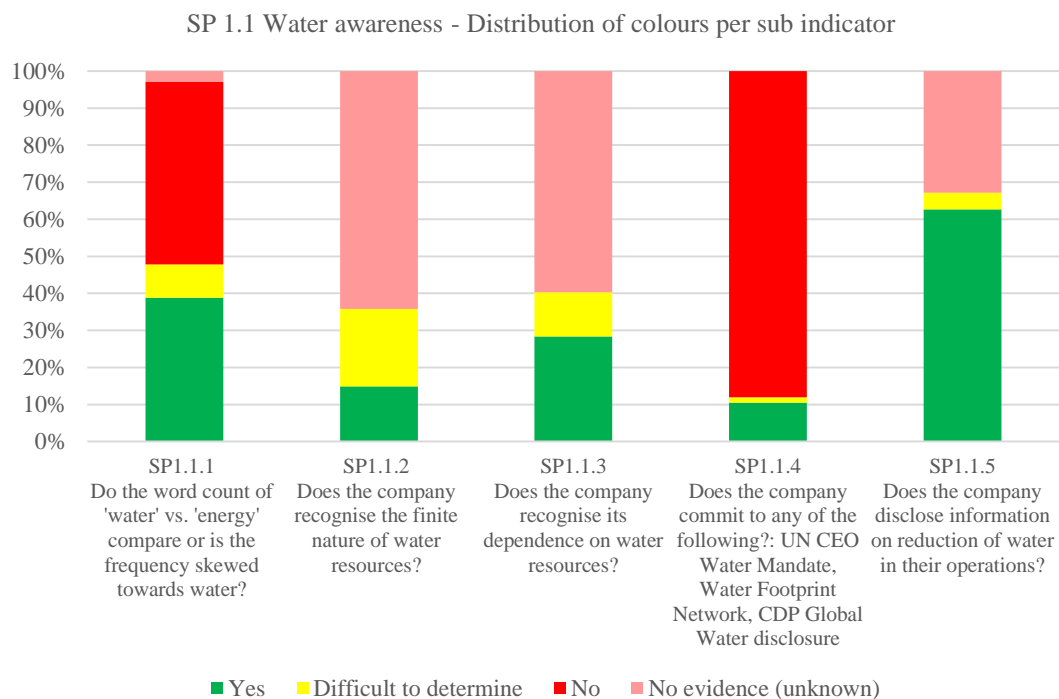


Figure 6.1: Water awareness (SP1.1) indicators colour distribution

The data presented in Figure 6.1 presents an overview of the obtained results. This figure was constructed from the metadata in the analysis matrix described in section 5.1. This is the reason why this section is divided into five areas, each of which presents a detailed analysis of the findings from the five indicators of the SP1.1 subtheme: water awareness.

6.1.1 ‘Water’ vs ‘Energy’ frequencies in publicly available data (SP1.1.1)

Climate change has turned the focus of the global sustainability agenda towards carbon reduction commitments and mitigation measures, however people know little about a mechanism through which they affect water systems in other parts of the world (Hoekstra and Chapagain, 2008). Food is an area responsible for both carbon emissions and water withdrawals, and it is therefore equally important for companies in this sector to concentrate their sustainability efforts in both the water and energy areas. The purpose of this indicator was to get an overview of the attention given by the companies to both topics. In order to do this, a word count was carried out in the collected environmental reports and websites. The questionnaires, interviews and FHC case studies were not taken into account in this part of the analysis as all three of them are focused on water only.

When analysing both websites and environmental reports it was found that the topics of ‘water’ and ‘energy’ were mentioned using a variety of synonyms. For this reason, the following criteria was used when running the word count queries (please note that an equal number (eight) of terms are used in both cases to make the frequencies comparable):

‘Water’: water, river, lake, loch, rain, H₂O, aqua-, hydro-

‘Energy’: energy, electricity, gas, petrol, diesel, carbon, GHG, CO₂

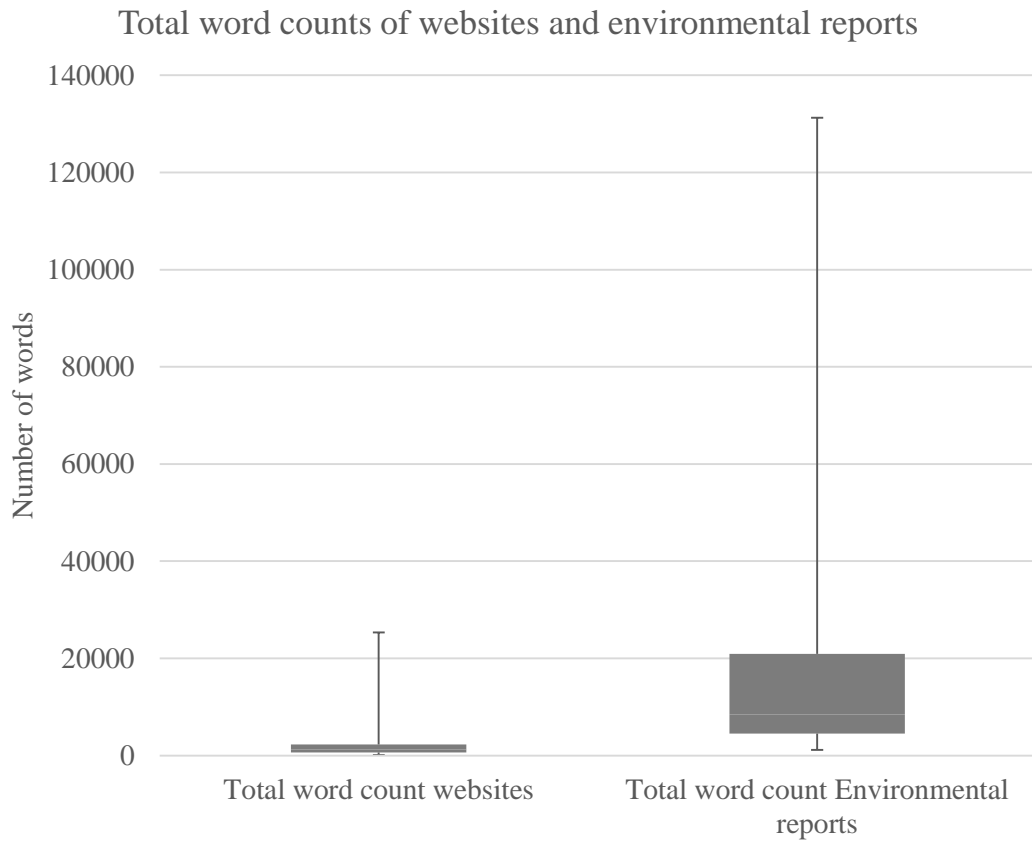
The indicator SP1.1.1 was formulated as: ‘Do the word count of ‘water’ vs ‘energy’ compare and/or is the frequency inclined towards water?’ Figure 6.1 shows the overall distribution of colours for this indicator. In the cases in which a company had both sources (environmental report and website), the evaluation was done according to the best case. For example, if the frequencies compared in the

environmental report but not in the website, a colour green was assigned because in at least one of the sources there was an indication of water awareness.

As it can be seen in Figure 6.1, 39% of the companies had comparable ‘water’ and ‘energy’ frequencies (green). Whereas in 49% of the cases ‘energy’ outnumbered ‘water’ (red), in 9% of the companies it was difficult to determine whether or not the frequencies compare (yellow) and in 3% there was not enough evidence. These results show some indication of water awareness in the sample but the balance seems to be still inclined towards a higher attention on energy and carbon reduction aspects.

The size of the publicly available environmental information in the websites and environmental reports range widely in size (total number of words per source). Figure 6.2 presents the boxplots that show the range of this variation. Data on websites varied from 110 to 25364 words with a median of 1243 words. On the other hand, information from the environmental reports varied between 1175 to 131237 words with a median of 8449 words²³. Websites were generally shorter in size (number of words) as only environmental information was downloaded, while the reports represent full documents. These findings suggest that the way companies report their environmental performance varies widely from company to company. For detailed information per company please see Appendix 11.

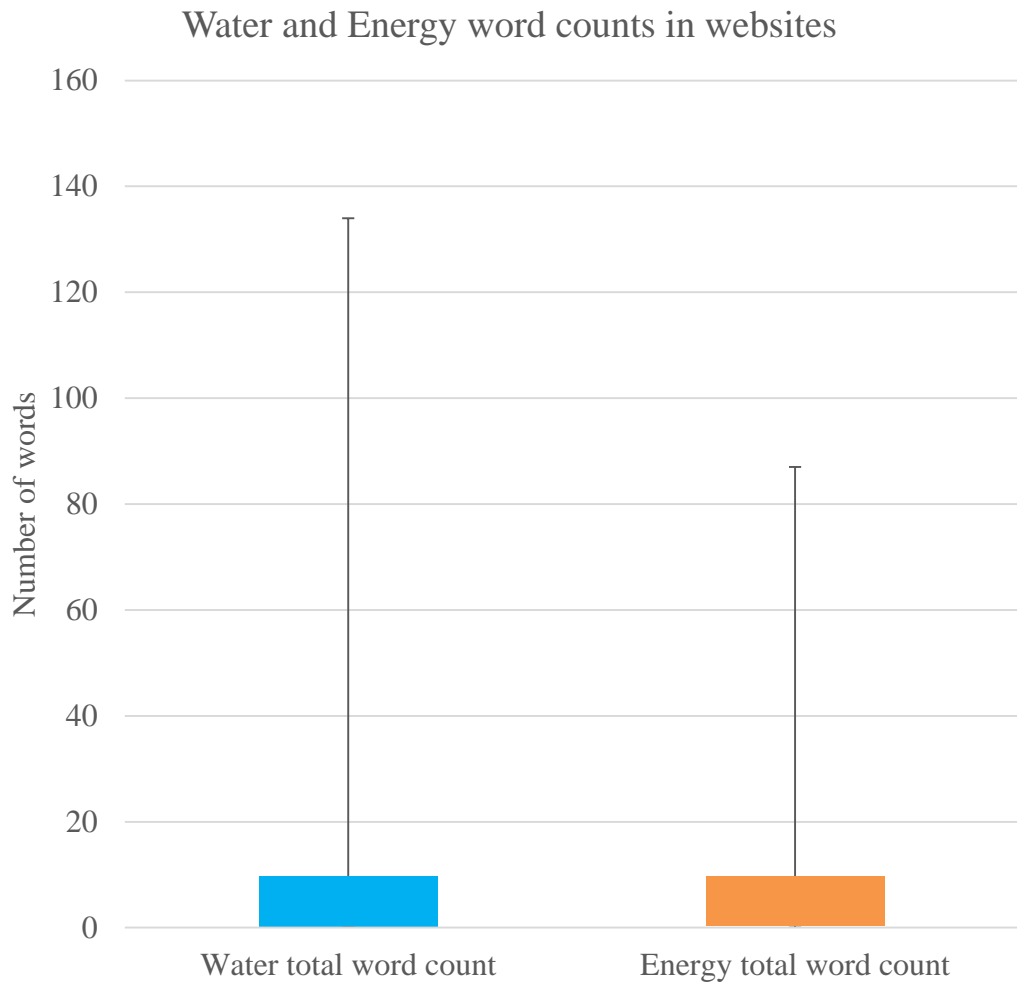
²³ It should be noted that this research found a lack of consistency on the way companies report their environmental impacts and progress. For example, in some cases environmental reports were embedded in the companies’ annual reports and hence the variation. The same lack of consistency was found in the websites.



	<i>Total word count websites</i>	<i>Total word count Environmental reports</i>
Min	110	1175
Q1	612	4496
Median	1243	8449
Q3	2280	20938
Max	25364	131237

Figure 6.2: Total word counts of websites and environmental reports

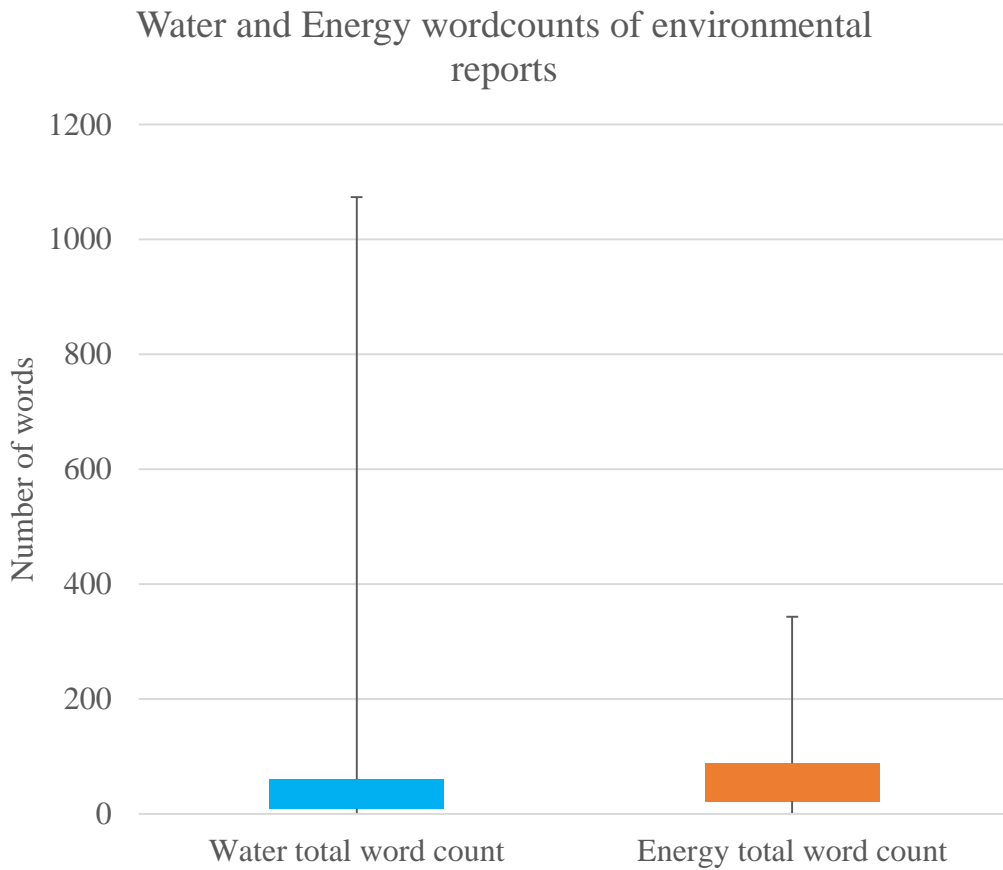
The word counts of the ‘water’ and ‘energy’ terms in the website analysis presented a similar distribution. Figure 6.3 shows the distribution of the frequencies both terms in the websites. The ‘water’ word count varied between 0 and 134 and had a median value of 2. The ‘energy’ distribution ranged between 0 and 87 and had a median of 3 words. In general, findings suggest that companies briefly mention their environmental performance in their websites. For detailed information per company please see Appendix 11.



	<i>Water total word count</i>	<i>Energy total word count</i>
Min	0	0
Q1	0	0
Median	2	3
Q3	10	10
Max	134	87

Figure 6.3: Water and Energy word counts in websites

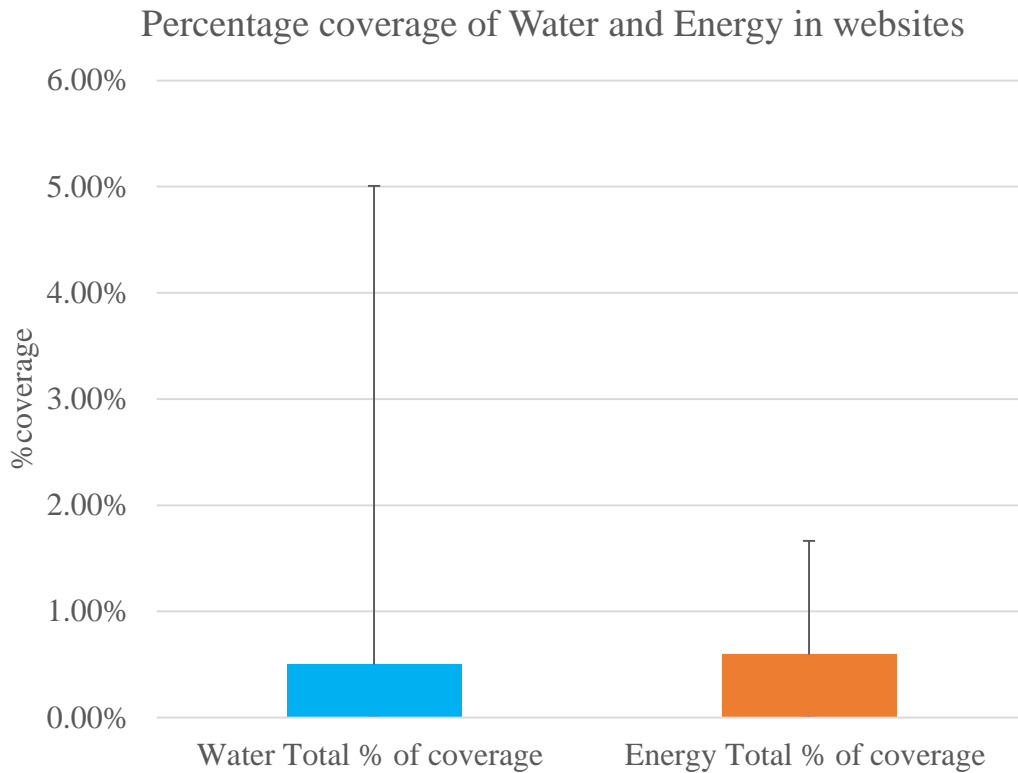
The frequency distributions of the word counts of the ‘water’ and ‘energy’ terms in the environmental reports are shown in Figure 6.4. Similarly to Figure 6.3, the frequency of the terms varied widely. The ‘water’ word count varied between 0 and 1074 and had a median value of 18. The ‘energy’ distribution ranged between 0 and 343 and had a median of 43 words. These findings suggest that the attention given to ‘energy’ in the websites seems to be higher than the one given to ‘water’.



	<i>Water total word count</i>	<i>Energy total word count</i>
Min	0	0
Q1	9	22
Median	18	43
Q3	60	88
Max	1074	343

Figure 6.4: Water and Energy word counts in environmental reports

Figures 6.2, 6.3 and 6.4 present absolute values of the length of websites and environmental reports and the frequencies of the ‘water’ and ‘energy’ in these sources. The percentage of coverage of the terms was calculated as the frequency of the term divided by the total number of words in the source. This ratio was calculated to give an indication of the attention given to both terms in the websites and environmental reports. Figure 6.5 present the percentage coverage distribution of ‘water’ and ‘energy’ in the websites, while Figure 6.6 shows this distribution in the environmental reports.

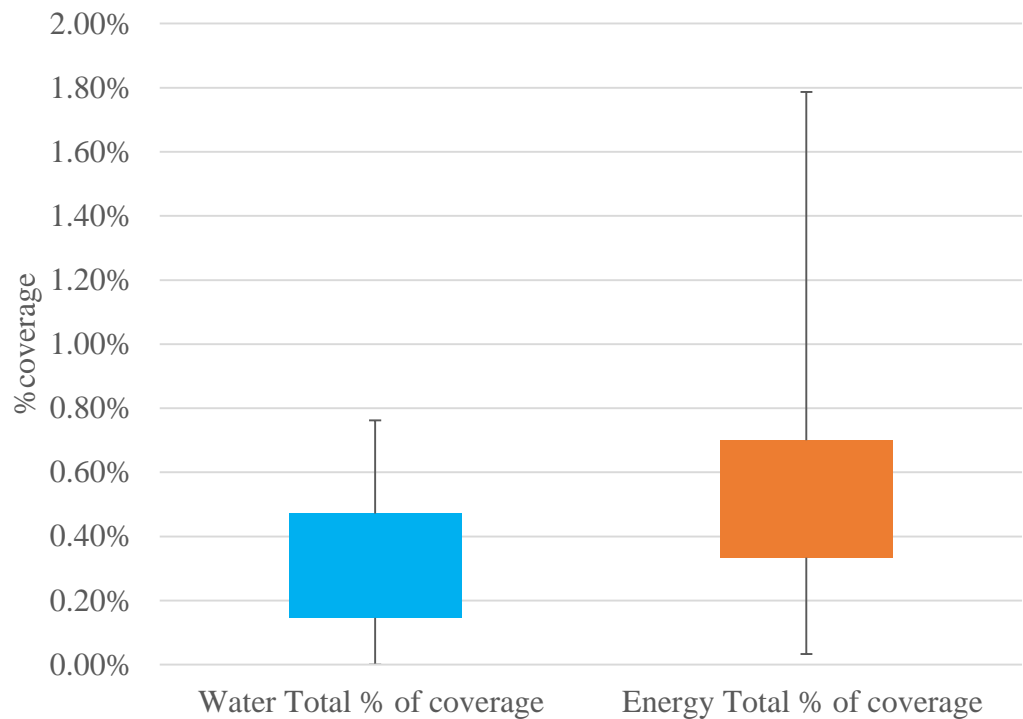


	<i>Water Total % of coverage</i>	<i>Energy Total % of coverage</i>
Min	0.00%	0.00%
Q1	0.00%	0.01%
Median	0.20%	0.31%
Q3	0.50%	0.59%
Max	5.01%	1.67%

Figure 6.5: Percentage coverage of Water and Energy in websites

In the websites (Figure 6.5) the percentage coverage of the ‘water’ term varied between 0% and 5.01% with a median value of 0.20%. In addition, the coverage of ‘energy’ ranged between 0% and 1.67% with a median value of 0.31%. These results indicate that, overall, companies briefly mention their water and energy strategies in their websites. In the environmental reports (Figure 6.6) the percentage coverage of both terms are higher than those in the websites. This indicates that ‘water’ and ‘energy’ are more mentioned in the environmental reports. However, in this case the percentage coverage for ‘energy’ are higher, which suggests that more emphasis seems to be given in the reporting of strategies and achievements in the energy area than in water.

Percentage coverage of Water and Energy in environmental reports



	<i>Water Total % of coverage</i>	<i>Energy Total % of coverage</i>
Min	0.00%	0.03%
Q1	0.15%	0.33%
Median	0.23%	0.56%
Q3	0.47%	0.70%
Max	0.76%	1.79%

Figure 6.6: Percentage coverage of Water and Energy in environmental reports

In conclusion, the word count frequency comparison in the analysed sources suggests that companies seem to take into consideration ‘water’ as an important topic when compared to ‘energy’ to some extent as almost 40% of the sample scored green in this indicator. Nevertheless, many efforts are still needed as for almost half of the cases analysed the focus appears to be more on the ‘energy’ topic. Another further link that it is also needed is the realisation of the water-energy nexus as both resources are highly interconnected. One key finding was the variability of the length of the sources analysed. On one side the websites varied from 110 words to 25364 whereas the

environmental reports from 117 to 131237. This high variability shows evidence of a lack of standard in the way environmental data and policies are reported, and therefore future research is needed in order to standardise this data. The next section discusses the companies' recognition of the finite nature of water resources.

6.1.2 Recognition of the finite nature of water resources (SP1.1.2)

This indicator (SP1.1.2) aimed to evaluate the extent to which companies recognise the finite nature of water resources. Contrary to common knowledge, water is not a limitless resource; the amount of water on Earth has remained almost constant since the creation of the planet (Shiklomanov, 1993). The resource moves around the Earth through the water cycle. Climate change has induced an uncertainty aspect in water availability as extreme weather events such as droughts and floods are expected to be more frequent and variable (Begon et al., 2006). In addition, higher population rates and an increase in consumption patterns have a direct impact on the availability of water. It has been discussed through this thesis that food growth and processing is an area highly dependent on water and therefore, future availability of this resource will have a direct impact on the companies belonging to the sector. For the evaluation of this indicator evidence from all the sources was sought in order to find a signal of the recognition of water as a finite resource.

For this case only 15% of the analysed companies were marked with green in this indicator. For 21% (yellow) it was difficult to determine whether or not the recognition of water as a finite resource has been made. Furthermore, for most of the sample (64%) no evidence was found that could give some indication for such recognition. In order to illustrate the type of evidence and quotes extracted from the data sourced some examples will be discussed²⁴. Table 6.1 presents some examples of quotes from companies who were marked with green in the SP1.1.2 indicator, a short analysis is presented in the second column of the table.

²⁴ For access to the dataset please e-mail: catalina.silva04@gmail.com

Table 6.1: Examples of quotes of companies marked with green in SP1.1.2

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>“Water is a finite resource and we as a business need to do our utmost for our customers, consumers and the communities within which we are based to do as much as we can to reuse, recycle and reduce our water consumption” – (Website) C41</i></p>	<p>It is clearly indicated in the website that water is a finite resource.</p>
<p><i>“Human life, sustainable development and economic activity rely on the continuing availability of natural resources such as water and agricultural crops. As a food and beverage company, we are committed to developing our business in a way that reduces our adverse environmental impact and preserves natural resources for future generations.” ... “A growing, more prosperous population, combined with the impact of climate change, is making water availability a serious problem in many parts of the world.”- (Environmental report) C43</i></p>	<p>The company clearly identifies the finite nature of water resources in both sources as well as the pressures on this resource due to human activity.</p>
<p><i>“Population growth, consumption habits and the impacts of climate change are combining to present a serious threat to the security of one of the world’s most precious resources – water. Global drying needs to quickly get to the top of the agenda because the issues related to water are short term and in many cases irreversible. As a founder signatory of the FHC we see the benefits of setting targets and dealing with water issues”- (FHC Case study) C43</i></p>	
<p><i>“[The company] understands that water is a precious resource. As a family business, they are conscious of the importance of conserving this natural resource for the sake of future generations.” – (FHC Case study) C63</i></p>	<p>To define water as a precious resource implies the recognition of the finite nature of water.</p>

For the example, three out of the ten companies who were marked with green in this indicator were selected. In the first case (C41), primary data from the questionnaire and interview was collected. Nevertheless, it is worth noting that the quote extracted for this indicator was sourced from their website and it specifically mentions water as a finite resource. In the second example (C43), two quotes were extracted from both of its sources: environmental and FHC reports. This company goes beyond and not only recognises the finite nature of water but also the impact that human activity has on it. This company was the only one who was marked with green in all its indicators and appears to be at the forefront of initiatives for the sustainable use of water. However a ‘high’ green score does not necessarily mean they are performing well in the water management area. As all the data gathered for this research was sourced from the companies directly, these results might mean they are good at reporting. There is a need for independent organisations and ‘watchdogs’ for monitoring and checking companies’ operations on the ground. In contrast, C63 in the

example is a company who was marked with green in five indicators out of 21 (24%) but that shows an understanding of water as a precious resource, which may imply recognition of water as a finite resource.

All the quotes (evidence) used for the companies who were marked with green in the SP1.1.2 indicators were analysed using the NVIVO software package and a word cloud²⁵ was generated using the 50 most frequent words found in them. (Figure 6.7).

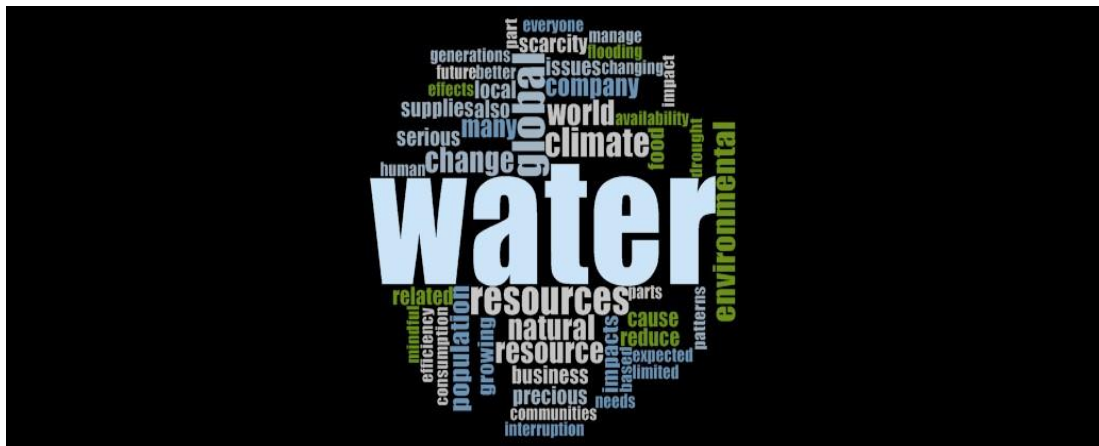


Figure 6.7: Word cloud of the green quotes for SP1.1.2 - Does the company recognise the finite nature of water resources?
Total of words analysed: 759

From the word cloud, few inferences can be made. Water is, of course, the most frequent term in the quotes as they all mention it. The term ‘global’ appears to be frequent and this suggests the recognition by the companies who scored green in this category of the global nature of water. The frequency of terms like ‘climate change’, ‘scarcity’ and ‘population’ suggests a level of awareness of water related issues. Furthermore, terms like ‘drought’, ‘scarcity’ and ‘impacts’ suggests a recognition of water as a limited resource.

For the SP1.1.2 indicator, 14 companies (21%) were marked with yellow because for them it was difficult to determine whether or not they recognise the finite nature of water resources. Table 6.2, presents some examples.

²⁵ Word clouds were generated in order to find themes and frequent terms used in the analysed quotes. One of the limitations of this approach is the variation of the length (amount of words) of the quotes analysed for each indicator. This is the reason why Figure 6.7 and all the subsequent word clouds presented in the different chapters of this thesis should be interpreted only as indicative and should not be compared amongst them as they are not comparable due to the variation of the number of words used in the analysis, as previously mentioned.

Table 6.2: Examples of quotes of companies marked with yellow in SP1.1.2 -Does the company recognise the finite nature of water resources?

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>"[We aim for] limiting our impact on the planet" - (Website) C1</i>	To limit the impact on the planet does not directly imply the recognition of the finite nature of resources.
<i>"We joined [the FHC] mainly because our main director has a keen interest in water ratios and water usage and water footprints in general. ... I think he [the main director] sees it [water] as part of the whole picture of the environmental impact really, of what we do. The cost isn't necessarily a big problem, because the cost of water is generally quite low really."- (Interview) C3</i>	The interest from the director on water usage and footprints shows indirect evidence for the recognition of the finite nature of water resources.
<i>"By focusing on reducing our water usage we also reduce the amount of wastewater we produce which is suitably treated before being returned to the natural environment"- (Website) C4</i>	Returning clean water into the environment has embedded the notion of a recognition of the finite nature of water resources. However, this is not specifically mentioned.
<i>"In 2007, [the company] was a founder signatory to the Federation House Commitment. This commits us to support best practice and report our achievements in reducing water usage."- (Environmental report) C6</i>	The data from the environmental report and the FHC case study evidence that water is one of the aspects of the company's sustainability agenda. However it is difficult to determine whether or not the finite nature of water is recognised.
<i>"Safety and Sustainability Manager, commented, 'Our response to the FHC naturally fits into our wider corporate sustainability agenda, and saving water is very much part of our resource efficiency policy.'" - (FHC Case study) C6</i>	
<i>"Recognising that water management is going to increase in prominence, it is our ambition that our proposed new dairy (...) will process milk using just 0.2 litres of water per litre of milk, against an industry average of 0.8 litres" – (Environmental Report) C7</i>	It is difficult to determine whether or not the company recognises the finite nature of water. From the data in the environmental report they recognise the importance on reducing water use but this does not necessarily imply that the resource is considered as finite.
No evidence in any of the sources C14	Although there is not a direct quote that evidences the recognition of water as a finite resource, the company has carried out much work in the area and this might suggest that one of the reasons for this is because this recognition has been done.

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"Water is arguably one of the most precious commodities in the world, and due to the nature of our business, we use a significant amount. It is therefore essential that we actively manage our water related risks in terms of supply, quality and efficiency."</i>- (Environmental report) C15</p>	<p>The definition of water as a precious resource has embedded the concept of its finite nature. Nevertheless, it could be argued that a direct reference to this recognition is not done</p>
<p><i>"Caring about the environment makes great commercial sense too: every activity and every product we make has an impact on the environment and every part of our business can help save resources. Regardless of the product, whether it's jam, chutney, marmalade or indeed even cake, the dedication to conservation is there"</i>- (Website) C65</p>	<p>The company recognises that their operations have an impact on the environment, but the clear recognition of water as a finite resource is not done.</p>

In the examples presented in the table above it can be seen that quotes have been extracted from both secondary and primary sources. In all of the cases, the extracts show a certain degree of awareness to water related aspects but it is difficult to determine whether or not the companies recognise water as a finite resource. There is one interesting case (C14) for which no evidence was found in the data collected but the company has evidence in other indicators for carrying out initiatives towards water sustainability and, therefore SP1.1.2 in this case was marked with yellow as this suggests that water might be recognised as a finite resource.

Most of the companies (64%) were marked with light red for the SP1.1.2 indicator. This indicates that for these signatories no evidence was found to determine whether or not water is being identified as a limited resource. There are some interesting cases worth mentioning. Seven companies out of the 12 from which primary data was collected, fell under the light red category for SP1.1.2 (C25, C29, C45, C46, C61, C64 and C66). This means that no evidence was found either in their primary or secondary sources that suggested the recognition of the finite nature of water resources. The next section discusses the findings for the SP1.1.3 indicator that aimed to determine if the companies recognise their dependence on water resources.

6.1.3 Recognition of dependence on water resources (SP1.1.3)

Similarly to SP1.1.2, this indicator aimed to explore if the analysed companies recognised their dependence on water resources. As it has been discussed throughout the thesis, food is an industry completely dependent on water resources, as these are

needed for growing crops, as animal feed and for processing. Results indicate that 28% (19) of the companies from the sample show evidence of a clear recognition of their dependence on water resources. For 12% (8) of the sample it was difficult to determine whether this recognition has been made. Moreover, for the majority (60%, 40 companies) no evidence was found in the data collected to assess this indicator. Some quotes were selected in order to present examples of companies who scored green for the SP1.1.3 indicator (see Table 6.3).

Table 6.3: Examples of quotes of companies marked with green in the SP1.1.3 indicator - Does the company recognise its dependence on water resources?

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"Water is the number one ingredient in all of our products, so it is therefore very important for us to work in this area. Then on the other side it is also cost and the benefits it brings for us to use less, but water is not a big cost in our operations so probably the big saving is on the waste water. However, in some sites we have had an adverse impact on the effluents because the water that comes out the drain is more concentrated and with this we might break the trade effluent permits that we have. We just want to understand better our operations and make the more efficient"- (Interview) C4</i></p>	<p>The main ingredient of the company's products is water, therefore it is a direct dependence on the resource.</p>
<p><i>"Water is an essential part of our products and processes, therefore, it is of utmost importance that it is used responsibly. Each year we use over 500 million litres of water from municipal and groundwater sources. Inevitably, our production processes create wastewater. By focusing on reducing our water usage we also reduce the amount of wastewater we produce which is suitably treated before being returned to the natural environment."- (Website) C4</i></p>	
<p><i>"Water use is essential in our processes and for cleaning our sites to ensure the highest possible quality product."- (Environmental Report and Website) C7</i></p>	<p>The same quote is repeated in the Environmental report and Website. The data shows evidence that water is recognised as a key resource to their operations.</p>
<p><i>"So our group, we actually have three pack houses where water is quite a huge part of the operation - washing our crop and for packing." – (Interview) C29</i></p>	<p>The company clearly identifies that water is a key resource to their operations in the data extracted from the Interview, Environmental Report and FHC case study.</p>
<p><i>"Potato packing and processing is a high water consumption industry but here at [the company] we have pioneered a new water recycling and treatment system called Cascade which has resulted in water savings of up to 85% at our Shropshire and Cambridgeshire sites."- (Environmental Report) C29</i></p>	
<p><i>"Fresh potato packing and processing is a water intensive industry and [we] recognise the true operational costs associated with this."- (FHC Case study) C29</i></p>	

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>[Why have you aimed for these savings – what are the drivers?]</i> <i>“Internally pure economics – driving down costs in a very competitive market, under constant pressure from their customers (e.g. the major supermarkets).”- (Interview) C41</i></p> <p><i>“Water is a finite resource and we as a business need to do our utmost for our customers, consumers and the communities within which we are based to do as much as we can to reuse, recycle and reduce our water consumption.”- (Website) C41</i></p> <p><i>“[we have] a comprehensive approach to water stewardship. Because we use water to make our products, maintaining the highest-quality standards for consumers means using the best water possible.”- (Environmental Report) C52</i></p> <p><i>“While around 70% of available fresh water is used for agriculture, when it comes to personal and domestic use, the UN estimates that each person needs about 50100 litres per day for drinking, cooking and washing. Yet in the poorest countries people live on as little as 10 litres a day. The collection of water, typically undertaken by women, is also an issue. According to the UN, sub-Saharan Africa alone loses 40 billion hours per year collecting water. Our approach is to work across our value chain from raw material sourcing to the design of our products. Since 2009 we have worked with the Water Footprint Network to measure our agricultural water impact. We have learnt that our priority water intensive crops are tomatoes and sugar cane and that overall our footprint is lower than we had previously estimated. We have been working with our tomato suppliers for many years and we will continue to introduce drip irrigation to our suppliers for this and other crops.”- (Website) C59</i></p>	<p>It is indicated in the website and interview that the company depends directly on the resource</p> <p>The company clearly recognises their dependence on water resources as water is the main ingredient in their operations</p> <p>The company states a clear recognition on how water is essential in agriculture. This shows evidence of the company awareness of their dependence on water resources on a broader scale.</p>

As shown in Table 6.3, the examples selected have both primary and secondary quotes. They all clearly identify their dependence on water resources and define it as a key ingredient in their products. C59 is an interesting case as they mention a direct recognition on water being essential not only in their internal processes but also in their value chain. All the quotes from the 19 companies who were marked with green in this indicator were used for generating a word cloud in order to illustrate the 50 most frequent words used in them (see Figure 6.8).

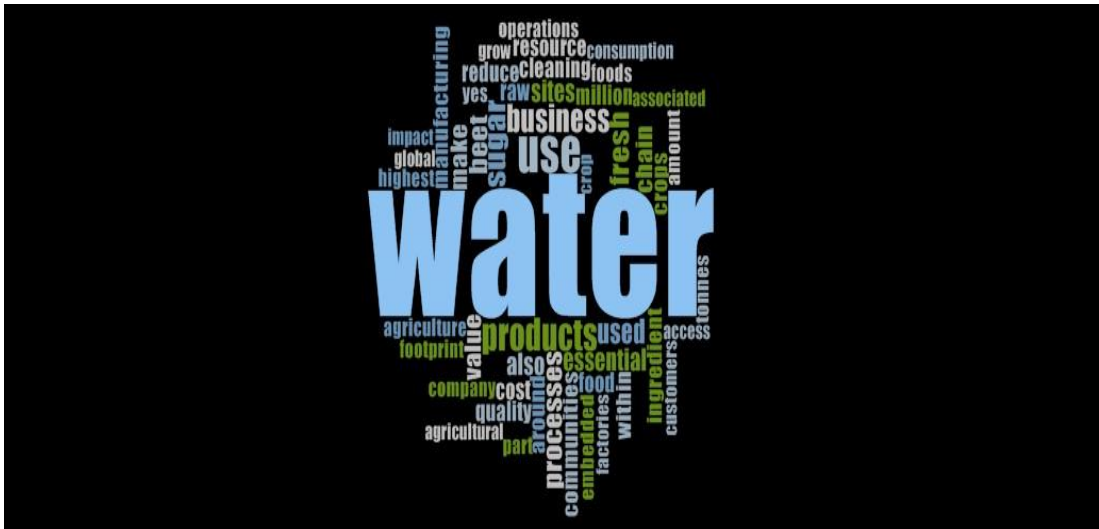


Figure 6.8: Word cloud of the green quotes for SP1.1.3 - Does the company recognise its dependence on water resources?
Total of words analysed: 1599

Once again ‘water’ is the most frequent term as the quotes extracted all talk about this resource. In the case for the recognition by companies on their dependence on water resources some key remarks can be inferred from Figure 6.8. First, terms like ‘use’, ‘products’, ‘processes’ and ‘essential’ appear to be frequent in the 19 companies that were marked with green for this indicator. This shows an indication of companies referring to water as an important resource for their business. Furthermore, in a lesser frequency words like ‘chain’, ‘agriculture’, ‘footprint’ and ‘global’ show evidence of recognition of water as essential throughout their supply chain and not only in their operations. A further analysis on value chain orientation will be made in chapter 8. For the case of the eight companies who were marked with yellow for this indicator, four examples were extracted in Table 6.4.

Table 6.4: Examples of quotes of companies marked with yellow in the SP1.1.3 indicator - Does the company recognise its dependence on water resources?

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"We joined [the FHC] mainly because our main director has a keen interest in water ratios and water usage and water footprints in general. ... I think he [the main director] sees it [water] as part of the whole picture of the environmental impact really, of what we do. The cost isn't necessarily a big problem, because the cost of water is generally quite low really."</i>- (Interview) C3</p>	<p>The interest from the director on water usage and footprints shows indirect evidence for the recognition of the company's dependence on water resources.</p>
<p><i>"In 2007, [the company] was a founder signatory to the Federation House Commitment. This commits us to support best practice and report our achievements in reducing water usage."</i>- (Environmental Report) C6</p>	<p>Their main motivation to join the FHC seems to be potential financial savings which could be indirectly related to the recognition of dependence on water resources. However, the evidence does not clearly answer the question.</p>
<p><i>"The financial benefits of undertaking a water efficiency programme are strong, but the buzz of being 'an environmental achiever' gives the business so much more. Once we got the ball rolling and the whole team got involved, the savings really began to materialise." - (FHC case study) C6</i></p>	<p>Although it is recognised by default their dependence on water resources, because water is their main ingredient, it is not clear whether or not the company explicitly recognises its dependence on this resource</p>
<p><i>"If we are unable to maintain relationships with our raw material suppliers, we may incur higher supply costs or be unable to deliver products to our customers. In addition to water, the principal raw materials required to produce our products are aluminium cans and ends, PET bottles, caps and preforms, labels, cartons and trays, sweeteners, such as HFCS and sugar, fruit and fruit concentrates. We rely upon our ongoing relationships with our key suppliers to support our operations."</i> - (Environmental Report) C19</p>	<p>Although it is recognised by default their dependence on water resources, because water is their main ingredient, it is not clear whether or not the company explicitly recognises its dependence on this resource</p>
<p><i>"The driving force behind it [to join the FHC] really was that we recognised that something needed to be done and we thought we needed to do our bit. The company is family owned, the shareholders have a very philanthropic attitude, a very responsible attitude towards how the business operates, and so it's a question of us doing our part. There's clearly a view that there's a cost benefit to be had but actually, the cost of water overall is not that great within our operations. So, cost was not a major driver."</i>- (Interview) C66</p>	<p>The respondent indicates that the company joined the FHC commitment because they recognised that something needed to be done. This does not directly imply that the company recognises their dependence on water resources but rather show evidence of the company's interest on their impact on the environment.</p>

In the example quotes presented above it is evidenced that in some cases it was not straightforward to determine whether the companies recognise their dependence on water resources. They all mention that they are committed to adopt measures to manage water more efficiently but this does not necessarily mean that the recognition of this resource as primordial to their businesses is being done. This also indicates the degree of uncertainty that has been discussed throughout this chapter which refers not only to the indicators marked in yellow but also for those in light red. For 40 of the

companies (60%) under this indicator no evidence was found in the data collected. The next section presents the findings for indicator SP1.1.4 that aimed to find out if the analysed companies commit to any of the three well recognised global water initiatives.

6.1.4 Commitment to international water initiatives (SP1.1.4)

There are three well-established water initiatives in the international scenario that aim to promote water sustainability practices in the private sector. The UN CEO Water Mandate aims to engage with business leaders to embed water sustainability solutions (UN Global Compact, 2014). In addition, the Water Footprint Network seeks to incentivise a sustainable, fair and efficient use of water across the supply chains of businesses worldwide (Water Footprint Network, 2014). Finally, the CDP Global water disclosure requested water data from 318 companies, listed in the FTSE Global Equity Index Series, which belong to water-intensive sectors (CDP and Deloitte, 2012). This indicator corresponds to the WAT1.4 indicator from the study carried out by Oxfam (2013b). However, in the Oxfam study companies score only if the companies they evaluated commit to at least two of the aforementioned initiatives. For this research, companies are marked with green if they commit to at least one of the initiatives because it is recognised that all analysed companies vary in size and nature.

For the evaluation of this indicator quotes from the data collected were not sourced but rather the companies' names were searched in the official webpages of the three initiatives. Results indicate that only 12% (8) of the companies commit to any of the three initiatives while 88% (59) do not. The lack of association with these initiatives does not necessarily mean that companies are not aware of water-related issues. These results may be affected by the size and type of the companies as all of the signatories who scored green under this initiative are all big multinational firms. The next section analyses the findings for indicator SP1.1.5 that aimed to find out if the companies disclosed data of water withdrawals in their operations.

6.1.5 Disclosure of reduction of water in companies' operations (SP1.1.5)

The last indicator utilised for determining the extent to which the analysed companies are aware of water-related issues and their responsibilities to manage water more sustainably was SP1.1.5. This indicator was set up in order to investigate if companies disclose data on the reduction of water use in their operations. Results indicate that from all the five indicators under the 'water awareness' theme this is the one with the highest number of companies marked with green (63%, 42 signatories). This result is expected as all the companies analysed for this research are committed to reduce water in their operations by 20% by 2020. Furthermore, for three companies (4%) it was difficult to determine whether a clear disclosure of water withdrawals is being done. In addition, for 22 companies (33%) no evidence was found in the data collected.

Since this is the only sub-indicator for the 'water awareness' theme that had the majority of companies marked in green, a range of different quotes extracted from 18 companies is presented in Table 6.5. There are some remarks worth noting from the information presented in the table. First data extracted from six of the 12 questionnaires collected is shown in the table. In the questionnaires the question for directly disclosing the water reduction they have achieved due to efficient technological adoption. In all the examples presented, respondents disclose different ranges that vary between 0 and 50%. Furthermore, in those companies from which only secondary data was sources figures are also presented in percentage terms and have a wide variation.

Table 6.5: Examples of quotes of companies marked with green in SP1.1.5 - Does the company disclose information on reduction of water in their operations?

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>"0-10% water reduction due to technology adoption."</i> - (Questionnaire)- C3	The respondent indicates a reduction of 10% of water in their operations.
<i>"21-30% water reduction due to technology adoption."</i> - (Questionnaire) C4	The company clearly discloses information on the amount of water that has been reduced in their operations. This is done in all the three sources of data collected.
<i>"We have reduced about 24% of our water usage (2006 baseline). We have reduced 700 million litres and on average on our operations we use 350000000 litres, all of this has been achieved through more efficient processes"</i> - (Interview) C4	
<i>"We reduced our total water consumption by 5% in 2011/12 and now consume 14% less water than in 2010"</i> - (Website) C4	
<i>"0-10% water reduction due to technology adoption: Low volume high pressure ring main technologies"</i> - (Questionnaire) C6	The data indicates a reduction of water by 10% in the questionnaire, 28% in both the interview and environmental report and of 43% in the website. This variation might be due to different time periods measured.
<i>"We were 97,000 cubic metres in total, when we started [FHC commitment], and we are now about 70,000 cubic meters in total (around 28% reduction)."</i> - (Interview) C6	
<i>"In 2007, we used 97,000m3 to produce 25,056 tonnes of product. Our water usage has reduced by 28% between 2007 to 2011"</i> - (Environmental report) C6	
<i>"43% reduction in water usage (litres excluding water in the recipe) (per product)"</i> - (Website) C6	
<i>"We already use grey water to wash our vehicles at sites saving an estimated 80% of fresh water per wash."</i> - (Website) C11	In the website it is stated that 80% of the water used for washing their vehicles is saved. In the FHC case study, it is shown that the company has achieved 22.4% of absolute water use (surpassing the commitment already).
<i>"Collectively [our] manufacturing sites have realised an impressive 22.4% reduction in absolute water use whilst recording an increase in total production since 2010."</i> - (FHC Case study) C11	
<i>"Since 2007 we have reduced our water usage by 15.7%"</i> - (Environmental report) C21	They disclose that since 2007 they have achieved a reduction of 17% of water usage in their operations
<i>"11-20% water reduction due to technology adoption (7000000 litres used per month)"</i> - (Questionnaire) C25	The respondent of the questionnaire discloses a water reduction in their operations of 11-20%
<i>"An 11 percent reduction in our water usage rate, halfway to our 20 percent goal. Our North American supply chain operation helped drive that reduction by reducing its water usage rate by almost 5 percent in one year." ... "Compared with fiscal 2010, in fiscal 2011 we ... Cut water usage by roughly 560,000 cubic meters."</i> - (Environmental report) C26	The company discloses an overall 11% water reduction in their global operations

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"And by the end of 2012, bearing in mind we had two horrendous years and we only had one of our cascades in place for a short period of time, we were down to 236,225. So, that was a saving overall by the end of 2012 of 24.6% - so almost half way there." - (Interview) C29</i></p> <p><i>"Potato packing and processing is a high water consumption industry but here at [the company] we have pioneered a new water recycling and treatment system called Cascade which has resulted in water savings of up to 85% at our Shropshire and Cambridgeshire sites." - (Environmental report) C29</i></p> <p><i>"65% water reduction when compared to a 2007 baseline"-(FHC Case study) C29</i></p> <p><i>"Water has reduced by 18% between 2007 and 2012" - (Environmental report) C36</i></p> <p><i>"Water usage continues to drop, and between 2007 and 2009 it decreased by 13% as a result of a number of initiatives, including reducing the level of wet cleaning within the factory and conducting studies assessing water usage on our bio-filter." -(FHC Case study) C36</i></p> <p><i>"Utility savings, per unit of output (UK poultry, 2012 vs 2011): 8% water" - (Environmental report) C39</i></p> <p><i>"Overall, [the company] have realised an impressive 16.9% reduction in absolute water use whilst recording a 19.1% increase in total production since 2007."-(FHC Case study) C39</i></p> <p><i>"[To date we have] Reduced absolute water usage by 36% since 2006, ahead of our own 2020 target and the Federation House Commitment (FHC) target of a 20% reduction by 2020."-(Environmental report) C43</i></p> <p><i>"To date we have reduced absolute water usage by 36% since 2006 – well ahead of our own 2020 target and our commitments under the Federation House Commitment"-(FHC Case study) C43</i></p> <p><i>"0-10% reduction of water due to technology adoption"- (Questionnaire) C45</i></p> <p><i>"I would say we've reduced it by 10 percent [since 2007]"-(Interview) C45</i></p> <p><i>"More than 50% water reduction due to technology adoption"- (Questionnaire) C61</i></p> <p><i>"11-20% water reduction due to technology adoption"- (Questionnaire) C29</i></p> <p><i>"Well, as a percentage, I think we could probably claim around 10%, 15%. It's also quite seasonal and it depends on how active we are, but that kind of figure anyway." - (Interview) C29</i></p>	<p>The company discloses water reduction in their operations in three of the sources, the information is different in each source but this might be due to a difference in the reporting period and/or the sites the refer to in each quote.</p> <p>The company clearly discloses the water reduction achieved between 2007 and 2012 in the Environmental report and between 2007 and 2009 in the FHC case study.</p> <p>The company clearly discloses the water reduction achieved between 2011 and 2012 in the Environmental report and between 2007 and 2013 in the FHC case study.</p> <p>The company has achieved an overall 36% water reduction and the same data is presented in both sources</p> <p>The company has achieved a 10% water reduction since 2007</p> <p>The questionnaire respondent discloses that the company has reduced its water consumption by more than 50% due to technology adoption.</p> <p>A reduction of water intensity between 10-15% is disclosed by the respondent</p>

The main aspect to take into account from the data collected for this indicator is the lack of consistency in terms on how figures are reported. For example, C3 and C61 in Table 6.5 provide data on reduction of water but no further information with regards of a baseline are given. In addition, not all companies report data in amount of litres and how does that compare with their overall production. In other words, the figures reported need to be provided with a context that covers geographical location, period of reporting and comparison with overall production. There is one aspect that does not seem to be addressed in the data collected and it is the impact on the environment raised from their withdrawals. This is a key aspect for the adoption of a soft path for water that will be discussed later in section 6.2

In order to identify key themes emerging from the quotes collected for those companies marked in green in the SP1.1.5 indicator a word cloud with the 50 most frequent terms was generated (see Figure 6.9). Words like ‘use’, ‘usage’, ‘reduction’ and ‘reduced’ suggest that companies are specifically reporting against water reduction targets which is the aim for this indicator.

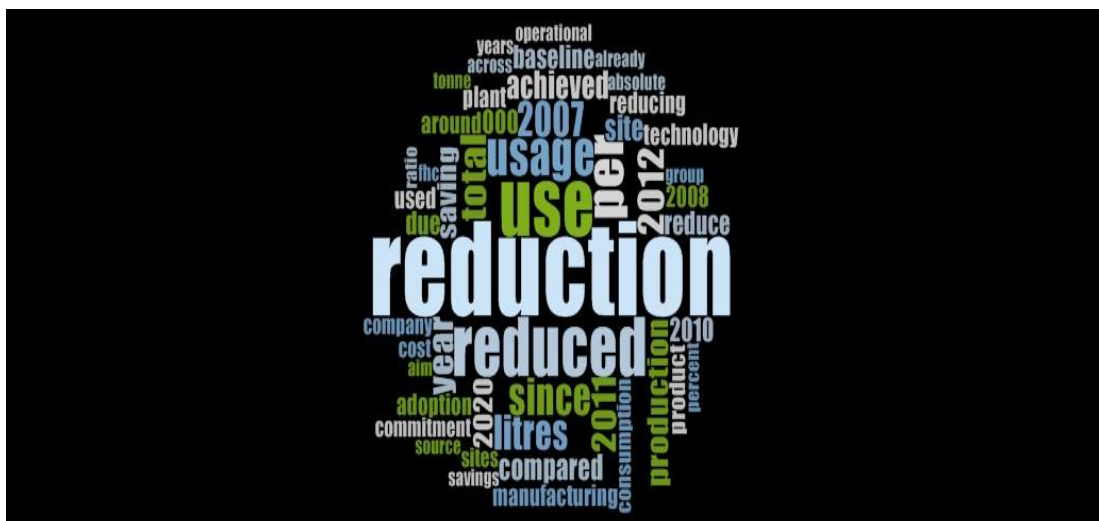


Figure 6.9: Word cloud of the green quotes for SP1.1.5 - Does the company disclose information on reduction of water in their operations?
Total words analysed: 2008

An interesting aspect from the word cloud for this indicator is that terms like ‘water’, ‘environment’ or ‘impact’ do not appear in the 50 most frequent words analysis. This shows evidence for the need of reporting water reduction achievements in terms of their meaning in terms of the impact on the environment.

For this indicator only three companies were marked with yellow. Table 6.6 presents the data for this indicator for these companies. All the companies shown in the table show figures of water increase instead of reduction in their operations. The reason why they were marked with yellow is to recognise their transparency on recognising that they have effectively increased their water consumption. It is important to take into consideration that an increase of water use is not necessarily negative. A context and evaluation of the impact on the environment of such use is key.

Table 6.6: Quotes of companies marked with yellow in SP1.1.5 - Does the company disclose information on reduction of water in their operations?

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>“To be honest with you, we knew about a lot of the things that were picked up in the surveys of what's [happened?] and things. As a business we've just never focused on it. So we knew where some of the areas were, where we could reduce water, but it's just the last thing people think about isn't it, water's free. Especially, it's not like, I suppose energy to some extent where you've got carbon credits and energy is expensive. Water is seen as a free resource. So everybody uses it freely.” – (Questionnaire) C64</i></p>	<p>In the questionnaire, interview and environmental report it is disclosed that the company has not achieved much water use reduction on their operations. Nevertheless, it is important that the company is honest about it and reports it transparently.</p>
<p><i>“We are behind on our pledges for water usage, but are considering ways of ensuring our 2020 targets are met”- (Interview) C64</i></p>	<p>The company has effectively increased its water usage but it is clear about it</p>
<p><i>“In 2010, we reduced its fresh water usage by 2.42%, when compared to the year 2009. In 2011, there was an increase of 4.92% when compared to 2010.”- (Environmental report) C49</i></p>	<p>The company has effectively increased its water usage but it is clear about it</p>
<p><i>“Although water usage was up during the Year (+5%), we now have water monitors installed in 15% of sites, doubling the number we had last year and giving data on the daily usage of water so we can detect higher than average usage and leakages much more quickly. We continue to work closely with water companies to encourage them to help us in this area as more accurate records are vital to us.” ... “[reduce water usage target] Our focus this year will be on continuing to introduce more water monitors across the estate, with a view to having around 30% of the estate fitted with them by the end of this financial year.”- (Environmental report) C28</i></p>	<p>The company discloses information on water consumption in their operations. Nevertheless, this increased during the reporting period.</p>
<p><i>“Water Consumption 5% [increase]”- (Website) C28</i></p>	

This indicator was the one with the lowest level of uncertainty under the ‘water awareness’ theme. For only 33% (22) companies evidence was not found in the data sourced. These results may be influenced by the existing commitment of all the companies analysed to reduce water consumption in their operations. The next section

of this chapter discusses the re-evaluation of water resources theme under the water awareness subject.

6.2 Re-evaluation of water services (SP1.2)

One of the key characteristics of the soft path for water is the “differentiation of waters with different qualities and match the quality needed with the quality that is available” (Gleick, 2009, p 53). This is also referred to as the re-evaluation of water services. In other words, high quality waters are not necessarily needed for all the processes. For example the same quality of water is not necessary for drinking and to flush down the toilet. In terms of defining what the re-evaluation of water services would entail in the food and drink industry three elements were defined. First is the exploration on whether different qualities of water are used for different processes specifically. Second was the investigation of the extent to which rain water harvesting had been implemented. Finally, was the degree to which water recycling has been done in the analysed companies. Figure 6.10 presents the results obtained for the three indicators.

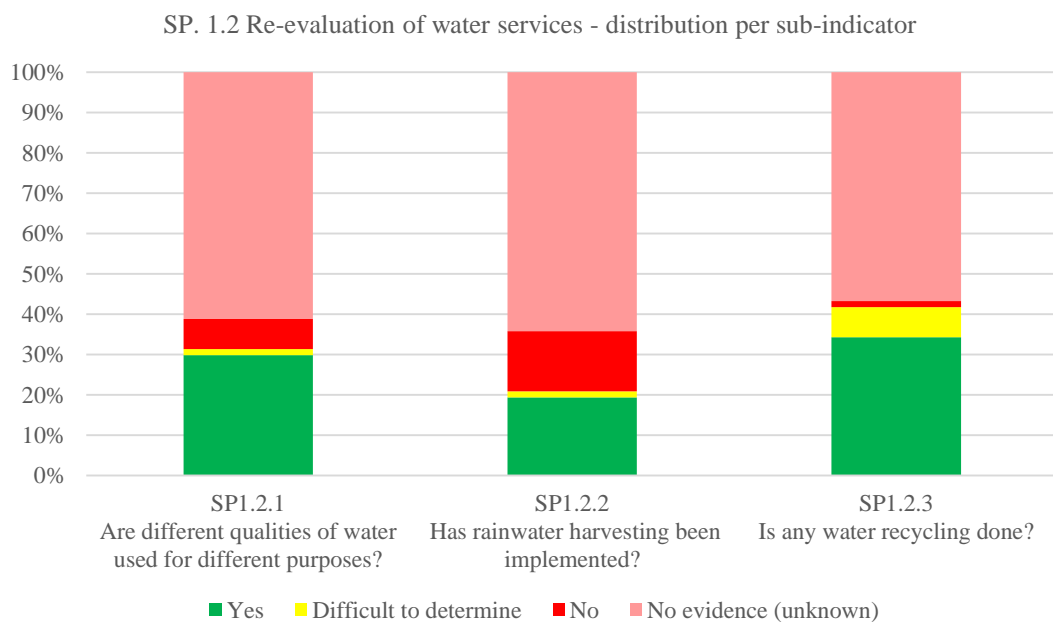


Figure 6.10: Summary of the Re-evaluation of water services (SP1.2)

The summary of the colour distribution of the ‘re-evaluation of water services’ shown in Figure 6.10 presents some key findings. First, the use of different qualities of water for different purposes (SP1.2.1) appears to be adopted by 30% of the companies investigated. Whilst 7% of the sample have not adopted it. Furthermore, for 1% it was difficult to determine whether or not such adoption had been made from the evidence gathered. On the other hand, for 61% of the sample no evidence was found in the data sources gathered. Second, the implementation of rain water harvesting shows a similar scenario in which 19% of the companies show evidence for adoption, for 15% is certain that this had not been carried out, for 1% it was difficult to determine and 64% of the companies shown no evidence of such adoption. Finally the results obtained from SP1.2.3 indicate that 34% of the sample had recycled water for their processes, 1% of the companies stated that this is something currently not being done, for 7% it was difficult to determine and for 57% of the sample no evidence was found for this indicator. The next section provides a discussion and analysis of the findings from SP1.2.1.

6.2.1 Use of different qualities of water for different purposes (SP1.2.1)

Water can be of different qualities, for example the highest quality of water may not be needed in all the companies’ operations. This indicator aimed to investigate if different qualities of water are used for different purposes in any of their activities. Food and drink processing needs high quality of water due to health-related aspects. For this reason, at first it might seem obvious that companies do not use different qualities of water as part of their processes. Nevertheless, from the evidence gathered for this research it was found that there are some efforts that have been put into this direction.

From the data analysed it was found that 20 companies (30%) already use different qualities of water for different purposes. Water is being reused in different ways and the way this is being done varies from company to company. Table 6.7 presents some examples from different companies and sources of data. It was found that some companies like C3, C18, C39 in the example reuse water, hence use different qualities of water, for their cooling and heating processes. Furthermore, companies like C25 and C29 in the example use a lower quality of water for the cleaning processes

of potatoes, as it does not necessarily need to be potable. Moreover, other companies like C65 in the example reuse the waste water generated from their processes for irrigation in their farm. Nevertheless, there are companies that present evidence but in a lesser extent like C61 who states in the questionnaire that different qualities of water are used for processes like ‘growing, washing, cleaning’ but no further information is given. A remarkable example, is C14 who shows evidence in its environmental report of having identified seven different qualities of water depending on their source and properties and use them in ways that match their services.

Table 6.7: Quotes of companies marked with green in the ‘use of different qualities for different purposes’ indicator (SP1.2.1)

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"We need brewing water which has had the chlorine removed and then treated with brewing salts we need soft water for boiler feed top up and cleaning tanks"- (Questionnaire) C3</i></p> <p><i>"We've always recycled the waters to a certain degree so there's lots processes in the brewing side where you have to cool something down or heat something up. Obviously that's usually done with water through heat exchanges. For most of these heat exchanges we recover the other heated or cooled water and use it in another part of the process. We try and recover that sort of water and the energy as much as possible."- (Interview) C3</i></p>	<p>Different qualities of water are being used for cooling and heating processes.</p>
<p><i>"Our Environment team has classified water into 7 different types, depending upon its source and properties. This allows our factories to match the suitability of water type to our process requirements. We use water for cleaning, heating, cooling and transportation (sugar beet float in water). To achieve the highest level of efficiency in manufacturing requires a careful balance between water use and energy use; ensuring that the reduction of one element does not require the increase of another."- (Environmental report) C14</i></p>	<p>It is worth noting that the company has classified its water into seven different types and use each type for a different purpose depending on its properties. In addition, it is important to note that the company recognises the water-energy nexus explicitly.</p>
<p><i>"[The company] purchases around 7.5 million tonnes of UK sugar beet annually, which means our factories receive over 5.5 million tonnes of embedded water in beet. We extract that water and put it to work in our factories to maximise efficiency. We use water for cleaning, heating, cooling and transportation."- (Website) C14</i></p>	

Quotes	Comments - Analysis
<p><i>“Across our system, we are reducing the amount of water we use per litre of finished product, treating and recycling wastewater (in some cases discharging it cleaner than it was originally), and striving to replenish an amount of water equal to what we use in our finished beverages by 2020.” - (Environmental Report) C18</i></p>	<p>The company shows a clear water strategy based on ‘reduce, reuse and replenish’ and shows an example where in one of their plants water is reused in a cooling process</p>
<p><i>“Our strategy is to reduce, recycle and replenish the water we use. Under our water stewardship strategy, we’re aiming to return safely to nature an amount of water equivalent to that which we use in all our drinks and their production” ... “We’re reusing water, too. In one of our factories the water that washes empty cans is now used to cool our pumping equipment, and where water used to wash empty packages we often use air to do the same job in many of our factories.”- (Website) C18</i></p>	
<p><i>“Water for use in flumes for removing waste does not have to be potable, for use with product and hand washing must be”- (Questionnaire) C25</i></p>	<p>In the questionnaire the respondent clearly states that different quality of water is being used in flumes to remove waste</p>
<p><i>“So, the water’s filtered and disinfected before returning back into the system. But it’s just a constant loop - constantly refreshing. So, our wash bowels previously, would have been emptied, cleaned down and refilled. They are never emptied out. They’re constantly just being recycled, with the water that’s been processed. So, we installed one at Tern Hill back in the end of 2009 and in our Flood Ferry site at the end of 2011, and they’re both massive investments - both projects were over a million pounds.”- (Interview) C29</i></p>	<p>In all three sources the ‘Cascade’ process is mentioned. It is a process that reuses water in a closed-loop for washing the potatoes</p>
<p><i>“Potato packing and processing is a high water consumption industry but here at [our company] we have pioneered a new water recycling and treatment system called Cascade which has resulted in water savings of up to 85% at our Shropshire and Cambridgeshire sites.”- (Environmental report) C29</i></p>	
<p><i>“The process [cascade] collects used water and treats it (filtered, purified, disinfected and chilled) so that it can be re-used. The system also recovers the sand and soil from the water so that it can be re-used and sold on, so that almost everything is recycled – eliminating costly sludge disposal costs.”- (Website) C29</i></p>	
<p><i>“... recovery of the reverse osmosis concentrate to the bulk hot water tanks” ... “recovery of softener regeneration liquors for use as the wash water for the Rotosieves” – (FHC) C39</i></p>	<p>Water is recovered from different process and reused; this implies the use of different qualities.</p>
<p><i>“CIP uses clean water, vehicle wash requires water to a lower standard.”- (Questionnaire) C41</i></p>	<p>There is clear evidence on how different qualities of water are being used for different purposes</p>
<p><i>“Pilot heat recovery heat pump system in the north of England has saved 200 T/week of water (~1% of total group water use) Achieved 94% recycle rates for vehicle wash at Manchester, saving about 100T/week.”- (Interview) C41</i></p>	

Quotes	Comments - Analysis
<p>"In 2011, we carried out water mapping studies at each of our manufacturing sites in the UK to identify ways of minimising our water use. At our Hayes factory alone, we put in place a number of projects that helped to achieve a water saving of 9% based on the previous year, including increasing our reuse of water."- (Environmental report) C43</p> <p>"This has been achieved through a range of site specific reductions ranging from the installation of a new £500,000 waste treatment plant at our Girvan site in September 2010 to reducing the amount of water taken in [one of our factories] by 25% by removing cooling towers and installing new washing systems."- (FHC report) C43</p>	<p>In both sources there is evidence of water being reused for different purposes</p>
<p>"Yes, Growing, washing cleaning cooking/toilets/drinking"- (Questionnaire) C61</p>	<p>The respondent indicates that different qualities of water are being used for different processes in the companies like growing, washing, cleaning.</p>
<p>"Jam & Marmalade manufacture 100% mains water Farm irrigation treated waste water through our effluent treatment plant (Set parameters for water Quality). Technologies such as final stage UV sterilisation are also employed to guarantee water quality."- (Questionnaire) C65</p>	<p>A treated waste water is used for irrigation in the farm</p>

A word cloud was created in NVIVO in order to identify the main themes arising from the quotes extracted for the evaluation of the use of different qualities of water for different purposes. These are all the quotes used for classifying companies as green for this indicator. Figure 6.11 shows the 50 most frequent words mentioned in the quotes, their size varies depending on their frequencies.



Figure 6.11: Word cloud of the green quotes for SP1.2.1 - the evaluation of different qualities of water used for different purposes
Total amount of words analysed: 1673

The total word count frequency of the quotes used of the 20 companies who were marked with green under the ‘use of different water qualities for different purposes’ was 1673. The 50 most frequent words in these quotes are presented in Figure 6.11 and from these some themes can be inferred. ‘Use’ is the most frequent term as all the quotes extracted referred to the way water is used in the companies. The data presented suggests that companies are using different qualities of water in processes such as cleaning, heating, washing and cooling. Another term that appears to be frequently mentioned in the evidence is ‘recycling’ which suggests that companies are reusing water in their operations. This overlaps with the indicator SP1.2.3 that aimed to determine if water is being recycled in their operations (see section 6.2.3).

Under this category it was difficult to determine whether different qualities of water are used for different purposes for one company: C66. In this case, the respondent of the questionnaire marked as ‘yes’ the question that asked if different qualities of water are used for different purposes. However, when further information was asked in the questionnaire the respondent stated:

"The bulk of water is used as a food ingredient. Smaller quantities are used in factory hygiene"- (Questionnaire) C66

As a result contradictory answers were given as it seems that the participant confused “qualities” with “quantities” and it is therefore difficult to determine from the data whether or not different qualities of water are used for different purposes.

Five of the companies were marked with red for this indicator. All these signatories answered the online questionnaire. Table 6.8 presents the quotes extracted from the questionnaire and a short analysis for each case.

Table 6.8: Quotes of companies marked with red in the ‘use of different qualities for different purposes’ indicator (SP1.2.1)

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>"Technically unfeasible at this time at existing installations but this is being built into our new factory plans. Retrofitting this to older factories may be progressed in the future."- (Questionnaire) C4</i>	This is not being done at the moment due to technical unfeasibility but might be considered in the future
<i>"It has been very much been evaluated and subject to practical constraints we are moving forward with a programme of scrubbing water to grey water quality for use in cooling towers for instance and possible collection and use of rain water"- (Questionnaire) C6</i>	This is not being done at the moment due to financial constraints but might be considered in the future.
<i>"We scrub the water, using-- scrub effluent, using an electrocoagulation system to reduce the solids and the BOD, COD of the effluents, but it continues to go to sewer for treatment, and we're still at the first stage, in progressing to recycling of water. We want to but it requires investment and organisation and the right moment to do it, retro-fitting and having the equipment is expensive"- (Interview) C6</i>	
<i>"working on rainwater harvesting for new build"- (Questionnaire) C45</i>	This is not being carried out by the company. The respondent is referring to rainwater harvesting which is sometime later asked in the questionnaire
<i>"We looked at it for harvesting rain for the livestock, but then we couldn't guarantee the quality of the water that we feed the birds. And because the birds are under [a line coax?] scheme, we couldn't use rain water."-(Interview) C45</i>	
<i>"it has - cost"- (Questionnaire) C46</i>	The respondent states that different qualities of water are not being used for different purposes due to cost constraints. Nevertheless, no further information is given
<i>"We are a food factory and it would not be practical to reuse water. The only area where water is reused may be part of cleaning in place systems" - (Questionnaire) C64</i>	The respondent of the questionnaire indicates that to use different qualities of water is not feasible due to the nature of the company (food factory).
<i>"We have looked at that sort of cleaning, for example, cleaning in place, CIP systems, things like that, looking at how you use hoses and, different technology of how we can clean vessels and everything. So we have looked at that and we have done work on that, looking at spray bars and all that sort of stuff that we can look at. We continue to look at new technology to see if there's any benefits there." - (Interview) C64</i>	

In the five responses presented in Table 6.8 some themes with regards of why different qualities of water are not being used emerge. First, two respondents indicate that this has not been implemented due to financial and cost constraints (C6 and C46). In addition, C4 indicates that it is technically unfeasible in their current infrastructure

but it is something that might be taken into account in future developments. Furthermore, C64 indicates that it is not feasible due to the nature of the company as high quality of water is needed for food processing. Nevertheless, the participant indicates that this might be done in activities like cleaning and cooling which is something being carried out by other companies. Finally, C45 refers to the use of rainwater harvesting which is something investigated in section 6.2.2.

For 61% (41 companies) of the sample there was no evidence found to determine whether different water qualities are being used for different purposes. In other words, for the majority of the sample it is uncertain if efforts towards this implementation are being carried out. The next section discusses the findings for the rain water harvesting indicator (SP1.2.2).

6.2.2 Implementation of rain water harvesting (SP1.2.2)

As its name implies, rain water harvesting refers to the use of water coming from rainfall. This indicator aimed to determine the extent to which this approach has been implemented in the evaluated sample. Results indicate that 19% (13) of the companies had applied this technique into their operations. For one company (1%) it was difficult to determine whether or not this has been done. Furthermore, 15% (10) had not implemented it, whereas for 64% (43) not relevant data was found.

Some examples of the companies marked with green for this indicator are shown in Table 6.9. Seven signatories with different sources of data were chosen to illustrate these findings. Some aspects are worth noting from the quotes presented in Table 6.9. First, it was found that the implementation of rain water harvesting depends on the water availability of the regions where companies have operations. For example, C4 indicates that rain water harvesting has been adopted in a water stressed-area in England. Similarly, C18 indicates in the environmental report that rain water harvesting has been implemented in their operations in India to capture water in the monsoonal season and recharge their aquifers.

Moreover, other companies make use of rain water for different activities. For example C11 states in their website that rain water is being used for vehicle washing as for the toilet areas and represents a good example for the re-evaluation of water

services. In addition, C51 indicates in its environmental report that rain water is being employed for irrigation of their tomatoes.

Table 6.9: Quotes of companies marked with green in the ‘rain water harvesting’ indicator (SP1.2.2)

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"Technically this is difficult and costly to integrate into older factories but it is being incorporated into our new factory designs"- (Questionnaire) C4</i></p> <p><i>"Rainwater harvesting is something we have considered in the past but to retrofit is very expensive, water is cheap so the cost saving of water isn't enough, as a business case and this make it not economically viable. However we have a site in Milton Keens (near Oxford) where we built a building recently and rainwater harvesting was in the design right from the start. So when it is a new development it is much easier and cost effective to put rain water harvesting technologies rather than retrofitting, where I think it is not economically viable. In this building this rainwater is used for domestic facilities, so things like toilets etc. Milton Keens is a very water stressed area and the supplier can switch off water when the demand is high, so this shows that there is a higher apparent need for adopting efficient technologies there. The critical thing is to start at the design stage, retrofitting is very expensive"- (Interview) C4</i></p>	<p>Rain water harvesting has been implemented in a new development in a water stressed area in England. Retro-fitting is not being considered due to cost effectiveness constraints.</p>
<p><i>"Their new dairy in Aylesbury incorporates a number of technologically advanced water-saving innovations in its design, such as water recovery and re-use, rainwater harvesting and a state of the art processing plant."- (FHC report) C7</i></p>	<p>In the data from the FHC case study, it is mentioned that rain harvesting is being implemented. No further data is presented.</p>
<p><i>"Waste heat energy from refrigeration units and other plants can be recovered and used to heat water, replacing the need to heat by burning gas whilst rain water harvesting is an effective way of harnessing natural resources for vehicle washing and sanitary use. Both these technologies now form an intrinsic part of any new build specification."- (Website) C11</i></p>	<p>Rain water is used in toilets and for vehicle washing and it is part of new building specifications</p>
<p><i>"At the end of 2011, our system in India had installed more than 600 rainwater-harvesting structures across 22 states to capture monsoonal rains for aquifer storage." ... "Our community water partnerships include initiatives that increase the ability of watersheds to absorb threats associated with the uncertainty of climate change and higher demands for water, energy and food. Other initiatives support climate adaptation and the increased food needs of a growing population through water body alterations, agricultural innovations, aquifer recharge, rainwater harvesting and other projects."- (Environmental report) C18</i></p>	<p>The data in the environmental report shows evidence of projects around rainwater harvesting implemented. Nevertheless, it is difficult to assess the extent of these projects with the data gathered.</p>

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>"Plant raising site (not covered by FHC). New build rainwater harvesting added as part of installation." - (Questionnaire) C25</i>	In the questionnaire the respondent clearly states that rainwater harvesting has been implemented in the plant raising site
<i>"[rain water harvesting has been implemented in] Bridgwater in Somerset and Amesbury in Wiltshire. Cost of water higher in these regions"- (Questionnaire) C41</i>	There is clear evidence rain water harvesting being implemented where water is more expensive.
<i>"Carbon dioxide from the CHP plant is pumped into the enormous glasshouse, encouraging plants to grow at twice the normal rate. The glasshouse is also home to over 5,000 bees which pollinate the plants naturally. The glasshouse is the size of ten large football pitches, so the rainwater from such a large roof is used as the main source of irrigation for the tomato plants." - (Environmental report) C51</i>	Rainwater is being used at a site to irrigate the tomatoes grown in the area.

In order to evaluate all the quotes of the companies marked with green for the SP1.2.2 indicator the 50 most frequent terms in such quotes were computed. Figure 6.12 presents the results of this analysis.



Figure 6.12: Word cloud of the green quotes for SP1.2.2 - the implementation of rainwater harvesting
Total amount of words analysed: 701

Some themes emerge from Figure 6.12. The first obvious remark is that ‘harvesting’ and ‘rainwater’ are the most frequent terms mentioned as all the quotes extracted refer to it. Furthermore, terms like ‘efficiency’, ‘technology’ and ‘innovation’ suggest that rain water harvesting is conceived as an efficient process for water management. The term ‘glasshouse’ appears to be mentioned frequently, this

indicates that rain water is being used for maintaining the green houses of the companies analysed. In a lesser extent words like ‘irrigation’, ‘recharge’ and ‘washing’ appear in the word count. This indicates that rain water is being used for such purposes for some of the companies who scored green under this indicator.

Results indicate that rain water is being used for different purposes depending on the nature of the company. Nevertheless, for one company (C36) it was difficult to determine whether or not rain water harvesting had been adopted. The evidence gathered from their environmental and FHC reports is presented as follows:

“Factories (0.8% of water use in our value chain) – this is tracked from municipal sources, ground water, surface water (for cooling only) and captured rainwater, though we only consider the first two sources to have an impact on availability”- (Environmental report) C66

“In our Kings Lynn factory we have installed retort weirs and started using rainwater for watering the gardens.” – (FHC report) C66

Company 66 was marked as yellow as the quotes extracted from both sources briefly mention that rainwater is somehow captured but it is difficult to assess the extent to which this water is being used other than for watering the gardens. Furthermore, it is not specified whether or not food is being grown in such gardens.

For 10 companies from the sample it was determined that rain water harvesting had not been implemented due to various reasons. Table 6.10 present the quotes for all the companies that fell into this category. It is interesting that all companies but one marked with red for this indicator correspond to companies from which primary data was collected. This suggests that the lack of adoption of rain water harvesting can be found from primary sources. This makes sense as it is expected that companies report in their publicly available data success and best practice efforts. Nevertheless, it was also interesting that one company (C20) clearly states in its website that rainwater harvesting is something that has been considered but has not been implemented due to cost constraints.

Table 6.10: Quotes of companies marked with red in the ‘rain water harvesting’ indicator (SP1.2.2)

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>"It was implemented at the distribution site as part of a new build in 2006. It has not been implemented at the brewery as the advice is that we are in one of the driest parts of UK and as such it is uneconomical" – (Questionnaire) C3</i>	Not economically feasible for the company.
<i>"Retrofitting anything is costly and difficult. The payback for retrofitting rainwater harvesting equipment is too slow for commercial purposes. We shall aim to include rainwater harvesting as a basic in future redevelopment of facilities. [Even the £100 I've spent at home on rainwater butts will take 25 years for a payback]"- (Questionnaire) C6</i>	This is not being done at the moment due cost and technical constraints but might be considered in the future
<i>"Rainwater harvesting has been examined both in existing plants and new builds. Without further treatment, this water is of restricted use and so far the benefits have been outweighed by the costs of the harvesting system."- (Website) C20</i>	The company has evaluated the implementation of rainwater harvesting but they do not see it as an economically viable option.
<i>"We have actually. We've looked at it on a couple of projects when we were refurbishing one of the sites. I think at the time what we decided to do, because of the roof condition on that specific building, I think we'll review it as and when there's an opportunity or a new building going up, or a new premises, then yes. It's part of our policy that we will consider it and look at incorporating that into a new build, potentially. But, based on the age and some of our building fabrics, when we looked at it last time it just was not feasible. We felt there were better, more important things to spend that money on, to be honest, on that project."- (Interview) C29</i>	They have considered it but not implemented it due to feasibility concerns.
<i>"too expensive"- (Questionnaire) C45</i>	Not cost effective
<i>"We don't. We looked at it, but it wasn't cost effective."- (Interview) C45</i>	
<i>"Cost"- (Questionnaire) C46</i>	This is not being carried out by the company due to cost constraints.
<i>"Infrastructure currently. It is considered in all new projects"- (Questionnaire) C61</i>	It has not been implemented but the respondent indicates that it is considered for new projects.
<i>"The main issues relate to the infrastructure within these sites and the associated cost in relation to water savings."- (Questionnaire) C64</i>	The company has not implemented rain water harvesting due to the perceived cost associated with it.
<i>"No. We have looked at it [rain water harvesting] and we will look at it in the future. We have looked at that sort of cleaning, for example, cleaning in place, CIP systems, things like that, looking at how you use hoses and, different technology of how we can clean vessels and everything. So we have looked at that and we have done work on that, looking at spray bars and all that sort of stuff that we can look at. We continue to look at new technology to see if there's any benefits there."- (Interview) C64</i>	

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"A new Factory site is at final stages of planning - Rain Water harvesting will be reviewed as part of the overall renewable technology requirements for this site."</i> (Questionnaire) C65</p>	<p>It has not been implemented yet but it will be reviewed for the construction of a new operating site.</p>
<p><i>"The majority of water is used as a food ingredient, for which harvested rainwater is not suitable. Alternative measures have been taken to reduce water use in lavatories and other areas and the cost of retro-fitting for other uses is currently prohibitive"</i>- (Questionnaire) C66</p>	<p>The participant indicates in both the questionnaire and interview that rain water harvesting is something that has been considered but it has not been adopted due to the costs involved in it. In addition, the respondent mentions that the quality of the rain water is not suitable for a food manufacturing company due to hygienic reasons.</p>
<p><i>"We have looked at rainwater harvesting on two of them and at least, at the moment, the capital cost is not particularly attractive."</i>- (Interview) C66</p>	

Cost and financial concerns seem to be a predominant theme emerging from the quotes of the companies marked with red for the implementation of rain water harvesting indicator. All companies but one mentioned cost-related constraints for harvesting rain water for their operations. It is worth noting that all the companies that fell into this category have their main operations in the UK. This suggests that rain water harvesting is considered expensive when compared to other options in the UK. Company 65 was the only who did not directly mention cost as a barrier but rather suggested that this type of technology will be considered for new developments.

The extent to which the implementation of rain water harvesting has been adopted was the indicator with the highest uncertainty under the re-evaluation of water services theme. For this case 64% (43) companies were marked with light red as no evidence was found in the collected data. The next section discusses the degree to which water recycling had been implemented (SP1.2.3)

6.2.3 Water recycling (SP1.2.3)

Water recycling refers to the reuse of water in the companies' operations. It differs from the use of water for different qualities (SP1.2.1) in the sense that water can be either recycled and treated to meet high standards or not. This indicator was the one which appears to be most adopted by the sample of analysed companies (34%, 23 companies). Nevertheless, for 7% (5 companies) it was difficult to determine whether this has been implemented or not. Furthermore, only one company was marked with red for this indicator and for 57% of the sample (38 companies) no evidence was found. Table 6.11 presents some examples of quotes of companies who were marked with green for this indicator.

Table 6.11: Quotes of companies marked with green in the 'water recycling' indicator (SP1.2.3)

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"As part of the new brew house we reuse cooling water as product water, we also capture the evaporate from the kettle and use this for heating"- (Questionnaire) C3</i></p> <p><i>"We've always recycled the waters to a certain degree so there's lots processes in the brewing side where you have to cool something down or heat something up. Obviously that's usually done with water through heat exchanges. For most of these heat exchanges we recover the other heated or cooled water and use it in another part of the process. We try and recover that sort of water and the energy as much as possible."- (Interview) C3</i></p>	<p>Different qualities of water are being used for cooling and heating processes. (Same as SP1.2.1)</p>
<p><i>"...the industry-first reverse osmosis system has meant that [one of our operation sites] is consistently recycling about 20% of all of its waste water."- (Website) C5</i></p>	<p>A reverse osmosis system is being utilised for water recycling in one of their sites</p>
<p><i>"We are at phase 1 of development of recycling we are using electrocoagulation technology to scrub effluent of fats and sugars at our main factory site. Next stage will be to take the water a little further and use as grey water"- (Questionnaire) C6</i></p>	<p>They have implemented a water recycling process in their main processing factory</p>
<p><i>"[water recycling has been implemented] To reduce mains water requirement and effluent disposal at 2 sites"- (Questionnaire) C25</i></p>	<p>In the questionnaire the respondent clearly states that different quality of water is being used in flumes to remove waste</p>

Quotes	Comments - Analysis
<p><i>"I can tell you a little bit more about later on, but basically it's called Project Cascade, which recycles. It's a closed-loop water system. One of the reasons we went so high was because one of our key objectives was actually to install these through the washing sites, and we knew it could be capable of reducing our water usage substantially."</i>- (Interview) C29</p>	<p>In all three sources the 'Cascade' process is mentioned. It is a process that reuses water in a closed-loop for washing the potatoes</p>
<p><i>"We have pioneered a new water recycling and treatment system called Cascade which has resulted in water savings of up to 85% at our Shropshire and Cambridgeshire sites."</i>- (Environmental report) C29</p>	
<p><i>"Their continued focus on water led [the company] to develop and pioneer an award winning water recycling and treatment system called "Cascade" which has significantly reduced water consumption further."</i>- (FHC report) C29</p>	
<p><i>"Vehicle drive through wash at Manchester has water recycling."</i>- (Questionnaire) C41</p>	<p>There is evidence shown in all three sources of water being recycled in their operations</p>
<p><i>"[we have] achieved 94% water recycle rates for vehicle wash at Manchester, saving about 100T/week."</i>- (Interview) C41</p>	
<p><i>"The Group is currently undertaking a water management review which will result in a Water Management Plan which will provide the framework for identifying and managing opportunities to reduce, reuse and recycle water."</i>- (Website) C41</p>	
<p><i>"This saved us the equivalent of nearly 14 billion liters of water in our direct operations in 2012, and more than \$15 million in water costs. These savings resulted from actions ranging from monitoring and fixing leaks to optimizing the water purification systems in our beverage plants to recycling and reusing water."</i>- (Environmental report) C52</p>	<p>The company discloses figure of water saved due to the implementation of water recycling and reuse technologies.</p>
<p><i>"[The company] received the 2012 Stockholm Industry Water Award. The company conserved nearly 16 billion litres of water in 2011, from a 2006 baseline, through the application of water saving equipment and technologies, creative recycling and re-use, and by deploying a water management system throughout its manufacturing facilities."</i>- (Website) C52</p>	
<p><i>"Water is used for washing, transporting, peeling and slicing potatoes and was previously only used once. However, to reduce the amount of fresh water consumed, [we] developed a system that would sufficiently clean the water to allow it to be used again. The used water is now passed through a water treatment system using biological treatment and filtration before returning it to a blending tank with fresh water, which is then used in the potato processing area."</i> – (FHC report) C60</p>	<p>Water is being recycled and reused in processing of potatoes.</p>
<p><i>"From factory to farm"</i>- (Questionnaire) C61</p>	<p>The respondent indicates that water is being recycled from the factory to the farm, no further information is disclosed.</p>

Quotes	Comments - Analysis
<p>"A condensate return is in place on our main cooking line with condensate being returned to our main steam generating boilers. Condensate has a high value."- (Questionnaire) C65</p> <p>"If we can re-use the water we cook with, that cuts our requirements by as much as a half."- (Website) C65</p> <p>"The company has recently identified further water saving opportunities, such as: improving condensate collection and return from some of the steam-heated pans (which will save water and energy)"- (FHC report) C65</p>	<p>Water recycling practices are disclosed in all three sources.</p>

From the quotes presented in Table 6.11 a common theme emerges, and it is that the adoption of water recycling appears to be overlapping with the use of different qualities of water for different purposes. For example, the same quotes for C3 were used by the participant of the questionnaire and the interview when first asked about different qualities of water and then about water recycling. Similarly, C6 mentions the use of grey water which is effectively use of a different quality of water. In order to identify the 50 most frequent terms mentioned in the evidence gathered for the implementation of water recycling a word cloud was constructed using NVIVO (see Figure 6.13).



Figure 6.13: Word cloud of the green quotes for SP 1.2.3 - the implementation of water recycling
Total amount of words analysed: 1522

The most frequent word in Figure 6.13 is ‘use’. Moreover, terms like ‘recycling’, ‘cleaning’, ‘osmosis’ and ‘heat also appear in the 50 most frequent words of the evidence for the SP1.2.3 indicator. This suggests that companies are reusing water for their cleaning and heating processes. Nevertheless, unlike Figure 6.11, the

term ‘quality’ does not appear in Figure 6.13 which suggests that some companies identify that waters can be of different qualities and used for different purposes.

For this indicator, five companies were marked as yellow as it was difficult to determine whether water recycling is being carried out in their operations. Table 6.12 presents all the quotes used for the companies that fell into this category.

Table 6.12: Quotes of companies marked with yellow in the ‘water recycling’ indicator (SP1.2.3)

<i>Quotes</i>	<i>Comments - Analysis</i>
‘yes’- (Questionnaire) C4	The respondent indicates that water recycling is being carried out but does not give any further information about it. It is worth noting that the same respondent indicated in indicator 1.2.1 that the use of different qualities of water is something they are not doing due to technical unfeasibility
<i>“Across our system, we are reducing the amount of water we use per liter of finished product, treating and recycling wastewater (in some cases discharging it cleaner than it was originally), and striving to replenish an amount of water equal to what we use in our finished beverages by 2020.”</i> – (Environmental report) C18	Although the company shows evidence of a water strategy based on 'reduce, reuse and replenish' it is difficult to assess until what extent are water is being recycled
<i>“Our strategy is to reduce, recycle and replenish the water we use. Under our water stewardship strategy, we're aiming to return safely to nature an amount of water equivalent to that which we use in all our drinks and their production”</i> - (Website) C18	
<i>“[We don’t recycle due to] contamination and cost of filtering”</i> - (Questionnaire) C45	Water is being recycled in the CIP cleaning, in the questionnaire the opposite is stated
<i>"And then when you look at water within in the product, we measure that now, which we didn't before, so that's another process. So I think it's more down to methodology rather than new equipment. It's the same with CIP cleaning, [cleaning plates]. You always use the first flush of water into the second, final flush of water. So, you're using the water twice effectively. Whereas before, what you'd do is you'd wash a tank out and you'd just drop the water to drain. Now what you do is you recover it and put it in the second tank for the second wash"-</i> (Interview) C45	
<i>"[Yes, we recycle because it is] cost effective"-</i> (Questionnaire) C6	The respondent only mentions that water recycling is being carried out because it is cost effective but no further information is given

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"The clean in place systems are inherently recycling" ... "Counter-flow in vegetable processing."- (Questionnaire) C66</i></p> <p><i>"We've also looked at water recycling on one of the sites, which is at the salad washing site, which would then have a multi-stage filtration reverse osmosis ultraviolet light treatment, maybe ozone as well, actually, I think are the four stages. That at the moment gain, the capital return, isn't quite right but there are question marks also over the customer acceptability of that, whether or not we would be able to convince our customers that that constitutes clean enough water to be used in that particular process."- (Interview) C66</i></p>	<p>In the questionnaire the respondent indicates that water recycling is being done in the cleaning processes. On the other hand, in the interview the participant indicates that water recycling is something that has been considered but has not applied yet due to cost and public perception constraints</p>

From the data presented in Table 6.12 some data triangulation can be carried out as all the companies that fell into this category but one show some contradictions in the primary data collected. For example, the respondent of the questionnaire for C4 indicates that water recycling is being done with a 'yes' and no further information is given. It is worth noting that C4 stated for indicator 1.2.1 that different qualities of water are not being used due to technical unfeasibility (see Table 6.7). Furthermore, C45 and C66 present contradictory information in their questionnaires and interviews as in one they say they do water recycling and in the other one they say they do not. In addition, C6 does not give enough information to assess whether water is being recycled in their processes. Lastly, C18 presents information in both their website and environmental report of a strategy based in 'reduce, reuse, replenish' it is difficult to assess from this secondary information the extent to which water is recycled.

Under this indicator only one company was marked with red (C64), as the participant clearly stated in both the questionnaire and interview that water recycling is not feasible for them due to the nature of the company:

"As a food manufacturer, water is used as a main ingredient and opportunities are limited. Certain processes do have the opportunity to recycle water and this is being investigated." - (Questionnaire) C64

" We have looked at that sort of cleaning, for example, cleaning in place, CIP systems, things like that, looking at how you use hoses and, different technology of how we can clean vessels and everything. So we have looked at that and we have done work on that, looking at spray bars and all that sort of stuff that we can look at. We continue to look at new technology to see if there's any benefits there." - (Interview) C64

The quotes extracted for C64 for this indicator evidence that there is some perception of water not being suitable for recycling in food and drink companies due

to health and safety concerns. However, the participant also acknowledges that water can be recycled and reused in other type of activities that do not compromise the quality of their products.

In summary, the overall results obtained for the ‘water awareness’ sub-theme (SP1.1) indicate that companies are somewhat aware of water related issues. First, there seems to be a tendency of companies focusing more on energy than water as part of their environmental strategies. In addition, a small proportion of companies clearly recognise water as a finite resource while for the majority such recognition is unknown. On the other hand, some companies acknowledge their dependence on water resources, but for the vast majority it is unclear whether this is the case. Most of the sample do not commit to either the UN Global Compact, Water Footprint Network or the CDP Water Disclosure initiatives; this may be attributed to the fact that such initiatives are intended for big global corporations and all the analysed sample may not fall into this category. In contrast, the majority of the sample does disclose the reduction of water achieved in their activities. However, there is a discrepancy on the way this is done, a standardised reporting does not seem to exist.

The overall findings on the ‘re-evaluation of water services’ sub-theme (SP1.2) indicate that companies are re-evaluating the services water provides in some extent. Companies showed evidence of using different qualities of water for different activities, implementing rainwater harvesting and water recycling. The ‘setting the ground’ element for a soft path for water in the food and drink industry seems to have been implemented in some extent in the sample, however there is yet a long way or its fully implementation. The next chapter presents the results obtained for the ‘knowing the environment’ (SP2) and ‘internal action’ (SP3) elements.

Chapter 7

To what extent have the ‘knowing the environment’ (SP2) and ‘internal action’ (SP3) themes been adopted?

What is a scientist after all? It is a curious man [or woman] looking through a keyhole, the keyhole of nature, trying to know what's going on
- Jacques Yves Cousteau

The findings on the ‘setting the ground’ theme (SP1) presented in chapter 6 indicate that this element appears to have been implemented in some extent in the sample, however there is yet a long way for its fully implementation. This chapter first discusses the findings for the theme ‘knowing the environment’ (SP2), which refers to the understanding of the water environmental impacts derived by the companies’ operations as well as the environmental limits in which they can operate (section 7.1). In addition, it presents the results obtained for the ‘internal action’ (SP3) theme, which denotes the evaluation of the type of technological and behavioural initiatives undertaken by the sample.

7.1 Knowing the environment (SP2)

Chapter 6 discussed the extent to which companies are aware of water-related issues as well as the degree of the re-evaluation of water services done by the analysed sample. This section is focused on the ‘knowing the environment’ theme; which refers to the companies’ awareness of the impact of their activities on the natural

environment, specifically on water resources. In order to evaluate this two main subthemes were proposed. Section 7.1.1 will discuss the extent to which companies know or disclose the impact generated from the water withdrawals from their activities. Furthermore, section 7.1.2 explore the awareness of the companies about the water environmental limits in which they can operate.

7.1.1 Knowledge of impact (SP2.1)

Impact for this research refers to the effect on the quantity of water resources generated from the water withdrawn from the environment for the companies' activities. As a result, the question for this indicator was set up as: 'does the [analysed] company disclose data on water withdrawals in their operations?' Figure 7.1 presents the overall findings for this indicator. In the analysed sample 21 companies (31%) presented evidence in the gathered data of disclosure of water withdrawals of their operations. Furthermore, for 18 companies (27%) it was difficult to determine or assess whether this disclosure is being carried out. None of the companies analysed stated that they do not disclose data for withdrawals in their activities. Finally, 28 companies (42%) were marked with light red as no evidence was found in the gathered sources about this indicator.

SP 2.1 Knowledge of impact (Do companies disclose data on water withdrawals in their operations?)

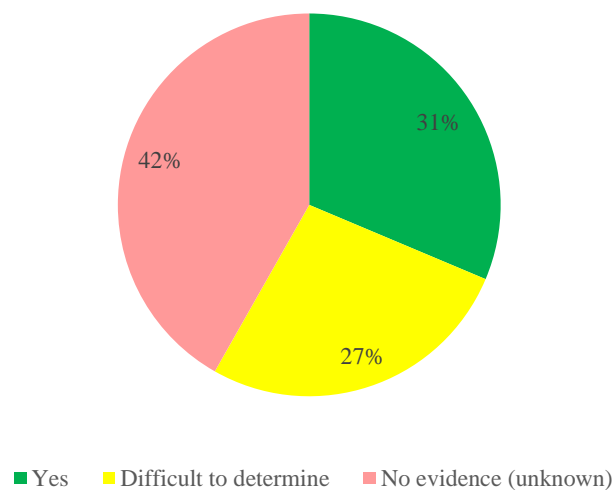


Figure 7.1: Knowledge of impact (SP2.1) overall results

It was found that 10 out of the 21 companies marked with green for this indicator were companies from which primary data had been sourced. Table 7.1 presents some examples of quotes extracted from the data gathered that evidence the disclosure by companies of the water withdrawn for their activities. There are some remarks worth noting from the data gathered. All the companies that disclose the amount of water abstracted for their activities do so by indicating an overall figure either in litres, cubic metres or percentages in a given period of time. This is a first good step but figures should be given within a context. For example, the water abstracted will be highly dependent on the production per site so figures are not comparable between them. Furthermore, it is not the same to extract water from a water-rich area than from a water-stressed area. It is therefore considered that companies should disclose data on water withdrawals of their operations providing more information about the context.

Table 7.1: Quotes of companies marked with green in the ‘knowledge of impact’ indicator (SP2.1) - Do companies disclose data on water withdrawals in their operations?)

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>Monthly monitoring reports sent to EPA (Environment Protection Authority Australia) - (Website) C2</i>	This company has a dedicated online report that they sent to the Australian Environment authority. This report presents data on water withdrawals per month in their winery site.
<i>“Water withdrawals, litres per month: 4,000,000” - (Questionnaire) C3</i>	The respondent indicates 4 million of litres withdrawn per month in their operations. Nonetheless, it is difficult to assess the impact of the abstraction of this amount of water.
<i>“50000000 litres per month (estimate)” - (Questionnaire) C4</i>	The company discloses the amount of water withdrawn in their operations
<i>“We have reduced about 24% of our water usage (2006 baseline). We have reduced 700 million litres and on average on our operations we use 350000000 litres, all of this has been achieved through more efficient processes” - (Interview) C4</i>	
<i>“Each year we use over 500 million litres of water from municipal and groundwater sources” - (Website) C4</i>	
<i>“We were 97,000 cubic metres in total, when we started [FHC commitment], and we are now about 70,000 cubic meters in total (around 28% reduction)” - (Interview) C6</i>	They do not specifically disclose the amount of water abstracted from the environment but the amount used in their production.
<i>“In 2007, we used 97,000m3 to produce 25,056 tonnes of product. Our water usage has reduced by 28% between 2007 to 2011.” - (Environmental report) C6</i>	This has been reduced due to efficient processes.

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>"[approximately water use] 7000000 litres per month [source of water: mains 100%]" - (Questionnaire) C25</i>	In the questionnaire the respondent discloses that the company uses around 7 million litres of water per month from the mains
<i>"So, we currently, as I look back at 2009, our group water usage in cubic meters was 303,282 cubic meters (per year)." ... "And by the end of 2012, bearing in mind we had two horrendous years and we only had one of our cascades in place for a short period of time, we were down to 236,225." - (Interview) C29</i>	In the interview the respondent discloses the amount on time given in two years and in the FHC case study a reduction target is given. The figures given don't coincide but this may be due to calculation methods and accountancy.
<i>"Based on its success, a second Cascade system was recently installed at the Floods Ferry site, Cambridgeshire, at a cost £1.7 million. With this, [we] is on target to reduce its water usage by 100 million litres a year across all its UK sites." - (FHC report) C29</i>	
<i>"Water Withdrawal Sources: Municipal Water: 81.2%, On wells site :18.8% 2012" - (Environmental report) C33</i>	Although the total amount of water withdrawn is not disclosed, the percentages and sources are.
<i>"We withdrew 138 million m3 of water in 2012 (2011: 143 million m3) or 2.89 m3 per tonne of product (2011: 3.17). This is a 9% reduction in withdrawal per tonne of product from 2011." - (Environmental report) C43</i>	The company shows clear figures of water withdrawals.
<i>"360000 litres of water per month" - (Questionnaire) C45</i>	The company presents an estimate of the amount of water used per month in their questionnaire
<i>"Water use: 200,000 litres per month" - (Questionnaire) C46</i>	The respondent gives an estimate of the amount of water used per month
<i>"270000000 litres of water used per month" - (Questionnaire) C64</i>	The company clearly discloses data on water withdrawals for their operations. The figures disclosed in the two sources but this might be due to the discrepancy of the period of time where the measures correspond to.
<i>"We have calculated our 2007 water consumption at 305,500m3" - (Environmental report) C64</i>	
<i>"4,138,167 litres of water used per month" - (Questionnaire) C65</i>	The respondent discloses that around 4.2 million litres are used in the company's operations per month.
<i>"36 million litres of water withdrawn per month" - (Questionnaire) C66</i>	The participant indicates that the company abstracts per month 36 million litres of water for their operations.

All the quotes extracted for the companies marked as green for this indicator were analysed in order to determine the 50 most frequent words mentioned. Figure 7.2 presents a word cloud constructed with the NVIVO software with this data. Terms like 'litres', 'million', 'month', 'cubic', 'metres' and 'year' which suggests that companies are reporting against millions of litres or cubic metres withdrawn per month or per year for their activities. It is worth noting that the term environment appears to be mentioned in some of the quotes. Interestingly, 'water' does not seem to be mentioned in the 50 most frequent words.

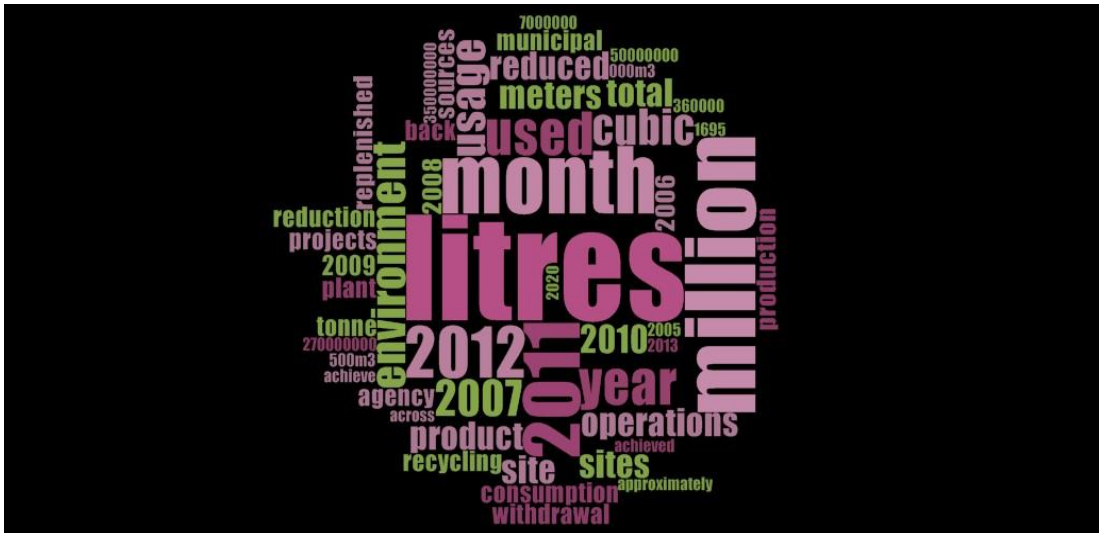


Figure 7.2: Word cloud of the green quotes for SP2.1 - Do companies disclose data on water withdrawals in its operations?
Total amount of words analysed: 569

For this indicator, 18 companies (27% of the sample) were marked with yellow as when carrying out the analysis as for them it was difficult to determine the extent to which water withdrawals are disclosed. Table 7.2 presents some examples for the companies marked with yellow under this category.

Table 7.2: Quotes of companies marked with yellow in the ‘knowledge of impact’ indicator (SP2.1) - Do companies disclose data on water withdrawals in its operations?)

Quotes	Comments - Analysis
<p>“Our vacuum pumps use water for cooling and forming the ‘seal’ - the liquid ring. Instead of using water on a once-through basis it was decided to try to recover this water and re-use it by recirculating the seal water via chillers. The first recirculation system was installed earlier this year and has been operating successfully. It is now saving us a lot of water (>75,000 m3/y).” - (FHC report) C19</p>	<p>The company does not specifically disclose any water withdrawals information. In the FHC report it is briefly mentioned how much water they have managed to reduce due to a change in their process but no further information is provided.</p>
<p>“Compared with fiscal 2010, in fiscal 2011 we ... Cut water usage by roughly 560,000 cubic meters.” - (Environmental report) C26</p>	<p>The company does not directly disclose the water withdrawn by their operations but rather discloses the amount of litres saved during the last fiscal year.</p>
<p>“[We launched in a factory in Russia] a \$200,000 water recycling scheme which is reducing freshwater withdrawal by 50 cubic meters a day”- (Environmental Report) C36</p>	<p>The company does not directly disclose water withdrawals but it briefly mentions a water reduction achieved in a specific site by 50 cubic metres per day</p>

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>“In recognition of our efforts, [we were] honored with both the prestigious 2012 Stockholm Industry Water Award and the U.S. Water Prize. These distinctions result from our efforts throughout our business operations, our work in the communities in which we operate, and our continued leadership in water stewardship in Total water withdrawal by source and Percentage and total volume of water recycled and reused” - (Environmental Report) C52</i></p> <p><i>“The company conserved nearly 16 billion litres of water in 2011, from a 2006 baseline, through the application of water saving equipment and technologies, creative recycling and re-use, and by deploying a water management system throughout its manufacturing facilities” - (Website) C52</i></p> <p><i>“13 million fewer m3 of water abstracted in 2012 than in 2008 (a reduction of 25% per tonne of production)”- (Website) C59</i></p> <p><i>“depends on how you assess use - millions of litres pass through the business daily”-(Questionnaire) C61</i></p>	<p>The company discloses their water withdrawals successes but no clear figures are presented. In the website it is stated that 16 billion litres of water were saved although this is not the total withdrawal figure.</p> <p>The company discloses information on 13 million cubic metres saved in the period (2008-2012). Although the company discloses some information is not clear exactly how much water do they withdraw for their operations.</p> <p>The respondent indicates that millions of litres of water are involved in the company's operations daily but no further information is given.</p>

The companies marked with yellow for the SP2.1 indicator are those who disclose information about amount of water saved rather than amount of water withdrawn. Table 7.2 presents some examples of the companies that fell into this category for this indicator. The reason why they were marked as ‘difficult to determine’ lies behind the rationale that if figures on the amount of water saved are disclosed then there should be some data on overall water withdrawn. However, it is difficult to determine from the gathered data whether or not this is the case.

In the examples shown in Table 7.2 there are two companies worth mentioning. First, C36 constitutes one of the companies analysed in the Oxfam report from which some indicators are being used (section 3.3). The indicator SP2.1 is one of these and therefore results were compared and differences were spotted out. In this case, in the Oxfam analysis done for C36 it is marked that the company does not disclose data on water withdrawals in their operations. For the analysis done for this research the company was marked with yellow as they disclose data on 50 cubic metres saved per day.

Furthermore, C61 indicates in their questionnaire that the figure on water withdrawals depend on how use is assessed. The company was marked with yellow as

no actual figures were given. However, this raises the need of disclosing figures giving background and baseline data as it was discussed in the findings of the green companies for the SP2.1 indicator.

Under this indicator companies did not fall into the red category. Additionally, 28 companies (42% of the sample) were marked with light red as no evidence was found to assess whether companies disclose data on their water withdrawals or not. A key finding is that figures on water use and abstraction should be given taken into account the context as the impact on the environment is highly dependent on the local environmental conditions. The next section will discuss the indicators that evaluate the awareness of the analysed sample on the water environmental limits in which they can operate.

7.1.2 Knowledge of water environmental limits (SP2.2)

The impact on water resources drawn from the companies' activities are highly dependent on the local environmental conditions. One of the principles of the soft path for water approach is the awareness of the limits each ecosystem has in terms of the amount of water that can be withdrawn without altering the local resilience (Walker and Salt, 2006). This principle is linked to the concept of 'backcasting' which aims to calculate the maximum total amount of water that can be extracted from a given environment and from there 'backcast' the activities to do not disturb such limits (Brooks and Holtz; 2009a; Brooks et al., 2009b). Although the notion of 'backcasting' and setting environmental limits is in the realm of the environmental authorities responsibilities, this subtheme aimed to evaluate if companies are aware of such limits.

Two indicators were set up to assess this subtheme, the first (SP2.2.1) refers to the knowledge of companies of the local water environmental limits in which they can operate. In addition, the second indicator refers to the disclosure by companies of the water-stressed regions in which they operate (SP2.2.2). Figure 7.3 presents the summary of the overall results obtained for these two indicators.

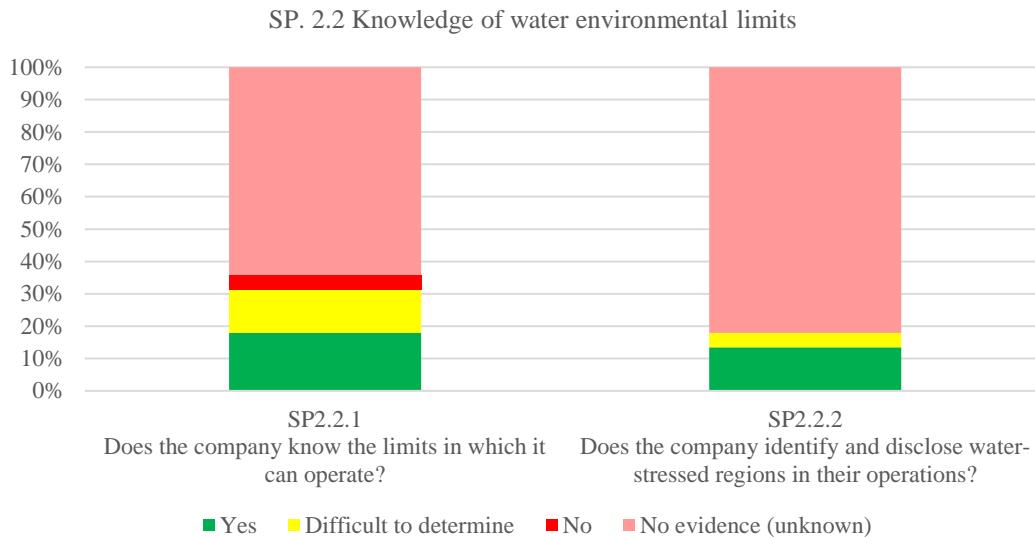


Figure 7.3: Knowledge of water environmental limits (SP2.2.1) overall results

As seen in Figure 7.3, less than 20% of companies were marked with green for both indicators under the evaluation of the knowledge of water environmental limits. For SP2.2.1 (Knowledge of water environmental limits), 18% of the companies scored green, for 23% it was difficult to determine, 4% indicated that they are unaware of such limits and for 64% of the companies no evidence was found. Similarly, for SP2.2.2 (identification and disclosure of water stressed regions where companies operate) 13% of the sample was marked with green, for 4% was difficult to assess and for the majority (82% of the sample) no evidence was found. The next subsection will discuss the findings for SP2.2.1

7.1.2.1 Do companies know the water environmental limits in which they can operate? (SP2.2.1)

As it has been discussed throughout this section, the total figure of amount of water withdrawn by a company is irrelevant if not given the context of the areas from which such abstractions take place. For this reason it was considered relevant to determine the extent to which companies know the water environmental limits in which they can operate. Under this category 12 companies out of 67 were marked with green, nine with yellow, three with red and 43 with light red. Green indicates that a company shows evidence for their awareness of the water environmental limits in which they can operate. Table 7.3 presents some examples of companies that fell into this category.

Table 7.3: Quotes of companies marked with green in the ‘do companies know the limits in which they can operate?’ indicator (SP2.2.1)

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>“We are restricted to producing a certain amount of effluent, both in terms of strength and volume” ... “The water vapour released from the boiler has always been maintained at a very good level and the in the effluent sent to the local waste treatment plant then we have improved the quality although not the quantity” – (Questionnaire) C3</i></p> <p><i>“Our water supplier has started the initiative to try and reduce water usage in this area and they have offered some help and guidance as to what we could do” – (Interview) C3</i></p> <p><i>‘yes’- [no further data] – (Questionnaire) C4</i></p> <p><i>“We have operations in Scotland and England. SEPA and the Environment Agency do not give a direct guidance on how to use water more efficiently, but of course they do have some information in their websites. I wouldn’t like to say that they don’t really pay much attention to how we use water when they come to our sites, because we are doing so many good things I think that they don’t focus on this. But in my knowledge I don’t think they have a standardised procedure for guiding companies on how to use water in a better way. In one manufacture site in Scotland we have an environmental permit for operation and with this permit we are bound to increase efficiencies and use water in the best way that we can.”– (Interview) C4</i></p> <p><i>“Inevitably, our production processes create wastewater. By focusing on reducing our water usage we also reduce the amount of wastewater we produce which is suitably treated before being returned to the natural environment.” – (Website) C4</i></p>	<p>The respondent is aware of the trade effluent and boiler limits they are obliged to comply with. In addition, the water supplier has given some guidance on how to reduce water usage. No further information is given</p> <p>In the interview response, the participant expresses that there is not much direct engagement from the environmental agencies (EA and SEPA) with the companies. In the site where they incur into direct water extraction they are bound to increase efficiencies to avoid breaching the limits and, therefore, the permit. In the website it is expressed the commitment to return clean water into the environment. In contrast, in the questionnaire not much information is given.</p>
<p><i>“Meanwhile, our water recycling plant, which we worked on in conjunction with the Environment Agency, recycles the water we use to wash our potatoes so we can use it again and again.” – (Website) C12</i></p> <p><i>“By working closely with the local Environment Agency office, [we] established the best long-term solution to water use at the site before commissioning the water recycling plant.” – (FHC report) C12</i></p> <p><i>“[we are aware of environmental limits] In farm operations limits on extraction from rivers etc.”– (Questionnaire) C25</i></p>	<p>The water recycling plant was built with direct guidance from the Environment Agency. This shows a clear engagement with the regulator and knowledge of environmental limits is expected to be known</p> <p>The respondent indicates that they are aware of the environmental limits in which they can operate in the farm places where water abstraction limits are set.</p>
<p><i>“We are committed to return clean water to the environment from our factories. We use municipal wastewater treatment facilities wherever possible, but where these are not efficient enough, we invest in our own facilities and return treated water to the environment according to local legislation and internal standards, whichever is more stringent.” – (Environmental report) C43</i></p> <p><i>“Abstraction licences on farms and for factory. Discharge consents” – (Questionnaire) C61</i></p>	<p>The company shows some evidence of knowledge about what the environmental limits are but not much detail is being specified.</p> <p>The respondent indicates that the company is aware of the environmental limits in the abstraction licenses they hold and well as the discharge consents.</p>

Quotes	Comments - Analysis
<p><i>“Direct supply to both sites is constrained by the capacity of the incoming water main. Indirect supply includes water consumed in the growing and processing of raw materials of which the most significant are flour, eggs and milk. The majority of these are sourced from areas where availability of water into the upstream value chain has not historically been constrained.” ... “Internal usage on 2 sites is via boreholes. Unit cost is very low, the key constraint is the limit on licensed abstraction. If technological and management controls keep usage comfortably below this threshold there is no incentive to conduct the work. On the third site supply is from mains water and the key constraint is the capacity of the inbound main. Indirect use is more significant with a significant proportion of crops being grown in low-rainfall areas in the UK or in water stressed regions of Spain. A project is planned for 2013 to start assessing the degree of risk.” – (Questionnaire) C66</i></p>	<p>The participant indicates that the company is aware of the environmental limits (water) of their operations. This, through the environmental permits they hold for direct water abstraction and engagement with the environmental agencies and their suppliers.</p>
<p><i>“Yeah. One of the sites in England is covered under environmental [?] or ITPC as it was at the time. All of the sites have some limits on discharge consents or noise or other variables. Now, discharge, it's not just the environment agency and SEPA on the Scottish side. In fact, it's Scottish Water that are-- sorry, it's a local commercial organisation that are the arbiters of the aqueous discharges. SEPA govern [abstracts?] from a borehole on the site. We have-- obviously there's the site that's got environmental permitting, that's done through the environment agency.” – (Interview) C66</i></p>	

From the analysis carried out for determining the degree of knowledge of the water environmental limits in which companies can operate some remarks are worth noting. First, some companies like C3 in Table 7.3 referred to water environmental limits to those they need to comply with the water that leaves their premises rather than with the one that enters their processes. In contrast, companies like C4, C25, C61 and C66 indicate that they are aware of the quantity of water they are allow to extract from the environment only in the cases where such extraction is directly carried out by them. Furthermore, companies like C12 and C43 indicate that they engage with the local environmental agencies to protect such limits.

An analysis of the 50 most frequent terms mentioned in the quotes extracted for the companies marked with green under this indicator was carried out. Figure 7.4 presents a word cloud with the results of this analysis.



Figure 7.4: Word cloud of the green quotes for SP2.2.1- the evaluation of the knowledge of water environmental limits
Total amount of words analysed: 1071

In Figure 7.4 can be seen that words like ‘environment’, ‘local’, ‘use’ and ‘sites’ appear to have a high frequency. This suggests that companies have a degree of awareness in terms of the impact the extraction of water for their operations has in the environment. In a lesser extent, companies mention terms like ‘discharge’, ‘effluent’, ‘capacity’, ‘treated’ and ‘abstraction’. This indicates that companies are reporting on the water discharged after being used in their activities as well as that extracted. Nevertheless, from the analysis it is not possible to determine the comparison of both sides. This is, how ‘abstraction’ vs discharge reporting compare.

For this indicator nine companies (13%) were marked with yellow as for them it was difficult to determine whether they are aware of the water environmental limits in which they can operate or not. Table 7.4 shows some examples of companies that fell into this category.

Table 7.4: Quotes of companies marked with yellow in the ‘do companies know the limits in which they can operate?’ indicator (SP2.2.1)

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"General resource availability (yes including in some circumstances water), greenhouse gas impacts, biodiversity depletion, human population growth, land use change from agricultural pressure"- (Questionnaire) C6</i></p> <p><i>"[Does the EA or SEPA advise them on environmental limits?] No. Not in plain speaking. No. They require of us, but don't advise very much."- (Interview) C6</i></p>	<p>The participant indicates in the questionnaire that in some cases they receive advice from the EA or SEPA with regards of water limits, although no further data is being given. In the interview it is stated that there is little information given by the environmental authorities.</p>
<p><i>"Fresh water is becoming a scarce resource the world over. In the eastern part of the UK drought conditions are a major concern for growers, farmers, manufacturers and domestic users alike."- (Website) C20</i></p>	<p>Although there is a clear recognition of an increasing pressure on water availability, it is not mentioned whether or not there is an awareness of the environmental limits in which they can operate.</p>
<p><i>"I have quite a lot of contact SEPA, the Scottish environment agency, but not on that. It's more with regards to discharge and our supply base on abstraction for irrigation and our own growing side of business as well. With regards to the environment agency, the pressure is more on the discharge-- not the pressure, but the communication always seems to be more on the discharge on our other sites. Where we have meetings and communication is more with our water provider"- (Interview) C29</i></p>	<p>The respondent mentions that there is guidance provided from the environment agencies in Scotland and England but it is not clear whether or not this guidance includes the environmental limits in which they can operate.</p>
<p><i>"Not audited" - (Questionnaire) C45</i></p> <p><i>"So, for a site that uses over 75 tons of milk products, you have to have a permit; for a site that has more than forty thousand birds, you have to have a permit; for a site that cooks more than 50 tons of meat, you have to have a permit. That site that is regulated under the Environment Agency under Environmental Permitting Regulations, and they can withdraw that permit at any time should you fail to achieve the standards, which means that your business would effectively close".- (Interview) C45</i></p>	<p>In the questionnaire the respondent shows that the company is not being audited but in the interview environmental permitting regulations are mentioned</p>
<p><i>"We have set and closely monitor our MDD levels and charges. Our MDD in the past has been negotiated down as in house improvements are made. The MDD is monitored on a daily basis. All irrigation water is formed from treated waste water throughout own effluent treatment plant." - (Questionnaire) C65</i></p>	<p>The respondent indicates that MDD levels are closely monitored. Nevertheless, it is not clear what does MDD stand for, it is guessed that the participant refers to maximum daily demand. Nevertheless it is difficult to determine whether this ‘daily demand’ is linked to the environmental threshold of their locations.</p>

The degree of knowledge of the water environmental limits in which companies can operate was difficult to determine for some of the evidence gathered. In some cases like C6 and C45 (see Table 7.4) companies presented contradictory information in the data, from one hand they expressed that they are aware of such limits and from the other the expressed the contrary. In some other cases like C29 and C65 companies expressed that they are provided with guidance from the environmental authorities but it is not clear to determine what kind of assistance. Additionally, other companies like C20 expressed a clear understanding on future

water availability issues but no data on the awareness of environmental limits was found. Three companies (4% of the sample) indicated in their primary data that they are not aware of the water environmental limits in which they can operate without disturbing the balance of the local environments. Table 7.5 presents the quotes for these companies. In all three cases the participants indicate their unawareness of such limits.

Table 7.5: Quotes of companies marked with red in the ‘do companies know the limits in which they can operate?’ indicator (SP2.2.1)

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>"Not investigated"</i> - (Questionnaire) C41	This is not investigated.
<i>"No idea"</i> - (Questionnaire) C46	The respondent indicates an unawareness of such limits
<i>"Not something that has been looked at."</i> - (Questionnaire) C64 <i>"So, as part of the IPPC permit, they [environment agency] like to see continuous improvement within things. So when we have our environment agency inspector, he will look at what we're doing as a business. But they don't really give us any guidance or anything."</i> - (Interview) C64	The company is not aware about the environmental (water) limits in which they can operate.

For the SP2.2.1 indicator no evidence was found in order to determine the awareness of the water environmental limits in which companies can operate for 43 companies (64% of the sample). This shows evidence for the uncertainty involved in the process of evaluating if companies are on track towards a soft path for water in the food and drink industry. The next section presents the results for the SP2.2.2 indicator that aimed to determine if companies identify and disclose the water-stressed regions in which they operate.

7.1.2.2 Do companies identify and disclose water-stressed regions in which they operate? (SP2.2.2)

As it has been discussed through this section water impacts and their significance depend on the local environmental conditions for each specific region. Hence, the importance for companies to identify those water-stressed areas where they have operations. This indicator aimed to determine whether such identification is being done and if companies disclose that information. The results obtained from the analysis

indicate that nine companies (13%) show evidence of such identification and disclosure, while for three (4%) was difficult to assess this indicator. Furthermore, for 55 companies no evidence was found in the data gathered.

Table 7.6 shows some examples of evidence extracted from the data collected for those companies marked with green. One of the themes found in the data was that all signatories referred to operations in other countries outside the UK where they have operations. This is the case of C15, C27 and C32 in the example in which they mention water stressed areas in India, Australia and Ethiopia. From the evidence gathered, only one company (C66) mentioned areas with low rainfall in England where they have activities.

Table 7.6: Quotes of companies marked with green in the ‘do companies identify and disclose water-stressed regions in which they operate?’ indicator (SP2.2.2)

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>“Poverty and hunger are widespread in Ethiopia [where they have a strong local presence] and millions face chronic food insecurity and severe water shortages. In rural Ethiopia, less than one third of the population has access to clean drinking water, and less than 8% use safe sanitation facilities. Inadequate access to safe water and sanitation and poor hygiene kills over 17,000 children under-five in Ethiopia alone each year.” – (Environmental report, Website) C15</i></p>	<p>In both the website and the environmental report the same quote is used. They disclose that Ethiopia is a water stressed region where they operate however no other regions are mentioned.</p>
<p><i>“At our plant in Port Fairy, Australia, water is required for three stages of the manufacturing process. Following a suggestion from an employee, instead of pulling fresh water from the local supply for each stage, water is now recycled, saving around 30 million litres every year, or 20% of water used at the plant.” ... “In Nabha, India – another water-stressed region – our staff have achieved a 48% reduction in water use since 2003, from 635 million litres to 330 million litres.”- (Environmental report) C27</i></p>	<p>Two clear examples of operations in water-stressed regions are mentioned in the report.</p>
<p><i>“This assessment [global evaluation assessment] is enabling the Company to implement focused conservation measures to ensure water optimization, especially at facilities in water-stressed regions”... “One example of our conservation efforts in a water-stressed region is the Aligarh, India, factory. This facility exhibited a long term trend in both absolute and normalized water-use reductions. Since 2005, we have recorded a 24.3% reduction of water usage per unit of finished product” - (Environmental report) C32</i></p>	<p>The company clearly identifies and discloses the water-stressed areas where they have their operations.</p>
<p><i>“Indirect use is more significant with a significant proportion of crops being grown in low-rainfall areas in the UK or in water stressed regions of Spain. A project is planned for 2013 to start assessing the degree of risk.”- (Questionnaire) C66</i></p>	<p>The respondent indicates that a project was due to start in 2013 to assess the degree of risk in their operations in terms of water availability in water-stressed areas where they (or their suppliers) have operations.</p>

A word cloud was constructed using the 50 most frequent terms mentioned in all the quotes gathered for the companies marked with green under this indicator. Figure 7.5 presents the results. As it can be seen, words like ‘stress’, ‘use’ and ‘local’

appear to be frequently used. This indicates that companies who disclose information for this indicator show some awareness of the impact their operations have in water-stressed areas. In addition, words like ‘sanitation’, ‘clean’ and ‘communities’ point into the direction of awareness of impact done in the communities in which they operate, this is an area that will be explored further in the indicator SP4.1 (see section 8.1.1).

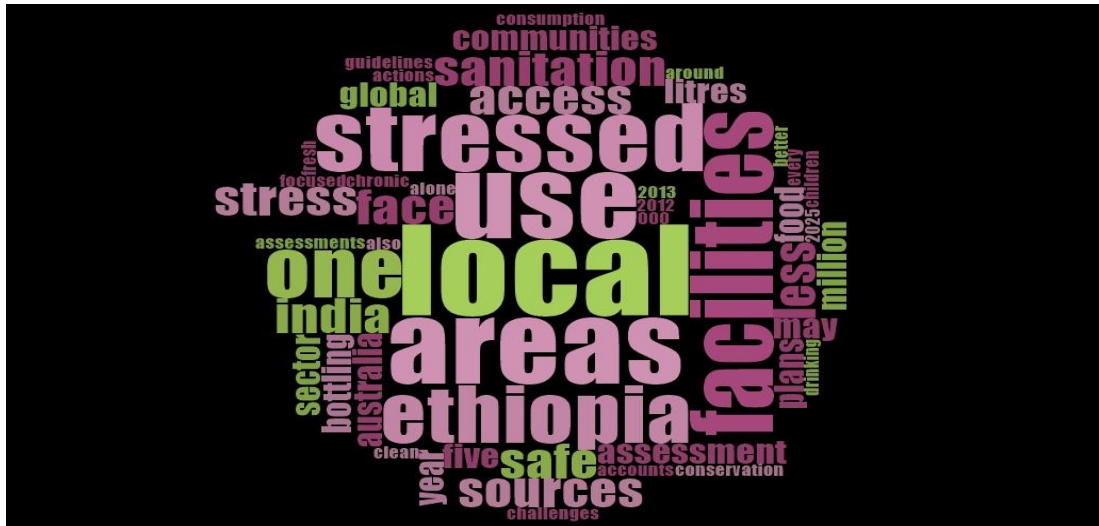


Figure 7.5: Word cloud of the green quotes for SP2.2.2 - disclosure of water-stressed areas in which companies operate
Total amount of words analysed: 832

Three companies were marked with yellow for the SP2.2.2 indicator. This means that for three companies it was difficult to determine the extent to which water-stressed areas where they operate are identified and disclosed. Table 7.7 presents all the quotes under into this category. C4 fell into this category because some information is given of operations in a water stressed area near Oxford, UK but not further data is provided. Similarly, C20 briefly mentions that water is becoming scarce in the east of the UK but no further information is disclosed. Finally, C59 is an interesting case that mentions the indirect water use associated to their cleaning products. This company manufactures a wide range of products that include food and cleaning, among others. Although this research is focused only in the food industry it is worth noting that the company shows evidence of understanding of the water footprint concept, which is something that will be discussed in detail in sections 7.2.4 and 8.1.2.

Table 7.7: Quotes of companies marked with yellow in the ‘do companies identify and disclose water-stressed regions in which they operate?’ indicator (SP2.2.2)

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"However we have a site near Oxford where we built a building recently and rainwater harvesting was in the design right from the start ... This area is very water stressed and the supplier can switch off water when the demand is high, so this shows that there is a higher apparent need for adopting efficient technologies there."- (Interview) C4</i></p>	<p>In the interview, it is briefly mentioned their operations in a water stressed area near Oxford but not further information is given. In this case rain harvesting was adopted to help alleviate demand.</p>
<p><i>"Fresh water is becoming a scarce resource the world over. In the eastern part of the UK drought conditions are a major concern for growers, farmers, manufacturers and domestic users alike."- (Website) C20</i></p>	<p>It is briefly mentioned that the eastern part of the UK has faced water stress over the year. Nevertheless, no further information is disclosed.</p>
<p><i>"We are making some progress in designing and rolling out products which require less water. Our Comfort One Rinse fabric conditioner is now available in more water scarce countries. Lifebuoy has launched a foam hand wash which cuts water use and we have rolled out dry shampoo to ten countries."... "In those parts of the developing world where water is scarce, women often have to walk long distances to collect water, or they have to become 'water managers' in the home – storing and rationing scarce water carefully. If we can develop more innovations like Comfort One Rinse, which reduce the water needed for doing the laundry, these will save people time as well as being more convenient."- (Website) C59</i></p>	<p>It is worth noting that the company seems to be more focused on the user-end side of the water footprint. This is due to the fact that much water is used when consumers use the hygiene and cleaning products the company makes. This is reflected in the fact that the company does not explicitly discuss about the water scarce regions where they have manufacturing processes but rather on the water scarce region that use their products. This is not necessarily relevant to the food industry where most of the water is used in the agricultural processes but it is relevant to note that the company is focusing on the other end of the value chain.</p>

For 55 companies from the sample no evidence was found in order to be able to evaluate if water-stressed regions are identified and disclosed. This brings an element of uncertainty as for the majority of companies (82%) is not possible to assess the extent to which companies are aware of their impact in water-stressed areas.

The ‘knowing the environment’ theme explored the degree of awareness and disclosure of companies in terms of the water environmental impacts derived from their activities. The next section evaluates the degree of internal action undertaken by the companies in order to reduce or mitigate such impact.

7.2 Internal action (SP3)

As its name implies, this subtheme refers to the internal action undertaken by companies as part of the soft path for water adoption in their activities and policies. The internal action in this research has been defined as the set of four indicators. First is the adoption of efficient technologies as part of their activities (SP3.1). Second, is the set-up of a specific target for water reduction (SP3.2). Third, is the promotion of

water awareness programmes to their staff members (SP3.3). Finally is the identification of the companies' internal water footprints, this is all the water involved in their internal operations (SP3.4).

Figure 7.6 presents a summary of the overall results obtained per indicator. As it can be seen, the majority of the sample was marked with green for SP3.1 as for 61% of the companies evidence was found for the adoption of efficient technologies. In addition, for 6% it was difficult to determine the extent of such adoptions, 1% indicated that they have not done so and for 31% no evidence was found.

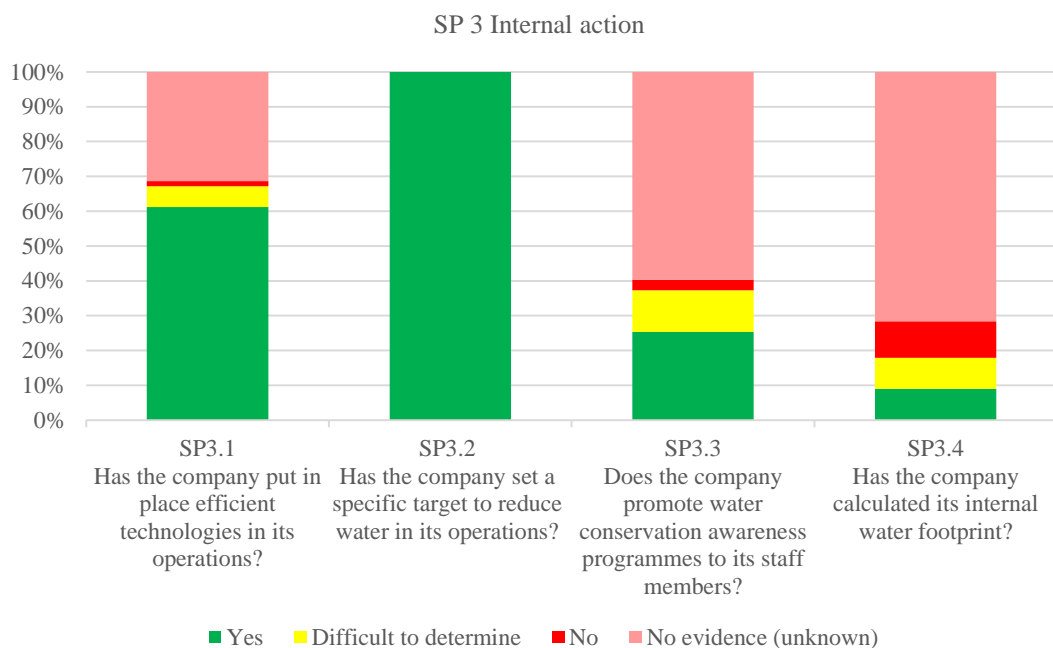


Figure 7.6: Internal action theme (SP3) overall results

In case of the SP3.2 indicator, all companies from the sample were marked with green as they all have committed to reduce water use in their operations by 20% by 2020. Furthermore, 25% of the companies presented evidence of staff water awareness programmes in their activities (SP3.3). For 12% it was difficult to determine whether these kind of initiatives are being carried out. Furthermore, 3% specifically indicated that they had not done so and for 60% no evidence was found in the data gathered.

Finally, SP3.4 or the calculation of the companies' internal water footprint was the indicator with the least number of companies marked with green under the 'internal action' them. In this case, 9% of the sample presented evidence of such calculation in

the data gathered. For 9% it was difficult to determine, 10% of the companies stated that they had not done so and for 72% no evidence was found. The next subsection presents the results for the first indicator (SP3.1) that aimed to evaluate the extent to which efficient technologies in the companies' operations had been adopted.

7.2.1 Efficient technologies in the companies' operations (SP3.1)

The 'internal action' theme aims to assess the type of internal initiatives companies have undertaken in order to embed sustainable water practices into their policies and processes. The first indicator for this theme was set up with the purpose of exploring the extent to which the sample analysed had adopted efficient technologies.

Companies marked with green in the matrix (see Table 5.4) were those who show evidence of the adoption of efficient technologies. A total of 41 companies (61%) fell into this category. The results for this indicator evidence that companies have embedded efficiency as part of their operations. This is something expected as all the analysed sample has signed up to reduce water consumption by 20% by 2020 and this is being sought primarily through efficiency (FHC, 2012b). Table 7.8 presents some examples of the evidence extracted from these signatories for the evaluation of the SP3.1 indicator.

A theme that emerged when analysing the quotes for the companies marked with green for this indicator was "productivity" and the "efficient use of resources". In the heart of a manufacturing company, which in this case is food, efficiency is one of the key drivers. As a result, it is therefore expected that the majority of companies had adopted this indicator.

Table 7.8: Quotes of companies marked with green in the ‘efficient technologies in the companies’ operations’ indicator (SP3.1)

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"Dry line lubricant. CIP optimisation. Rinse water recycling. Production planning. etc.". ... "We've reduced our water use ratio by 6% in 2012 and 24% since 2007. In the last 12 months our water usage increased by 7% but has reduced by 8% since 2007." – (Questionnaire) C4</i></p> <p><i>"On a 2006 baseline and calculated to 2013 we have reduced about 24% of our water usage we have reduced 700 million litres and on average on our operations we use 350000000 litres., all of this has been achieved through more efficient processes."- (Interview) C4</i></p> <p><i>"We reduced our total water consumption by 5% in 2011/12 and now consume 14% less water than in 2007."... "Total water used per litre of product produced increased by 2.3% across our manufacturing sites in 2011/12 due to increased usage of the pasteuriser on the can line at the Cumbernauld site and a change to the plant cleaning regimes at our Forfar manufacturing site. Despite these operational changes we remain on track to achieve our objective to reduce waste water volumes by 30% compared to 2007 levels by 2020."- (Website) C4</i></p>	<p>All sources demonstrate that there has been an adoption of water efficient technologies. Nevertheless, the only specific data given was the data given in the questionnaire.</p>
<p><i>Technologies used to reduced water: "Low volume high pressure ring main"... "Technology represents only part to our water saving"- (Questionnaire) C6</i></p> <p><i>"We scrub the water, using-- scrub effluent, using an electrocoagulation system to reduce the solids and the BOD, COD of the effluents, but it continues to go to sewer for treatment, and we're still at the first stage, in progressing to recycling of water. We want to but it requires investment and organisation and the right moment to do it, retro-fitting and having the equipment is expensive"- (Interview) C6</i></p> <p><i>"Our manufacturing team delivered this by focusing on best practice – turning off taps, narrowing flow, chasing leaks, investing in water-efficient equipment, involving staff, and monitoring and reviewing figures to identify successes." (Environmental report) C6</i></p> <p><i>"[Water saving achieved through:] regular surveys to identity and rectify leaks; addressing the obvious: turning off taps, reducing flow rates, investigating alternative cleaning procedures; water reduction policy, sharing it with all work groups; water saving features in the design of refit and factory upgrade; switching from high pressure to low pressure water ring main; replacing open hoses with high velocity low volume trigger release nozzles; and keep on looking for savings." - (Website) C6</i></p>	<p>Evidence from all sources but one (website) shows that the company has put in place efficient technologies in their operations.</p>
<p><i>"To achieve the highest level of efficiency in manufacturing requires a careful balance between water use and energy use; ensuring that the reduction of one element does not require the increase of another." (Environmental report) C14</i></p> <p><i>"[The company] purchases around 7.5 million tonnes of UK sugar beet annually, which means our factories receive over 5.5 million tonnes of embedded water in beet. We extract that water and put it to work in our factories to maximise efficiency. - (Website) C14</i></p>	<p>The company shows evidence that water efficiency is sought at all levels.</p>

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"But actually, we had done a lot of work on a project, and it's actually a project I can tell you a little bit more about later on, but basically it's called Project Cascade, which recycles. It's a closed-loop water system. One of the reasons we went so high was because one of our key objectives was actually to install [these?] through the washing sites, and we knew it could be capable of reducing our water usage substantially."- (Interview) C29</i></p>	<p>In all three sources the 'cascade' technology is quoted. It is a process that uses water in a closed-loop system.</p>
<p><i>"Potato packing and processing is a high water consumption industry but here at [our company] we have pioneered a new water recycling and treatment system called Cascade which has resulted in water savings of up to 85% at our Shropshire and Cambridgeshire sites."- (Environmental report) C29</i></p>	
<p><i>"Initially, efforts were made to install water sub-metering to identify where and how much water was being used. This alone led to a reduction in water consumption of over 20% (between 2009 and 2011). Their continued focus on developing and pioneering an award winning water recycling and treatment system called "Cascade" which has significantly reduced water consumption further."- (FHC report) C29</i></p>	
<p><i>"In Viersen, Germany we have implemented successful strategies to improve energy and water efficiency."... "Another factory in Newmarket, Canada, is using WAGES (Water, Air, Gas, Electric, Steam) meters to reduce energy and water use. The meters were installed in November 2010 and show that between 2009 and 2012, when production fell by 3 percent, energy use was down by 24 percent and water use by 33 percent" ... "[We launched in a factory in Russia] a \$200,000 water recycling scheme which is reducing freshwater withdrawal by 50 cubic meters a day"- (Environmental report) C36</i></p>	<p>In both sources there is evidence of efficient technologies adopted.</p>
<p><i>"Water usage continues to drop, and between 2007 and 2009 it decreased by 13% as a result of a number of initiatives, including reducing the level of wet cleaning within the factory and conducting studies assessing water usage on our bio-filter." (FHC report) C36</i></p>	
<p><i>"Water recycling of vehicle wash and waste water." - (Questionnaire) C41</i></p>	
<p><i>"Pilot heat recovery heat pump system in the north of England has saved 200 T/week of water (~1% of total group water use) Achieved 94% recycle rates for vehicle wash at Manchester, saving about 100T/week."- (Interview) C41</i></p>	<p>Evidence of technological adoption for water efficiency is shown in both the questionnaire and interview.</p>

The fifty most frequent terms used when companies refer to the adoption of water efficient technologies were identified and plotted in Figure 7.7. This was done in order to identify the terminology companies employ when reporting the ways in which they attempt to reduce water in their operations. In the figure several words appear to be frequently used such as: 'cleaning', 'use', 'reduce', 'process', 'system', 'technology' and 'plant'. This suggests that companies are making use of efficient technologies and processes inside their processing facilities to reduce their water use.



Figure 7.7: Word cloud of the green quotes for SP3.1 - the efficient technologies in the companies’ operations
 Total amount of words analysed: 4563

In the analysis of this indicator, it was difficult to determine for four companies whether they had adopted efficient technologies in their operations. All the quotes of these companies are shown in Table 7.9. Three companies (C21, C23 and C28) fell into this category due to their vague statements that refer to water efficiency in their operations. Furthermore, C65 was marked with yellow because in both their questionnaire and FHC report it is stated that efficient technologies had not been yet adopted but rather reductions have been achieved through process. The latter company shows evidence of willingness to do so in the future.

Table 7.9: Quotes of companies marked with yellow in the ‘efficient technologies in the companies’ operations’ indicator (SP3.1)

Quotes	Comments - Analysis
<p><i>“Over the course of 2012/13 we have continued to focus on our levels of water efficiency at our manufacturing sites and are confident we will achieve our target of reducing water usage by 20% by 2015 against 2007 levels.” – (Environmental report) C21</i></p>	<p>The company clearly states that efficient processes have been implemented but no further information is given.</p>
<p><i>"Our sustainability initiatives resulted in a significant saving in water and energy use"- (Website) C23</i></p>	<p>The company briefly mentions that some sustainability initiatives towards water have made them to reduce water but there is no mention on what these initiatives are.</p>

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>“Although water usage was up during the year, we now have water monitors installed in 15% of sites, doubling the number we had last year and giving data on the daily usage of water so we can detect higher than average usage and leakages much more quickly.” – (Environmental report) C28</i></p>	<p>The company mentions the installation of metres and detection of leakages but no further information is provided.</p>
<p><i>“Recommendations from Independent Energy Auditors including the FHC have been considered. Technologies such as Reverse Osmosis and Nano Filtration Water Treatment Plant on our Gas Fired Boilers have been reviewed and costed but as we are at the final stages of a planning application for a new factory the spend/ payback cannot be justified at the moment. Water efficient Technologies are being reviewed at new factory design stage.” – (Questionnaire) C65</i></p>	<p>In both sources it is indicated that efficient technologies have not yet been implemented but rather the water reductions have been achieved through process improvements. However, the company is aware of the efficient technologies they can adopt and have received guidance from the FHC and other external consultants.</p>
<p><i>“With assistance from the FHC, the site has identified and implemented a number water efficiency measures, including: improving water metering and data acquisition; addressing ‘quick wins’ to reduce water use within the process and ancillary activities; and training staff to better understand the true cost of water. As a result the site achieved a water intensity1 reduction of 4.9% between 2012 and 2013. Recognising the need for continual improvement, the company has recently identified further water saving opportunities, such as: improving condensate collection and return from some of the steam-heated pans (which will save water and energy); reducing the water flow to the cap and bottle washers; and fitting an automatic shut-off system on the water supply so that water is turned off when machinery is not operating.” – (FHC report) C65</i></p>	

One company (C46) specifically indicated that they had not adopted efficient technologies in their operations. In the questionnaire the respondent answered: “Cost” under the question that asked if the company had implemented efficient technologies for the use of water. Furthermore, for 21 companies no evidence was found in the data gathered and hence the assessment for this indicator could not be carried out for them.

The ‘implementation of efficient technologies’ (SP3.1) along with the ‘disclosure of water reduction achieved’ (SP1.1.4) were the indicators with the most evidence of adoption in the analysed sample. This suggests that technology and efficiency is often used as a way for companies to reduce water. The next indicator discusses the specific targets companies have to reduce water.

7.2.2 Specific target to reduce water (SP3.2)

A specific target to reduce water was considered as an important indicator for the evaluation of the adoption of a soft path for water. It is essential that companies set up targets for managing water more sustainably and reduce their impact on the environment. Due to the nature of the sample all the analysed companies had set a target of reduction of water by 20% by 2020 against a 2007 baseline. For this reason,

all companies were marked with green under this indicator. However, it was found that some companies have more ambitious goals than the one previously discussed. An example of this are C43 and C60:

“Reduce total water consumption by 50% by 2020”- (Environmental report, FHC report) C43

“Achieve a 45% reduction in water use by 2020 compared to 2007”- (Environmental report, Website, FHC report) C60

Another example is C58 that aim to reduce water in their operations by 20% by 2015 (in a shorter period of time):

“[The company] has a corporate objective to reduce water use at all our facilities by 20% by 2015.”- (Environmental report, Website, FHC report) C58

Additionally, there are companies who had already achieved the 20% water reduction by 2020 target. An example of this is C67 that by 2010 had already surpassed the target:

“[the company] has now delivered savings of up to 30% reduction across the group, resulting in a staggering 155,000m³ savings since joining the FHC in 2007. Aggressive targets are now in place for the next five years aimed at bringing about a 7% reduction in consumption year on year.” - (FHC report) C67

All companies have water reduction targets and some examples were presented of signatories that aim to achieve higher reductions. So far, results have indicated that most of the achievements in the analysed sample have been done through the water reductions due to efficient processes and technologies. Nevertheless, this thesis argues that the management of water need to be addressed in a holistic way that takes into consideration other aspects aside from the mere adoption of technology. The next section explores how much work has been undertaken by the companies in terms of water awareness initiatives targeted to their workforce.

7.2.3 Water conservation awareness in the workforce (SP3.3)

Technological approaches are a good way for reducing water use in the companies' operations but should not be the only action adopted. The soft path for water theory argues that *soft* actions should also be adopted in order to promote a corporate cultural change that embeds sustainability in its core. For this reason indicator SP3.3 was set up in order to evaluate the extent to which staff engagement

in the water sustainability area has been sought or implemented in the evaluated companies.

For this indicator, 17 (25%) companies were marked with green as evidence was found in their data that point out to the engagement with staff in programmes or initiatives that take into account the sustainable use of water. Some examples have been selected in order to illustrate the type of actions being undertaken by the companies that fell into this category (see Table 7.10).

Table 7.10: Quotes of companies marked with green in the ‘staff engagement’ indicator (SP3.3)

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"[Water awareness in the induction] 30 secs spent in the induction there is a limit to how many issues and topics you can cover in a commercial workplace" ... "We also use softer cultural change approaches"- (Questionnaire) C6</i></p> <p><i>"The company moved forward on a water saving programme by forming a lead team and involving the entire workforce. Good data management was found to be central to the programme. Weekly meter readings were collected for each production area and the trends analysed."- (FHC report) C6</i></p>	<p>The information given by the questionnaire respondent shows that little time is spent in water awareness during the induction (only 30 secs). However, in the FHC report it is discussed that much of the water savings have been achieved through staff engagement.</p>
<p><i>"[The company] also recognises that employee engagement is key to reducing water use. Throughout 2013, [we] produced a series of posters to encourage employees to reduce water, energy, fuel and carbon impact across its operations. The posters were designed to link into the company's existing LEAN and Continuous Improvement activities. Both topics were covered by posters which appeared in sequence: one looked at the bigger picture - the water savings that the company as a whole needed to achieve to meet their target; the second then broke it down – expressing the target as equivalent savings that was required per employee. In both parts of the campaign, employees were asked for their ideas as to how [we] could improve. All ideas are captured and recorded in each manufacturing site's Continual Improvement (CI) log. The ideas are reviewed by the CI team and allocated for action, where possible. The colleague who raised the idea receives feedback and the opportunity to be involved in the implementation stage, as appropriate." - (FHC report) C7</i></p>	<p>In the FHC report, the engagement of staff to achieve water reduction is clearly highlighted. A campaign using posters and visual aids was developed and the input and ideas from staff were taken into consideration. The process was based in a continuous improvement model.</p>
<p><i>"Many effective ideas for reducing water use come from employees, especially in water stressed areas. For example, at our plant in Port Fairy, Australia, water is required for three stages of the manufacturing process. Following a suggestion from an employee, instead of pulling fresh water from the local supply for each stage, water is now recycled, saving around 30 million litres every year, or 20% of water used at the plant. In Nabha, India – another water-stressed region – our staff have achieved a 48% reduction in water use since 2003, from 635 million litres to 330 million litres."... "To get employees involved, we have set up a global network of 'sustainability advocates'. These employees typically volunteer to take on the role, and are enthusiasts who promote sustainability among colleagues, changing practices and behaviours at work and at home. Advocates help to establish waste reduction programmes, encourage employees to share good environmental practices and promote community projects. As well as increasing awareness, many advocate-led projects result in savings for [the company]." - (Environmental report) C27</i></p>	<p>It is clearly indicated in the report that engagement with employees in sustainability matters is a priority in the company. This engagement does cover water as one of the main topics.</p>

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>“To help us achieve our carbon ambition we have appointed green Teams at a local level across our bakeries and depots to raise awareness of the impact of climate change and engage our people to help change behaviour and reduce water, energy and fuel usage.” - (Website) C63</i></p>	<p>The company indicates on its website that green Teams have been created across their bakeries to achieve awareness around environmental issues (water included) and to help achieve their sustainability targets.</p>
<p><i>“Employees understand that any monetary savings achieved through energy is overall bottom line profits to the business and therefore a potential increase in the annual bonus given.” - (Questionnaire) C65</i></p>	<p>Water awareness programmes are in place for the workforce of the company specifically on the cost associated to this resource in the company.</p>
<p><i>“With assistance from the FHC, the site has identified and implemented a number water efficiency measures, including: improving water metering and data acquisition; addressing ‘quick wins’ to reduce water use within the process and ancillary activities; and training staff to better understand the true cost of water.” - (FHC report) C65</i></p>	<p>(Q, FHC)</p>

From the examples presented in Table 7.10 some themes emerge. First, some companies like C6 recognise that much of the savings they have achieved have been through good management and engagement with their staff. Furthermore, companies like C7 and C27 show evidence of taking into consideration staff ideas through continuous improvement initiatives at local and global levels. In addition companies like C63 have embraced water sustainability aspects into their carbon reduction programmes, which shows evidence of recognition of the water-energy nexus. Other companies like C65 refer to the monetary savings achieved while saving water and use this approach to engage with their workforce.

All the quotes that showed evidence for the adoption of water conservation awareness initiatives carried out with members of staff were analysed using the NVIVO software and the 50 most frequent terms were identified. Figure 7.8 presents the results of this analysis.

Table 7.11: Quotes of companies marked with yellow in the ‘staff engagement’ indicator (SP3.3)

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>"We are going much further than that by promoting behavioural change across our business, to drive down waste and its effect on the environment"- (Website) C1</i>	Vague statement. No clear mention of staff engagement in their behavioural change programmes.
<i>"A priority for the business is to fully engage with our employees and a key part of this is listening to what they have to say. Recognising the huge part our employees play in delivering CSR initiatives towards our Sustainable Business, all pictures featured on the front of this report are our own employees working across our group." - (Environmental report) C15</i>	Although from the data presented it could be inferred that some engagement towards environmental topics is being carried out it is difficult to determine whether or not water is one of those topics and the extent in which staff are empowered.
<i>"This project was also an opportunity to raise awareness to our employees about environmental protection and create an awareness of the high impact on water savings." - (Environmental report) C49</i>	There is a reference to how a project help them to create awareness on water savings but it is not clear if this is a company strategy or a one off achievement.
<i>"Employees are encouraged to engage in a better water management by competitions and promotions in posters and periodic emails." - (Questionnaire) C61</i>	The respondent indicates that encouragement to employees to manage water better is being done through posters, emails and competitions but no further information is disclosed. It is difficult to assess the extent to which this engagement is being done.

Companies that fell into this category where those that had vague statements in their publicly available data or primary sources. In all the examples presented in Table 7.11 there is some indication of initiatives been sought or carried out by the businesses but they tend to be general and from this data is difficult to assess whether staff engagement around water-related topics has been done.

Two companies indicated in their primary data that water-related awareness initiatives are not being carried out with their members of staff. C46 mentioned that this is an area out of the competence of the company’s realm:

"None of our business"- (Questionnaire) C46

Whereas C64 indicated that this is an area in which the company has not focused yet but it is something that will be considered as part of their future water strategy

"It is not an area that the business has focused on until recently."... "The business is in the process of developing a specific water awareness campaign as part of our water strategy." - (Questionnaire) C64

"It's probably environment in general (the guidance given). When people are in the factory, we will talk to them about how they operate, and we have operating procedures and things on what to do, what to use, and water would be one of those things as well." - (Interview) C64

For this indicator, evidence was not found for 40 companies (60% of the sample). This suggests that there is uncertainty on whether or not these companies carry out water engagement programmes with their members of staff. The next section evaluates the extent to which companies had carried out a water footprint assessment in their internal operations.

7.2.4 Awareness of company’s internal water footprint (SP3.4)

Water footprint refers to the water flows in the companies’ operations, this is the amount of fresh water used for the processing of the businesses’ goods and services. This term is related to the ‘supply chain’ water footprint later discussed in Section 6.4.2.2.

Under this indicator six companies were marked with green as evidence was found in their data of a water footprint assessment had been carried out. Table 7.12 shows the quotes of the companies that fell into this category.

Table 7.12: Quotes of companies marked with green in the ‘internal water footprint’ indicator (SP3.4)

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>“As a partner of the Water Footprint Network, we are working with The Nature Conservancy, WWF and others to account for all the water embedded in or used with respect to the sourcing and production of our products and to understand the implications for our business. To date, we have focused studies on the “blue,” “green,” and “grey” water footprints of sugar beets, orange juice and [our main product] to help us pinpoint potential sustainability impacts in specific watersheds. In August 2011, [our company in] Europe published a report on its assessment of the water footprint of sugar use in Europe, 80 percent of which is derived from locally grown beets. The report underscored the importance of assessing the impacts of water used, not solely the quantity. This is a key distinction, because the sustainability of a water footprint entirely depends on local factors.”- (Environmental report) C18</i></p>	<p>The company is highly engaged with NGOs and with the water footprint network in the assessment of the water footprint of their operations. In terms of its internal footprint, they have calculated 2.16 litres of water per litre of product, this does not take into account the supply chain footprint.</p>
<p><i>“But around 80% of our value chain water footprint is associated with the sourcing of raw materials, for instance the milk used in products” – (Environmental report) C27</i></p>	<p>Although there is no quantity data on their water footprint (both internal and external), there is a clear recognition that 80% of their footprint is associated to their sourcing of materials.</p>
<p><i>“In the short term, we are working to measure and reduce water use throughout our value chain: Factories (0.8% of water use in our value chain). Raw materials (96.6% of water use in our value chain) – we estimate the fresh water from rivers, lakes and aquifers used to grow the raw materials we source based on data from the Water Footprint Network (WFn). Packaging (2.6% of water use in our value chain)” – (Environmental report) C36</i></p>	<p>The company has estimated the percentages of their water footprint in their value chain.</p>

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>“We are working with the International Water Management Institute (IWMI) to identify key areas where local initiatives for better water management in agriculture could be developed. These include a six-month pilot project to study the water footprint of milk and other local crops in Punjab, India and another project currently ongoing in Vietnam.” ... “Improving consistency in the way water impacts are measured by helping to develop a new standard, ISO 14046: Water Footprint Principles, Requirements and Guidelines, which should be completed by 2014” ... “A lack of global standards means that organisations around the world apply different methodologies to assess the impact of water use. We support internationally consistent measurement and management tools, processes and practices, and are helping to develop a new ISO 14046: Water Footprint Standard.” – (Environmental report) C43</i></p>	<p>The company shows clear evidence on how they have had much engagement on the development of the water footprint standard.</p>
<p><i>“Our approach is to work across our value chain from raw material sourcing to the design of our products. Since 2009 we have worked with the Water Footprint Network to measure our agricultural water impact. We have learnt that our priority water intensive crops are tomatoes and sugar cane and that overall our footprint is lower than we had previously estimated. We have been working with our tomato suppliers for many years and we will continue to introduce drip irrigation to our suppliers for this and other crops.” – (Website) C59</i></p>	<p>The company does not directly disclose that they have worked towards the calculation of their internal footprint but rather their value chain footprint. It can be inferred that some work has been carried out towards their internal footprint.</p>
<p><i>The company has calculated a water footprint of: “2.73 cubic metre per tonne of product”– (Questionnaire) C64</i></p>	<p>The company has calculated their internal water mass balances and the footprint at the factory level. They have not done so at the farm level.</p>
<p><i>“What we have done is, we’ve certainly done footprints at the factory level, to say, this is the water coming in and this is where it goes, so this much is used in the product, this much is used in cleaning, this much is used in this [inaudible], and done it that way.”- (Interview) C64</i></p>	

Companies that refer to their water footprint in their publicly available information (C18, C27, C36, C43 and C59) do so by mentioning the overall footprint of their products. This is something that will be later analysed in Section 6.4.2.2. On the other hand C64 specifically refers to the amount of water per tonne of product used in their processes at their factory but they make no reference to the water footprint of their supply chain.

For six companies it was difficult to determine whether the water footprint assessment in their operations has been carried out. Table 7.13 shows the quotes for the companies that were marked with yellow under this indicator

Table 7.13: Quotes of companies marked with yellow in the ‘internal water footprint’ indicator (SP3.4)

<i>Quotes</i>	<i>Comments - Analysis</i>
<p>“We completed a first-of-its kind project that mapped our company’s total environmental footprint: carbon (air), land and water.” – (Environmental report) C35</p>	<p>It is briefly mentioned that their water footprint has been calculated but no more information is disclosed.</p>
<p>“around 7 litres [of water] per kg of product” – (Questionnaire) C45</p>	<p>The respondent seems to confuse the carbon and water footprint terminology.</p>
<p>“Yes. We have calculated the water footprint for eggs, and we’ve calculated the water footprint for liquid eggs because we supply [a main fast food company] liquid egg. So the footprint for that and also for [a main retailer], we supply eggs so there’s a footprint for that as well.” Q: And the drivers for calculating it was where, like, your retailers were asking you for that? – “Yeah, but it also formed part of a group wide carbon footprint.” Q: But that’s the carbon footprint, but have you calculated the water footprint? Are you familiar with the water footprint methodology? – “Probably not because I’m just thinking about carbon footprint.” – (Interview) C45</p>	
<p>No evidence – C52</p>	<p>The information is not disclosed, but the company is a partner of the water footprint network.</p>
<p>“[One of the company’s targets is] to measure the total water footprint used in producing our products.” – (Website) C63</p>	<p>The company has not calculated their water footprint yet but, according to their website, is on their targets to do so. Nevertheless, a timeframe is not specified.</p>
<p>“I am aware of the water footprint term. We are currently working on Water Balance / flow rates/ usage data at present in conjunction with the FHC and our Energy Consultants. This includes data on flow rates through our effluent treatment plant and farm reservoirs.” ... “Water usage and minimisation is high on the agenda the water footprint will be calculated at some point. The business is complex as well as the main manufacturing site we also have 1100 acres of farmland which includes irrigation for fruit growing.” – (Questionnaire) C65</p>	<p>The water footprint of both the factory and the farm has not been calculated so far but the company has a clear strategy for doing so in the future.</p>
<p>“The company has only recently reached a level of awareness where such strategic concerns are being addressed. We are in discussion with academic and third-sector institutions to conduct a pilot study in 2013” – (Questionnaire) C66</p>	<p>The company has not calculated their water footprint (internal or external) yet but have clearly identified the need of doing so in the near future and engage with their suppliers for this.</p>
<p>“For us particularly, we’re not a very large company so there is a limit to our ability to influence what goes on in the value chain up and downstream of us, but one of the reasons I did those exemplar footprints was to justify the next stage which would involve value chain engagements. That might be a particular project with particular grower groups or it might be engaging with tools that are already there and building back into an audit process, just building that into a supplier evaluation process.” – (Interview) C66</p>	

From the quotes of the companies marked with yellow under the SP3.4 indicator some themes emerge. First, there are companies that present some evidence for the assessment of the water footprint in their operations but it is vague and not enough information is discussed, this is the case of C35 and C63. Furthermore,

companies like C65 and C66 indicate that this is something they have not done so far but plan to do it as part of their future water strategy. In addition, the participant of the questionnaire and interview of C45 appears to confuse the water footprint and carbon footprint terminologies. In the questionnaire a figure is given on the amount of water used per kilogram of product but in the interview it is revealed that the participant is not familiar with the term. Finally, no evidence was found for C45 but it was marked with yellow as the company is a signatory of the Water Footprint Network as discussed previously in Section 6.1.1.4. Seven companies clearly indicated that the assessment of their water footprints is something that they have not yet done. Table 7.14 presents the responses given by the participants.

Table 7.14: Quotes of companies marked with yellow in the ‘internal water footprint’ indicator (SP3.4)

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>"We are currently working on the carbon footprint of our products and that is the current priority"- (Questionnaire) C3</i>	Their priority is to calculate their carbon footprint first. They have a notion on their onsite ratio but the overall water footprint is something they have evaluated yet.
<i>"We know our ratio is on site in terms of what we use but we haven't calculated the footprint in terms of what it takes to grow barley or what it takes to grow hops. We haven't done that yet."- (Interview) C3</i>	
<i>"We concentrate on reducing our water use ratio and this is how we manage the efficient use of water in our operations. Calculating our water footprint wouldn't add any further incentive to reduce our water usage."- (Questionnaire) C4</i>	The company does not see the value on calculating its water footprint
<i>"There's only so much time available in a commercial workplace working day - water stress is not a central issue for businesses based in our region or many of our suppliers"- (Questionnaire) C6</i>	The participant clearly expresses that water stress is not an issue for them or many of their suppliers. 'Many' means that probably some of their suppliers might be in water stressed areas, but it is difficult to assess with the data provided. The value of the water footprint calculation is not recognised and considered as complex
<i>"No. Carbon foot printing is exquisitely complex, my view would be it's probably even harder with water, because you've got to factor in the extra dimension of whether there is water stress in that area, where the food or raw material is being protected." - (Interview) C6</i>	
<i>" [water footprint has not been calculated due to] Other priorities"- (Questionnaire) C25</i>	It has not been calculated due to other priorities, no further information is provided.
<i>"[It has not been calculated due to] Resources and other priorities"- (Questionnaire) C41</i>	It has not been calculated due to resources and other priorities
<i>" [It has not been calculated because they are] Not aware of the term"- (Questionnaire) C46</i>	This is not being carried out by the company
<i>"[It has not been calculated because they do not know if] Is there a standard method?" (Questionnaire) C61</i>	The water footprint in the company's operations has not been calculated. The respondent indicates evidence of the unawareness of a standard methodology for the water footprint calculation.

In the companies that fell into this category, C3 expresses that their current priority is to carry out a carbon footprint assessment. In addition C4 state that they do not see an added value to reduce water by carrying out a water footprint assessment. On the other hand, C6 discusses the perception of the assessment of the water footprint as a complex process that requires time and resources. Furthermore, C25 and C41 indicate that it is not part of their priorities and C61 express they unawareness of the term and the methodology. For the majority of the sample (48 companies, 72%) no evidence was found on whether or not the internal water footprint assessment had been carried out.

In summary, findings of the ‘knowing the environment’ (SP2) theme indicate that some companies (31%) disclose their water withdrawals figures but they do so in a non-standardised way as some present percentages and others absolute numbers. The degree of impact on water resources depends on the local environmental conditions. Results indicate that only 18% of the companies presented a degree of awareness of the water environmental limits in which they can operate, while 13% of the sample had some evidence of the identification and disclosure of water-stressed regions. These overall results suggest that the knowledge of environmental impacts and limits in terms of water withdrawals by companies seems to be superficial.

In addition, the general findings of the ‘internal action’ (SP3) theme indicate that the majority of the sample (61%) show evidence of the implementation of efficient technologies being adopted in their processes. Furthermore, a total of 25% of companies pointed towards the engagement with staff in initiatives that take into account the sustainable use of water. On the other hand, only 9% showed evidence of calculating their internal water footprint. In other words, results indicate that there is evidence of adoption of the ‘internal action’ theme in much of the sample, making it the most adopted theme of the soft path for water evaluation. These results are expected as the analysed companies have all committed to reduce water in their internal operations; hence measures towards this achievement are needed. However, it should be noted that the level of lack of evidence for this indicator suggests that further efforts need to be carried out in reporting. The next chapter discusses the results obtained for the ‘external action’ and ‘influence on water governance’ themes.

Chapter 8

To what extent have the ‘external action’ (SP4) and ‘influence on water governance’ (SP5) themes been adopted?

*Alone we can do so little; together we can
do so much.
- Helen Keller*

Chapter 7 discussed the results obtained on the ‘knowing the environment’ (SP2) and ‘internal action’ (SP3) themes. These findings suggest that the companies’ knowledge of their water environmental impacts and limits seems to be superficial. In addition, results indicate that there is evidence of adoption of the ‘internal action’ theme in the majority of the sample. This chapter discusses the outcomes for the ‘external action’ (SP4) and ‘influence on water governance’ (SP5) elements. Section 8.1 discusses the results for the ‘external action’ (SP4) theme which includes the extent to which companies are engaging with communities as well as their supply chains for the protection of water resources. Section 8.2 presents the findings obtained for the ‘influence on water governance’ (SP5) theme which cover the extent to which companies seek to influence the water governance of the UK and elsewhere.

8.1 External action (SP4)

External action denote the SP4 theme for the soft path for water adoption in the food and drink industry. It refers to the initiatives undertaken by the businesses that have an outside influence or impact. The theme is divided in two: community engagement (section 8.1.1, indicator SP4.1) and supply chain engagement (section

8.1.2, indicator SP4.2). First, SP4.1 aims to investigate the extent to which companies undertake any kind of impact assessments in their operations that explicitly consider water. In addition, it also explores the kind of social or community projects that businesses carry out that are water-related. Second, SP4.2 aims to determine the extent to which companies require or advise their suppliers to adopt improved water management practices. Furthermore, it also investigates if companies have carried out a water footprint assessment of their supply chain.

8.1.1 Community engagement (SP4.1)

The impact on water resources derived from the companies' daily activities directly affects communities in the surrounding areas and regions. The soft path for water approach aims to promote a framework in which water resources are protected for the adequate provision of ecosystem services (Gleick, 2009). These services are those provided by nature for human wellbeing (MA, 2005). The impact on water resources and their availability ultimately affect human communities that rely on those resources. For this reason, the soft path for water proposition for the food and drink industry aims to evaluate the extent to which companies engage with the communities where they operate with the aim of reducing their socio-ecological impact. Two indicators were set up for this evaluation. The first indicator (SP4.1.1) aimed to assess whether or not a human rights or social impact assessment that takes into account the human right to water has been carried out. The second indicator (SP4.1.2) aimed to determine if companies have community or social programs that aim to address the impact on water resources. Figure 8.1 presents the overall results obtained in the analysis of the degree of community engagement carried out by the sample used for this study.

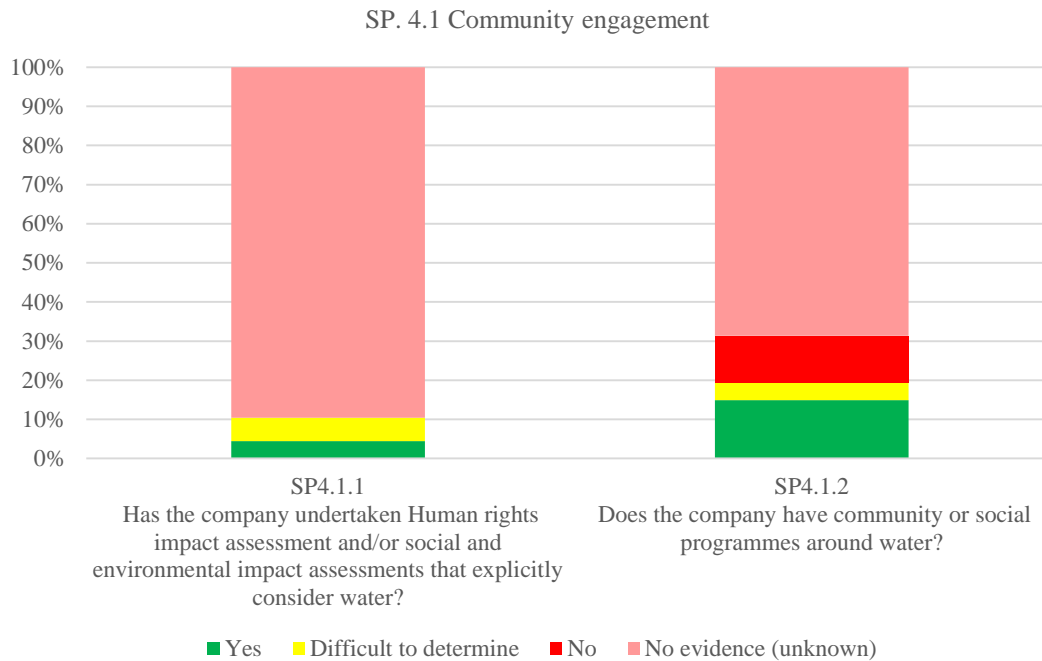


Figure 8.1: Community engagement (SP4.1) overall results

Results indicate that some evidence of adoption was found for the SP4.1.1 and SP4.1.2 indicators under the community engagement theme, 4% and 15% respectively. In both cases it was difficult to assess whether the indicators had been implemented. Furthermore, evidence of no implementation was found for 12% of the sample for the SP4.1.2 indicator. Additionally, no evidence was found in the majority of the sample in order to assess their extent of adoption. The next section analyses the results obtained for SP4.1.1, which aimed to assess if companies have undertaken human or social impact assessments that considered the impact on water resources in the communities where companies have operations.

8.1.1.1 Have companies undertaken human rights impact assessments and/or social impact assessments that explicitly consider water? (SP4.1.1)

Water is vital for all type of life in this planet. In 2008, the UN human rights council published the ‘protect, respect and remedy’ framework whose aim is to ensure all human rights are respected in the activities of development (UNHRC, 2008). In addition, in 2010 the United Nations General Assembly declared safe and clean drinking water and sanitation as a human right (UNHRC, 2010). The human rights impact assessment aims to ensure all human rights (water included) are protected,

respected and remedied by all the members of the corporate sector (Boele and Crispin, 2013). Similarly, a social impact assessment is a process of “of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions” Vanclay (2003, p. 7) in which companies’ projects are included. This indicator aimed to determine the type of initiatives carried out by companies in order to protect, respect or remedy the human right to water.

Evidence of implementation was found in only three companies of the sample. These companies are those marked with green under the SP4.1.1 in the matrix (see Table 5.4). Table 8.1 presents the evidence found for each case and a short analysis.

Table 8.1: Quotes of companies marked with green in the ‘human right to water’ indicator (SP4.1.1)

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>“[we are] a signatory to the UN CEO Water Mandate... This demonstrates our commitment to working with governments, civil society and other stakeholders to protect and fulfil the human right to water as defined by the United Nations – and in particular to reducing our water consumption in parts of the world where it will make the biggest difference. We are developing a longer-term water strategy with input from NGOs to build on commitments made in the Water Mandate and plan to launch this before 2015.” - (Environmental report) C27</i>	There is a direct reference to the human right to water and the commitment of the company to work in initiatives that protect this right. There is no direct indication of human rights or socio-environmental impact assessments being carried out but it could be inferred that they have taken place.
<i>“We are a founding signatory of the UN Global Compact CEO Water Mandate, a unique private-public initiative in which approximately 87 companies are working with environmental organisations and other stakeholders to support water disclosure, public policy engagement and the human right to water.” – (Environmental report) C43</i>	The company shows on how it seeks the protection of the human right to water.
<i>“Our search for a clean and ample water supply has an impact on each community in which we operate, as well as on our business operations. We are committed to working with governments that preserve the human right to water for individuals in the communities where our company operates, in addition to advocating for this right more broadly.” – (Environmental report) C52</i>	The company clearly identifies the human right to water and shows a clear commitment to protect this right.
<i>“In 2009, [The company] was among the first large companies in the world to recognise and to formally adopt the human right to water. The company has established numerous public-private partnerships and collaborations, which have increased access to safe water and sanitation services around the globe.” – (Website) C52</i>	

The data shown in Table 8.1 correspond to the three companies marked with green under this indicator. In all three cases a direct mention to the protection of the human right to water is being done. However, it is worth mentioning that human rights or social impact assessments are not specifically mentioned. Additionally, it is worth

to mention that all three companies correspond to multinational corporations that have operations across the globe.

Four companies were marked with yellow under this indicator as for them it was difficult to assess whether they recognise water as a human right and hence their responsibility on conserving it. Table 8.2 shows the quotes for all the companies that fell into this category.

Table 8.2: Quotes of companies marked with yellow in the ‘human right to water’ indicator (SP4.1.1)

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>"We're proud to uphold the ideals of corporate citizenship set out in the United Nations Global Compact. This covers areas such as human rights, labour standards, the environment and anti-corruption"- (Website) C6</i>	In the website it is briefly mentioned that they are part of the UN Global Compact (initiative for human rights impact assessment), nevertheless no further information is provided.
<i>"A significant function for the purchasing function is to identify, if possible minimise, and otherwise manage the likely impact of such risks (to the organisation itself and to other stakeholders). For any significant expenditure, long-term commitment, or identifiable 'pinch-point' formal risk assessments will be made, as appropriate, addressing:" ... "Environmental risks" ... "Social risks – arising from issues related to Corporate Social Responsibility such as Human Rights and so on"- (Website) C9</i>	The data evidences that some sort of human rights impact assessment is being carried out but it is not possible to determine whether or not this includes water.
<i>"[The company] is supporting a charity project along with the Government of Ethiopia to help achieve a target of safe water and sanitation for every child by 2015. The project aims to provide water and sanitation to the most vulnerable communities, reduce diseases and contribute to a reduction in child mortality. [Our] contribution is helping support the construction of sustainable water points, gender separated latrines, hand washing facilities, and hygiene education across local communities, schools and health posts."- (Environmental report and Website) C15</i>	From the data can be inferred that the human right access to water is something that is being taken into consideration in the company. Nevertheless, it is difficult to determine whether the human right to water is something they recognise. The same data is presented both in the environmental report and website.
<i>"In 2010, the United Nations General Assembly passed a resolution recognizing the human right to water and sanitation and declared that clean drinking water and sanitation are 'essential to the realization of all human rights.' The UN called upon nations and international organizations to provide financial resources and facilitate capacity building and technology transfer to help all countries provide safe, clean, accessible and affordable drinking water and sanitation for all residents."-(Environmental report and Website) C18</i>	From the data can be inferred that the human right access to water is something that is being taken into consideration in the company. Nevertheless, it is difficult to determine whether or not they try to protect the human right to water in the places where they operate

From the companies for which it was difficult to determine whether or not their responsibility on protecting the human right to water through has been addressed, some key remarks are worth noting. First, companies C6 and C9 do not specifically mention water but rather a vague statement in which they mention that human rights are being protected throughout their operations. On the other hand, C15 mentions their support for a charity that works towards safe water and sanitation in Ethiopia. However, they do not specifically mention their direct responsibility on protecting the human right to

water. In addition, C18 mentions the UN resolution for the recognition of water as a human right but no evidence is shown on their direct responsibility and action on protecting such right.

A main aspect to denote is that for 60 companies (90% of the sample) no evidence was found in the data gathered that pointed out to the direct recognition of water as a human right, and more importantly their responsibility on protecting it. As a result, it is unknown whether or not these companies have adopted the principles for this indicator. The next section discusses the results obtained for the indicator that aimed to evaluate if companies have in place community or social programmes that directly address water.

8.1.1.2 Do companies have community or social programmes specifically on water issues?

The activities companies carry out ultimately have a direct impact on the water resources of the areas in which they operate. Unlike carbon, water and their impacts need to be dealt locally (Hoekstra and Chapagain, 2008). As a result, it is the companies' responsibility to be aware on the impact their operations have on water resources and work with local communities in order to protect the water resources from which all depend on. This is the reason why the SP4.1.2 indicator was set up. Its main aim was to evaluate the extent to which communities have been engaged in order to promote programmes that address water issues.

In the analysis carried out, evidence of community or social programmes around water issues was found for 10 companies. Table 8.3 presents a sample of five companies that fell into this category.

Table 8.3: Quotes of companies marked with green in the ‘community or social programmes around water’ indicator (SP4.1.2)

Quotes	Comments - Analysis
<p>“Collaboratively these are just some of the things we have been able to achieve [In the project in Ethiopia] :- Cleaning and disinfection of 147 water supply schemes in 12 districts has been undertaken, benefitting 44,100 users of these water systems - Five shallow (drilled) wells have been installed and 27 dysfunctional water points have been repaired, in total benefitting 9,600 people with new or improved community water supplies - A water supply well, gender-separated toilets and hand washing facilities have been installed in two schools and school sanitation clubs have been established with teacher training and hygiene promotion, benefitting a total of 1,340 school children The project also promoted a community led total sanitation and hygiene (CLTSH) mass communication campaign on the importance of hygiene. A total of 721 households gained access to basic sanitation facilities, benefitting over 3,600 people.” - (Environmental report and Website) C15</p>	<p>There is a clear evidence of engagement with communities in Ethiopia where water centred projects are being carried out. The same data is presented in both the environmental report and website.</p>
<p>“[We] helped set up and fund an extensive biodiversity programme whereby dairy farmers are paid to leave at least 10% of their land free for wildlife to flourish. As of 2012 the average amount of land given over to wildlife is about 25% - the equivalent of 18 times London’s Hyde Park. Farmers involved in the scheme leave hedgerows to grow, blossom and fruit and maintain wide field margins where wild flowers provide food and egg-laying areas for butterflies. Other initiatives include the introduction of ponds, ditches, beetle banks, skylark scrapes, barn own boxes, wetland and overwintered stubble. As a result of the programme it was found that wildlife has increased by 19% and sightings of birdlife considered to be in decline were up 47%.”- (Environmental report) C21</p>	<p>Although the initiative does not involve directly the community (but rather their suppliers), it has a direct impact on the community by the enhancement and improvement of local habitats and environments.</p>
<p>“[We help] to translate the human right to water and sanitation into reality in communities where we operate, because improved water access and sanitation are essential for rural development and quality of life in the communities we depend on for raw material supply. In line with [our] belief in the importance of raising awareness about water, this work often includes an education component or comes in addition to other education or awareness-raising initiatives.” ... “We work with local partners and NGOs by contributing funding, operational support and training for sustainable, technologically adapted community water management schemes. We also support projects to deliver water, sanitation and hygiene projects in schools and villages near our operations around the world.”- (Environmental report) C43</p>	<p>The company shows clear examples on how community and social programmes around water are being promoted and implemented</p>
<p>“Yes, in Scotland, we’ve got a site that’s got a sustainable drainage system of sorts. And what that is, it’s a large shallow pond that takes the water off the farm sheds. What we’re doing with that site is we’ve created it into a bio-diversity site. So we’ve got meadow grass in there, we’ve got trees, and we get ducks and swans flying in. And we explain to the children that that’s part of sustainable draining system from the farm shed, that’s why it’s there.” - (Interview) C45</p>	<p>The respondent mentions the engagement with the community around a sustainable drainage system.</p>
<p>“[we] established a goal of partnering to provide access to safe water to 3 million people in developing countries by the end of 2015. We met that goal three years ahead of schedule through the efforts of the [our] Foundation, our local facilities and multiple partners. These efforts have helped to install village water and irrigation systems, establish water health centers, construct rainwater harvesting cisterns, improve sanitation programs and recharge aquifers in developing communities.” - (Environmental report) C52</p>	<p>The company indicates clear examples of community engagement where the provision of clean water is sought.</p>
<p>“Our stewardship efforts are crucial in securing a resilient supply chain for our business and helping the communities where we operate to thrive.” - (Website) C52</p>	

In the first example, C15 shows evidence of efforts carried out in Ethiopia, all of these have sought to increase access and sanitation of water in communities. This is a positive engagement and an example of the company's efforts to improve the quality of water in this country. However, there is a lack of evidence on the engagement with communities that involve water-related awareness.

On the other hand, C52 mentions in its environmental report that one of their aims is to provide access to safe water to 3 million people by 2015. On the contrary to C15, C52 mentions the installation of rainwater harvesting and the recharge of aquifers in developing nations. However, water awareness programmes are not mentioned.

Some companies like C45 and C21 also mentioned examples of programmes carried out in the UK. Both companies give a general description of projects they have carried out for biodiversity enhancement that take into consideration improved drainage systems and the introduction of ponds and ditches. These examples do not consider community engagement directly but are examples of the companies aiming to enhance the environment in the communities where they operate in the UK.

One of the key findings of the data analysis for this indicator was the lack of evidence of clear community or social programmes that address the awareness of water related issues. The only company that specifically mentions their responsibility on raising awareness in the communities where they operate is C43. In their environmental report they mention their involvement in water education and water-awareness initiatives.

Figure 8.2 presents a word cloud with the 50 most frequent terms mentioned in all the quotes of the companies marked with green under this indicator. It can be seen that terms like sanitation and hygiene appear to be mentioned frequently. This suggests that the community and social engagement efforts of companies tend to be concentrated in this area. It is worth noting that sanitation and hygiene are societal issues in least developed regions and countries.



Figure 8.2: Word cloud of the green quotes for SP4.1.2 - the community or social programmes around water
Words analysed: 1160

Under the indicator SP4.1.2, three companies were marked with yellow as it was difficult to determine whether or not they have community or social programmes that specifically address water. Table 8.4 presents the data for these companies.

Table 8.4: Quotes of companies marked with yellow in the ‘community or social programmes around water’ indicator (SP4.1.2)

Quotes	Comments - Analysis
<p>“Advocates [employees] help to establish waste reduction programmes, encourage employees to share good environmental practices and promote community projects” - (Environmental report) C28</p>	<p>There is no mention to water specifically, only sustainability in general</p>
<p>“To an extent - we support local events” - (Questionnaire) C61</p>	<p>The respondent indicates that the company engages to local events that promote the sustainable use of water. Nevertheless, it is difficult to assess the extent to which this is being done.</p>
<p>“The provision of water in the local area is robust and other social concerns take priority” ... “We have focussed on other engagement with the broader community. With the workforce we have used the company newsletter and provided contact details for local water companies which distribute water-efficiency aids and advice.” - (Questionnaire) C66</p>	<p>The company has not carried out community programmes that directly involve water issues because it is not perceived as a priority in the local context where they have their operations.</p>
<p>“We do have community programs. We have what's called an employer sponsored volunteering program. Every one of our employees has, if they wish to take it up, one day per year in which they're able to volunteer to do some work supporting a charity. Because it's volunteering, we don't prescribe what those activities are. It tends to be that the employees choose activities which are more social than environmental in their primary aim but there might be an environmental impact in a secondary way.” - (Interview) C66</p>	<p>Nevertheless, community programmes are carried out by their employees in other social issues.</p>

C28 mentions in its environmental report that employees help to set up a programme that aims to share good environmental practices and community projects. However such engagement with the community is not clear and water is not specifically mentioned. Similarly, C61 indicates in its questionnaire that they support local events to a certain extent but it is difficult to determine the types of programmes they have in place and how water is addressed on them.

On the other hand, C66 indicates that they do not run community or social programmes that embed water topics as the provision of water in the areas where they operate is robust and other concerns take priority. This company was marked with yellow under this indicator as in the interview the respondent indicated that community programmes are carried out in other environmental and social issues.

Eight companies were marked with red under this indicator as they specifically stated in their questionnaires or interviews that they do not have community programmes that address water related topics. Table 8.5 presents a sample of quotes extracted for four of these companies

Table 8.5: Quotes of companies marked with red in the ‘community or social programmes around water’ indicator (SP4.1.2)

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>“With the community we are actively involved in a project with Zero Waste Scotland in which we promote recycling in different places. But we haven’t been focusing on water itself, water is not really an issue in there.” - (Interview) C4</i>	Water is not perceived as an issue therefore the company does not focus on carrying out community programmes around it.
<i>“Not a priority currently” - (Questionnaire) C25</i>	Community engagement has not been sought due to other priorities.
<i>“Resources and other priorities”- (Questionnaire) C41 C41</i>	This has not been done due to resources and other priorities.
<i>“It is not something that the business has focused on.” - (Questionnaire) C64</i>	Is an area in which the company has not focused on yet.
<i>“No. Unfortunately not, no, that's something we don't do”- (Interview) C64</i>	

As the examples in Table 8.5 illustrate, all the companies marked with red under this indicator mentioned that this is not an area in which they have focused yet as it is not perceived as a priority at the moment. In contrast to the companies marked with green under this indicator, all the companies marked with red refer only to their operations in the UK in which water is not yet perceived as an issue.

For 46 companies from the sample the evaluation of this indicator was not possible as no evidence was found either for or against community engagement towards water related issues.

Something that was not mentioned in any of the evidence gathered for this indicator was the impact on the global water resources through the activities and processes of their supply chain. For this reason, the next subtheme aimed to evaluate the extent to which companies evidence their engagement with their supply chain to reduce the impact on water resources derived from each step of the growth and processing of their products.

8.1.2 Supply chain engagement (SP4.2)

Food is an industry in which the overall impact on water resources is highly linked to the activities in the whole supply chain of each product (Allan, 2003; Hoekstra, 2013). Under the proposition of a soft path for water framework for this industry it is therefore considered imperative for companies to engage with their supply chain and work towards the overall reduction of the impact on water resources throughout. For this reason, two indicators were set up to evaluate the extent to which the analysed sample has engaged with their supply chain.

First, SP4.2.1 aimed to evaluate if companies require suppliers to adopt specific practices in order to improve their water management. Furthermore, SP4.2.2 aimed to determine if the companies have calculated or engaged with the understanding of the overall water footprint of their products. The overall results derived for the analysis of this subtheme are presented in Figure 8.3.

SP. 4.2 Supply chain engagement

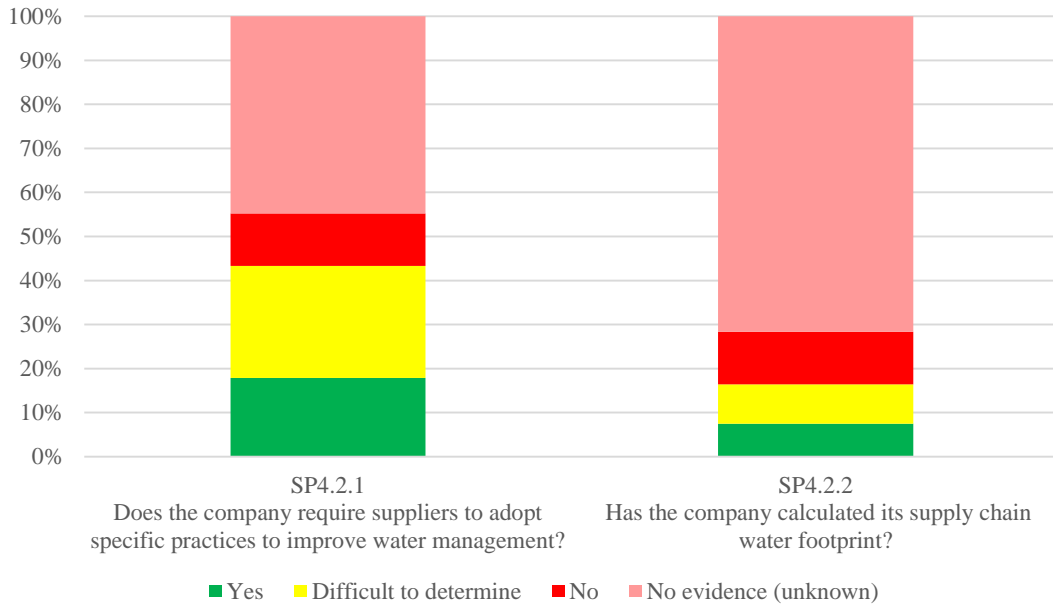


Figure 8.3: Supply chain engagement (SP4.2) overall results

Results for SP4.2.1 indicate that 18% of the companies analysed present evidence of requiring suppliers to improve their water management practices. However, for 25% of the sample it was difficult to determine the extent to which this has been done. Furthermore, 12% of the companies indicated that this is something they currently do not do and for 45% of the companies no evidence was found in order to evaluate this indicator.

In contrast, for SP4.2.2 results indicate that 7% of the samples analysed present evidence on their understanding of the water footprint derived from the activities of their whole supply chain. In addition, for 9% of the companies it was difficult to determine whether this understanding and calculation of their supply chain water footprint has been sought. Furthermore, 12% of the sample indicated that this is something that they have not carried out so far and for 72% of the companies no evidence was found in the data that allowed to evaluate this indicator. The next sections provide an in depth analysis of the findings for the supply chain engagement subtheme.

8.1.2.1 Do companies require suppliers to adopt specific practices to improve their water management? (SP4.2.1)

The soft path for water approach consists of a holistic framework that looks at the overall impact on resources. In order to reduce the overall impact on water resources derived from all the activities and steps undertaken for the growth and processing of food products guidance and encouragement from manufacturers to their suppliers is essential. This indicator aimed to evaluate the extent and type of guidance given to suppliers by the sample of companies analysed.

Under this indicator, 12 companies were marked with green as evidence was found in the data gathered that indicate an engagement with their supply chain with the aim to reduce the impact on water resources. Table 8.6 presents a sample of six companies that fell under this category.

Table 8.6: Quotes of companies marked with green in the ‘requirement of suppliers to adopt better water practices’ indicator (SP4.2.1)

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>"We will actively engage with suppliers to ensure sustainable environmental impacts, including but not necessarily limited to reducing consumption of natural resources, water, carbon footprint, emissions, improving efficiency, protecting biodiversity etc."-(Website) C9</i>	The data show evidence of direct engagement with suppliers with regards of their water impact
<i>"Each year we survey the source and level of water our growers use to irrigate their beet crop and currently over 95% of the water contained in our beet is from rainwater alone."... "[a crop assurance standard] covers production, food safety and environmental safety criteria and has become a condition of all of our grower contracts." - (Environmental report) C14</i>	They survey the sugar beet growers and have an engagement with them in terms of water use. In addition, in their environmental policy they mentioned that they aim to achieve sustainability throughout their supply chain. Nonetheless, it is difficult draw further conclusions with the data gathered.
<i>"Our company is committed to the core principles of sustainable development and we aim to achieve economic, environmental and social sustainability throughout our business and supply chain." - (Website) C14</i>	
<i>"We are working in partnership with [a recognised food manufacturer] to build a sustainable dairy supply chain for their Girvan factory in Ayrshire. Over 60 [of our] farmers who supply the site have reduced their total greenhouse gas emissions by an average of 5.7%, equating to 5,517 tonnes of carbon saved, and reduced total non-livestock water usage by 5.1%."... "[Objective:]Reduce water use on farm and improve efficiency of water use at factory" - (Environmental report) C22</i>	The company shows evidence of aiming to reduce impact throughout the supply chain in different environmental topics where water is included
<i>"Reduce, Renew, Recycle [Internal programme] supports our drive towards renewable energy, zero waste and recovered water use throughout the supply chain. By helping farmers understand their carbon footprint, and partnering with them on renewable energy projects, we can bring benefits to both farm and factory." - (Website) C22</i>	

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>“Our target is to reduce the impact of water consumption across the value chain by 20% by the end of 2020. We think it is important to start with our own operations before asking others to change, not least because we can learn valuable lessons that can be shared with suppliers.” ... “[so far we have] Engaged 32 suppliers on carbon, water and waste reduction.” - (Environmental report) C27</i></p>	<p>The data shows a clear commitment of the company to reduce the water footprint across their value chain, this implies a direct engagement with suppliers</p>
<p><i>“We do like a scorecard of our supply base and when I first joined the business - I joined the business in operations and quality role about eight years ago - there was no content on there with regards to environmental practices and biodiversity or anything like that. Now there is content and consideration given to how we score our suppliers, taking that out of our raw materials supply. We do have expectations of them, certain standards they must meet”- (Interview) C29</i></p>	<p>The respondent clearly states that there is engagement with their suppliers in terms of better environmental performance including water. Furthermore, the report mentions their membership to SEDEX but it in case it is not clear if these guidance includes water.</p>
<p><i>“We ensure that all our potatoes come from sound, ethical sources, and monitor this by adopting the following procedures: AB Membership of SEDEX (Supplier Ethical Data Exchange). As an AB Member we encourage all of our suppliers to join SEDEX and complete the on-line Self-Assessment questionnaire.” - (Environmental report) C29</i></p>	<p>The company engages with suppliers and consumers together, this shows evidence of a whole value chain orientation in their strategy.</p>
<p><i>“While around 70% of available fresh water is used for agriculture, when it comes to personal and domestic use, the UN estimates that each person needs about 50100 litres per day for drinking, cooking and washing. Yet in the poorest countries people live on as little as 10 litres a day. The collection of water, typically undertaken by women, is also an issue. According to the UN, sub-Saharan Africa alone loses 40 billion hours per year collecting water”.... “We have learnt that our priority water intensive crops are tomatoes and sugar cane and that overall our footprint is lower than we had previously estimated. We have been working with our tomato suppliers for many years and we will continue to introduce drip irrigation to our suppliers for this and other crops.” - (Website) C59</i></p>	<p>The company engages with suppliers and consumers together, this shows evidence of a whole value chain orientation in their strategy.</p>

Table 8.6 presents a sample data for seven of the 12 companies that showed evidence of suppliers’ engagement so to promote best water management practices in their supply chain. Some companies like C9, C59 and C14 present general evidence of their commitment to reduce their impact on water resources through the engagement with their suppliers. On the other side, C27 presents a clear target reduction of the overall water involved in their supply chain of 20% by 2020. C22 presents data on achievement of water reduction of the water used by their farmers by 5.1%. However, a clear distinction between the water ‘used’ (as blue water) and the water ‘consumed’ (green water) does not appear to be done. Furthermore, the interview respondent of C29 indicates that their suppliers are reviewed against an internal scorecard so they must meet certain standards that include the use of water resources.

A word cloud was constructed with the 50 most frequent terms mentioned in the evidence gathered from the companies marked with green under this indicator. Figure 8.4 presents a graphic representation of these findings. It is important to note

that apart for the words that specifically make reference to the supply chain, terms like ‘farmers’, ‘farm’, ‘growers’, ‘agriculture’ and ‘agricultural’ are also mentioned. This is important as for most food products the largest amount of water in their whole supply chain is being used at the agricultural level (UN WWAP, 2012).



Figure 8.4: Word cloud of the green quotes for SP4.2.1 - the requirement of suppliers to adopt better water practices
Words analysed: 955

For 17 companies it was difficult to determine the extent to which they engage with their supply chain with the aim of reducing the overall impact on water resources derived from the growth and processing of their products. Table 8.7 shows seven examples of companies that fell into this category.

In all cases, companies presented data that in general mention an engagement with their suppliers in socio-environmental aspects. However from the quotes extracted for these businesses it results difficult to assess the extent to which such engagement is being done in terms of a sustainable use and consumption of water. Some companies like C6 and C66 in Table 8.7 indicate their membership of SEDEX (Supplier Ethical Data Exchange), which is a global initiative that aims to promote ethical standards in the supply chain of businesses (SEDEX, 2014). The criteria used for this standard includes labour and environmental aspects but there is not a clear mention on the extent to which water is embedded in it.

Table 8.7: Quotes of companies marked with yellow in the ‘requirement of suppliers to adopt better water practices’ indicator (SP4.2.1)

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"We discuss with them their water programmes as part of a range of sustainability issues." - (Questionnaire) C6</i></p> <p><i>"No, we don't challenge, yet, our suppliers to targets. We would question them and audit them, and review if they have set themselves targets, on a range of issues, including water, we ask them if they're taking-- What measures they're taking to improve their water efficiency." - (Interview) C6</i></p> <p><i>"Our 'Sourcing With Integrity' Procurement Policy ensures we trade ethically. All suppliers must meet the minimum standards of the Ethical Trading Initiative (ETI) Base Code, and the requirements of [our] Environment Policy. We assess and support suppliers by questionnaire and audit visits and, as members of SEDEX (Supplier Ethical Data Exchange), we can access other organisations' reviews for comprehensive assessments." - (Environmental report) C6</i></p> <p><i>"We work in close partnership with our suppliers to ensure they share our commitment to doing business in an ethical way. As part of this, we operate a 'Sourcing With Integrity' Procurement Policy. Under this policy: All suppliers must meet the minimum standards of the Ethical Trading Initiative (ETI) Base Code, and the requirements of [our] Environment Policy." - (Website) C6</i></p> <p><i>"Ensure employees, [our] suppliers and contractors engaged by are aware of their responsibilities in relation to this environmental policy, and where we are in a position to influence their environmental performance, do so in a positive and collaborative manner." ... "We encourage all our employees and business partners to appreciate the environment and our interactions with it. And we take our principles home too, trying to think just as carefully about the impacts we have outside of work." - (Website) C12</i></p> <p><i>"Contract egg producers to reduce carbon footprint"- (Questionnaire) C45</i></p> <p><i>"Well, we are a vertically integrated company, so we virtually got control of all of the supply chain. We produce desserts, we produce eggs, we produce liquid egg, we produce feed and that's all in house. From my point of view, we have 50 sites throughout and I need to be able to measure each site. The thing I did with the FHC is to go to the highest user sites for water and do a mass balance to make sure there were no water leaks, to make sure that what's coming in is coming out"- (Interview) C45</i></p> <p><i>"[the company] has built up a comprehensive quality assurance system. This covers all aspects such as traceability, animal welfare, environmental protection and sustainability." - (Environmental report) C49</i></p> <p><i>"[Engagement with customers for the promotion and assistance of better water management done] through sharing of best practice" - (Questionnaire) C61</i></p> <p><i>"We believe in a collaborative approach in our working practices and throughout our supply chain, from suppliers through to our customers and consumers, and we take a similar view in our progress towards sustainability." - (Website) C63</i></p>	<p>In the data gathered from the different sources there is some evidence of the company seeking engagement with suppliers in sustainability issues. However, there is no clear evidence of the company challenging or requiring their suppliers to improve their water policies and practices. Further investigation is needed in the criteria used in the SEDEX and ETI standards.</p> <p>The evidence shows that some sort of supplier engagement towards environmental issues and objectives is being carried out but it is difficult to assess its extent and whether or not this cover water issues.</p> <p>In the questionnaire the respondent gives information about carbon footprint reduction. In the interview it is indicated that they are a vertically integrated company, which means that they control most of their supply chain, which means a direct "supplier" engagement.</p> <p>A supply chain engagement is mentioned but water is not clearly specified.</p> <p>The respondent indicates that engage stakeholders to improve water use in the supply chain with customers through the sharing of best practice. This corresponds to a generic answer and no further information is shared.</p> <p>The company indicates on its website that a supply chain orientation is part of their philosophy. However, no further information is given and water is not mentioned.</p>

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"We are not in a sufficiently authoritative position to give such advice"... "This is more a question of being sure that suppliers have their own robust management systems but we employ an agronomist who discusses water efficiency as part of crop reviews and spreads advice and best practice where appropriate." - (Questionnaire) C66</i></p> <p><i>"We do have international suppliers but the bulk of what we buy is UK grown. The other major growing areas are [Murcia?], which is for leaf salad during the winter, and we have some product grown in France and Italy on the same basis and for wheat, we buy Canadian. North American but usually Canadian, for the bread bakery." ... "The closest we get is GlobalGap and Sedex. Although Sedex is principally about worker rights, there is something in there about the environment. But we don't have a company-specific standard so the standard we would normally apply is GlobalGap." ... "Now, for us particularly, we're not a very large company so there is a limit to our ability to influence what goes on in the value chain up and downstream of us, but one of the reasons I did those exemplar footprints was to justify the next stage which would involve value chain engagements. That might be a particular project with particular grower groups or it might be engaging with tools that are already there and building back into an audit process, just building that into a supplier evaluation process." - (Interview) C66</i></p>	<p>The company has not had such engagement yet but recognises the importance on doing so and seems to have a plan for carrying it out in the future. One of their major concerns is the perception that they do not have enough authority for influencing their supply chain.</p>

Eight companies were marked with red under this category as evidence of not adoption of the SP4.2.1 indicator was found for all of them. Table 8.8 presents the quotes for all these companies.

Table 8.8: Quotes of companies marked with red in the ‘requirement of suppliers to adopt better water practices’ indicator (SP4.2.2)

<i>Quotes</i>	<i>Comments - Analysis</i>
<p><i>"We give advice on better environmental practices to our staff through a newsletter but not to customers or suppliers. We are a relatively small company and as such we are resourced accordingly and we have other priorities." -(Questionnaire) C3</i></p> <p><i>"Well, I think we talked to our main suppliers quite regularly about this sort of environmental impact but we've sort of been focusing more on the carbon footprints rather than just the water usage. I wouldn't say we pushed our suppliers to reduce their water usage yet." -(Interview) C3</i></p> <p><i>"[We aim to] Communicate and negotiate with suppliers to apply comparable environmental standards to our own, when operating on our behalf." -(Website) C3</i></p> <p><i>"On the supply side management of things, we do not give much guidance to our suppliers but it is an area in which we would like to focus on in the future." -(Interview) C4</i></p> <p><i>"We will work with our suppliers to ensure that their environmental practices are compatible with our own, and annually we review objectives and targets for any packaging waste." -(Website) C17</i></p>	<p>The company does not engage with suppliers to promote better water use practices in their operations, this is evidenced by the responses in both the questionnaire and interview. Moreover in their website they indicate vaguely that they liaise with suppliers for them to apply comparable environmental standards.</p> <p>They do not give guidance or carry out engagement with suppliers but the interviewee recognises that there is an area they should be focusing on in the future.</p> <p>It is briefly mentioned that a type of engagement is being carried out with suppliers but only packaging waste is mentioned.</p>

<i>Quotes</i>	<i>Comments - Analysis</i>
<i>"Looking at our own practices first"- (Questionnaire) C25</i>	Supply chain engagement has not been sought because they are focused only on their operations at the moment
<i>"Resources and other priorities"- (Questionnaire) C41</i>	This has not been done due to resources and other priorities
<i>"None of our business"- (Questionnaire) C46</i>	The respondent indicates that it is not the company's responsibility to do so.
<i>"Lack of resources." - (Questionnaire) C64</i>	The participant indicates that this is an area in which they have not done much work due to lack of resources.
<i>"No. We haven't really. No to be honest with you, not for water. That's one of the things that we've done. We haven't really got to grips where it's our suppliers, and pushing them. We maybe request to see what they're doing in terms of environment or what policies they have, and what their corporate social responsibility might be. We don't push our suppliers really to meet targets or anything." - (Interview) C64</i>	
<i>"The overall Environmental / Sustainability Agenda has been disseminated down through the business from Board Level and we have a well-articulated set of principles and overall desire to do the correct thing. Excellent results through our Waste /Recycling Programme and Energy Minimisation Practices have been achieved year on year and I am sure as we move forward with the Sustainability Agenda issues such as stakeholder assistance for better water practices will have a raised profile." - (Questionnaire) C65</i>	Engagement with suppliers has been carried out in other sustainability areas such as energy and waste. The respondent indicates that water will be an area that will be incorporated in the future to such engagement.

As shown in Table 8.8 all the companies marked with red but one explicitly indicated in their primary data (interviews or questionnaires) that they do not carry out engagement with their supply chain for improved water management. They all indicate that they do not do so because of lack of resources and/or because it is not considered as an important aspect for them to carry out. On the other hand, C17 is the only company with evidence solely from secondary data for this indicator. This company fell under this category as in their website it is briefly mentioned that some engagement is undertaken with their suppliers but it appears to be centred mainly in packaging waste.

Furthermore, 30 companies (45% of the sample) were marked with light red for the evaluation of the SP4.2.1 indicator. For these companies no evidence or relevant information was found in their sourced data.

The overall results for SP4.2.1 indicate that there is a level of awareness in the industry with regards of the importance of aiming for a sustainable use and consumption of water throughout all the steps involved for the growth and processing of their products. This is evidenced by the number of companies marked with green under this indicator (18%). However, evidence of unawareness was also found in 12%

of the sample as companies specifically indicated that they do not perceive this aspect as important. Furthermore, for 25% of the sample it was difficult to determine whether this importance has been realised from the evidence gathered. Whereas for 45% of the analysed sample no evidence was found.

The next section presents the results derived from the SP4.2.2 indicator that aimed to go a step forward and explore whether companies in the sector had identified the water footprint of their products in their supply chains.

8.1.2.2 Awareness of companies supply chain water footprints (SP4.2.2)

The water footprint to the water withdrawals involved in each step of the value chain of a product or service (Hoekstra, 2003). This footprint can refer to the impact on water resourced derived directly from the specific operations of a company, as analysed for the indicator SP3.4 (section 7.2.4). Nevertheless, it is worth noting that the main footprint of food products is the one derived from agriculture (Hoekstra, 2013). For this reason, SP4.2.2 was set up in order to explore the companies' awareness of the water footprint of their supply chains.

The results of this indicator are similar to those obtained for SP3.4. Table 8.9 presents the comparison of companies marked with green, yellow, red and light red for each case. As it can be seen, there are small differences in the number of companies that fell in each of the four categories.

Table 8.9: Comparison of results for SP3.4 (internal water footprint) and SP4.2.2 (supply chain water footprint)

<i>Colour</i>	<i>SP3.4 Internal water footprint awareness</i>	<i>SP4.2.2 Supply chain water footprint awareness</i>
Green	6	5
Yellow	6	6
Red	7	8
Light red	48	48

Key: Does the data gathered evidence the adoption of the indicator?: ■ Green: Yes, ■ Red: No, ■ Yellow: Difficult to assess or ambiguous, ■ Light red: No evidence

It is worth noting that most companies were marked with the same colour for both the SP3.4 and SP4.2.2 indicators. This is because it was found that companies that are aware of their internal water footprint are often working towards the reduction

of the overall water footprint of their products in their supply chains. In addition, in most cases the same quotes (evidence) were used for assessing both indicators. However, there are three companies that differed in the results for these two indicators. Table 8.10 shows a comparison of the results and data for such companies.

Table 8.10: Comparison of companies that differed in the results for SP3.4 (internal water footprint) and SP4.2.2 (supply chain water footprint)

	<i>SP3.4 Internal water footprint awareness Evidence</i>	<i>Analysis</i>	<i>SP4.2.2 Supply chain water footprint awareness Evidence</i>	<i>Analysis</i>
C14	No evidence	Not mentioned	"Each year we survey the source and level of water our growers use to irrigate their beet crop and currently over 95% of the water contained in our beet is from rainwater alone."... "[a crop assurance standard] covers production, food safety and environmental safety criteria and has become a condition of all of our grower contracts." – (Environmental report)	Although a direct mention to supply chain water footprint is not done, it is interesting that they survey the level of water use from their growers. This activity is related to the calculation of water footprint.
C35	"We completed a first-of-its kind project that mapped our company's total environmental footprint: carbon (air), land and water." – (Environmental report)	It is briefly mentioned that their water footprint has been calculated but no more information is disclosed.	No evidence	Not mentioned
C64	The company has calculated a water footprint of: "2.73 cubic metre per tonne of product". – (Questionnaire)	The company has calculated their internal water mass balances and the footprint at the factory level. They have not done so at the farm level	"No we haven't. No, that's something we haven't done. We've done a carbon footprint but we haven't done a water footprint." ... "What we have done is, we've certainly done footprints at the factory level, to say, this is the water coming in and this is where it goes, so this much is used in the product, this much is used in cleaning, this much is used in this [inaudible], and done it that way. So we've done a little bit but not the proper footprint that you're used to." – (Interview)	The company has calculated their internal water mass balances and the footprint at the factory level. They have not done so at the farm level

Key: Does the gathered data evidence the adoption of the indicator? ■ Green: Yes, ■ Red: No, ■ Yellow: Difficult to assess or ambiguous, ■ Light red: No evidence

In the case of C14, no evidence was found to assess whether the company is aware of their internal water footprint (SP3.4). However, for SP4.2.2 it was found that

although there is no explicit mention to the water footprint term they show an indication of surveying the water use (blue water) from their growers of beet, however there is no mention of the water consumed (green water). This shows that some work is being carried out towards the understanding of their supply chain water footprint but further efforts are needed.

Similarly, C35 briefly mentions in their environmental report that their environmental footprint (water) has been calculated but no further information is given. For this reason, they were marked with yellow for the SP3.4 indicator whereas for the SP4.2.2 indicator no evidence was found in terms of their awareness of the water footprint in their supply chain.

On the other hand, C64 scored green for the SP3.4 indicator while red for SP4.2.2. This is because the participant indicated in both the interview and questionnaire that they have calculated their water-mass balances internally which can be interpreted as their awareness of the water footprint derived from their internal operations. Nevertheless, the participant also indicated that they have not done so at a farm level, which is in other words their supply chain.

Results for the SP4.2.2 indicator were close to those in the SP3.4 indicator, this is because both indicators are close related. Another possible factor is that companies that embark the understanding of the water footprints of their operations due so in a holistic way that takes into account both their internal processes as well as those from their supply chain.

The analysis carried out for the 'external action' theme indicates that there is some evidence of adoption of the soft path for water elements for this category. However, the lack of evidence for each indicator introduces a level of uncertainty on the extent to which this has been done. The next section discusses the results obtained for the 'influence on water governance' theme proposed as part of this research.

8.2 Influence on water Governance (SP5)

Water governance refers to the political, administrative and socio-economic systems in place that influence the development, management and delivery of water resources in the society (GWP, 2002). The framework for the soft path for water in the food and drink industry proposed in this thesis takes elements of the water stewardship

concept. This indicator aims to evaluate step 5 of the water stewardship concept: 'Influence on water governance'. Governance under this indicator goes beyond the responsibilities and the actions undertaken by governments. It also refers to the engagement with non-governmental actors for promoting water sustainability in a specific nation or region (WWF, 2013).

The motivation of the private sector, and in this case the food and drink industry, to engage with the water public policy arena relies on the mitigation of risk and of the uncertainty embedded in the availability of water resources. Such influence can be carried out independently or in junction with other businesses or NGOs. Morrison et al. (2010, p36) propose five principles for responsible engagement with water governance:

1. *Advance sustainable water management*: this refers to a clear and honest interest in a sustainable water management that is equitable, efficient and that does not compromise ecological thresholds. This means that the businesses' objectives should be aligned with a genuine commitment for improving social, environmental and economic conditions related to water whilst addressing the companies' impacts.
2. *Respect public and private roles*: it is the governments' responsibility to establish and implement water policies that guarantee water sustainability in a given region or country. As a result, businesses engaged with the influence on water governance should act as a support rather than a replacement to such responsibility. In other words, to reinforce existing legislation and proactively engage with governments to enhance regulations in a continuous process that seeks water sustainability.
3. *Strive for inclusiveness and partnerships*: companies engaged with the influence on water governance need to seek approaches that bring together affected stakeholders. This inclusiveness and partnership can be reached through working with existing water sector actors such as NGOs and researchers.

4. *Pragmatism and integrated engagement*: governments, NGOs and other stakeholders are already carrying out efforts in most countries seeking for water sustainability. Pragmatism means that companies need to engage and add momentum to these efforts rather than working independently. Integrated engagement refers to the recognition of the complexities and interconnectedness with water and other policy areas like energy and food, and to the facilitation of raising awareness of such links and complexities in the wider policy.
5. *Accountability and transparency*: this is an important principle for managing and acknowledging achievements throughout the business as well as for promoting trust among stakeholders. This principle aims to reduce reputational risk which is something crucial for businesses.

In order to measure the extent to which the analysed sample engages and influences water governance, two indicators were set up. First, the indicator SP5.1 aimed to find evidence for an influence on governance in the UK, given that all the analysed companies belong to the UK's food and drink industry. Furthermore, it was found that most of the companies have transnational operations across the globe and the SP5.2 indicator aimed to evaluate the influence on water governance in other locations worldwide.

8.2.1 Influence on water governance in the UK (SP5.1)

In order to determine whether the analysed companies seek to influence the UK's water governance, evidence was sought in all the data sourced for the 67 businesses chosen for this research. Evidence of adoption was found in the sources of only two companies, this is 3% of the sample. While for 97% (64 companies) no evidence was found and the extent of influence on water governance in the UK could not be determined. Figure 8.5 presents a pie chart with the overall results for this indicator.

SP 5.1 Water governance influence in the UK

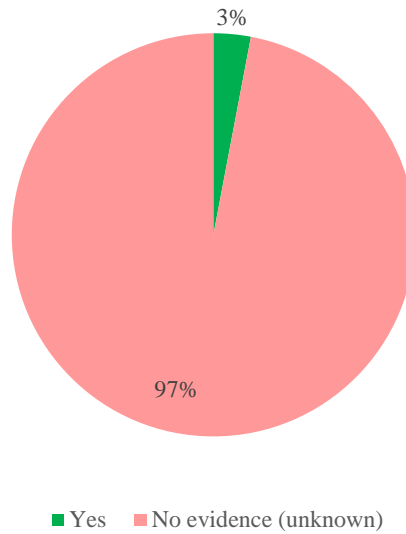


Figure 8.5: Influence on water governance in the UK (SP5.1) overall results

C18 presented evidence in their website of their work in partnership with WWF UK. Their efforts have focused on the replenishment and enhancement of two catchment areas in Norfolk and restoration projects around the same area. The quote extracted from their website is presented as follows:

“We are one year into our three year replenishment partnership with WWF UK to measurably improve the quality and quantity of water in two river catchment areas close to our business in Norfolk and south London. Already two restoration projects have been completed, including the creation of a new river channel on the River Nar in Norfolk and in stream restoration work at two locations on the River Cray in Sidcup.” - (Website) C18

On the other hand, C43 presents evidence in their environmental report of engagement with the promotion of water sustainability in the UK as it is involved in the Food and Drink Federation’s water working group. Their main purpose of this group is to encourage water efficiency throughout the industry’s supply chain. Following is the quote from their environmental report:

“As part of our commitment to drive water efficiency across the industry, we chair the Food and Drink Federation’s Water Working Group, and have helped to develop a guide on managing water use along the supply chain. The Every Last Drop guide provides a series of golden rules to help food and drink manufacturers save water.” - (Environmental report) C43

As it can be seen, both companies show some evidence of influence in the UK’s water governance. In the first case, C18 indicates an engagement with an NGO

for replenishing a catchment area and improving its water quality. Furthermore C43 indicates their commitment to improve water efficiency in the whole UK's food industry. In both cases there is evidence of principle 1 (advance sustainable water management) as both companies show an interest on striving for sustainable water management. Furthermore, the evidence gathered from both companies also suggests that principles 3 (strive for inclusiveness and partnerships) and 4 (pragmatism and integrated engagement) are also fulfilled as they indicate a partnership with a recognised NGO as well as with a UK's food association. From the data gathered, the fulfilment of principles 2 (respect public and private roles) and 5 (accountability and transparency) could not be evaluated.

A main finding in this indicator was the degree of uncertainty involved in its evaluation. For 97% of the sample no evidence was found in the data gathered that pointed to the engagement with water governance of the individual companies. In other words, the extent to which companies seek an influence on the UK's water governance could not be determined. The next section presents the findings of the evaluation of the engagement with water policy of the analysed companies in other countries outside the UK.

8.2.2 Influence on water governance elsewhere (SP5.2)

A similar analysis to the one made for SP5.1 was done for this indicator. Results for SP5.1 indicated that, from the evidence gathered, a degree of engagement in the UK's water policy arena was found for two companies. For the rest 65 companies from the sample no evidence was found which suggests a level of uncertainty on whether businesses from the food sector participate or seek influence on the British water governance. This is the reason why the extent to which companies engage with water policy in other countries was evaluated.

Figure 8.6 presents the overall results obtained for this indicator. In this case evidence of water policy engagement in other countries aside from the UK was found in 10% of the sample (seven companies). Furthermore, for 1% (one company) such involvement was difficult to determine and for 88% (59 companies) no evidence was found.

SP 5.2 Water governance influence elsewhere

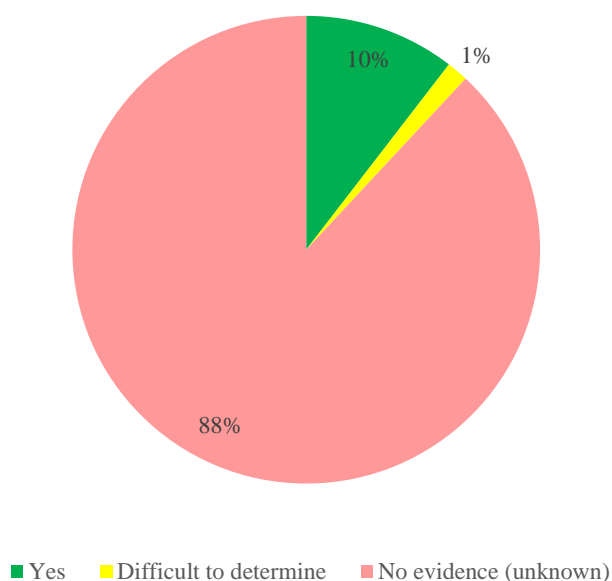


Figure 8.6: Influence on water governance elsewhere (SP5.2) overall results

Seven companies (10% of the sample) were marked with green under this indicator as evidence of engagement in water policy was found in the data gathered. Table 8.11 shows the quotes gathered for each of these companies and the evaluation of fulfilment with the influence on water governance principles.

Table 8.11: Quotes of companies marked with green in the ‘influence on water governance outside the UK’ indicator (SP5.2)

Quotes	Comply with the principles?*				
	1	2	3	4	5
<p>“[We are] supporting a charity project along with the Government of Ethiopia to help achieve a target of safe water and sanitation for every child by 2015. The project aims to provide water and sanitation to the most vulnerable communities, reduce diseases and contribute to a reduction in child mortality. [Our] contribution is helping support the construction of sustainable water points, gender separated latrines, hand washing facilities, and hygiene education across local communities, schools and health posts.” – (Environmental report, Website) C15</p>	Y	Y	Y	Y	U
<p>“We are a founding member of the Water Resources Group (WRG) ... which is helping to change the ‘political economy’ for water reform by leveraging a wide ranging and unique network of experts; by convening and promoting on-going dialogue among communities, civil society, water user groups, experts and government officials; and by building bridges between water experts and non-experts, enabling a wider set of government, community and business leaders to become engaged in the water reform process. WRG is helping countries perform an initial diagnostic of gaps in their water supplies and consider the economics of various solutions.” – (Environmental report) C18</p>	Y	Y	Y	Y	U
<p>“[We are] a signatory to the UN CEO Water Mandate, an initiative to help companies develop, implement and disclose sustainable water practices. This demonstrates our commitment to working with governments, civil society and other stakeholders to protect and fulfil the human right to water as defined by the United Nations – and in particular to reducing our water consumption in parts of the world where it will make the biggest difference.” – (Environmental report) C27</p>	Y	Y	Y	Y	U

Quotes	Comply with the principles?"				
	I	2	3	4	5
<p>“Our global stakeholder network is vast. It ranges from people we regularly engage with as part of our operations, to those whose public positions influence our activities. We identify the following groups as fundamental to our continuing business success (in alphabetical order) and aspire to deeper stakeholder engagement with them. - Academia - Communities - Consumers and general public - Customers - Employees - Governments - Industry and trade associations - Inter-governmental organisations - Non-governmental organisations - Reporting agencies - Shareholders and the financial community - Suppliers (including farmers and smallholders)”... “On water, we have been reporting for several years now on our public policy engagement and collective action. We also publish on our website our positions on the World Health Organization and World Health Assembly’s agenda points related to maternal, infant and young child nutrition, as well as our membership to industry associations in the field of infant nutrition.” – (Environmental report) C43</p>	Y	Y	Y	Y	U
<p>“Engagement with the Institute for Public & Environmental Affairs (IPE), a Chinese environmental NGO, to discuss water quality in effluent discharged by our yeast factories in China”– (Environmental report) C51</p>	Y	Y	U	U	U
<p>“By working with governments, academia, NGOs, business associations and other interested stakeholders, we strive to develop effective and sustainable solutions to environmental, health and safety challenges we face in our business activities. ... “We will engage, as appropriate, government bodies to ensure our position is known concerning the Human Right to Water and that supplies should be available in a fair and equitable manner to members of the community. Such water should be safe and of consistent and adequate supply and affordable within local practices.” ... “Our search for a clean and ample water supply has an impact on each community in which we operate, as well as on our business operations. We are committed to working with governments that preserve the human right to water for individuals in the communities where our company operates, in addition to advocating for this right more broadly.” – (Environmental report) C52</p>	Y	Y	Y	Y	U
<p>“We need to work in partnership with governments, NGOs and consumers to address and manage water use effectively. Water pricing and water metering, alongside consumer education, will ultimately be necessary to drive systemic change.” – (Website) C59</p>	Y	Y	Y	Y	U

Key: “Principles for water policy engagement (Morrison et al, 2010, p. 36) : 1. Advance sustainable water management; 2. Respect public and private roles; 3. Strive for inclusiveness and partnership; 4. Pragmatism and integrated engagement; 5. Accountability and transparency
U – undetermined, cannot be determined from the data gathered
Y – yes, the data gathered shows evidence of principle fulfilment

From the data gathered, engagement in the water policy arena in specific countries outside the UK was found in C15, which mentions its work with the Ethiopian government towards water sanitation. Furthermore, C51 briefly mentions its work with the Chinese government in terms of water quality. The remaining five companies (C18, 27, 43, 52 and 59) do not mention any countries specifically but they rather indicate a broad engagement with governments, NGOs, research bodies and academia across the globe.

It is worth noting that from the data gathered, an extensive in-depth analysis for each of the principles cannot be carried out, so results presented are indicative. Principle 1 or the interest in a sustainable water management was marked as fulfilled in all the companies marked with green under the SP5.2 indicator (see Table 8.11). Similarly, principle 2 or the respect of public and private roles was marked as fulfilled

for all companies, as they all seem to be working in junction with governments. Furthermore, principle 3, or the seek for inclusiveness and partnerships, and principle 4, or the pragmatism and integrated engagement, were marked as fulfilled for all companies marked in green but C51 as from the data gathered for this company this could have not been determined. Finally, principle 5, which refers to accountability and transparency, was marked as undetermined for all the companies that fell into the green category for SP5.2. In order to evaluate this last principal a more in-depth analysis should be carried out.

One company was marked with yellow under the evaluation of the SP5.2 indicator, as it was difficult to determine whether they are committed to influence water governance. The quote gathered from their environmental report is presented as follows:

“We are also committed to working with others, including our customers, suppliers, governments, nongovernmental organizations, industry, academia and research centers, to help create a successful future for all our stakeholders.”- (Environmental report) C36

C36 was marked with yellow as it is not clear from the data presented in their environmental report whether the commitment they have to working with governments, NGOs, academia and research centres include water governance but rather other topics.

For the evaluation of the SP5.2 indicator, or the influence on water governance in other countries aside the UK, 59 companies (88% of the sample) were marked with light red as no evidence was found in the data gathered that pointed out to such engagement. This does not necessarily mean that companies are not working towards it but rather that if they are doing so they are not communicating it in their publicly available information. Furthermore, work towards the influence on water governance could also be carried out through the association with other companies in the sector rather than a direct engagement with the water policy arena. Nevertheless, it is a responsibility for the private sector to strive for a more sustainable water management in the areas they and their suppliers operate in order to reduce risk and to work towards the building of a more equitable society in environmental terms.

In summary, the results obtained for the ‘external action’ theme (SP4) indicate that a formal recognition of water as a human right was only found in 4% of the sample. In all these cases there was an explicit mention of the protection of the human right to

water. In addition, 15% of the sample briefly mentioned water community programmes they have around the world or their target to provide safe water to people. Moreover, 18% of the companies presented evidence for their commitment to reduce their impact on water resources through their supply chains, while only 7% of the sample present evidence of their work towards the calculation and understanding of their supply chain water footprints. Results in this theme indicate that there seems to be some adoption of this element and its elements in the sample analysed. However, the lack of evidence for each indicator introduces a level of uncertainty on whether this theme has been adopted or not by the sample.

Findings in the ‘influence on water governance’ theme (SP5) evaluation indicate that this area seems to have been embraced by only few companies of the sample. In contrast, for 93% of the companies no evidence was found in the data gathered that pointed towards the influence on water governance either in the UK or elsewhere. This does not necessarily mean that companies towards this theme but rather that they are not communicating effectively if they do so. Also, work in this area could also be carried out through the association with other companies rather than a direct engagement. Whatever the case, it is a responsibility of the corporate sector to strive for a sustainable water management and positively influence the governance of resources in places where they operate. Chapter 9 provides a summary of key findings and recommendations for future practice and research.

Chapter 9

Conclusions and Recommendations

Research is creating new knowledge
- Neil Armstrong

This chapter discusses the key findings obtained in this research. Water and its better management are an urgent need society as a whole is facing. There is a particular interest on how to embed water sustainability principles in the food sector due to the vast amounts of this resource that are involved in it. Corporations in this area hold a responsibility for striving for a sustainable use and consumption of water throughout their operations and strategies. Many previous efforts that aim to propose ways in which this can be done were found in the literature such as the virtual water and water footprint concepts and the corporate social responsibility and water stewardship initiatives. All of these proposals share a common philosophy, which is the acknowledgement of the water planetary boundaries we are subjected to. The soft path for water is a concept that offers a paradigm shift in the water management area and proposes an alternate ‘path’ society can follow for not crossing such boundaries. It was found that there is a need for a framework that translates all these ideas into action and proposes steps companies can undertake in order to move towards this new path.

This study aimed to first define what the principles of a soft path for water in the corporate sector would be. Second, it aimed to determine if there is any evidence of these principles being applied in the food sector. This sector was chosen as food is the most water-intensive area in our society. A set of experts was consulted in order to build a clear framework for defining a soft path for water for the corporate sector. Results obtained from this data combined with previous works carried out by WWF

(2013) and Oxfam (2013), led to a proposition of a multi-criteria framework for a soft path for water in the corporate sector (see chapters 3 and 4).

This framework was used for evaluating the water policies and practices of a sample of 67 companies in the UK food sector engaged with the reduction of water use. Results indicate a degree of adoption of a soft path for water, however there is still a long way ahead for a fully adoption of a soft path approach in the food sector (see chapters 5, 6, 7 and 8). This concluding chapter discusses in section 9.1 the summary of key findings, section 9.2 offers recommendations for business practice, while section 9.3 offers avenues for future research and some concluding remarks.

9.1 Summary of key findings

This research aimed to investigate and evaluate a way in which corporations in the food sector can embed soft path principles. Previous efforts found through the review of literature, combined with the themes obtained with the experts' data analysis, served as the stepping stones for the proposition of a set of principles and indicators for a soft path for water for businesses, specifically for the food sector. A framework was then designed around five main themes: 'setting the ground', 'knowing the environment', 'internal action', 'external action' and 'influence on water governance'. Following this framework, a sample of companies from the food sector was evaluated. This section presents a summary of the key findings obtained in this research.

9.1.1 There is still a long way to a soft path for water in the food sector

The obtained results indicate some level of implementation of the soft path for water principles proposed in this research, as evidence of their adoption was found in the minority of the evaluated sample. However, the majority of the sample presented a lack of implementation or an absence of evidence in the gathered data. Companies' efforts appear to be mostly centred on their internal efficiency spectrum. Aspects related to the reduction of water impacts in their supply chains, the understanding of their water footprints (and virtual water), the awareness of water environmental limits or the engagement with society for protecting the human right to water are not yet a

common practice. Results suggest that there is still a long way to go towards a soft path for water in the food sector. It was also highlighted the need for better reporting and data disclosure from businesses.

It is worth noting that the findings obtained in this study are only centred in the 67 companies analysed, who had committed to reduce water as they all are signatories to the Federation House Commitment (FHC). This poses a question about the situation of the companies who have not made a formal commitment to water sustainability. A soft path for water should not be seen as a goal but rather as a process that is always evolving and improving. The results obtained in this research for the evaluation of the proposed framework for a soft path for water in the food sector are a snapshot in time of the status quo of the UK's food sector.

9.1.2 More work is needed in the supply chain

The food sector requires vast amounts of water in all the steps of the supply chain as this resource is essential for growing and processing food. For this reason, this research aimed to identify if companies work closely with their suppliers in order to promote a better water management throughout their whole supply chain. The obtained results indicate that only 12 companies (18%) showed evidence of engaging with their suppliers for this purpose. However, it was found that eight companies (12%) specifically stated that they do not engage with suppliers for improved water management due to lack of resources or because it is not considered as an important aspect for them to carry out.

Results indicated that only a small proportion of the sample evaluated (five companies, 7%) have calculated the overall water footprint of their products. These findings suggest that the virtual water or the water embedded in each of the steps of growth and processing of food products is yet something that companies are not taking into consideration. In other words, results indicate that it is imperative for companies to work with their supply chain, especially with farmers, for minimising the overall environmental impacts on water resources derived from their products.

9.1.3 Efforts are centred in companies' internal efficiency

The findings of this research suggest that all the 67 analysed companies are addressing, in a greater or lesser extent, elements of the proposed soft path for water. These findings indicate that concerns about water are shaping their corporate strategies. The indicator with the highest degree of adoption was the disclosure of information on the reduction of water in the companies' operations. Results of the analysis show that 42 companies (63%) present figures of water reduction in their operations. However, it was found that there is a lack of consistency on how these figures are reported and, more importantly, companies do not report the link between how the achieved reductions relate to the environmental conditions from where water is being abstracted. Some companies disclose their reduction of water in terms of absolute percentages, some others present data in amount of litres or cubic metres, some provide baseline data and some others do not. Consistency in the way these figures are reported is very important for the assessment of the degree in which the impact on the environment is being minimised.

Similarly, it was found that 21 companies (31%) of the sample disclose data on the amount of water they withdraw from the environment. However, none of the data presented showed a link with the environmental context, which is imperative for the assessment of the scale of the impacts generated on the environment. The assessed sample seems to be centred in their operational efficiencies as 41 companies (61%) indicate that efficient technologies have been implemented in their operations. This result is expected as all the evaluated companies have committed to reduce their internal water usage. The findings indicate that companies are adopting water-efficient processes and technologies in operations like cleaning and cooling. This represents a positive first step companies can carry out in order to achieve relatively easy wins in the reduction of water impacts derived from their operations and strategies. However, there is much more to the sustainable use and consumption of water than the mere adoption of efficiency.

9.1.4 There is still a need for thinking different about water

A key characteristic in the soft path for water philosophy is the re-evaluation of water services, which is to look at water as the services it provides rather than the resource itself. For the corporate sector this was translated in three ways: first the use of different qualities of water for different purposes, which in the assessment 20 companies (30%) of the sample indicated that this is something they do in activities like cooling and heating, cleaning and irrigation. Second, the implementation of rain-water harvesting, which 13 companies (19%) presented evidence of this being implemented. Third, the recycling of water, which presented a similar result to the use of different qualities of water and evidence of this being carried out was found in 23 companies (34%). However, some companies specifically stated that they do not carry out a re-evaluation of water services due to reasons like financial and cost constraints, technical unfeasibility or perception that a high quality of water is needed in all the steps of food processing.

Results obtained indicate that companies are starting to put attention on water as much as they do on carbon, however this does not seem to not be a mainstream practice yet. This is evidenced in 26 of the companies (39%) in which the word count frequency of both terms compare in their publicly available information. Water poses a key risk for companies in the food sector as it is a main resource on which they are dependant. In the assessment carried out, only 19 firms (28%) make a clear recognition of such dependence. In addition, only ten companies (15%) acknowledge specifically the finite nature of water resources. These findings indicate that there is still a need for a shift in the way companies think about water. This resource is no longer the 'limitless' resource it was thought to be in the past.

In order to achieve sustainability of water resources it is crucial to know the environmental limits each ecosystem can withstand. This is one of the main characteristics of the soft path thinking. In the evaluation carried out it was found that 12 companies (18%) have some knowledge of such limits. However, this understanding appears to be centred on the water standards they need to comply with when water leaves their premises. Some companies indicate that they know how much water they are allowed to extract from the environment only when this activity is

directly done by them. These results indicate that there is a lack of knowledge on the thresholds ecosystems can sustain in terms of the water that can be withdrawn and suggest that environmental agencies and regulatory bodies need to carry out more work not only on determining such limits but also on communicating them to the water users, which includes businesses.

Impacts on water resources and their significance depend on the local environmental conditions from which water is being used and consumed. This research aimed to investigate if companies identify and disclose the water-stressed regions in which they have operations. Evidence of this was found only in nine companies (13%), however all the evidence found but one referred to areas outside the UK such as India, Australia and Ethiopia. Only one company mentioned a low rainfall area in England where they operate. These findings suggest that there is a need for companies to identify and disclose all the water-stressed regions where they operate, this is key for the reduction of risk to their businesses.

9.1.5 External engagement is on early stages

Companies are, in some extent, engaging with the social aspects and impacts of their water use. It was found that 17 businesses (25%) are working towards the engagement with staff for a sustainable use of water and have achieved water reductions through this. In addition, ten companies (15%) evidenced that they carry out community programmes around water, most of which are done outside the UK. Water is a human right and companies have the responsibility for protecting it, results indicate that only three companies (4%) from the evaluated sample specifically mention their duty for the protection of the human right to water. On the other hand, companies mentioned some reasons for not engaging in this area like it is something out with the company's realm or their lack of resources for doing so. These findings evidence that there is a need for businesses in the food sector for engaging with the social aspects of water in order to embrace water sustainability in their strategies.

Influence on water governance is an important step for companies to adopt a soft path for water in their strategies. Results indicate that there is very little work carried out in this area by the evaluated sample. Evidence of influence on water governance was found in only nine companies (13%), most of which is being done in

countries outside the UK. The next section provides a series of recommendations for businesses to carry out in order to embrace a soft path for water in their companies.

9.2 Recommendations for business practice

This research evaluated the degree to which the proposed soft path for water has been adopted in a sample of companies committed to reduce water in their activities. It should be recognised that a degree of adoption of all five principles was found in a greater or lesser extent in the sample. This evidences that companies are already working towards a sustainable water management in different areas. Nonetheless, a lack of adoption was also found in the sample as well as a level of uncertainty as no relevant data was found in many cases. This lack of data points out the need for businesses for better reporting and disclosing data. This section provides a series of recommendations for businesses to incorporate soft path principles in their strategies and operations. (Appendix 12 presents an executive summary of the findings and recommendations of this research sent to the FHC signatories after the completion of this thesis)

9.2.1 Work closely with the supply chains

It is positive that businesses are aiming to reduce the direct impact on water resources derived from the food products that are manufactured. However, the highest impact is done at the growth stage of food (agriculture). Results obtained in this research suggest that the evaluated companies need to work more closely with their supply chains in order to reduce the overall impact on water resources that they incur on. This can be done through advising and requiring suppliers to adopt practices that improve their water management. It is important for companies to understand the water that is embedded in all the steps of their products, this can be achieved by committing to the process of calculating and understanding the overall water footprint in the supply chain. In other words, the overall water flows involved in all the supply chain.

9.2.2 Enhance the existing internal water efficiency initiatives

In this research it was found that companies from the sample are already concentrating most of their efforts on undertaking internal activities for a sustainable use of water. Obtained results suggest that companies are adopting efficient technologies and processes that require less water for their functioning. However, these initiatives can be enhanced by: empowering staff through the promotion of water conservation initiatives and awareness activities; and by engaging in the process of calculating and understanding the water footprint derived from the internal operations. This footprint refers to the water quantities involved in all the internal processes. There is more to a sustainable use and consumption of water than just an adoption of efficient technologies and processes in the internal operations, the food sector needs to start thinking about water differently.

9.2.3 Change the way they think about water

Businesses need to think about water as a resource vital for all human and natural processes rather than a resource simply to be consumed (Tercek, 2015). Companies can embrace this by giving the same importance to water and its management as much as they do for carbon reduction and energy efficiency. They need to start looking at water as the services it provides rather than the resource itself. For example, high quality water may not always be needed in the different activities companies carry out. Pragmatically, this can be done through the implementation of rainwater harvesting, using different qualities of water for different purposes and carrying out water recycling in-situ.

All human activities have an impact on the environment, no matter how big or small. An important step for businesses is to understand and disclose their impacts on the water environment. This can be done though publicly disclosing water withdrawals per operating site, with special attention given to water-stressed areas. It is recommended to do this not only country-wise but also in all sites owned by companies globally. Moreover, companies need to work with environmental agencies and regulatory bodies, locally and globally, in order to understand the water thresholds in

which companies can operate. In addition, they need to identify and disclose the global water-stressed regions in which they have activities.

In addition, companies need to clearly recognise the finite nature of water, as well as their dependence on this resource, not only for their internal activities but more importantly in their supply chains. Businesses are part of an interdependent system constituted by suppliers, customers and communities in which they operate. This interconnectivity means that impacts on the environment are cumulative and dependent on all the activities in this network.

9.2.4 Go beyond and engage with ‘external’ bodies to their organisations

‘External’ has been marked with inverted commas as often externality can be misunderstood with areas in which companies have no influence. However, businesses need to seek to influence all involved stakeholders in order to promote a collective action for the reduction of the impacts on water resources. Findings in this research suggest that this is an area in which businesses do not seem to be working on. In practical terms this can be done by carrying out community or social programmes that promote water awareness and conservation in all the communities where they operate. In addition, there is a need for companies to formally recognise and protect the human right to water. This can be done through the execution of human rights impact assessments and/or social impact assessments that specifically address water.

To businesses fully embrace water sustainability in their strategies, the external action needs to go beyond the aforementioned activities and seek to positively influence the broader water governance arena. This is an activity that needs to be done in all countries and regions in which they operate. In order to achieve this, companies’ objectives need to be aligned with a commitment for improving sustainability and addressing the impacts on the environment. In addition, companies need to reinforce the existing legislation and enhancing existing regulations. Furthermore, they need to work collectively with existing actors such as NGOs and academia and in line with existing efforts. It is important that businesses improve accountability and transparency, which entails the public disclosure of achievements and performance in the water sustainability agenda.

9.2.5 Better reporting of strategies and achievements

An issue that commonly emerges in the corporate social responsibility area is the need for an improved and standardised way of reporting. Companies appear to disclose their advancements in this area in different ways and data is usually difficult to compare. This research corroborated this trend as a key finding was the lack of consistent reporting carried out by businesses. This study proposed a framework of steps and initiatives that companies in the food sector need to carry out for embedding water sustainability in their strategies. This tool can be used as a model for reporting that companies can follow in the future.

The series of recommendations for business practice posed in this thesis aim to propose ways in which businesses from the food sector can embrace water sustainability. All of these suggestions should not be seen in isolation but rather as an interconnected network of activities and initiatives that need to be continuously reinforced. A sustainable use of water is not a goal but rather an ever-changing process that needs to adapt constantly.

9.3 Areas for future research

This study has taken a particular approach for a sustainable use and consumption of water in the food corporate sector. It has proposed a framework with five elements for a soft path for water in the food sector, and subsequently tested this framework with a sample of companies in order to find the extent to which a soft path has been embraced in this industry. Results obtained indicate that there is a degree of adoption of a soft path for water in the evaluated companies but there is still a long way for its fully implementation in the corporate strategies. There are many more avenues for future research that need to address different areas.

Results from this research suggest that much future work is needed for companies to understand the overall water footprint their products have and, more importantly, to work towards the reduction of such impact holistically. Companies have a vast network of global operations and supply chains, which means that environmental impacts on water resources are not done in one specific location but worldwide. This introduces a level of complexity for regulatory bodies when promoting best practice. Special attention should be given to developing nations that

may or may not have the institutional capability for promoting soft path for water practices. As a result, further research and efforts are needed for bridging this gap.

The total impact on water resources derived from the food sector has two categories. First, the water consumed in agriculture for crop growth, known as green water, accounts for 92% of such impact. The remaining 8%, known as blue water, is the water used for food processing in each of the supply chain steps (Allan et al., 2015, p. 308). These figures point out the urgent need for carrying future work and research at the farm level for their sustainable use of water. Consequently, farmers hold a great responsibility as they are the ones who directly manage water. As a result, companies urge to have more engagement with farmers in their supply chains in order to reduce the overall water footprints of their products. It is worth noting that such future studies in this area need to take into account the local environmental and social conditions of the places evaluated.

A key finding of this study was the lack of consistent reporting carried out by businesses in the area. This research proposed a framework for evaluating corporate strategies towards the sustainable use and consumption of water. Further research should focus on how to embed this framework into the existing reporting practices companies have. Special attention should be given to the quality and type of data disclosed in order to strive for consistency and facilitate comparability in future studies.

This research evaluated a sample of 67 companies in the UK food sector that are already committed to the reduction of water in their operations through the Federation House Commitment (FHC). As a result, future research should investigate companies that do not have such commitment and evaluate if soft path for water principles are being adopted in their strategies.

This study provided an overview of the corporate soft path elements adoption in a sample of food manufacturing companies. Future research could be developed for corroborating the results obtained in this study by carrying out an in-depth investigation with some case studies. In other words, observation, ethnographic or action research studies can be carried out for witnessing how does a soft path for water 'look like' in the daily activities of a given company. Moreover, all the five principles proposed in this thesis could be seen as different topics for investigation.

Often one of the most difficult challenges of corporate environmental management is integration in the core of businesses (Schaltegger et al., 2003). The soft path for water approach proposes an alternate paradigm for water management and policy. It then suggests to ‘think out of the box’ and look at water in a different way. It is therefore important to carry out businesses’ perception studies for examining the willingness companies have for adopting a soft path for water in their strategies. A starting point for this could be similar to the research carried out by Wutich et al. (2014) on people’s perceptions on soft path solutions in different countries across the globe.

This study acknowledges that policy and regulation have a big role to play in the management and conservation of water. It is then important for governments and regulatory bodies to include soft path for water principles in their policies in order to influence industry. At European level, the water framework directive (WFD), adopted in 2000, is a framework that has the objective of the protection and improvement of aquatic environments as well as ensuring a sustainable water use (EC, 2000). This is an initiative that, in other words, has introduced soft path thinking in its core (Klawitter, 2009). Regulations like the WFD, or any new emerging complementary policy instruments that have potential to contribute to the WFD (Gouldson et al., 2008), could benefit from the results obtained in this study as a way for informing businesses in order to meet with the objectives set by the WFD.

The results obtained in this research derived from data disclosed directly by the evaluated companies. There is a great responsibility on independent ‘watchdogs’ such as NGOs and academia for verifying the different claims companies make through their reporting and disclosed information. Future research and practice needs to focus on mechanisms for ensuring transparency and independent monitoring.

Future research needs to investigate the political economy complexities involved in the consumption of water along the supply chains. As it was discussed in this thesis, companies in the food and drink industry often have vast supply chains across the globe. Political economy refers to the effects of politics on the economy (Morton, 2013) and in this context it indicates the effects politics have on water consumption for the production of food. As a result, future research should take into account political economy factors of soft-path approaches to water management.

This research focused on the food sector due to first, the large amounts of water involved in this area and second, because of the importance of food in our society as it is vital for human life. However, a soft path for water proposition can be done for other sectors that also require much water such as the textile industry. Like food, the textile industry relies on agriculture and hence large water flows are expected to be involved in it.

As a concluding remark, sustainability needs to take into account all the environmental, social and economic aspects of development. This study focused only on one environmental aspect (water), however the framework proposed in this research can be tailored to any of the other aspects of sustainability. In other words, future research could focus on the proposition of a 'soft path for corporate social and environmental responsibility'.

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Appendices

Appendix 1: IWA Conference 2012 Output

Abstract of Poster Presented in: IWA (International Water Association), World congress on Water, Climate and Energy. Dublin, Republic of Ireland, 13-18 May 2012. Dublin: IWA

The role of competition in Scotland to facilitate the sustainable use of water

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Keywords: Competition, water efficiency, sustainability, soft path.

Abstract

Soft-path for water emerges as the next paradigm for water management. It seeks the sustainable use of water by taking into consideration the intrinsic environmental limits and by highlighting the importance for behavioural shift in the society. Scotland opened the water industry non-domestic market to competition since 2008. The research carried out sought whether the opening to competition has facilitated the sustainable use of water within the market. The study sought to set a starting point for analysing the possibility for adopting a *soft path* approach in the country. Semi-structured interviews with a sample from all stakeholders were carried out. The research yielded some interesting results. The opening to competition has, in some extent, pushed some sustainable measures in the market such as improved service levels, reduced prices and some significant volume savings. These seemed to have been driven merely by cost. Nevertheless, the market is in an immature state and there is still a long way to travel in order to achieve sustainability and to adopt *soft path* measures.

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Appendix 2: PRE XI Conference 2012 Output

Conference Paper Presented in: In: Aristotle University of Thessaloniki, International Conference Protection and restoration of the Environment XI. Thessaloniki, Greece, 3-6 July 2012. Thessaloniki: Aristotle University of Thessaloniki.

CAN THE SOFT PATHS FOR WATER BE ADOPTED AND BE USEFUL AT FOOD INDUSTRY SCALE?

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ABSTRACT

Higher population rates and demands have raised the concern for adopting better practices with regards of the way water is managed. The soft path for water is a concept first introduced in 2002 where the main emphasis is centred on efficiency and conservation. The soft path for water is focused on demand rather than supply and in how services currently provided can be delivered in ways that recognize the need for economic and socio-ecological sustainability. This new approach for demand management has currently being applied at regional scale, examples of this can be found in Canada and the US. Nevertheless, there is still a need for applying it at a micro scale. The purpose of this research is to evaluate whether the adoption of soft paths at the industry level is useful and achievable. This paper will explore the methodology to follow in order to evaluate how this approach can be applied in businesses in the food industry in Scotland. First, a selection of case studies will be done in order to research in depth by using both qualitative and quantitative approaches to determine the physical, reputational, regulatory and financial risks that the adoption of soft paths will help (or not) to overcome. Additionally, the paper will propose a method to be applied when evaluating socio-ecological resilience at a business level.

Keywords

Water; soft path; water footprint; sustainability; resilience

1. INTRODUCTION

This paper is based on a doctoral research currently being carried out by Catalina Silva-Plata at the David Livingstone Centre for Sustainability (DLCS), University of Strathclyde. The soft-path in water management is a recent paradigm that has taken force due to its intrinsic preservation for the environment. Few examples have been adopted this approach into practice at regional policy-levels in places like Canada and California (Kampragou et al, 2010). Nevertheless, its application at a smaller scale has not been researched. The purpose of this study is to evaluate the feasibility of its adoption at the industry scale. This paper will first make a brief introduction to the subject and to the different paradigms for water management. In addition, it will discuss the methodology to be followed in order to make a feasibility analysis of its application at the food industry scale and early findings drawn up from the research. Furthermore, some conclusions will be discussed along with the scope for further research.

With the high population growth, the demand of water has increased in such an extent that its future availability is endangered, it is estimated that if the current levels of water consumption continue by 2025 two thirds of the global population will suffer from water stress (Pacific Institute, 2007). As a result, it becomes crucial to take actions in order to reduce the water consumption at all levels so sustainability can be achieved and the impact on the environment

can be reduced. Current practices for water management at industry level take little consideration to the environmental limits to which they are subject to. This is due to the lack of introduction of the environmental protection into the traditional paradigms in water management. The traditional *supply-led* and centralised infrastructure engineering approach has been effective in establishing large infrastructure projects such as hydro schemes (Wolff and Gleick, 2002). This philosophy focuses on supplying water without taking into account the environmental limits for water subtraction. The next paradigm commonly referred as *demand management* is based on efficiency and technology solutions for reducing the amount of water used for different activities (Brandes et al., 2005).

Soft-path for water emerges as the step forward approach that complements the other two by taking into consideration environmental limits and the importance for behavioural change (Gleick, 2003). In the *soft-path* for water management, companies, individuals and government agencies work together in order to meet their water needs and provides water systems that supply different qualities tailored to their use (Wolff and Gleick, 2002). This latter paradigm seeks sustainability in the water sector, which CIWEM defined as:

“A sustainable water sector would ensure that water supply meets appropriately managed demand within natural environmental limits in all regions of the country and that water services are delivered at an acceptable price to the consumer.” (CIWEM, 2010 p. 13)

The purpose of this research is to evaluate whether the adoption of a soft-path paradigm facilitates the sustainable use of water at the food-industry level. This, with the aim of setting a starting point to analyse the possibility of applying this concept at a much wider range at industrial scale. The next section makes a brief summary of the three water management paradigms that have evolved during time, in addition to the importance of its applicability in the food-industry level.

2. KEY CONCEPTS

2.1 Water Management Paradigms

Only until recent years the global concern for how water is managed has been addressed. During the last 2500 years the management of water has been centralised on building large infrastructures for water supply (Brooks et al., 2009). This includes dams, reservoirs, large aqueducts, etc. This process constitutes a linear process in which water is abstracted from the Earth and distributed to cities/human communities and sent back to rivers and streams. Nevertheless, a perfectly linear process cannot be sustained over the long term with increasing population rates and a changing climate.

The water soft path approach can be traced back to writers in Canada and the USA where new ideas on how to meet the demand for water required more radical solutions. According to Brooks (2005), it can be traced back to the “energy soft path” of the 1970s when a similar contrast was made between small-scale, localised supply as against the large-scale “hard path.” This later developed into the concept of providing for a perceived need or service, rather than simply supplying a commodity.

This is a new approach for water management in which the main focus is conservation and efficiency of this resource (Maas and Porter-Bopp, 2011). People do not want to use water itself, they want to drink, grow food, produce goods and services, be clean, etc. This constitutes the final goal of using this environmental service that the Earth provides. Once the objective has been set, there are different ways in which it can be achieved. There are

two paths of meeting this fundamental need: the hard and the soft path (Wolff and Gleick, 2002). The “hard path” approach for water management is based on the traditional “supply-led” and “centralised infrastructure” engineering approach (Gleick, 2003). As a result, this approach manages assets (watersheds) rather than people. In contrast to it, the soft path for water manages people as its main priority.

Wolf and Gleick (2003) mention six differences between the soft and hard paths, these are listed below:

1. Rather than only supplying water, the soft path tells companies, individuals and government agencies to work together in order to meet their water needs. It takes environmental limits into consideration.
2. The soft path introduces water systems that supply different qualities. The highest quality of water is not necessary for all the activities that need water.
3. The soft path argues that investments in decentralised alternatives can be as cost-effective as the investments in the centralised solutions.
4. The soft path obliges the water agency/company to work closely with the end water users.
5. In the soft path water is being used productively to meet water demands.
6. The soft path recognises the complexity of water economics.

Gleick (1998) was the first to introduce the concept of the soft path for water. This approach bases itself in demand rather than supply management. In other words, it makes emphasis on reducing demand rather than increasing supply. This soft approach may also rely on centralised infrastructure but it complements it with decentralised approaches such as efficient technologies and human capital (Wolff and Gleick, 2002). In Gleick’s own words:

“A transition is under way to a ‘soft path’ that complements centralized physical infrastructure with lower cost community-scale systems, decentralized and open decision-making, water markets and equitable pricing, application of efficient technology, and environmental protection.”(Gleick, 2003)

The soft path for water does not see water as the end product; it rather considers it as the means for accomplishing another goal or need (Brandes et al., 2005). As a result, in planning projections the demand that is taken into consideration is not water itself but the services it provides. This approach is the step forward for what academics call demand management, which is the “planning and implementation of programs to influence the amount, composition, or timing of demand for some commodity or service” (Shrubsole and Tate 1994 cited in Brandes and Ferguson, 2004 p. 1). As a result, the soft path for water aims to satisfy the demands for services based on water rather than supplying water per se (Brandes et al., 2005) (See Table 1).

TABLE 1: Water management paradigms Source: Adapted from Brandes et al (2005 p. 8)

	Supply-side approach	Demand-Management	Soft path
Philosophy	Water virtually limitless. Storing larger volumes	Water finite. Conservation. Efficiency	Water is finite and driven by Ecological processes. Fundamental re-evaluation of the way we meet the services that water currently provides
Approach	Reactive	Short-term and temporary	Proactive - long term change focused on attitudinal change
Fundamental Question	How can we meet the future projected needs, given current trends and population Growth	How can we reduce needs for water to conserve the resource, save money and reduce environmental impacts	How can we deliver the services we currently provided by water in new ways that recognise the need for long- term systematic changes to achieve sustainability?
Primary Focus	Built infrastructure	Efficiency	Conservation
Tools - disciplines	Large scale - centralised engineering. Solutions. e.g. Dams, reservoirs, distribution systems	Innovative engineering And market based solutions. E.g. Low- flow technologies. Drop irrigation	Full suite of social sciences, relies on decentralised distribution. E.g. Grey water re-use. Dry sanitation. Industrial innovation

2.2 Research gap on the soft-path applicability at a small scale

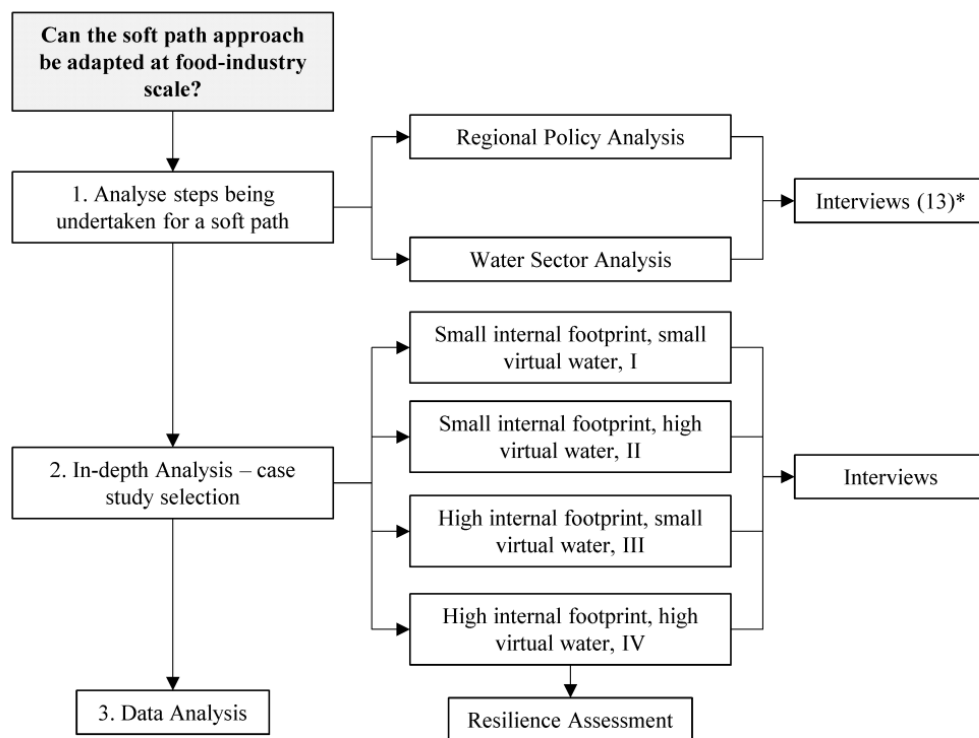
Review in the literature has little evidence on research carried out for the applicability of the soft- path for water at a smaller scale. Some examples can be seen at regional scale in places like Guelph city in Ontario, Canada. Bitstock (2010), in his study for this region, noted how water conservation measures, in particular water supply and wastewater limitations were written into the strategy document “Growth Plan for the Greater Golden Horseshoe” region. This attempted to reconcile growth of the urban area with water conservation, backed up by education campaigns, therefore preventing major infrastructure projects such as pipelines to the Great Lakes. He felt it was too early to claim the 2009 “Water Conservation and Efficiency Strategy” had achieved its aim but there was evidence of civic leaders at least understanding the ecological limits to growth.

Industry and energy together account for 20% of water demand (UNESCO, 2009). Although it is not the main responsible for water withdrawals (Agriculture accounts for 70%), it is considered that significant reductions and soft water path approaches can be adopted in this sector. In addition to this, cost-related benefits might be more tangible in this sector. As a result, for the study being carried out for this paper, the food industry in Scotland has been chosen as the sample for evaluating the feasibility of the soft-path approach at a micro-scale. It is important that corporations implement sustainability measures with regards of the water consumption in their operations. Hoekstra et al (2011) identify four reasons why companies should implement these measures:

Physical risk: companies need to prevent future risks due to water shortages that might affect their operations.
 Reputational risk: a company needs to take care for its image and the public perception of whether or not sustainable measures are being adopted.
 Regulatory risk: regulations in the water sector are projected to increase.
 Financial risk: all of the above risks can be translated into cost increase or revenue reduction.

Companies should consider water as one of their most valuable resources, especially in the food industry sector where it is essential for its operations. With the increasing pressure put on water, it becomes more crucial to put measures into place for its conservation. At the end, *water is life* and humanity cannot survive without it. The soft-path for water could be a good approach for managing water more sparingly by taking into consideration the natural threshold that cannot be crossed so sustainability is achieved. The proposed method for analysing the feasibility of this paradigm adoption at a much smaller scale is discussed in the next section.

3. METHODOLOGY



Key: * Number of interviews carried out in step 1.

FIGURE 1: Methodology Steps

The methodology proposed for this research entails both quantitative and qualitative analysis. It is important to capture the views of the practitioners in the field using both methods to find out the feasibility of the *adoption of a soft path approach at food industry scale*. The different steps to be followed are shown in Figure 1.

3.1 Analyse the steps being undertaken for a soft path

This constitutes the first stage in the proposed methodology shown in Figure 1. This first phase constitutes the analysis of the steps already being undertaken in the region of study (Scotland). This region has been selected since the study is built upon a small research project run by the David Livingstone Centre for Sustainability (DLCS) and CookPrior Associates born out of the unique experiment taking place in the Scottish water industry. The non-domestic sector has been opened to competition since April 2008 and a small number of retail Licensed Providers (LPs) have been established to service the commercial sector. This research investigated if the arrival of competition has seen LPs offering value-added services focused on demand management and other aspects of *soft-path* measures employed in other countries such as Canada and Australia. The boxes coloured in grey in Figure 1 represent this first small research project. This section shows the methodology used for data collection in the first stage.

Semi-structured interviews were employed to capture the interviewees' views of the "role of competition in Scotland" and its contribution in facilitating "the sustainable use of water". Participants were chosen according to their roles in the water sector in Scotland (See Figure 2.). In total thirteen interviews averaging an hour were carried out by two researchers. Audio recordings were avoided so as to encourage more forthright views.

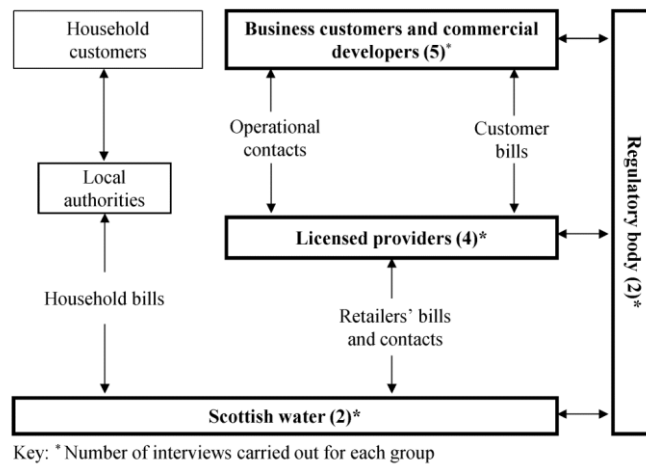


FIGURE 2: Scottish water industry structure

3.1.1 Participants

The methodology set out to cover all levels of the non-domestic Scottish water industry. Figure 3 shows in detail the type and date of the interviews. There were two levels at which the research focused. Firstly, the macro level comprising the regulators WIC (Water Industry Commission for Scotland) and CMA (Central Market Agency), and the principal water supplier, Scottish Water Wholesale (SWWS); and secondly, at the micro level the LPs, who provide a retail service directly to individual customers, and the customers themselves.

The first interview was Scottish Water Horizons, a SW subsidiary focused on the renewable sector, which provided a useful access point to the industry and a source of important contacts. It gave an opportunity to test out the research questions. Following this, a series of interviews were carried out with representatives from each stakeholder group. All participants received the questions for the semi-structures interviews in advance.

The head of SW Wholesale Revenue and Management was approached as a suitable representative to express SW's viewpoint. Meetings with both regulators (WIC and CMA) followed. Interviews with four LPs were then arranged according to availability. Note that not all LPs agreed to have face-to-face interviews (See Figures 2 and 3.). Instead teleconferencing or emails were used. Wessex Water was not approached due to its limited activity in the market at present.

Interviews		
Regulator	Date	Type
Market administrator	28-Sep-11	M
Regulator	28-Sep-11	M
Scottish Water (SW)		
Scottish Water Horizons	Date	Type
Water Wholesaler	4-Aug-11	M
Licensed Providers		
LP	Date	Type
LP1	13-Oct-2011	M
LP2	9-Nov-2011	TC
LP3	10-Oct-2011	E
LP4	4-Oct-2011	M
LP5	n/a	n/a
Non-domestic customers - BS		
Recommended customers		
Customer	Date	Type
A (City council)	9-11-2011	M
B (Hospital)	17-11-2011	TC
C (Food retailer)	17-11-2011	TC
Customers approached independently		
Customer	Date	Type
D (Dairy)	8-11-2011	M
E (Drinks)	7-11-2011	TC

Key: M – meeting, TC – teleconference, E- email

FIGURE 3: Semi-structured interviews

From a methodological perspective, it was important to capture the opinions from both sides. As a result, a small cross-section of consumers was selected. Business Stream, by far the largest LP, recommended three of its customers (named A, B and C for confidentiality purposes). In addition, two more customers (D and E) using the same LP were approached independently. The sample excluded customers from the other LPs due to time constraints. This is an area which would benefit from further research.

As discussed earlier, sustainability here has been defined as a water supply that “*meet appropriately managed demand within natural environmental limits in all regions of the country*” and at an “*acceptable price to the consumer*”. Questions were designed to provide a framework for interviews. Their purpose was to explore whether competition had encouraged the implementation of sustainable measures such as water efficiency and demand management and ultimately encouraged the adoption of a soft path for water. The key questions were:

- What and how have reductions in water usage been achieved in recent years?
- Why have you sought these savings?
- What are the drivers and who initiated them?
- Has the opening up of retail competition in Scotland made any difference?

The study used primarily semi-structured interviews, a recognized tool for data collection when carrying out qualitative research. Notes were taken by the two researchers in charge of collecting data. Grounded theory was used to analyse the data gathered. The next section discusses the findings derived from the data analysis.

3.2 In depth-analysis

The first step in the methodology entailed an analysis of the water sector in Scotland, to evaluate the possibility of the adoption of soft paths at industry scale. The purpose was to analyse until what extent the sustainable use of water is promoted at policy level in Scotland. The next stage constitutes the analysis of the food industry itself in a more in-depth way to test whether the soft path approach is feasible for its adoption at this scale (See Figure 1). For this, a selection of four companies will be done accordingly to their both internal and external water footprint. The water footprint is defined as the total water (in litres) involved in the production of goods and services (Chapagain and Hoekstra, 2004). The methodology to be used for the selection of the companies for the research will be based in the internal water footprint, in other words the water used on-site, versus the external footprint; or the overall water involved in the whole supply chain (See Table 2).

TABLE 2: Case study selection

Internal water footprint	External water footprint (virtual water)	
	Low	High
High	III	IV
Low	I	II

One company from each quadrant will be chosen for the study, for each of them semi-structured interviews and questionnaires will be applied. Additionally, a more in-depth study will be carried out for the company in the quadrant IV, which leads to the next step which is to carry out a resilience assessment (See Figure 1).

3.3 Resilience Assessment

Resilience is the capacity of a socio-ecological system to absorb changes without changing to an alternate estate (Holling, 1978). The purpose of the last stage is to carry out a resilience assessment for a company in the industry sector with both high internal and external footprints to measure how sustainable are their practices towards water management. Teigão dos Santos and Partidário (2011) have developed a simplified tool for measuring resilience which they called SPARK (Strategic Planning Approach for Resilience Keeping) (See Figure 4). This methodology has been developed for its adoption in planning processes and will be adapted to the current industry study.

The last stage intends to measure whether or not the adoption of soft paths for water build up resilience when adopted by companies. As a result, before and after measurements should be taken in order to evaluate this. A resilience assessment is being carried out by a group of stakeholders in the field. Consequently, this will include representatives from all the people described in Figure 2. This would be done as a form of a workshop.

To summarise, the methodology followed has first entailed the analysis of the Scottish water sector as a whole to determine what steps have been taken towards the sustainable use of water. In addition to this, a more in depth analysis in the food industry will be carried out. This step will entail the selection of four companies accordingly to both their internal and external water footprints. Additionally, a resilience assessment will be carried out for the company with a high overall footprint to determine whether the adoption of a soft-path enhances socio-ecological resilience or not. Until now, only the first stage has been successfully finished, the next section will show the early findings from it as well as the further

research that has to be done for evaluating the feasibility of a soft path approach at industry level.



FIGURE 4: Methodological framework for socio-ecological systems
Source: Adapted from Teigão dos Santos and Partidário (2011 p. 1532)

4. DISCUSSION AND CONCLUSIONS

4.1 Results from the analysis being undertaken for a soft-path

The interviews revealed a wide degree of agreement between Licensed Providers and customers alike that opening the retail market to competition had improved service levels, reduced prices and in some instances produced some significant volume savings. The regulators believed it was too early to expect these savings to appear in the national consumption figures due to the poor quality of historic data, though competition itself seemed to be driving improvements in the quality of data.

Throughout the discussions the word “sustainability” was hardly used, with a preference for “innovation” and “water efficiency”. There was no mention either of the concept of *soft path*, even at the level of the regulator. Future research could investigate whether this is because customers do not see themselves as likely to monopolise their regional water supply in such a way as to breach environmental limits of the region’s water resource.

Although evidence showed that some progress has been made, there is evidently still much further to go to achieve a sustainable use of water. Most of the focus has been on cost-savings, rather than pure demand management and as yet the “soft path” approach remains a distant goal for the Scottish water industry.

4.2 Conclusions and Further research

The soft path is a new paradigm for water management that has taken more acceptances since its introduction. It takes into consideration the natural water limits to which every human activity is subject to. Up till date, the concept has been applied at regional and policy levels in different locations. Nevertheless, there is no evidence for its applicability at a much smaller scale. The PhD research that is currently being carried out is analysing the feasibility of its adoption at a food industry scale.

The methodology to be followed entails the use of both qualitative and quantitative analysis to determine how feasible is the adoption of the soft path for water at food industry scale. The first step was to analyse the scope of its applicability in Scotland in which, according to early findings, it appears that the concept has not been heard of before. These findings pointed

out those small steps are being carried out for promoting the sustainable use of water in Scotland since the water sector opened to competition in 2008.

The next steps to be followed entail a more in-depth analysis with four companies in the food industry with different internal and external water footprints. Additionally, the firm with the highest overall water footprint will be chosen to carry out a resilience assessment whose purpose is to determine if by adopting soft-path measures sustainability is achieved with regards of the water use.

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Appendix 3: IWRA Congress 2015 Output

Congress presentation in: World Water Congress XV,
International Water Resources Association (IWRA).
Edinburgh, Scotland, 25-29 May 2015. Edinburgh: IWRA.

In the quest for a *soft path for water* in the food industry

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(Theme: Global challenges for water governance)

(Subtheme: Corporate Social Responsibility: impacts on the water sector)

Introduction

Water is a vital natural resource upon which all human and environmental activities depend. Climate change, future population growth and consuming trends are factors that pose major uncertainties with regards to the future availability of this resource (WWAP, 2012). The *soft path for water* concept was first proposed as a paradigm shift in the water management area. It is centred in the sustainable delivery and use of water-related services matched to the needs of end users, rather than seeking sources of new supply (Gleick, 2002 & Wolff and Gleick, 2002). The concept was conceived as a way for governments and societies to embed water sustainability principles in their policies (Brooks et al, 2009 & Brooks and Brandes, 2011). This paper argues that this concept has also potential implementation in corporations and in their water policies.

Food is responsible for high amounts of water withdrawals in the world as crops and livestock need it for their growth and processing. Agriculture accounts for 70% of these withdrawals while industry for 20% (WWAP, 2012). The food industry is an interesting case as it joins both the agriculture and manufacture sectors. This research investigates for the first time the adoption of the *soft path for water* in the food manufacturing industry by analysing a sample of 67 companies in the UK. This paper presents the method utilised, followed by an analysis of the results and the conclusions obtained.

Methodology

The first step of this research aimed to define the *soft path for water* elements for the food corporate sector. A multi-criteria model was constructed based on the review of relevant literature and the consultation with 16 experts in the field. This model set up the baseline criteria for analysing the data obtained from the 67 companies. It consists of the following five themes, each of which has elements of the proposition of what a *soft path for water* means for the corporate food sector:

Setting the ground: water awareness & re-evaluation of water services

Knowing the environment: knowledge of impact & knowledge of environmental limits

Internal action: efficiency, technology adoption & staff engagement

External action: community & stakeholder engagement

Influence on water governance: engagement in the water public policy area

All the signatories to the Federation House Commitment (FHC) were selected as the sample for this study. The FHC is an initiative in the UK's food sector that aims to reduce water consumption in this industry by 20% by 2020 (FHC, 2007). These companies were selected due to their existing commitment to adopt better water practices in their policies. Data was

collected from both primary and secondary sources, which included: eight interviews, 12 questionnaires, 32 environmental reports, 57 websites and 22 published FHC case studies. The analysis of the data was done following the elements of the proposed model and the results obtained are presented and discussed in the next section.

Results

The evaluation of the extent to which the *soft path for water* had been implemented in the food industry was pursued through a series of 21 indicators. These indicators relate to the themes of the multi-criteria model proposed and each one was formulated in form of a question that could be answered in four possible ways: yes, no, difficult to assess and no evidence. Table 1 presents the summary of the overall results obtained per theme.

<i>Table 1: Summary per theme</i>						
	Yes	No	Difficult to assess	to	No evidence (Unknown)	
Setting the ground	30%	7%	20%		43%	
Knowing the environment	21%	15%	1%		63%	
Internal Action	49%	7%	4%		41%	
External Action	11%	11%	9%		69%	
Influence on water governance	7%	1%	0%		93%	

The category with the highest evidence of adoption was ‘internal action’; this is expected as the companies are already committed to increase their internal water efficiencies through the FHC. One of the key findings was the percentages of unknowns obtained for each category; this is potentially influenced by the wide range of sources collected but raises the question of the type of data companies disclose. In other words, there is a degree of uncertainty involved on whether or not each theme has been adopted in the analysed sample. The results also indicate that the highest uncertainty was obtained in the ‘influence of water governance’ theme which points out the complexity involved in the evaluation of this category.

Conclusion

This study evaluated the potential adoption of the *soft path for water* concept in the food industry and analysed all the FHC signatories in the UK. A five-element model was proposed to determine the extent to which the *soft path* concept had been implemented. Results indicate that most of the efforts have been done through efficiency and technology adoption in the companies’ internal processes. Evidence of adoption in all the themes was found but in a lesser degree. One of the key findings was the lack of evidence involved in each of the categories, which brings a level of uncertainty on whether or not they have been adopted. In conclusion, there is evidence that indicates that the *soft path for water* has been implemented to some extent in the sample evaluated but further efforts are required for to be fully adopted.

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Appendix 4: Experts' questionnaire - hardcopy version

Participant Information Sheet

Name of department: Department of Civil and Environmental Engineering

Title of the study: Water practices and attitudes in the food and drink industry in the UK.

Introduction

My name is Catalina Silva-Plata and I am a researcher at the University of Strathclyde. You have been invited to participate in a research project in the area of the sustainable use of water in the food industry. Before you decide whether to take part it is important that you understand why the research is being done and what it will involve. Please take time to read the following information carefully.

What is the purpose of this investigation?

In the modern world, it is becoming increasingly important to address how water is managed. In this study we are particularly interested in how the food and drink industry of the UK deals with the issue of water. Our concept termed the "soft path for water" called for increased efficiency, conservation and behavioural change. The research start by identifying current water practices in the UK food and drink industry and it will then determine the scope for water management improvement using the idea of the soft path for water. The study will also evaluate the industrial applicability of this soft path concept and will propose further developments.

This research is the most extensive study being done for evaluating the possible applicability of the soft path approach at industrial level. It is therefore of high importance to get your inputs in it. Results and outcomes of the study will be anonymous and confidential and will be shared with all the participants after its completion.

Why have you been invited to take part?

You have been invited to take part in this project because you are a representative academic and/or expert working in the area. This research is the most extensive study being done for evaluating the possible application of the soft path approach at industrial level. It is therefore of high importance to get your inputs in it. Results and outcomes of the study will be anonymous and confidential and will be shared with all the participants after its completion.

Do you have to take part?

Participation is voluntary and if you decide to take part you will be asked to sign a consent form. You can withdraw your consent at any time without having to give a reason. All responses will be anonymous and nobody will be referred to by name in the research findings.

What does your participation involve?

You will be asked to complete an on-line questionnaire, which will take approximately 10 minutes. Once completed, a small sample of participants will then be invited to take part in a semi-structured interview. This involves a face-to-face meeting or a phone call in which more in-depth questions will be asked, this interview should last no more than 20 minutes.

What happens to the information in the project?

On inclusion of this study, each participant will be allocated a code and the data will be stored on the basis of this code. No information that will identify individuals will be included in the data file. The electronic form of the data will be preserved for 5 years on a password-protected computer. The paper format of the data will be held in locked conditions for 5 years then destroyed through the safe mechanisms provided by the University of Strathclyde. The University of Strathclyde is registered with the Information Commissioner's Office who implements the Data Protection Act 1998. All personal

data on participants will be processed in accordance with the provisions of the Data Protection Act 1998.

What happens next?

If you agree to take part of the study you will be asked to read and sign a consent form to confirm this. Once the research is complete, research findings are to be published by keeping the anonymity of the information recorded. If you require any further information or feedback please contact us.

Thank you for reading this information – please ask any questions if you are unsure about what is written here.

Contact Details:

If you wish more information please contact me or my supervisor, the information is listed below:

Catalina Silva-Plata

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Graham Hills Building, 50 Richmond Street, Glasgow, G1 1XN
E-mail: elsa.joao@strath.ac.uk

Consent Form

Name of department: Department of Civil and Environmental Engineering

Title of the study: The soft path for water and its applicability in the food and drink industry in the UK.

Research summary

Higher population rates and demands have raised the concern for adopting better practices with regards of the way water is managed. Food is one of the areas that need special attention in order to promote sustainable practices for water management. The soft path for water is a concept where the main emphasis is centred on efficiency, conservation and behavioural change. The aim of the research is to identify current practices in the food and drink industry in the UK with regards of water, as well as the scope for improvement and the concept's applicability in the food and drink industry in the UK.

This research is the most extensive study being done for evaluating the possible applicability of the soft path approach at industrial level. It is therefore of high importance to get your inputs in it. Results and outcomes of the study will be anonymous and confidential and will be shared with all the participants after its completion.

I hereby:

Understand that any information recorded in the investigation will remain confidential and no information that identifies me will be made publicly available.

Understand that my participation is voluntary and that I am free to withdraw from the project at any time, without having to give a reason and without any consequences.

Confirm that I have read and understood the information sheet for the above project and the researcher has answered any queries to my satisfaction.

Understand that I can withdraw my data from the study at any time. Consent to being a participant in the project.

Yes

No

If 'Yes' is selected, the system displays question 1.

If 'No' is selected, Qualtrics directs the user is to question 3.

1. General Information

The following information will be kept confidential and is needed for classifying the samples. Each participant will be allocated a code and the data will be stored on the basis of that code.

1.1 Contact

Name

E-mail

Telephone

Organisation

2. Soft path for water

2.1 Are you familiar with the soft path for water management terminology?

Yes

No

If 'Yes' is selected the system displays questions 2.1.1. and 2.1.2.

If 'No' is selected, question 2.2 is prompted right after.

2.1.1 What does the soft path for water imply?

2.1.2 Do you think there is scope for its application in the food industry? - Why?

2.2 Demand Management is frequently used as the way for improving efficiency and reducing water use in the industry. Do you think this approach could be improved? How?

3. Expert nomination

3.1 Would you like to nominate another academic and/or practitioner for taking part of this survey?

Information will be kept confidential and your name will not be mentioned when we contact the person you are nominating

Yes

No

If 'Yes' is selected the system displays questions 3.1.1

If 'No' is selected, question 4 is prompted right after.

3.1.1 Please provide the contact information for your nominee

Organisation

Contact name

Contact E-mail

Contact Telephone number

4. Comments

Thank you for your responses and your time. If there is anything else you would like to add please leave your comments in the space below.

We thank you for your time spent taking this survey.
Your response has been recorded.

Appendix 5: Experts' profiles

Identified through literature

<i>Code</i>	<i>Expertise</i>	<i>Affiliation</i>	<i>ID</i>	<i>Q</i>	<i>I</i>
Exp02	Water and wastewater	Research associate, Centre for alternative wastewater treatment, Fleming College, Ontario, Canada	(1)		
Exp03	Transboundary water resource management	Director of TouchStone Resources	(1)	x	x
Exp04	Water management	Professor in Multidisciplinary Water Management, University of Twente	(2)		
Exp05	Water footprinting	Senior Water Advisor at WWF	(2)		
Exp07	Land use and watershed management	Independent	(1)		
Exp08	Water policy	Director of Innovation, POLIS Water Sustainability Project	(1)		
Exp13	Policy Development, energy and water conservation	International Institute for Sustainable Development	(1)	x	x
Exp14	Water footprint	WWF consultant	(4)	x	
Exp15	Water policy	Research associate, University of Waterloo	(1)		
Exp16	Water policy	Research associate, Waterwise UK	(1)		
Exp17	Farmers behaviours	Wheat/Sheep farmer South Australia	(1)		
Exp18	Environmental policy	Co-chair of the Program Management Committee for the Canadian Water Network	(1)		
Exp19	Water management and policy issues	Canada Research Chair in Water and the Economy, University of Lethbridge. Associate Research Professor, University of South Australia	(1)		
Exp20	Transboundary water resource management	Water Governance Systems Research Group, South Africa	(1)		
Exp24	Water policy	Master's candidate, University of Waterloo	(1)		
Exp25	Habitat and wildlife protection, environmental policy	Dalhousie University	(1)		
Exp26	Sustainable consumption and production	Consultant for the Sustainable Consumption and Production Branch - UNEP	(4)	x	x

<i>Code</i>	<i>Expertise</i>	<i>Affiliation</i>	<i>ID</i>	<i>Q</i>	<i>I</i>
Exp30	Water Sustainability	Senior Research Associate and Co-Director of POLIS Project on Ecological Governance, University of Victoria, Canada	(1)	x	
Exp32	Climatic variability and water resources	Emeritus Professor, University of Waterloo	(1)	x	x
Exp33	Pioneer of the soft path concept, leading expert on water and climate change issues	Founder and Head of the Pacific Institute	(1)	x	
Exp35	Freshwater programme officer	WWF Netherlands	(4)	x	
Exp36	Water policy	Chair of the Canadian Partnership Initiative	(1)		
Exp38	Food and water security	International Development Research Centre, South Asia	(1)		
Exp39	Land use of energy developments	PhD researcher, University of Calgary	(1)		
Exp40	Water policy	Assistant Professor, Department of Environment and resource studies, University of Waterloo	(1)		
Exp42	Water economics and governance	Financial advisor in Southern Africa, German Development Cooperation	(1)		
Exp43	Environment and development consultancy	Independent	(1)		
Exp44	Freshwater management	Freshwater manager WWF International	(3)	x	
Exp45	Environmental law and policy	Canadian Institute for Environmental law and policy	(1)		
Exp47	Freshwater management	Senior Freshwater Policy advisor WWF Canada	(1)		
Exp52	Water Footprint	Water Footprint Network	(4)	x	x
Total			31	10	5

Key:

ID : Method of identification

- (1) Brooks, D. B., Brandes, O. M., & Gurman, S. (Eds.), 2009. *Making the most of the water we have: The soft path approach to water management*. London: Earthscan
- (2) Hoekstra, A. Y. and Chapagain, A. K., 2008. *Globalization of water: Sharing the planet's freshwater resources*. Blackwell Publishing, Oxford, UK.
- (3) Chapagain, A. K. & S. Orr, 2008. *UK Water Footprint: the impact of the UK's food and fibre consumption on global water resources*. WWF-UK, Surrey.
- (4) Water Footprint Network, 2013. Water Footprint. [online] Water Footprint Network. Available at: <www.waterfootprint.org/?page=files/WFN-mission> [Accessed 8 April 2013]

Q: Questionnaire respondent I: Interview respondent

Identified through Networking

<i>Code</i>	<i>Expertise</i>	<i>Affiliation</i>	<i>ID</i>	<i>Q</i>	<i>I</i>
Exp01	Water and Assessment of Environmental Impacts	Secretary of Water, Hellenic Ministry for the Environment, Energy and Climate Change	(5)	x	
Exp09	Hydrology and Water Resource Management	Cranfield University	(6)	x	
Exp10	Water economics and governance	Researcher, ETH Zürich	(6)	x	
Exp11	Geographies of Development and the Environment.	University of St Andrews	(7)	x	
Exp12	Water and wastewater	Senior Visiting Research Associate, University of Oxford	(9)	x	x
Exp21	Hydrology	Universidad Javeriana, Colombia	(8)	x	
Exp23	Water footprint	S-Kern	(6)	x	
Exp27	Resources recycling	International Resources and Recycling Institute	(9)	x	
Exp28	Water treatment	Ecosse water services limited	(9)	x	
Exp29	Water footprint	Aristotle University of Thessaloniki	(8)	x	
Exp31	Food Security and Water Arsenic Contamination	SOAS, University of London	(6)	x	
Exp37	Research and Innovation in the water sector	Scottish Water	(5)	x	
Exp41	Environmental governance	Lecturer, University of St Andrews	(7)	x	x
Exp48	Business Strategy	Business Stream, Scottish Water	(5)	x	
Exp50	Human geography	Panteion University, Greece	(5)	x	
Exp53	Environmental engineering	Palestinian Water Authority	(5)	x	x
Total			16	16	3

Key:

ID : Method of identification

- (5) Networking in University of Strathclyde
- (6) IWA (International Water Association), World congress on Water, Climate and Energy. Dublin, Republic of Ireland, 13-18 May 2012. Dublin: IWA.
- (7) University of St Andrews, Future Connections. St Andrews, United Kingdom, 7-8 June 2012. St Andrews: University of St Andrews.
- (8) International Conference Protection and restoration of the Environment XI. Thessaloniki, Greece, 3-6 July 2012. Thessaloniki: Aristotle University of Thessaloniki.
- (9) Global Water Scarcity Conference 2012. Glasgow, UK, 22-23 May 2012. Glasgow: Radisson Blu Hotel

Q: Questionnaire respondent I: Interview respondent

Respondents from the Link Posted in The Water Network (2013)

<i>Code</i>	<i>Expertise</i>	<i>Affiliation</i>	<i>ID</i>	<i>Q</i>	<i>I</i>
Exp06	Corporate Social Responsibility	Marlboro MBA in Managing for Sustainability	(10)	x	N/A
Exp22	Accounting and Corporate Governance	Macquarie University	(10)	x	N/A
Exp34	Water Resource Management	Colorado State University	(10)	x	N/A
Exp46	Water Resource Management	VU University Amsterdam	(10)	x	N/A
Exp49	Impact Evaluation and Gender	International Water Management Institute	(10)	x	N/A
Exp51	Watershed Management	The Water Network	(10)	x	N/A
Total			6	6	N/A

Key:

ID : Method of identification

(10) Invitation posted on the 23 of June 2013 in: The Water Network, 2013. The Water Network. [Online] The Water Network. Available at: <water.tallyfox.com/> [Accessed 27 June 2013]

Q: Questionnaire respondent I: Interview respondent.

Note: respondents from 'The Water Network' link were not approached to take part in an interview

Appendix 6: Experts' interview guide

Participant Information Sheet

Introduction

You have been invited to participate in a research project in the area of sustainable use of water in the food industry. Before you decide whether to take part it is important that you understand why the research is being done and what will it involve. Please take time to read the following information carefully.

What is the purpose of this investigation?

In the modern world, it is becoming increasingly important to address how water is managed. The research start by identifying current water practices in the food and drink industry and it will then determine the scope for water management improvement in terms of increased efficiency, conservation and behavioural change.

Why have you been invited to take part?

You have been invited to take part in this project because you are a knowledgeable person in the water area and your insights are highly valuable for this study. This academic research is the most extensive study being done in its kind. It is therefore of high importance to get your inputs in it. Results and outcomes of the study will be anonymous and confidential. This research is completely independent and we do not hold any other affiliation aside from the University of Strathclyde

Do you have to take part?

Participation is voluntary and you can withdraw your consent at any time without having to give a reason. All responses will be anonymous and nobody will be referred to by name or affiliation in the research findings. Once the study is finalised every participant will get a report on the research outcomes.

What does your participation involve?

You will participate in a semi-structured interview (a guide of the questions can be found at the end of this document) that involves a face-to-face meeting or a phone call in which more in-depth questions will be asked, this interview should last no more than 30 minutes.

What happens to the information in the project?

On inclusion of this study, each participant will be allocated a code and the data will be stored on the basis of this code. No information that will identify individuals or companies will be included in the data file. The electronic form of the data will be preserved for 5 years on a password-protected computer. The paper format of the data will be held in locked conditions for 5 years then destroyed through the safe mechanisms provided by the University of Strathclyde.

The University of Strathclyde is registered with the Information Commissioner's Office who implements the Data Protection Act 1998. All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 1998.

What happens next?

Once the research is complete, research findings are to be published by keeping the anonymity of the information recorded. If you require any further information or feedback please contact us.

Thank you for reading this information. For questions or comments please use the contact details below

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E-mail: elsa.joao@strath.ac.uk

Semi-structured interview questions

1. Water is often one of the topics that have less attention in the global sustainability agenda – why do you think this is happening?
2. In your opinion, what are the key areas where policy and governments should work on in order to achieve a better water management?
3. What does the soft path for water imply and how would you imagine a soft path for water applied in an industry?
4. What about the water-energy nexus?
5. Water-footprint is a methodology commonly used for identifying the water flows and quantities in the production of a specific good or service. What do you think are the flaws, if any, of this approach?
6. Many of our environmental problems have an origin on wasteful behaviours. How do you think we can push behavioural change in the society?
7. Do you advocate for the use of technology or for pushing behavioural change as a way to solve environmental issues? (for both?)
8. Any additional comments or insights?

Appendix 7: Companies' profiles

(As of February 2014)

<i>Code</i>	<i>Sector</i>	<i>Q</i>	<i>I</i>	<i>ER</i>	<i>W</i>	<i>OPC</i>
C1	Beef, pork and poultry				X	
C2	Alcoholic drinks				X	
C3	Alcoholic drinks	X	X		X	
C4	Soft drinks	X	X		X	
C5	Beef, pork and poultry				X	
C6	Catering	X	X	X	X	X
C7	Dairy			X	X	X
C8	Beef, pork and poultry				X	
C9	Cereals and Bakery				X	
C10	Frozen and chilled foods			X	X	
C11	Catering				X	X
C12	Fruits and Vegetables				X	X
C13	Cereals and Bakery				X	
C14	Seasonings and sugar			X	X	
C15	Soft drinks			X	X	
C16	Cereals and Bakery				X	
C17	Dairy				X	
C18	Soft drinks			X	X	X
C19	Soft drinks			X		X
C20	Beef, pork and poultry				X	
C21	Dairy			X	X	
C22	Dairy			X	X	
C23	Fruits and Vegetables				X	
C24	Fruits and Vegetables				X	
C25	Fruits and Vegetables	X			X	
C26	Multiple products [†]			X	X	
C27	Multiple products [†]			X		
C28	Alcoholic drinks			X	X	
C29	Fruits and Vegetables	X	X	X	X	X
C30	Organic food			X	X	
C31	Confectionery and Snacks				X	
C32	Frozen and chilled foods			X	X	X
C33	Multiple products [†]			X		X
C34	Frozen and chilled foods				X	
C35	Confectionery and Snacks			X	X	
C36	Confectionery and Snacks			X		X
C37	Dairy				X	
SO1*	Confectionery and Snacks					
C38	Seafood				X	
C39	Beef, pork and poultry			X	X	X
C40	Dairy			X	X	
C41	Dairy	X	X		X	
C42	Fruits and Vegetables				X	X
C43	Multiple products [†]			X		X
C44	Seafood				X	
SO2*	Seasonings and sugar					
C45	Eggs	X	X		X	
C46	Dairy	X				
C47	Fruits and Vegetables				X	X
C48	Frozen and chilled foods					X
C49	Beef, pork and poultry			X		

<i>Code</i>	<i>Sector</i>	<i>Q</i>	<i>I</i>	<i>ER</i>	<i>W</i>	<i>OPC</i>
SO3*	Cereals and Bakery					
C50	Frozen and chilled foods				x	
C51	Seasonings and sugar			x		
SO4*	Cereals and Bakery					
C52	Multiple products ^y			x	x	
C53	Cereals and Bakery			x	x	x
C54	Fruits and Vegetables			x	x	
C55	Dairy				x	
C56	Soft drinks				x	
SO5*	Honey					
SO6*	N/A					
C57	Confectionery and Snacks				x	x
C58	Beef, pork and poultry			x	x	x
C59	Multiple products ^y			x	x	
C60	Confectionery and snacks			x	x	x
C61	Fruits and Vegetables	x			x	
C62	Beef, pork and poultry				x	
C63	Cereals and Bakery				x	x
C64	Cereals and Bakery	x	x	x	x	
C65	Confectionery and Snacks	x			x	x
C66	Frozen and chilled foods	x	x		x	
C67	Frozen and chilled foods				x	x
Total:		12	8	30	58	22

Key:

Total of signatories as of February 2014: 73

*: Companies scoped out from the analysis

^y: Multiple products refers to a set of multinational corporations that manufacture a wide range of food products from confectionery to soft drinks, cereal and coffee.

Q: Questionnaire respondent

I: Interview participant

ER: Environmental report sourced

W: Website sourced

OPC: Online published case studies

Appendix 8: Companies' questionnaire - hardcopy version

Participant Information Sheet

Introduction

You have been invited to participate in a research project in the area of sustainable use of water in the food industry. Before you decide whether to take part it is important that you understand why the research is being done and what will it involve. Please take time to read the following information carefully.

What is the purpose of this investigation?

In the modern world, it is becoming increasingly important to address how water is managed. In this study we are particularly interested in how the food and drink industry of the UK deals with the issue of water. The research start by identifying current water practices in the UK food and drink industry and it will then determine the scope for water management improvement in terms of increased efficiency, conservation and behavioural change.

Why have you been invited to take part?

You have been invited to take part in this project because you represent a company in the food and drink industry in the UK that has already identified the need for better water management and your insights are highly valuable for this study. This research is the most extensive study being done in its kind. It is therefore of high importance to get your inputs in it. Results and outcomes of the study will be anonymous and confidential. This research is completely independent and we do not hold any other affiliation aside from the University of Strathclyde.

Do you have to take part?

Participation is voluntary and if you decide to take part you will be asked to sign a consent form. You can withdraw your consent at any time without having to give a reason. All responses will be anonymous and nobody will be referred to by name in the research findings. Once the study is finalised every participating company will get a report on the research outcomes.

What does your participation involve?

You will be asked to complete an on-line questionnaire, which will take approximately 15 minutes. Once completed, a small sample of participants will then be invited to take part in a semi-structured interview. This involves a face-to-face meeting or a phone call in which more in-depth questions will be asked, this interview should last no more than 30 minutes.

What happens to the information in the project?

On inclusion of this study, each participant will be allocated a code and the data will be stored on the basis of this code. No information that will identify individuals or companies will be included in the data file. The electronic form of the data will be preserved for 5 years on a password-protected computer. The paper format of the data will be held in locked conditions for 5 years then destroyed through the safe mechanisms provided by the University of Strathclyde.

The University of Strathclyde is registered with the Information Commissioner's Office who implements the Data Protection Act 1998. All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 1998.

What happens next?

If you agree to take part of the study you will be asked to read and sign a consent form to confirm this. Once the research is complete, research findings are to be published by keeping the anonymity of the information recorded. If you require any further information or feedback please contact us.

Thank you for reading this information. For questions or comments please use the contact details below

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Consent Form

Research summary

In the modern world, it is becoming increasingly important to address how water is managed. In this study we are particularly interested in how the food and drink industry of the UK deals with the issue of water. The research start by identifying current water practices in the UK food and drink industry and it will then determine the scope for water management improvement in terms of increased efficiency, conservation and behavioural change.

This research is the most extensive study being done in its kind. It is therefore of high importance to get your inputs in it. Results and outcomes of the study will be anonymous and confidential and will be shared with all the participants after its completion.

I hereby:

Understand that any information recorded in the investigation will remain confidential and no information that identifies me will be made publicly available.

Understand that my participation is voluntary and that I am free to withdraw from the project at any time, without having to give a reason and without any consequences.

Confirm that I have read and understood the information sheet for the above project and the researcher has answered any queries to my satisfaction.

Understand that I can withdraw my data from the study at any time.

Consent to being a participant in the project.

Yes No

If 'Yes' is selected, the system displays question 1.

If 'No' is selected, the user is directed to question 9.

1. General Information

The information requested in this section will be kept confidential and is needed for classifying the samples. Each participant will be allocated a code and the data will be stored on the basis of that code.

Contact

Name of the company

Contact person

E-mail

Telephone

Role

1.2 Sector

Wholesale and Distribution

Meat

Fish

Poultry

Dry Grocery

Bakery

Dairy

Soft drinks

Fruits and Vegetables

Confectionery

Frozen Foods

Other (please specify) _____

1.3 I am answering this questionnaire on behalf of:

The company holding as a whole

A specific site of the company

Other (please specify) _____

Comments

1.4 Number of employees

Please answer accordingly to your answer on question 1.3

0-4

5-9

10-19

20-49

50-99

100-249

250+

1.5 Type of company

SME - below £50m turnover

Corporate - above £50m turnover

1.6 Number of sites per region

Please put the number 0 in those regions where the company does not have operations

England and Wales	<input type="text"/>
Scotland	<input type="text"/>
Northern Ireland	<input type="text"/>
International	<input type="text"/>

If International is Greater Than 0, the system prompts question 1.6.1

1.6.1 In what other countries does the company have operational sites? - Please be as specific as possible

1.7 When did the company join the Federation House Commitment and what were the reasons for this?

We do not hold any affiliation with the FHC, we are only interested on the drivers for better water management

2. Cost of water

2.1 How much water (in litres) does the company use per month? - Please give an estimate

2.2 How much of the total operational cost does water represent?

0-20%

20-40%

40-50%

> 50%

I don't know

Comments

If 'I don't know' is Selected, 2.2.1 is displayed

2.2.1 You have answered 'I don't know' in Q 2.2 - Why is this information not available to you?

2.3 Where does the water used for the company's operations come from?

Please tick as many as appropriate and use the line for indicating how much percentage of water does it represent (give an estimate).

Mains water _____
Groundwater _____
Direct extraction from surface water _____
Rainwater _____
Other (please specify) _____
I don't know

Comments

If 'I don't know' is Selected, 2.3.1 is displayed

2.3.1 You have answered 'I don't know' in Q 2.2 - Why is this information not available to you?

3. Efficiency and Demand management

3.1 Has the company put into place water efficiency technologies in its operations?

Yes
No
I don't know

If 'Yes' is selected, 3.1.1(a) and 3.2 are displayed

If 'No' is selected, 3.1.1(b) is displayed

If 'I don't know' is selected, 3.1.1(c) is displayed

3.1.1(a) Please specify the types of technologies that have been adopted, and since when have they been adopted.

3.1.1(b) Please give any reasons why the company has not explored this possibility yet

3.1.1(c) You have answered 'I don't know' in Q.3.1 - Please the reasons why is this information not available to you?

3.2 How much water has been reduced due to technology adoption?

- 0-10%
- 11-20%
- 21-30%
- 31-40%
- 41-50%
- >50%
- I don't know

Comments

If 'I don't know' is selected, 3.2.1 is displayed

3.2.1 You have answered 'I don't know' in Q.3.2 - Please the reasons why is this information not available to you?

4. Staff engagement

4.1 Is water use and conservation one of the topics in the staff induction?

- Yes
- No
- I don't know

If 'Yes' is selected, 4.1.1(a) is displayed

If 'No' is selected, 4.1.1(b) is displayed

If 'I don't know' is selected, 4.1.1(c) is displayed

4.1.1(a) How is the induction given? And how much time is spent to cover the water topic?
(Estimate)

4.1.1(b) Why water has not been included in the induction package?

4.1.1(c) You have answered 'I don't know' in Q. 4.1 - Why is this information not available to you?

4.2 Does the induction include guidance on how the members of staff can manage water better at home?

Yes
No
I don't know

If 'Yes' is selected, 4.2.1(a) is displayed
If 'No' is selected, 4.2.1(b) is displayed
If 'I don't know' is selected, 4.2.1(c) is displayed

4.2.1(a) Why is this important?

4.2.1(b) Why is this not done?

4.2.1(c) You have answered 'I don't know' in Q.4.2 - Why is this information not available to you?

4.3 Are employees encouraged on finding new ways in which water can be better managed in the company's operations?

Yes
No
I don't know

If 'Yes' is selected, 4.3.1(a) is displayed
If 'No' is selected, 4.3.1(b) is displayed
If 'I don't know' is selected, 4.3.1(c) is displayed

4.3.1(a) What strategies are employed to provide this encouragement. Please tick as many as appropriate.

By giving economic incentives
By giving non-economic incentives
Promotion in posters, periodic emails, etc.
Regular meetings for finding new areas of improvement.
Other (Please specify) _____

Comments

4.3.1(b) Why is this not done?

4.3.1(c) You have answered 'I don't know' in Q.4.3 - Why is this information not available to you?

5. Environment

5.1 Are you familiar with the water footprint* term and methodology?

**Water footprint is the indicator of freshwater use that takes into account not only the direct water use of the company but also at its indirect water use. The water footprint methodology refers to the tool used for its calculation.*

Yes

No

Comments

If 'Yes' is selected, 5.2 is displayed

5.2 Has the water-footprint been calculated in the company's operations?

Yes

No

I don't know

If 'Yes' is selected, 5.2.1(a) is displayed

If 'No' is selected, 5.2.1(b) is displayed

If 'I don't know' is selected, 5.2.1(c) is displayed

5.2.1(a) How much is the water-footprint per product in the company? Please give as much information as possible

5.2.1(b) Why it has not been calculated?

5.2.1 You have answered 'I don't know' in Q.5.2 - Why is this information not available to you?

5.3 Is the company aware of the environmental limits* in which it can operate?

**Environmental limits refers to how much water can be extracted from the environment*

Yes
No
I don't know

If 'Yes' is selected, 5.3.1(a) is displayed

If 'No' or 'I don't know' are selected, 5.2.1(b) is displayed

5.3.1(a) Please explain which are these limits

5.3.1(b) You have answered 'No' or 'I don't know' in Q 5.3- Why is this information not available to you?

6. Re-evaluation of water services

6.1 Are different qualities of water used for different purposes?

Yes
No
I don't know

If 'Yes' is selected, 6.1.1(a) is displayed

If 'No' is selected, 6.1.1(b) is displayed

If 'I don't know' is selected, 6.1.1(c) is displayed

6.1.1(a) Please describe the activities/operations in which different qualities of water are used for different purposes

6.1.1(b) Please indicate the reasons why this option has not been yet evaluated

6.1.1(c) You have answered 'I don't know' in Q.6.1 - Why are you not aware of this?

6.2 Has the company implemented rain-water harvesting in any of its sites?

- Yes
- No
- I don't know

If 'Yes' is selected, 6.2.1(a) is displayed
If 'No' is selected, 6.2.1(b) is displayed
If 'I don't know' is selected, 6.2.1(c) is displayed

6.2.1(a) Please briefly explain the reasons why it was implemented and mention the geographical sites in which this has been carried out.

6.2.1(b) Why this has not been done? - Briefly explain the barriers for rainwater harvesting in your company's operations.

6.2.1(c) You have answered 'I don't know' in Q 6.2 - Please indicate why you are not aware of this

6.3 Are there any water recycling practices put into place?

- Yes
- No
- I don't know

If 'Yes' is selected, 6.3.1(a) is displayed
If 'No' is selected, 6.3.1(b) is displayed
If 'I don't know' is selected, 6.3.1(c) is displayed

6.3.1(a) Why and where has water recycling been implemented?

6.3.1(b) Why this has not been done? Briefly explain the barriers for water recycling in your company's operations.

6.3.1(c) You have answered 'I don't know' in Q 6.3 - Please indicate why are you not aware of this.

6.4 Has the company reduced the pollution of the water released to the environment?

Yes
No
I don't know

If 'Yes' is selected, 6.4.1(a) is displayed

If 'No' is selected, 6.4.1(b) is displayed

If 'I don't know' is selected, 6.4.1(c) is displayed

6.4.1(a) Why has this been done?

6.4.1(b) Why this has not been done? What are the barriers for water pollution reduction?

6.4.1(c) You have answered 'I don't know' in Q 6.4 -Please briefly comment on why you are not aware of this

7. Community engagement

7.1 Has the company implemented community/social programmes to help to promote sustainable water practices?

Yes
No
I don't know

If 'Yes' is selected, 7.1.1(a) is displayed

If 'No' is selected, 7.1.1(b) is displayed

If 'I don't know' is selected, 7.1.1(c) is displayed

7.1.1(a) Please give a brief statement on what do these programmes entail, and specify the geographical region in which these take place.

7.1.1(b) Please briefly explain the reasons why these programmes have not been yet implemented.

7.1.1(c) You have answered 'I don't know' in Q.7.1- Please briefly comment on the reasons why you are not aware of this

8. Value chain

8.1 To what stakeholders does the company give assistance for better water practices? - Tick as appropriate

- Suppliers
- Distributors
- Customers
- Others (please specify) _____
- I don't know
- None

If suppliers, distributors, customers and/or others are selected, 8.1.1(a) is displayed

If 'None' is selected, 8.1.1(b) is displayed

If 'I don't know' is selected, 8.1.1(c) is displayed

8.1.1(a) How and to whom has this assistance been given?

8.1.1(b) Why is this assistance not been given?

8.1.1(c) You have answered 'I don't know' in Q 8.1 - Please comment on the reasons why you are not aware of this.

9. Respondent nomination

9.1 Would you like to nominate another person within or outside your company for completing this survey?

Information will be kept confidential and your name (or the company you represent) will not be mentioned when we contact the person /company you are nominating.

- Yes
- No

If 'Yes' is selected, 9.1.1 is displayed

9.1.1 Please provide the contact information for your nominee

Organisation	<input type="text"/>
Contact name	<input type="text"/>
Contact E-mail	<input type="text"/>
Contact Telephone number	<input type="text"/>

10. Comments

Thank you for your responses and your time. If there is anything else you would like to add please leave your comments in the space below.

We thank you for your time spent taking this survey.
Your response has been recorded.

Appendix 9: Companies way of contact

Note: The questionnaire link was sent to the companies' environmental managers when possible and to the companies' generic contact emails otherwise

<i>Code</i>	<i>Contact emails</i>	<i>Generic email</i>
C1	x	
C2		x
C3		x
C4		x
C5		x
C6		x
C7	x	
C8		x
C9		x
C10		x
C11		x
C12	x	
C13		x
C14		x
C15		x
C16		x
C17		x
C18	x	
C19		x
C20	x	
C21	x	
C22		x
C23	x	
C24	x	
C25	x	
C26	x	
C27	x	
C28	x	
C29	x	
C30		x
C31	x	
C32	x	
C33		x
C34		x
C35	x	
C36		x
C37		x
SO1		x
C38		x
C39		x
C40		x
C41		x
C42		x
C43	x	
C44		x
SO2		x
C45		x
C46	x	
C47		x
C48		x

<i>Code</i>	<i>Contact emails</i>	<i>Generic email</i>
C49		X
SO3		X
C50		X
C51		X
SO4		X
C52		X
C53	X	
C54	X	
C55		X
C56		X
SO5		X
SO6		X
C57		X
C58		X
C59		X
C60	X	
C61	X	
C62		X
C63	X	
C64		X
C65		X
C66		X
C67		X
Total	23	50

Appendix 10: Companies' interview guide

Participant Information Sheet

Introduction

You have been invited to participate in a research project in the area of sustainable use of water in the food industry. Before you decide whether to take part it is important that you understand why the research is being done and what will it involve. Please take time to read the following information carefully.

What is the purpose of this investigation?

In the modern world, it is becoming increasingly important to address how water is managed. In this study we are particularly interested in how the food and drink industry of the UK deals with the issue of water. The research start by identifying current water practices in the UK food and drink industry and it will then determine the scope for water management improvement in terms of increased efficiency, conservation and behavioural change.

Why have you been invited to take part?

You have been invited to take part in this project because you represent a company in the food and drink industry in the UK and your insights are highly valuable for this study because your company has already identified the need for better water practices in their operations. This academic research is the most extensive study being done in its kind. It is therefore of high importance to get your inputs in it. Results and outcomes of the study will be anonymous and confidential. This research is completely independent and we do not hold any other affiliation aside from the University of Strathclyde

Do you have to take part?

Participation is voluntary and you can withdraw your consent at any time without having to give a reason. All responses will be anonymous and nobody will be referred to by name or affiliation in the research findings. Once the study is finalised every participant will get a report on the research outcomes.

What does your participation involve?

You will participate in a semi-structured interview (a guide of the questions can be found at the end of this document) that involves a face-to-face meeting or a phone call in which more in-depth questions will be asked, this interview should last no more than 30 minutes.

What happens to the information in the project?

On inclusion of this study, each participant will be allocated a code and the data will be stored on the basis of this code. No information that will identify individuals or companies will be included in the data file. The electronic form of the data will be preserved for 5 years on a password-protected computer. The paper format of the data will be held in locked conditions for 5 years then destroyed through the safe mechanisms provided by the University of Strathclyde.

The University of Strathclyde is registered with the Information Commissioner's Office who implements the Data Protection Act 1998. All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 1998.

What happens next?

Once the research is complete, research findings are to be published by keeping the anonymity of the information recorded. If you require any further information or feedback please contact us.

Thank you for reading this information

For questions or comments please use the contact details below

Catalina Silva-Plata

Researcher

Department of Civil and Environmental Engineering

David Livingstone Centre for Sustainability, Level 7

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Semi-structured interview questions

1. When did the company join the FHC?- are you aware of the drivers for joining? – (What are the main drivers for reducing water?)
2. How much water has the company reduced since?
 - a. How has this been achieved?
3. Does the company have any guidance from the Environment Agency for reducing water?
4. Has the company evaluated the possibility of water recycling or rainwater harvesting in any of its processes? – why?
5. Does the company liaise with its suppliers and/or distributors in terms of meeting environmental targets?
6. Are there any environmental awareness community projects put into place?
7. Are there any environmental awareness staff projects put into place?
8. Any additional comments?

Appendix 11: Description of websites and environmental reports

<i>Company</i>	<i>Websites word counts</i>					<i>Environmental reports word counts</i>				
	<i>Total</i>	<i>Water</i>	<i>Water % coverage</i>	<i>Energy</i>	<i>Energy % coverage</i>	<i>Total</i>	<i>Water</i>	<i>Water % coverage</i>	<i>Energy</i>	<i>Energy % coverage</i>
C1	759	2	0.26%	2	0.26%	-	-	-	-	-
C2	3085	0	0.00%	1	0.03%	-	-	-	-	-
C3	1362	0	0.00%	7	0.51%	-	-	-	-	-
C4	8202	25	0.30%	31	0.38%	-	-	-	-	-
C5	3721	32	0.86%	31	0.83%	-	-	-	-	-
C6	1730	12	0.69%	12	0.69%	7944	4	0.05%	5	0.06%
C7	1849	4	0.22%	23	1.24%	4534	10	0.22%	81	1.79%
C8	2785	14	0.50%	21	0.75%	-	-	-	-	-
C9	937	2	0.21%	3	0.32%	-	-	-	-	-
C10	25364	0	0.00%	0	0.00%	1175	1	0.09%	11	0.94%
C11	8195	10	0.12%	47	0.57%	-	-	-	-	-
C12	2111	7	0.33%	9	0.43%	-	-	-	-	-
C13	610	0	0.00%	0	0.00%	-	-	-	-	-
C14	7381	20	0.27%	10	0.14%	8449	40	0.47%	90	1.07%
C15	4091	52	1.27%	10	0.24%	13700	90	0.66%	77	0.56%
C16	1332	1	0.08%	2	0.15%	-	-	-	-	-
C17	958	0	0.00%	11	1.15%	-	-	-	-	-
C18	3583	134	3.74%	13	0.36%	48940	373	0.76%	170	0.35%
C19	-	-	-	-	-	57258	20	-	16	-
C20	6553	35	0.53%	87	1.33%	-	-	-	-	-
C21	3552	0	0.00%	0	0.00%	69391	8	0.01%	23	0.03%
C22	1447	10	0.69%	7	0.48%	8822	47	0.53%	49	0.56%
C23	1162	2	0.17%	4	0.34%	-	-	-	-	-
C24	191	0	0.00%	2	1.05%	-	-	-	-	-
C25	162	2	1.23%	1	0.62%	-	-	-	-	-
C26	262	0	0.00%	0	0.00%	4201	12	0.29%	26	0.62%
C27	-	-	-	-	-	41767	64	-	135	-
C28	1141	1	0.09%	19	1.67%	4455	11	0.25%	13	0.29%
C29	438	0	0.00%	0	0.00%	2883	8	0.28%	13	0.45%
C30	425	0	0.00%	0	0.00%	8987	11	0.12%	33	0.37%
C31	619	2	0.32%	2	0.32%	-	-	-	-	-
C32	2024	10	0.49%	33	1.63%	NARQ	143	NARQ	308	NARQ
C33	-	-	-	-	-	41141	115	-	122	-
C34	2241	1	0.04%	3	0.13%	-	-	-	-	-

Company	Websites word counts					Environmental reports word counts				
	Total	Water	Water % coverage	Energy	Energy % coverage	Total	Water	Water % coverage	Energy	Energy % coverage
C35	110	0	0.00%	0	0.00%	2156	4	0.19%	5	0.23%
C36	-	-	-	-	-	11982	40	-	46	-
C37	134	1	0.75%	1	0.75%	-	-	-	-	-
C38	438	0	0.00%	0	0.00%	-	-	-	-	-
C39	396	0	0.00%	1	0.25%	11536	24	0.21%	46	0.40%
C40	457	0	0.00%	0	0.00%	6917	0	0.00%	43	0.62%
C41	688	11	1.60%	2	0.29%	-	-	-	-	-
C42	1502	3	0.20%	4	0.27%	-	-	-	-	-
C43	-	-	-	-	-	131237	1074	-	343	-
C44	902	0	0.00%	0	0.00%	-	-	-	-	-
C45	2293	0	0.00%	2	0.09%	-	-	-	-	-
C46	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C47	182	0	0.00%	0	0.00%	-	-	-	-	-
C48	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C49	-	-	-	-	-	10756	30	-	43	-
C50	722	1	0.14%	7	0.97%	-	-	-	-	-
C51	-	-	-	-	-	28176	105	-	167	-
C52	2540	56	2.20%	3	0.12%	NARQ	245	NARQ	179	NARQ
C53	5327	50	0.94%	16	0.30%	7671	13	0.17%	22	0.29%
C54	1605	9	0.56%	7	0.44%	NARQ	0	NARQ	0	NARQ
C55	587	0	0.00%	1	0.17%	-	-	-	-	-
C56	1247	0	0.00%	0	0.00%	-	-	-	-	-
C57	1389	0	0.00%	0	0.00%	-	-	-	-	-
C58	953	4	0.42%	5	0.52%	4457	21	0.47%	27	0.61%
C59	1238	62	5.01%	1	0.08%	4552	7	0.15%	26	0.57%
C60	496	1	0.20%	2	0.40%	2058	12	0.58%	23	1.12%
C61	731	3	0.41%	4	0.55%	-	-	-	-	-
C62	730	0	0.00%	0	0.00%	-	-	-	-	-
C63	3160	9	0.28%	19	0.60%	-	-	-	-	-
C64	166	1	0.60%	2	1.20%	4574	15	0.33%	52	1.14%
C65	969	4	0.41%	7	0.72%	-	-	-	-	-
C66	2029	6	0.30%	8	0.39%	-	-	-	-	-
C67	1346	0	0.00%	0	0.00%	-	-	-	-	-

Key: N/A: companies that did not have website or environmental report

NARQ: documents in which it was not possible to run query for word count in Adobe Acrobat

The symbol (-) denotes absence of website or environmental report

Companies shaded in grey were screened out from the analysis

Appendix 12: Research executive summary for business practice

Sent to the FHC signatories after completion of this thesis

June 2015

POLICY BRIEF

Recommendations for Adopting Sustainable Water Strategies in the Food Industry

By Catalina Silva-Plata

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This report summarises the findings obtained from a research carried out by the Department of Civil and Environmental Engineering of the University of Strathclyde during the period 2011 – 2014. This research aimed to investigate a way in which businesses from the food sector can embed *soft path for water* principles in their CSR strategies. The *soft path for water* concept was proposed as a paradigm shift in the water management area and is an idea that focuses on the sustainable delivery and use of water-related services matched to the needs of end users, rather than seeking sources of new supply. The concept was initially conceived as a way for governments and societies to embed water sustainability principles in their policies. Food is considered as one of the

most water intensive areas in the society due to the water involved in all steps of the supply chain (from agriculture to processing), therefore businesses from this sector need to strive for reducing their overall direct and indirect impact on water resources.

The methodology used in this research first entailed the development of a framework for translating what does a *soft path for water* mean for businesses in the food sector. The proposed framework involves a set of five principles for achieving water stewardship and sustainable water strategies in the food sector (see Figure 1). As of February 2014, a set of 70 UK food and industry companies had committed to the reduction of water through the Federation House Commitment

<p>Setting the ground</p> <p>Water awareness</p> <ul style="list-style-type: none"> • Give as much importance to water as you do for carbon • Formally recognise the finite nature of water resources • Formally recognise your direct and indirect dependence on water resources • Commit to international initiatives such as the UN CEO Water Mandate, the Water Footprint Network or the CDP Global Water Disclosure • Publicly disclose information on the reduction on water you have achieved <p>Re-evaluation of water services</p> <ul style="list-style-type: none"> • Use different qualities of water for different purposes • Implement rain water harvesting in your operations • Undertake water recycling practices 	<p>External action</p> <p>Community Engagement</p> <ul style="list-style-type: none"> • Formally recognise and protect the human right to water. • Undertake and promote community programmes on water conservation. • Engage with your workforce in water conservation projects. • Understand your direct water footprint <p>Supply-chain Engagement</p> <ul style="list-style-type: none"> • Require suppliers to adopt water-reduction practices • Understand your indirect water footprint (all the water involved in your supply chain) • Set a specific target for the reduction of water in the supply chain
<p>Internal action</p> <ul style="list-style-type: none"> • Put in place water efficient technologies and processes • Set a specific target for the reduction of water • Engage with your workforce in water conservation projects. • Understand your direct water footprint 	<p>Know your water environmental limits</p> <ul style="list-style-type: none"> • Disclose data on the water withdrawn as part of the company's operations • Understand the water environmental limits of the locations where you operate • Identify and disclose the water-stressed regions where you have operations
<p>Influence water governance</p> <ul style="list-style-type: none"> • Engagement in the broader debate of the sustainable management of common resources and aim to influence the water governance of the regions where you have operations, which may be outwith the UK 	

Figure 1: Five principles for achieving a soft path for water in the food industry

(FHC). This commitment suggests that its signatories have an interest on embedding water sustainability aspects as part of their environmental policies. For this reason, the developed framework was used to assess the water strategies and practices of the FHC signatories in order to evaluate if the proposed principles are already adopted by the sample. This research entailed the content analysis of 89 publicly available documents, 12 questionnaires and eight interviews.

Results and recommendations

A degree of adoption of all five principles was found in a greater or lesser extent in the sample (See Figure 2). This evidences that companies are already working towards a sustainable water management in different areas. However, a lack of adoption was also found in the sample as well as a level of uncertainty as no relevant data was found in many cases. This lack of data points out the need for businesses for better reporting and disclosing data.

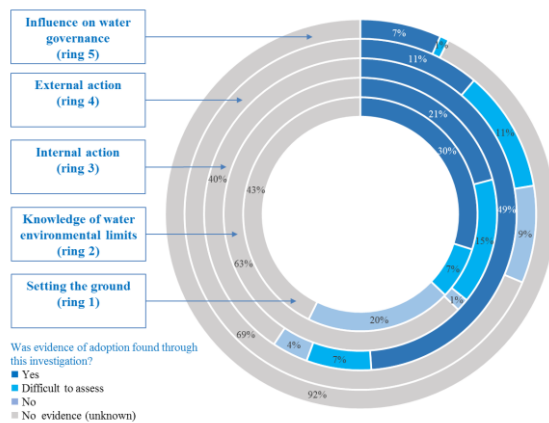


Figure 2: To what extent have the soft path for water principles been adopted in the FHC signatories?

The obtained results indicate that in order to adopt a water sustainability strategy, the FHC signatories need to centre their efforts on:

Working closely with the supply chains:

The highest impact on water resources of the food sector is in agriculture. The evaluated companies need to work more closely with their supply chains in order to understand their overall water footprints and reduce both their direct and indirect impact on water.

Changing the way they think about water by:

- Recognising their dependence on water resources and the finite nature of water.

- Giving the same importance to water and its management as much as they do for carbon reduction and energy efficiency.
- Implementing water recycle and reuse in their operations.
- Publicly disclosing their water withdrawals, with special attention given to water-stressed areas.
- Working with environmental agencies, locally and globally, in order to understand the water thresholds of their operations.

Going beyond and engaging with external bodies to their organisations by:

- Carrying out community programmes that promote water awareness and conservation in the communities where they operate.
- Seeking to positively influence the water governance arena and working with existing actors such as NGOs and academia

Enhancing the existing internal water efficiency initiatives by:

- Empowering staff through the promotion of water conservation initiatives and awareness activities.
- Engaging in the process of understanding the water footprint of their internal operations.

Better reporting of strategies and achievements:

A key finding was the lack of consistent reporting carried out by businesses. This study proposed a framework of steps and initiatives that companies in the food sector need to carry out for embedding water sustainability in their strategies. This tool can be used as a model for reporting that companies can follow in the future.

The series of recommendations for business practice posed by this research aimed to propose ways in which businesses from the food sector can embrace water sustainability. All of these suggestions should not be seen in isolation but rather as an interconnected network of activities and initiatives that need to be continuously reinforced. A sustainable use of water is not a goal but rather an ever-changing process that needs to constantly adapt.