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Review of the private water sector enterprises in Finland and their potential in the Chinese business sector

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LEHTINEN, LILLI:

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ABSTRACT

Finland has a good knowledge of water technology and strong potential to export more services and expertise in the water sector. China is the world's second largest market area and it needs innovative water expertise to be able to respond the growing needs in the water sector. All over the country water shortages and water pollution are serious environmental issues, which can affect world food security and global prosperity.

This thesis introduces the general state of the companies in the water sector in Finland. The main objective is to define the companies, which have been often described to be wide and scattered. This thesis also describes the water challenges and business opportunities in China. Moreover, the study underlines the importance of sustainable development and sustainable business. It is particularly essential aspect in China, where rapid industrial development, population and economic growth have increased water demands and created even so-called water crisis.

This study is a theoretical research. It has been completed with a literature review and a document analysis. The data collection has been mostly based on online archives and collections. The literature review consists of a review of the state of the Finnish water sector by using the example of Tekes Water programme and general views of China's water crisis and China as a market area. The document analysis forms a catalogue of the water sector enterprises in Finland. Classification makes the information more understandable and beneficial for further use. The water sector and its enterprises is a complex entirety, which is important to define and analyse also in the future.

The documentary analysis was cohesive with the literature review. However, the hidden potential in the water business would need further future studies. The internal and international collaboration business opportunities also need more effort, resources and research.

Key words: water technology, sustainable development, water sector in Finland, business expertise in the field of water, China's water crisis, China as a market area

Lahden ammattikorkeakoulu
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LEHTINEN, LILLI:

Katsaus Suomessa toimiviin vesialan yrityksiin ja niiden potentiaaliin Kiinan liiketoimintasektorilla

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TIIVISTELMÄ

Suomessa on hyvä tietämys vesiteknologiasta sekä vahvaa potentiaalia vesisektorin palvelujen ja osaamisen viennissä. Kiina puolestaan on maailman toiseksi suurin markkina-alue, ja se tarvitsee innovatiivista vesialan asiantuntemusta vastatakseen vesisektorin kasvaviin tarpeisiin. Veden puute ja veden saastuminen ympäri maata ovat vakavia ympäristöongelmia, jotka voivat johtaa globaaliin ruokaturvan ja hyvinvoinnin horjumiseen.

Tämä opinnäytetyö esittelee Suomen yleistä yritystilannetta vesisektorilla. Päätavoite on ollut kuvailla yrityksiä, joita on usein luonnehdittu laaja-alaisiksi ja hajanaisiksi. Opinnäytetyö myös esittelee veteen liittyviä haasteita ja liiketoimintamahdollisuuksia Kiinassa. Lisäksi työ korostaa kestävän kehityksen ja kestävän talouden tärkeyttä. Kestävä talous on erityisen tärkeä näkökulma Kiinassa, jossa nopea teollistuminen, väestönkasvu ja taloudellinen kasvu ovat lisänneet veden kulutusta ja luoneet jopa niin kutsutun vesikriisin.

Tämä työ on teoreettinen tutkimus, joka on suoritettu kirjallisuuskatsauksen ja dokumenttianalyysin avulla. Aineiston kerääminen on perustunut pääasiassa elektronisiin arkistoihin ja kokoelmiin. Kirjallisuuskatsauksessa tarkastellaan Suomen vesisektorin tilaa, Kiinan vesikriisiä ja Kiinaa markkina-alueena. Dokumenttianalyysi puolestaan muodostaa katalogin suomalaisista vesialan yrityksistä. Luokittelu tekee informaatiosta ymmärrettävämmän ja hyödyllisen jatkokäyttöä ajatellen. Vesisektori yrityksineen on moninainen kokonaisuus, jota on tärkeä tunnistaa ja analysoida jatkossakin.

Dokumenttianalyysi oli yhtenäinen kirjallisuuskatsauksen kanssa. Vesisektorin piilossa oleva potentiaali tarvitsee kuitenkin lisää selvitystä. Kansallinen ja kansainvälinen verkostoituminen ja yhteistyömahdollisuudet vaativat myös tulevaisuudessa lisää ponnistelua, resursseja ja tutkimusta.

Avainsanat: vesiteknologia, kestävä kehitys, Suomen vesisektori, vesialan yritysosaaminen, Kiinan vesikriisi, Kiina markkina-alueena

Content

1 INTRODUCTION

Water related problems affect over two billion people in the world every day. Water shortage, the lack of sanitation, water pollution, the depletion and allocation of water resources are threathening the daily lives of people all over the world. The need for new technology and innovations in the water sector is inevitable and it creates international business opportunities. China is one of the biggest market areas in the world and it has severe water issues which need new innovative solutions. (Tekes 2008.)

The Chinese government is open for new exports and goods that increase the strategic value of China. Besides that, the Chinese water sector needs foreign expertise and technology to meet the growing water demand. China has confronted increasing challenges due to water shortages, which are a consequence of the rapidly developing Chinese economy and population growth. China's groundwater tables are decreasing rapidly and municipal wastewater treatment is insufficient in many areas. (Ambler, Witzel & Xi 2009, 16; KWR Watercycle Research Institute 2013; Hu & Cheng 2013.)

This thesis investigates the private water sector enterprises in Finland and their potential in the Chinese business sector. The study has a focus area on China, meaning the People's Republic of China (PRC), and throughout this study "China" means the PRC. Southeast Asia has 60 million ethnic Chinese also outside mainland China, including countries such as Singapore, Malaysia, Thailand, the Philippines, Taiwan, Indonesia, Vietnam, Cambodia, Myanmar and Laos. These communities form the so called overseas Chinese. These communities have similar ways of doing business to those of China, and they are a powerful economic area that needs to be taken into account particularly, when the focus is on the Chinese market. However, this thesis only concentrates on China, to keep the content clear - although China itself is a vast and diverse country with

over 1.385 billion inhabitants. (Ambler, Witzel & Xi 2009, 8-9; Worldometers 2017.)

1.1 Background

The idea for this thesis project came from author's personal interest and working background. Moreover, the need for this kind of study already existed in the Water Department of the Centre for Economic Development, Transport and the Environment of Southwest Finland (ELY Centre). The role of ELY Centres is to promote regional business policy and it also covers the internationalisation aspect of business operations (Elinkeino, liikenne ja ympäristökeskus 2015).

The ELY Centre in Southwest Finland is involved in different water activities with China, including collaboration with the Ministry of Water Resources of the People's Republic of China and the China Europe Water Platform (CEWP). This active collaboration with Chinese partners was the main reason why the target area of this study is in China. This collaboration included this year a water related conference, which is an important event for enhancing the collaboration between the European Union and China in the water sector. This conference was one major reason for this study as well; because the responsibility of the author was to assist with practical arrangements of the China Europe Water Platform Annual High-Level Policy Dialogue Conference. The conference was held in September 2017 and it included a high-level business conference, which enhanced information exchange and business sector cooperation in water sector between China and European Union.

Besides the connections to China, the starting point from the ELY Centre's point of view was the so-called Water Programme. ELY Centres and Tekes, the Finnish Funding Agency for Innovation, carry out close collaboration and they both promote business operations. The Tekes funded water programme ”Water - International Business from Water 2008-2012” was an important reference for this study. The programme boosted knowledge, innovations, technology and networking in the Finnish

water sector. It improved companies' competitiveness, communication, marketing, pitching and networking skills. It also created improved products and business concepts. All in all, the programme funded 92 projects for companies to the sum of 33.1 million euros and 30 projects for public research organisations at a cost of 15.9 million euros. Most financed projects formed two strong themes: water and wastewater treatment concepts and related technology; and water-ICT or smart water. The Finnish water sector has potential in both themes, which have both international value and demand. (Salminen & Lehtinen 2013.)

Besides connections to China and the Tekes Water Programme, sustainability in the water sector interested the author personally and throughout her work. This thesis is in line with the UN Sustainable Development Goals (SDGs). Sustainable Development Goals have a high importance globally and sustainability includes the way to do greener business. The author chose to have these as key concepts and as a specific aspect of this thesis. This thesis is also connected to the blue bioeconomy and the National Development Plan for Blue Economy 2025.

1.2 Research questions

The research questions and the main goal of this thesis were formed after a literature review and a few discussions with Tekes experts. Fundamentally, the main goal is to define and analyse the companies in the Finnish water sector. The main research questions are the following:

1. What kind of private water sector enterprises exist in Finland?

2. What kind of potential do companies in Finland have in the water sector?

3. What are the main challenges for companies in Finland dealing with water related business in China?

1.3 Structure of the thesis

This thesis contains eight major parts. The part I introduces the topic of the thesis and gives the general overview. The part II discuss about the framework of the thesis, which basically means the concept of sustainability. The methodology is discussed in the part III. The part IV and V provide a literature review. These parts mostly deal with the Tekes Water programme 2008-2012 and the Finnish water sector, the water sector in China and China as a market area. The process continues with the document analysis. The part VI discuss about the document analysis and how the study was carried out. Finally, based on all the gathered data, this thesis assembled preliminary guidelines for the future. Results have been combined in the part VII and conclusions and discussion in the last part (VII). This thesis process has been completed with the support of ELY centre's specialists, certain companies in the water sector and teachers from the Lahti University of Applied Sciences.

2 FRAMEWORK OF THE STUDY

The key concept for this study is sustainability. Sustainability is a global trend and driver in the future development of natural resources, including water. Sustainability is a perspective which has signicant value also in business. In this thesis, sustainability has been observed from the water perspective of Finland and China. The concept of sustainability includes sustainable development. More sustainable choices can be made by following Sustainable Development Goals, which have specific goals for the water sector. In addition, Environmental Performance Index describes and demonstrates sustainability between the countries. (Luoma, Harder, Hjelt, Larvus, Pursula, Raivio & Vanhanen 2015; Cleantech Finland 2016.)

2.1 The concept of sustainability

Sustainability is a concept which focuses on the condition of the Earth's biophysical environment. This means the respectful use of natural resources, including water. The World Commission on Environment and Development in 1987 described sustainability as economic-development activity, which "meets the needs of the present without compromising the ability of future generations to meet their own needs." The basic rule is that natural resources cannot be used, damaged or depleted infinitely. (Portney 2015, 8-9.)

Sustainability consists of three main equal pillars: environment, economy, and equity. Without the synergies of environmental protection and implementation, economic growth, and equity, it is impossible to achieve sustainability. (Portney 2015, 8-9).

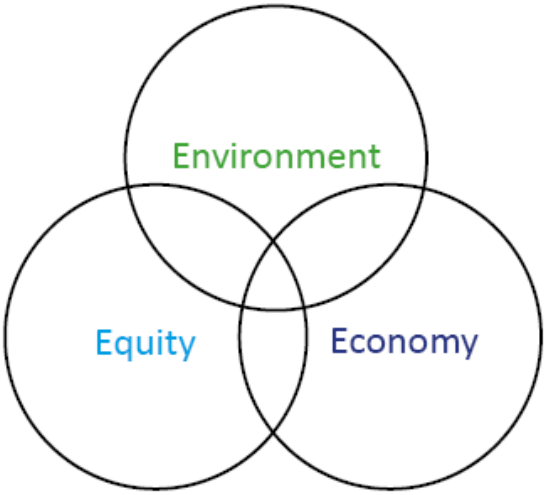

FIGURE 1. Three pillars of sustainability (Portney 2015, 9)

From environmental, societal and economic perspectives in the water sector, sustainability and sustainable development form a framework for strategies and policies. This framework needs institutional support and capacity building to ensure the required motivation and skills of policymakers, local business entrepreneurs and technical personnel. (VTT 2009, 19.)

2.2 Sustainability and the role of business

Sustainability embraces the economic, financial, legal, industrial, material, social and behavioural arenas. From a business viewpoint, sustainability means reducing expenses – including future expenses – in every form which facilitates profitability, longevity and competiveness. The pursuit of neverending economic growth challenges sustainability. If the economic growth is the priority, a sustainable future will be threatened. However, green businesses have been established as early as 1985. It is the important development in economies, where companies make their business, services and products, toward sustainability. Governments have debated a long time about the need for change to sustainability policies

around the world. At the same time, many private-sector businesses have implemented sustainable solutions for many years. (Scott 2013, 2; The Worldwatch Institute 2015, 48; Portney 2015, 112.)

Sustainable management of natural resources, including water resources, is one of the main factors in the discussion on natural resources in general. The global demand for sustainable water solutions is growing rapidly and sustainable ecosystems are needed to ensure the water supply in the future. In the short term, sustainable water business might be a competitive advantage. In the long term, sustainable management practices will drive the regulations, business and consumer preferences, while unsustainable practices will become less competitive. A more service-based economy and technological change is a combination which could be the important change for a greener economy in the future. (Luoma & al. 2015; Rinne, Halonen, Lindholm, Heikinheimo, Hillgren, Luoma, Makkonen, Sulkinoja, Nykänen, Salmi, Kaurissaari, Patala, Tuukkanen, Silvennoinen & Saarinen 2017; The Worldwatch Institute 2015, 48-49.)

2.3 Sustainable Development Goals

Water is a key to to sustainable development. Global Sustainable Development Goals includes water as a crucial part. All the world's international agencies and governments have committed themselves to the Sustainable Development Goals of the United Nations. In September 2015, a new sustainable agenda was launched after the Millennium Development Goals. This relatively new universal agenda has 17 goals and 169 targets, which are meant to be achieved by 2030. The set of goals aim to end poverty, protect the planet, and ensure prosperity for everyone. The goals seek to build on the previous Millennium Development Goals and, in addition, to complete the goals that were not achieved last time. All countries and stakeholders, including governments, the private sector and civil society, will be part of this sustainable agenda, which implement sustainable development economically, socially and

environmentally. Middle-income emerging economies, such as China, will have a major importance for leading the SDGs, and will have their internal challenges of balancing environmental sustainability and population growth, vulnerabilities to adverse trends and rising geopolical roles, both regionally and globally. (Sachs 2012, 2208; United Nations 2015.)

The Sustainable Development agenda came into effect on the first of January 2016 and it has specific goals for water and sanitation, oceans, and climate change (Sjölander Holland, 2005, 13; United Nations, 2015). The direct water related sustainable development goals are goals number 6 and 14. “To ensure access to water and sanitation for all” and “to conserve and sustainably use the oceans, seas and marine resources”, these affect the water sector all over the world. In this thesis, the goal number 6, water and sanitation, is especially important. Both goals have the specific target areas with deadlines that are presented on tables below. Goal number 6 has been partly highlighted, since this thesis is mostly linked to those target areas. For example, water-use efficiency, water scarcity, wastewater treatment, recycling and reuse technologies are discussed in the further chapters part of the literature review. (United Nations 2015.)

TABLE 1. Sustainable Development Goal 6 (United Nations 2015)

By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
By 2030, achieve universal and equitable access to safe and affordable drinking water for all
By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies
Support and strengthen the participation of local communities in improving water and sanitation management

TABLE 2. Sustainable Development Goal 14 (United Nations 2015)

By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans
By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics
By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information
By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation
By 2025, prevent and significantly reduce marine pollution of all kind, in particular from land-based activities, including marine debris and nutrient pollution
By 2030, increase the economic benefits to Small Island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism
Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels
Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries
Provide access for small-scale artisanal fishers to marine resources and markets
Enhance the conservation and sustainable use of oceans and their resources by implementing international law

As can be seen from table 1, water quality and water-use efficiency are part of the main objectives of the sixth Sustainable Development Goal. If the business sector is willing to improve sustainable and environmental friendly technology solutions, the cooperation with United Nation's Sustainable Development Goals is vital.

To make Sustainable Development Goals easier to understand and to provide a comparison between the countries, the Environmental Performance Index (EPI) has been created. The Environmental Performance Index is connected to Millennium Development Goals and SDGs. The Environmental Performance Index (EPI) ranks performance of the countries for high-priority environmental issues, which has been divided to protection of human health and protection of ecosystems. The index has been designed based on the United Nations Millennium Development Goals, and it includes, for instance, water and sanitation and water resources themes. The index was created by the universities of Yale and Columbia along with the World Economic Forum. It has been formed by calculating and aggregating nine different issues, which have more than 20 factors. The EPI's indicators together with SDGs provides a basis for national performance assessment and enable comparisons of countries and global targets. In 2016, Finland had the top ranking. China was ranked as 109th country of all the 180 countries. China's poor ranking can be explained by the country's severe environmental issues and long-term negligence in environmental protection. (Hsu 2016, Luova 2010, 151; Cleantech Finland 2016.)

The main reasons for Finland's top ranking were mostly based on societal commitment to reaching a carbon-neutral society, which means that Finland will not exceed nature's carrying capacity by 2050. Finland has good goals and measurable indicators for sustainable development, and particularly, water and sanitation was one of the areas that performed very well. Generally, the EPI report shows the direction of the world's environmental issues. Promising trends are related to health impacts, access to drinking water and sanitation. (Cleantech Finland 2016.)

3 METHODOLOGY

This thesis uses qualitative research approach and methods. The research questions form a phenomenon, which requires better understanding and expressing. The phenomenon of water sector enterprises in Finland and their business potential in Chinese market needs a description or a deeper insight. (Kananen 2010, 37, 41.)

The study was carried out through a literature review and document analysis. The document analysis is based on the data collected through online archival research and literature surveys. It gives deeper insight to the reseach questions and the main objective. Finally, the document analysis was compared to the literature review and the results of the study were formed based on that comparison.

3.1 Objectives of the study

The main objective of this thesis is to recognise and define the companies in the Finnish water sector. The purpose is to get better understanding of the companies in the field. The emphasis is on internationalisation and this study is focused on the Chinese market.

3.2 Research methods

The author has familiarized herself with important issues concerning the themes of the literature review and the document analysis. The literature review gave the needed knowledge for using the document analysis as the second method. The important part of the study was to form a catalogue of the private water sector enterprises in Finland and analyse that data.

In the document analysis, the material can consist of yearly reports, memos, personal documents, publications, laws, advertisements and contracts. The data is in most cases extracted from written material. This data gives objective or neutral information about the specific phenomenon as the material has been primarily produced for another purpose. In this

thesis, the data has been based on online reports meaning the company websites and official company information. These online sources can offer the most updated data, which has been crucial for this study. (Piergiorgio 2003, 287-309.)

The idea of the document analysis is to collect available information and attempt to collect and extract the relevant data. The aim of the document analysis is to analyse systematically the information of the documentaries and to create a clear description of the research phenomena. Logical thinking and analysis are essential. Document analysis finds out the content of the data and possible hidden messages. These hidden messages can describe for example the business potential of the companies in the Finnish water sector. (Ojasalo, Moilanen & Ritalahti 2015; Piergiorgio 2003, 287-309; Rapley 2007, 11-113.)

This thesis first discusses the literature review and then the document analysis.

4 TEKES WATER PROGRAMME AND THE CURRENT SITUATION

Tekes, the Finnish Funding Agency for Innovation, has a significant financial role in business cooperation and innovations in Finland. Tekes has, and has had tailored funding solutions for the water sector. The structural problem in the water sector in Finland is that only few large or medium-sized companies exist and the public sector has a dominating role as an owner. In addition, the turnonver in the Finnish water sector has been small and international business has been limited. However, on the whole, the companies have become more international over the last few decades. Many of the companies in Finland have expanded their activitites and merged with Nordic and international companies. (Luoma, et al. 2015; Katko 2016, 216.)

The Tekes funded programme “Water – International Business from Water 2008-2012” had as its main objectives to develop and reform the Finnish water sector and improve the access to international markets, particularly through internationalisation tools and small or medium-sized enterprise growth. It included objectives such as reforming business operations, promoting Finnish knowledge on the international markets, supporting growth and internationalization of small and medium-sized enterprises, and creating new business models, service concepts and solutions. These were completed by utilising modern technology, promoting customer-focused service, boosting innovations in water sector business models and using comprehensive solutions. The table below has grouped the main issues of the Water programme. The water sector was regarded as a potential and growing business area in the Finnish economy. Aging infrastructure, water scarcity and urbanization, were considered globally important issues for investments in water management infrastructure in the future. (Salminen & Lehtinen 2013; Luoma, at al. 2015.)

The Water programme was launched in cooperation with the public sector and water industry companies in Finland. Tekes total funding for the water programme 2008-2012 was approximately 49 million euros, which was divided into 33.1 million euros for the private sector, including 92 projects

for companies, and 15.9 million euros for public sector, including 30 research projects. Most of the companies involved were micro companies (35 companies) but on the other hand, the full scale of the companies was observed, as can be seen from the table below. (Salminen & Lehtinen 2013; Luoma, at al. 2015.)

TABLE 3. Synopsis of the Water Programme (Luoma, et al. 2015)

Water Programme 2008–2012	
Objectives	• Reform business operations in water sector • Promote Finnish knowhow on the international markets • Support growth and internationalisation of SME's • New innovative business models, service concepts and solutions
Research areas	• Control, calculation and measurement methods • Improvement of water quality • Water treatment and infrastructure • Water management
Volume	• Total volume of the Programme 94 MEUR • Volume of company projects 72 MEUR • Volume of research projects 22 MEUR
Participating companies and research organisations	• 16 large companies • 6 medium companies • 12 small companies • 35 micro companies • 3 associations and other organisations • 18 public research organisations

4.1 Most funded activities by Tekes Water programme

According the figure below, which is from the Tekes final report, water and wastewater treatment and water ICT were the most funded activities in the Water programme (72 percentages from the all categories). All the funded projects formed the five main categories, which were:

1) The development business services, including creating new business models and related services, enhancing business know-how
2) Water and waste water management
3) Water ICT, including water monitoring and measuring methods
4) Water resources management
5) Water supply networks and other water supplies (Salminen & Lehtinen 2013)

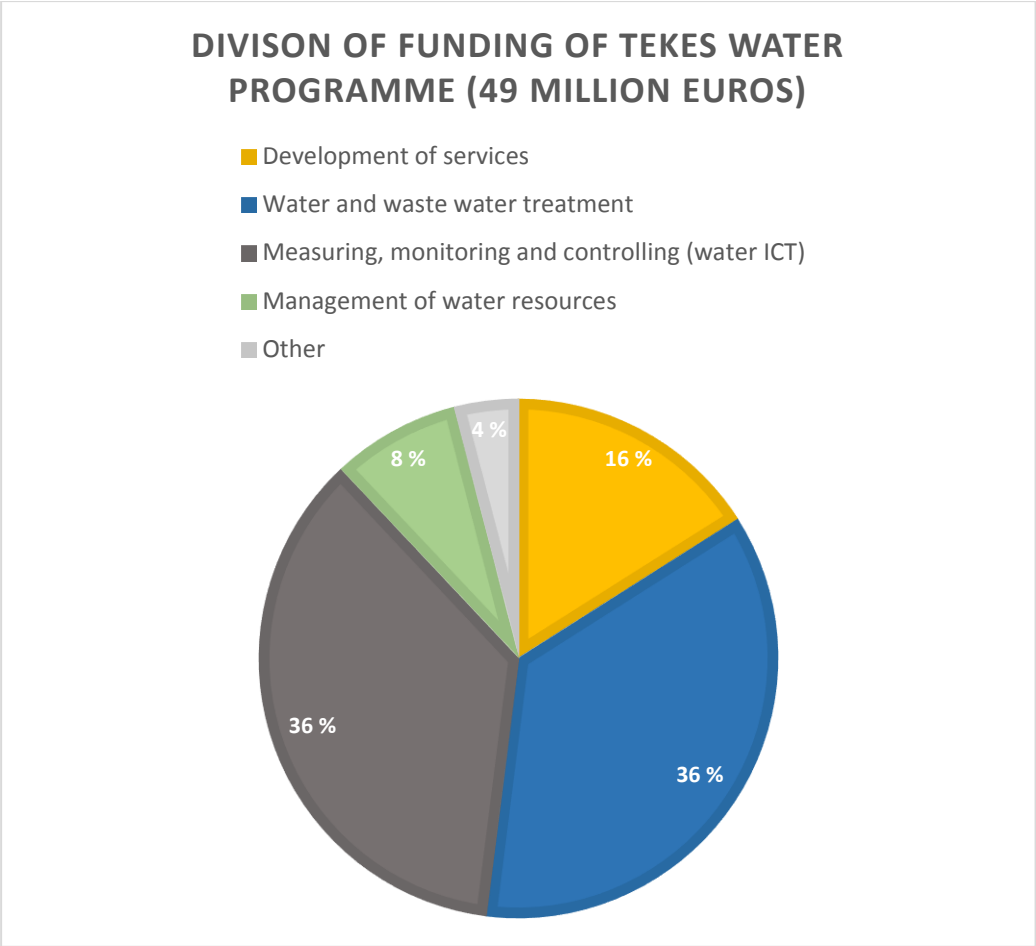

FIGURE. 2. Tekes funded water activities in Water programme 2008-2012 (Salminen & Lehtinen 2013)

The division between public and private sectors was quite similar. In public reseach projects, the main theme was Water ICT. In private sector, the most funded theme was water and waste water treatment. The Water programme contacted a total of 400 companies and led to 70 projects. 47 companies out of the 69 companies were small or medium sized. The average size of a company project was not large (0.7 MEUR). (Salminen & Lehtinen 2013; Luoma, et al. 2015.)

4.2 Internationalisation

The Water programme had international focus on the European Union as a market area and its neighbour countries such as Russia. Furthermore, China was one of the potential market areas together with USA, Canada, India and Mexico. The Water programme followed generally the development of the water sector in China. Finnish Environmental Cluster for China and other Tekes funded and China related programmes were introduced to Finnish companies. One of them was the Groove programme – Growth from Renewables programme 2010-2014, which put great emphasis on international networks. The most popular countries in cooperation with international research projects were Germany, Sweden, China, Hungary, Netherlands, Italy, Czech Republic and United Kingdom. Companies worked mostly with their counterparts from the US, Sweden, Germany, Canada and Russia. (Salminen & Lehtinen 2013.)

It was already recognised in Tekes final report that international services were not found useful enough. In addition, it was challenging to get companies committed to carrying out international business and networking. Concrete actions and results were lacking. Companies also had limited resources to use the Programme services. The programme would have benefitted from more large and particularly medium sized companies participating bringing in more resources and existing international business. However, nearly 60 % of companies have reported that their international collaboration has increased since the water programme activities. International interest is and has been growing among companies. (Salminen & Lehtinen 2013; Luoma, et al. 2015.)

After the Water programme, companies and research institutions have been encouraged to promote international busiess and to participate in other Tekes programmes such as Green Growth, Green Mining, Bionets and Smart City programmes. Tekes has innovation funding for companies, which is also a good option if the company meets the necessary requirements. Another example of Finnish funding mechanisms is water related programmes of the Academy of Finland. In addition, the European

Union has significant programmes, such as Horizon 2020 programme with water related topics and, for example, JPI-Water (ERA/Joint Programming Initiative), CIP (Competence and Innovation Program), EUREKA Acque-au Eurostars, Life+ and EIP Water (European Innovation Partnership on Water). After a few years of the Water programme, it is good to raise the question of whether these funding opportunities have kept the companies and research organisations active by responding to the needs of the water sector. (Salminen & Lehtinen 2013.)

4.3 Final report, evaluation and the current state

The Water programme was finished in 2012 and Tekes final report was published in 2013. During that time, approximately a half of the funded projects were still ongoing. In 2015, the Water Programme was evaluated by Gaia Consulting. The final report made by Tekes recognised many of the challenges of the programme and the sector, and Gaia's evaluation deepened that view and gave strong guidelines for the future. The evaluation focused on programme objectives and timing, added value of services, participants and results. Sources for the assessment were the programme preparation material, the final report, expert interviews and views and other documentation. (Luoma, et al. 2015.)

As mentioned earlier, the Finnish water sector has a few big companies, such as Econet, Kemira, Lamor, Outotec and Uponor, and several small ones. A lack of medium sized companies exists. Strategic partnership between different sectors is valuable and especially important in smart water business. The water sector has strategic partnerships for example in the field of agriculture, energy, mining industry, forestry, chemical industry, construction and development cooperation. That kind of partnership cooperation should be increased and considered as a growing business model in the future. Synergies were missing during the Water programme. Synergies between companies and research projects were limited and

business ecosystems lacked a dynamic model. (Salminen & Lehtinen 2013; Luoma, et al. 2015.)

According to the evaluation report, participating companies had challenges to utilize programme services, especially global business development services. Reform and internationalization objectives were considered too ambitious, since the state of the Finnish water sector was structurally challenging and diverse. The programme results could not clarify the water sector or realize its business potential. (Luoma, et al. 2015.)

All in all, the overall goal for networking and facilitating discussion was considered as a great success. The platform for information delivery was created and the Finnish Water Forum continued the organizing work of water sector. The water programme helped to form the key themes in the Finnish water sector: smart water, waste water management and industrial water. (Luoma, et al. 2015.)

The interesting but harmful issue is that still in 2017, five years after the Water programme, the same obstacles exist as during the Water programme. According to the recent publication “New partnership- and business models for the strengthening of Finnish water expertise and businesses in addressing global water challenges”, which was published in 2017, it was stated that a clear strategic vision and ambition are required to answer the needs of internationalization of the water sector. Finnish companies have comprehensive and international water expertise, but internationalisation has still many challenges in 2017. These challenges are similar as it was recognized in Tekes final report and the evaluation report of Gaia Consulting. Finnish companies focus on technology expertise but not on the market area, customer or sales perspectives. Resources and networking are limited and in some cases, for example in development cooperation, Finnish companies rather work alone than together. In addition, the water sector itself might be too narrow – water technology companies should put more effort into the strategic partnerships as mentioned before. The leader companies could be for example the big forest or construction companies, who have already

international business. These actions were already mentioned during the Water programme, but these issues are still relevant in 2017. (Koskinen 2016; Rinne & al. 2017.)

All in all, the real ambition to expand business internationally and going global is needed. More synergies between public, private and third sector organisations should be formed and utilized. It is also important to know better the trends, the most wanted concepts and solutions. Finnish companies can greatly contribute to possible solutions of global water-services related problems which support sustainable communities. Exports of water technology and services could lead to key success factor for the country. (Katko 2016, 248; Koskinen 2016; Rinne & al. 2017)

5 CHINA AS A FOCUS AREA

China is the target area on this thesis. China has water challenges, mainly water shortages and water pollution, which have been described in more detailed in this chapter. China needs tailored solutions and business concepts. These themes are also discussed in this chapter.

5.1 China's water crisis

An adequate supply of freshwater is vital to the whole ecosystem: health, environment and economy. China has the world's largest population and the second-largest national economy. Water shortages in China could mean serious consequences for world food security and global prosperity. Water shortage is the key issue on water challenges in China, and it is primarily caused by demographic and climate conditions. China suffers from a common problem: too much water in the wrong place and uneven temporal and spatial distributions of water resources. In addition, China has a continental monsoon climate, which deteriorates water utilization and resourcing leading drought and flood disasters. (Cheng, Hu & Zhao 2009, 240, Hu & Cheng 2013, 58.)

China's rapid and intensive Industrial development, population and economic growth and accelerated urbanization have radically increased water demand, together with improvements in the standard of living and the surrounding ecosystems. The demand for water supply is predicted to increase significantly as urbanization continues in the future. China has approximately one fifth of the world's population, and only 7 % of the world's freshwater resources. Water resources in China also have large inter- and intra-annual varibiality, which is a challenge for effective utilization of the surface water. Especially, western and northern parts of China have serious water shortage issues. Approximately 400 of 668 cities have insufficient water supply and more than 100 of them have serious water shortages. The balance between water supply and increasing water demand is a complex challenge. The figure below demonstrates total

water supply and water consumption. (Cheng et al. 2009, 240-241; Luova 2010, 166, Hu & Cheng 2013, 58.)

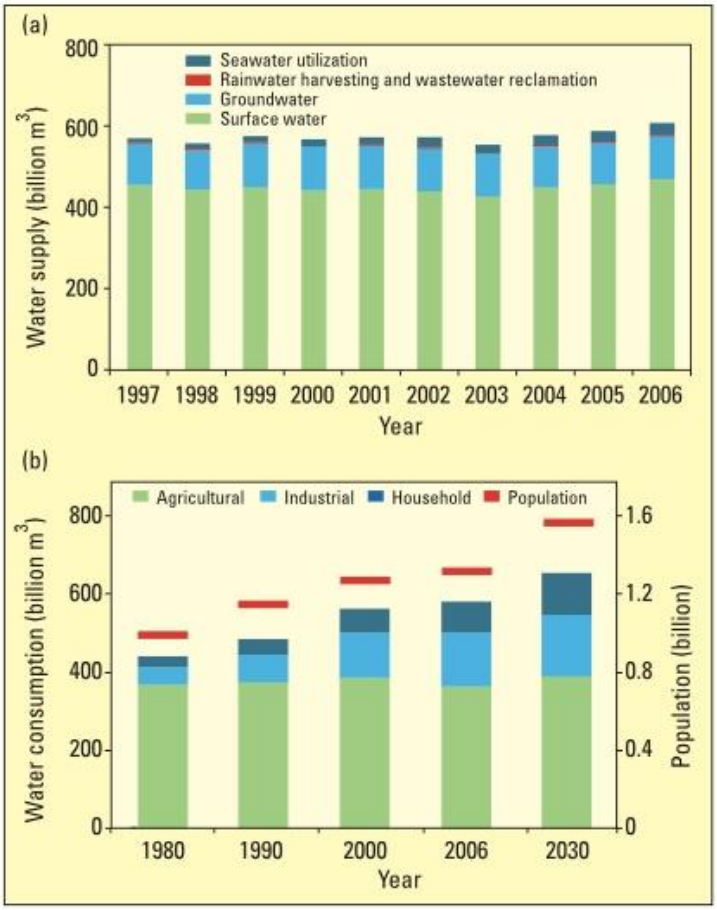

FIGURE 3. China's water: (a) total supply by sources; (b) trends in total withdrawal. (Cheng et al. 2009, 241.)

Another of China's major water challenges is water pollution. For two decades, the government of China treated environmental issues as consequence of capitalism and environmental protection as a distraction from economic growth. Breakneck industrialization led to some of the

worst water pollution in the world. Polluted water is difficult to use beneficially, which leads again to water shortage problems. Heavy pollution has made 25 % of the lake areas, 17 % of the river sections and 4.5 % of the reservoirs useless. The major sources for water pollution are industrial and municipal wastewater, and agricultural emissions. The most common pollutants in water systems include organic pollutants, nutrients and heavy metals. Pollutant discharges from agricultural, industrial and municipal sources have increased water pollution. Other notable causes for water pollution are poor water resources management, freshwater abstraction from the environment and enforcement of pollution control regulations. The water pollution problem is so extensive that even southern China, which has relatively well-stocked water resources, faces shortages of clean and safe drinking water. The table below combines the root causes and solutions for water pollution. (Shirk 2007, 33; Hu & Cheng 2013, 58.)

TABLE 4. The root causes for water pollution and the key drivers of long-term water quality improvement in China (Hu & Cheng 2013)

ROOT CAUSES FOR WATER POLLUTION IN CHINA
Excessive water abstraction from the environment (causes: urbanization, industrialization, population and economic growth, agricultural changes, improvements in living standards etc.)
Poor water resources management
Poor enforcement of pollution control regulations
Increased pollutant discharges from industrial, municipal and agricultural sources
SOLUTIONS
Technological innovation (e.g. development of water-saving and pollution control technologies, waste water treatment technologies)
Institutional and policy reforms
Water quality improvement

5.2 Possible solutions

One of the key challenges for water resources management in China is to make a balance between limited and poor quality water resources and increasing water demands. Economic, technological and policy drivers have major roles in water conservation and water quality improvement of water quality in the long-term. China is moving from a low-cost manufacturing economy to a knowledge economy which is powered by science and innovation. Only through intergration into the global economy and continued economic growth can China provide needed technologies and policy approaches to protect the environment. Water-saving technology and pollution control need more investments from the government and private sector. In addition, the development of certain

policy incentives, such as controlling the heavily polluting factories, need also financial resources. (Hu & Cheng 2013.)

The Chinese government has already put efforts into implementing water saving technologies. In addition, changes in water management and practices, along with reforming prices and fee collection systems have been implemented. Despite such important investments and changes in the past two decades, there is still a huge gap in agricultural water use efficiency compared to elsewhere in the world. Water use efficiency is becoming the crucial means of balancing limited water supplies with growing water demand in China. (Cheng, Hu & Zhao 2009, 241.)

Limited water resources or too much water is partly caused by China's monsoon climate, which creates drought and flood periods. Consequently, reservoirs and dams have an important role in the effective management of surface water resources. China has most of the large-scale dams in the world, including the largest one called the Three Gorges Dam. It includes a 39.3 billion m^3 reservoir. Nevertheless, large-scale reservoirs and interbasin projects have complex technical, environmental, economic and social issues. These projects should be used only to as supplement to water conservation and recycling options. However, large water transfer infrastructures have a significant role now and in the future in China. Several major interbasin water transfer projects have been already created to resolve water shortage and spatial distribution problems in one of the most water-stressed areas. (Cheng et al. 2009, 241.)

Water conservation, water efficiency, water reservoirs and interbasin water diversions are means to address water shortages. The most effective and environmental friendly means is through water conservation and improving usage efficiency in agriculture and industry. Waste and pollution are restricted by market-driven water prices. Also, alternative water resources can be utilized, such as rainwater, municipal wastewater, and seawater. These alternative resources might be costly but could be promoted when possible. The complex reasons for China's water shortage need a variety of solutions. In order that reasonable cost and sustainable development of

water resources can be reached. It means changes in government laws and policies, new technology, economic factors and increased awereness of environment protection and conservation. (Cheng et al. 2009, 242-243.)

5.3 China as a market area

China is the world's largest market area. The country's economic growth and rise has been fast and unpredicted. China had so called gold rush days in the beginning of the 1990s. In 1995, China had its strongest post-economic reform boom. Western companies wanted to enter the Chinese market and the reason for their interest was inevitable: China was the place where to make money. It still attracts companies worldwide. (Ambler, Witzel & Xi 2009, 7, Rosenqvist 2015.)

China is nowadays increasingly more open for foreign investment. The most significant countries and regions investing in China consists of Hong Kong, South Korea, Virgin Islands, the United States, Japan, Taiwan, and the European Union. An easy and popular way to enter Chinese markets is trough joint ventures. (Frost & Sullivan 2005.)

However, entering Chinese markets has challenges. These challenges, or threats, have been presented in table below. The table is a SWOT analysis of China as a market area. A SWOT analysis means a table, which has four elements: strengths, weaknesses, opportunities and threats (Kaplan & Norton 2009, 71). Two outstanding weaknesses are corruption and the economic and social divisions, meaning the huge gap between rich and poor people. In addition, Chinese companies differ from Western companies on many levels. Shortly, it can be said that Chinese companies are young and learning and the Chinese government has a more "hands-on" attitude. Chinese companies are relatively young in many industries, and the water sector seems not to be an exception. (Backaler 2014.)

Also, doing business in China has challenges. The Chinese market area demands continuous learning, social networking and good overall management of the business. Tough competition in the market in China is

challenging. Tailored solutions, flexibility and rapid actions have a high importance. Finland has confronted challenges with multicultural relations and social networking. Networking has been limited and unilateral, and there has been a lack of cultural knowledge and cultural education. In addition, there is a need for more active participation in international meetings and conferences, as well as the need for a more creative and broad-minded attitude in general. Companies, research organisations and authorities altogether would need a greater boost for international collaboration and activity. (Havren & Rutanen 2010, 87-90, Rosenqvist 2015.)

Besides differences with the market area and the way to do business, China also has other challenges. Cultural aspects, Chinese language, networking and relationships, are usually the major challenges for foreigners. Culture and traditions have a big importance for the Chinese – also in business. Old culture and civilisation form a strength for China, but they can be a threat for foreigners entering the market (Rosenqvist 2015). In addition, geographical differences are vast and finding the most suitable location for the business is in a key role. In many cases, business has been concentrated in the Shanghai area, while inner China could offer more inexpensive labour costs and premises. (Havren & Rutanen 2010, 93, 100.)

To make the entry to the Chinese market easier, it is possible to use China specialized consulting services, which offer assistance to find the needed information or partners. Many of these service providers are private consultants, but also organisations, including universities and polytechnics, which offer training focused on Chinese markets and trade. In addition, some of these service providers and consultants have specialized in environmental technology. (Hirvi 2006, 41, 84.)

Presenting different technology services in practice is important. In 2005, Finland-China Innovation Center was established in Shanghai. The center increases cooperation between Finland and China by enabling projects for

companies and research institutions. It also provides commercialization opportunities for Finnish technology. (Hirvi 2006, 11.)

Logically, when thinking about business opportunities in China, the focus should be in the future and especially in the areas, which are keyplayers in China's strategy. Finnish business should answer for those strategical keypoints and Finland should be aware different plans in China. For example, China's Five-Year Plans give good aspect for the current focus areas in economic and social development. The ongoing Thirteenth Plan 2016-2020 has key initiatives in water pollution including construction of urban sewage treatment, reduction of waste emissions and urban reclaimed water recycling. This Five-Year Plan has specific objectives and in water sector it means reduction of water consumption by 35% by 2020 in comparison with the year 2013. (Havren & Rutanen 2010, 95; King & Wood Mallesons 2017.)

The future development of China offers numerous opportunities for business. As mentioned in the table below, increased environmental issues and related actions for them, can offer many business opportunities. These actors have been highlighted in the table 5. Table 5 has also more detailed information concerning the strengths, weaknesses, opportunities and threats. For example, copying risks, insufficient local knowledge and complexity of rules and laws are some of the challenges. There is a growing need for quality products and services in China. Products, services and marketing should be tailored to China. Innovations are one way to receive competitive advantage. (Rosenqvist 2015, 3.)

TABLE 5. SWOT analysis (Rosenqvist 2015)

STRENGTHS	S
availability and affordability of labour	
proximity to Asian market	
large population	
growing internal markets	
increased purchasing power	
affordable energy	
good transport connections	
economic growth	
old culture and civilisation	
centralised control of the state	
flexible decision-making	
predictability of economic plans	
reverence of diligence, study and work	
innovativeness and creativity	
internal competition	
flexible networks and guanxi	

WEAKNESSES	W
complexity of rules and laws	
corruption and hidden problems	
culture of controlling and supervision	
old-fashioned and ineffective industry	
strong role with state-owned companies	
policy of favouring domestic players	
copy culture and information leaks	
increase of environmental issues	
unequal distribution of well-being	
restrictions converning rights and freedom	
imbalance between cities and countryside	
high unemployment rate and hidden unemployment	
extensive internal intergration without social security	
low levels of productivity	
challenges with licensing, certification and registration	
vulnerability of information system	

OPPORTUNITIES	O
increasing consumer demand	
technology development	
economic liberalization	
liberalization of financial markets	
increased innovativeness	
increased know-how due to competition	
environmental conservation and remediation	
developing agriculture, developing inner land	
development of cities	
development of construction industry	
cleantech solutions	
the growing needs of social and public health	
changes in the life style	
possibilities of personal relationships	
development of good governance	
growth and delveopment of service sector	
cleaning up land, air and water	
industrial streamline	

THREATS	T
challenges in air pollution	
political changes	
increase of nationalism and ethnical tensions	
unequal balance with gender and age	
availability of raw materials	
debt growth	
decline in profitability	
rapid changesin the exchange rate	
cultural differences	
changing consumption patterns	
problems with human rights and civil commotions	
environmental crisis and catastrophes	
health problems	
trade wars and regional conflicts	
increase of social inequality	
changes in taxation, property and investment	
community decline	
population ageing without social networks	

6 DOCUMENT ANALYSIS

This chapter discuss about the document analysis, which was completed after the literature review. The outcome of the document analysis is an excel table on the appendices, which is a generic review of the companies in the Finnish water sector. The companies were chosen by using three different databases: Tekes Water programme company list, Finnish Water Forum private enterprises member list and the participant list of the business conference held in Turku in 2017. Although it can be seen that more companies exist in the field, this study has a limited scope. Further information about the companies can be found from the collaboration members of Finnish Water Utilities Assocation (FIWA). FIWA is the association of the Finnish water and wastewater utilities. Approximately 300 Finnish water utilities have FIWA's membership and 150 collaboration members, which consists of companies, institutions and other parties. (Finnish Water Utilities Association 2017.)

All the formed information is based on the data from the internet. The biggest challenge was to gather the most relevant data from the very scattered sources and be able to analyse it.

6.1 Gathering the data

The final database was gathered by using the three main sources.

Tekes Water programme

Several company projects were funded by Tekes Water programme. Those companies whose projects were funded, were collected and listed by using the final report of Tekes Water programme and Tekes open data storehouse. The gathered information was the name of the company, the name of the funded project and the summary of the project. In total, there was 71 companies and 91 projects. Certain bigger companies had more than one project. Six of the projects has been gathered into the table below. The table describes the company projects and shows the duration of the projects. All the projects on the table lasted approximately one or

two years. The common factor for several of them was the development work in an international strategy and a global expansion.

In the document analysis, the number of Tekes Water programme companies is 69 instead of 71. Two of the enterprises do not represent a company: The Finnish Water Forum and Suomen Vesilaitosyhdistys ry.

TABLE 6. Examples of the funded company projects by Tekes Water programme (Tekes 2017).

Doranova Oy	
Name of the project	Doranova International expansion
Project summary	Doranova Oy has created innovative environmental technology solutions and systems for example for water treatment, soil treatment and green energy systems for landfills. The aim of the project is to create systematical international strategy. The project is the basis for the company's international expansion.
Duration	5.11.2008 – 31.12.2010
EHP-Tekniikka Oy	
Name of the project	Internationalisation in Scandinavia for EHP-Tekniikka
Project summary	The aim of the project is to expand deliveries to Scandinavian clients. The company provides high-quality environmental monitoring solutions that can be adapted for local conditions.
Duration	3.9.2012 – 31.5.2013
Kemira Oyj	
Name of the project	Desalination
Project summary	The project develops new chemistry for desalination technologies. The aim is to create more environmental friendly and energy efficient processes. The safety of the drinking water, the acceptance of manufacturers and sustainable development will be taken into account.
Duration	11.1.2010 – 30.6.2012

Korves Oy	
Name of the project	Product-10
Project summary	The goal of the project is to develop safe and environmentally sound chemicals for water systems.
Duration	1.2.2010 – 31.5.2011
PAC-Solution Oy	
Name of the project	Broadening PACS 8 system's applications
Project summary	The project is a research program where PAC-Solution Oy investigates new application areas for the proprietary of the company's technologies for water treatment. The project will be completed in collaboration with the University of Oulu and Oulu Waterworks, also other several research institutes and companies will contribute to the research.
Duration	18.8.2010 – 30.4.2012
Pöyry Management Consulting Oy	
Name of the project	Project Geysir
Project summary	The background of the project is global confusion: water and water related businesses have been investigated globally. However, water business has been complex and perplexing even for many experts due to the paradox linked to water value. This project, thus, has a niche carved out globally.
Duration	1.8.2009 – 1.2.2011

List of private enterprises members of Finnish Water Forum

Numerous Finnish companies in the water sector are members of The Finnish Water Forum (FWF). The FWF is a platform for cooperation between commercial enterprises, scientific institutions, government and non-government organizations and water related associations. The private enterprises members of the FWF were listed and classified. (Finnish Water Forum 2017.)

In total, there was 93 companies which are members of the FWF. The document analysis consists of 89 of these companies, since 4 of these 93 members were not actually companies. The description of each company,

including the product or service, and the sector was provided. The used sectors were:

Automation & Remote Control and Information Management

Chemicals

Consulting & Design

Contractors

Energy & Hydropower

Forestry

Smart Water

Special services and other

Technical Solutions & Equipment

Water Quality & Hydrological Monitoring & Remote Sensing

(Finnish Water Forum 2017.)

Participant list of the CEWP Business conference and matchmaking event

Several European and Chinese companies in the water sector participated in the China Europe Water Platform Annual High-Level Dialogue Conference, which was held in Turku on September 2017. In addition, the conference included a High-level Business Conference, which consisted of seminars, B2B meetings and matchmaking events. The two-day Business Conference had approximately 250 participants and it hosted 160 meetings between Chinese and European companies. (China Europe Water Platform 2017.)

The Finnish companies which participated in matchmaking events, were listed and classified. In total, there were 46 Finnish company participants. The business fields, size, city (or location of the main headquarter in Finland), website and other important data were collected from the

company profiles. In addition, the sector of company was provided. The sectors used were:

Hydraulic infrastructure construction

Irrigation

Measuring technologies

Urban water management

Water quality and technology

Water saving/efficiency solutions

(B2match 2017).

These sectors were based on the focus areas of the Business Conference. The focus areas were: water measuring and water efficiency solutions; smart city solutions, including water quality, treatment and urban water management; and hydraulic infrastructure construction. The company interests and more detailed information can be found via b2match-website (B2match 2017).

Profiles with authority/government and universities types were not added to this list. In addition, financial institutions or Finnish Water Forum were not listed, although they participated in matchmaking.

6.2 Combining the data

All these above mentioned three databases were merged and the most relevant information was collected into the final table. The chosen parameters in the final table were:

Name

The name of the company.

B2match

B2match section was ticked if the company participated in the CEWP Business conference.

FWF member

FWF member section was ticked if the company is a member of the Finnish Water Forum.

Water programme

The water programme section was ticked if the company has been funded by the Tekes Water programme.

Size

The size means the number of the employees in the company. The scale of the size has been divided into five groups as can be seen from the table below. In the simplest case only the size defines the company category while occasionally also the turnover and balance sheet are used. (Tilastokeskus 2017; Yrittäjät 2017.)

TABLE 7. The company category based on the number of employees in Finland (Yrittäjät 2017)

Number of employees	Company category
1 – 10	micro
11 – 25	small
26 – 50	small
51 – 250	medium-sized
250+	large

Service/product

The service or the product of the company or short description of the company.

Location (the headquarter in Finland)

The location of the company's headquarter in Finland.

Founded

The year when the company was first founded.

Turnover rate

Company's turnover rate in million euros. The information is provided by Fonecta Finder online service (https://www.finder.fi)

Webpage

The link to company website.

Webpage in English

The webpage in English was ticked if the company has their webpage translated into English.

Email

The general email address of the company was added.

All these parameters were formed and merged as most of this information already existed on the databases. This information provides the basic review of the field and it gives answers to the research questions. In addition, this certain number of parameters enabled the excel table to be compiled, which is still easy to read and understand. The resources of the writer were also considered. The missing information was found by using the official websites and linkedin profiles of the companies. In addition, basic company information was founded from the Fonecta Finder service.

The classifying of the companies' services was challenging. The terms used for the sectors differed from each other. Moreover, the class might not sufficiently describe the company services. Therefore, the author used instead a short description of the company. Those descriptions were collected from the websites of the companies and the company profiles from the Finnish Water Forum website.

Finally, the company data was analysed and wrote out to get a better view of the water sector enterprises. The results have been discussed in chapter 7.

7 RESULTS

This chapter reviews the results of the methods used. The outcomes of the document analysis were analyzed and compared with the literature review. The final results answered the research questions satisfactory and completed the main goal, which was to recognize and define the companies in the Finnish water sector. The research questions were the following:

1. What kind of private water sector enterprises exist in Finland?

2. What kind of potential do companies in Finland have in the water sector?

3. What are the main challenges for companies in Finland dealing with water related business in China?

The literature review and the document analysis both showed that the Finnish water sector is wide and scattered, and various micro sized companies exist. The table in the appendices consists of 169 companies. According to the number of the employees, 44% of the companies (74) are micro sized, 35% of the companies (60) are small sized, 11% of the companies (19) are medium sized and 10% of the companies (17) are large sized. 39% of the companies (66) operate mainly in the capital region, which includes the cities of Helsinki, Espoo, Vantaa and Kauniainen. 7% of the companies (12) operate in the Turku region, which consists of the cities Kaarina, Naantali, Raisio and Turku. The table below shows the company profiles by size.

TABLE 8. The size of the companies

Size of the company	Amount	%
micro	74	44
small	37	22
medium	20	12
large	17	10
closed	9	5
no data	12	7
IN TOTAL	**169**	**100**

The biggest companies by size are Alfons Håkans Oy, Andritz Oy, Consti Talotekniikka Oy, Kemira, Metsä Fibre Oy, Onninen Oy, Outotec Oy, Ramboll Finland Oy, Sito, Stora Enso Oyj, Trimble Solutions Oy, UPM Kymmene Oyj, Vaisala, Valmet Technologies, Valmet Automation, WSP Finland and Yara Suomi Oy. The fields of forestry, construction and engineering consultancy services to the built and natural environment are well represented. All in all, the variety of the services and products is diverse. Tekes Water programme also mentioned Econet, Lamor and Uponor as the largest companies in the field. As can be seen from the table, these companies are not the largest ones regarding the number of people they employ, instead the turnover rate is relatively high.

The structure of the companies in the document analysis supports the view of the Tekes Water programme. The lack of medium sized companies exists, which can be interpreted as being due to a shortage of resources and existing international business. In addition, an interesting

fact is that 5% of the companies (9) are already closed or bankrupt as early as 2017. All these companies were participants in the Tekes Water programme. It also means that 13% of the companies that participated in the Tekes Water programme, are terminated by 2017. This could mean that those funded projects and business ideas did not succeed or at least did not have the expected results.

According to the company databases, 17% (29) of the companies show up in more than one database. Seven companies exist in all three databases; they participated in Tekes Water programme, B2match event and they are members of the Finnish Water Forum. Approximately a half of the companies (89) are members of the Finnish Water Forum. 27% of the companies (46) participated in the B2match event and 41% of the companies (69) participated in the Tekes Water programme.

Some of the companies did not have much details on their websites and it was quite challenging to find any relevant information. Furthermore, several companies have their websites only in Finnish or in Finnish and Swedish. In total, 19 of the companies have not had their website translated into English. 12 of these companies were micro sized and three small-sized. One of the companies was medium sized. One common factor is that all these companies have relatively small turnover rates. One can assume that internationalization might not be their target even in the slightest. For the author, it was interesting to notice and compare the differences between the companies which work in the sector and realize how big the gap is between the most international companies and the least ones.

Some company profiles in the B2match database were incomplete. The company profiles were lacking relevant information, while some companies put much more effort into their profile descriptions than others. For example, two companies had even translated their profiles into Chinese; while some companies did not add any basic information in English. However, most of the companies had filled in the most important information. The incomplete information might indicate a lack of motivation

or a lack of resources and time. The event was also new and most companies were not familiar with it, which might decrease the interest and effort put by the companies into their profiles.

Based on the Tekes Water programme, the key themes in the Finnish water sector are smart water, waste water management and industrial water. The most funded themes in the private water sector enterprises were water and waste water treatment. The document analysis shows that the companies represent numerous fields from the traditional water management services to the newest ICT solutions and they mostly support the key themes mentioned above. In addition, some companies do not directly represent the water sector, but water still is the common factor. The Chinese water sector would especially require water conservation and water efficiency solutions. The document analysis offers concrete company examples of those services, but the table would need further research.

According to the literature review, the Tekes Water programme had a significant budget; 49 million euros. The programme was a large investment, which developed the means and resources in the Finnish water sector. However, internationalization services in the Tekes Water programme were not found useful and the same obstacles still exist in the Finnish water sector. The recognized problems in Finland have been particularly networking and lack of resources. In addition, a lack of cultural knowledge and cultural education have been typical challenges for Finnish water sector enterprises, whose international focus is on China. More creative and broad-minded attitudes would be an advantage. Moreover, the active participation in international meetings and conferences would be needed.

Unfortunately, the document analysis could not directly answer the third research question and more research would be needed. While gathering the relevant data for the document analysis purpose, the author noticed that some companies have their websites translated into Chinese and have offices in China, while some companies have only limited business in

Finland. The stage of the internationalization would be interesting and important to find out, as well as the business potential of the companies. In addition, a more detailed review of the startups could give further information about their hidden business potential.

8 CONCLUSIONS AND DISCUSSION

The result of the document analysis is coherent with the literature review. The literature review forms a general view of the enterprises in the water sector in Finland, whereas the document analysis gives concrete company and service examples. Both methods describe the Finnish water sector in similar ways. Moreover, the literature review also gives a general view about business opportunities and challenges in China.

According to the final report of the Tekes Water programme, companies' interest in international business is increasing, although it is challenging to get the companies involved and achieve concrete actions and results. It is quite easy for companies to participate in related events and funded programmes, but more decisive actions in international business are needed after those events.

Several companies participated in the water conference held in Turku in 2017. More specifically, the study shows the amount and the profile of those companies. Further actions need to be taken after the conference as mentioned earlier. The same issue exists in the Water programme. Companies' actions and results should be also monitored for several years after the programme; while the evaluation of the Water programme was a step in the right direction, the need for taking further measures still exists. This study also shows that some Tekes funded company projects were not likely profitable, since those companies have been closed or bankrupt as early as in 2017. Although, the reasons behind those issues are complicated, it can be clearly seen how the companies took unprofitable decisions thus leading to financial loss.

According to the literature review, it is very important to identify strengths and weaknesses in the Finnish water sector. This has been done in the Water programme and similar identification should be carried out more regularly. It should be also considered that the sector develops all the time. This study completes the identification which was conducted earlier. The table in the appendices shows the general view of the companies and

it can be used as a basis for future studies. Furthermore, the table includes a plethora of information that could be further analysed. In addition, more companies in the sector can be found from the list of collaboration members of the Finnish Water Utilities Association.

The personal development during the thesis process has been instructive. The author's knowledge and understanding of the field has been deepened and the opportunities to work with similar issues in the future have been increased. The process of writing the thesis included some challenges. Firstly, the author had to modify the research methods. Instead of the document analysis, the semi-structured theme interviews were first considered. However, a handful of interviews without a deeper understanding of the sector would have been disconnected. Thus, it would not be possible to form a bigger or more concrete picture based solely on those interviews. Nonetheless, it would be interesting to conduct semi-structured theme interviews in the future in order to obtain additional information from the companies. Especially the views from those companies which are less well-known, start-ups or even those new in the sector, would be valuable to hear. Possibly the voice of those companies has not been heard before.

All in all, companies' potential in the Chinese business sector as well as their water knowledge in general would need further future research. Interesting and supporting data can also be extracted by interviews of different experts. For example, experts and consultants from the international business, marketing communications, and the water sector could be interviewed. It would be important to get new viewpoints and influential people who can make a difference. So far it seemed that the same Finnish experts or companies were mentioned repeatedly while the literature review was taking place.

The concept of sustainability should be a significant part of the environmental and water business. However, the environmental business does not mean it is automatically green or sustainable. The water crisis in China is an example of negligence of sustainability in the water business.

The concept of sustainability is a particularly important aspect in China so that the past environmental issues would not reappear. The companies in Finland represent mostly the innovative expertise and knowledge, which can be discovered from the literature review and the document analysis. Their solutions should support the concept of sustainability.

Promoting Finnish water expertise requires an effort. European clusters can offer good opportunities for global water business expansion. It is important to develop strategic partnerships between the sectors and be open to transboundary thinking and networking in general. Especially Chinese markets require continuous learning, social networking and good overall management of business. The collaboration, forming strategic partnerships and creating international business opportunities still need more effort and resources in the future. Tekes has already taken this challenge into action and has modified its programmes in order to be more diverse and multidisciplinary. The Water programme was probably the last one in the format of large funding programmes for particular sectors, but the opportunities in the water sector enterprises are constantly growing. In addition, environmental issues in China and the demand for water supply is predicted to increase significantly and thus create more business opportunities. The Chinese water sector needs foreign expertise and technology to meet this growing water demand. In addition, the complex reasons for China’s water crisis require a variety of solutions. The water sector enterprises in Finland have to decide whether to utilize possible opportunities or insist on selecting the safe choice of focusing only on local markets.

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APPENDICES

The table begins from the next page. The star icon (*) means that the information is not available on the table. The size means the number of employees in the company and the turnover rate is in million euros.

COMPANY	B2 MATCH	FWF	TEKES	SIZE (by people)	LOCATION	FOUNDED	TURNOVER RATE	WEBPAGE (URL)	WEB PAGE (EN)	EMAIL	SERVICE/PRODUCT
A-Lab Oy		x		51-250	Keuruu	2000	0 - 0.2	http://www.a-lab.fi	x	info@a-lab.fi	Wireless measurement, remote control and data gathering technology
Aeromatic Finland	x			1-10	Raisio	2015	*	www.aeromatic.fi ; envieno.com	x	pekka.vieno@envieno.com	Water treatment industry
Aikola Spring Water	x			*	*	*	*	*	*	*	*
Alfons Håkans Oy Ab			x	250 +	Turku	1945	*	https://www.alfonshakans.fi	x	office.turku@alfonshakans.fi	Technology solutions
Alleco	x	x	x	1-10	Helsinki	1989	0.2-0.4	www.alleco.fi	x	info@alleco.fi	Marine Biological and Limnological Consultants; Software for field data collection and analysis, underwater equipment
Alshain		x		1-10	Espoo	2008	0.2-0.4	https://alshain.fi	x	markus@alshain.fi	Real-time water & soil analysis
Andritz Oy			x	250 +	Helsinki	1852	200 +	https://www.andritz.com/group-en	x	welcome@andritz.com	Pulp and paper industry
Anthurium		x		1-10	Helsinki	2013	0 - 0,2	http://www.anthurium.fi	x	attm@anthurium.fi	Consulting, sales and marketing, international business and cooperation
Aprotech Oy		x		1-10	Hamina	2009	1-2	http://www.aprotech.fi/fi/		sales@aprotech.fi	Sludge management, solid liquid separation
Aqsens Oy		x	x	11-25	Helsinki	2009	0.2-0.4	http://www.aqsens.com	x	timo.teimonen@aqsens.com	Water chips for water quality monitoring

Aqua Advisor		x		1-10	Vantaa	2012	0 - 0.2	http://aquaadvisor.fi	x	aquaadvisory@gmail.com	Aqua Advisor Oy engineering and realize projects where needed different kinds of pumping stations, booster stations and tanks.
Aqua Nova Oy	x			11-25	Turku	1979	2 - 10	www.aquanova.fi		aquanova@aquanova.fi	Water purification
Aquamarine Robots		x		*	Ylitornio	2013	0 - 0.2	http://www.aquamarinerobots.com	x	info@aquamarine.fi	Water measurements using a robotic system.
Aquamec Oy (Watermaster)	x	x		11-25	Loimaa	1995	10-20	http://www.watermaster.fi/company	x	watermaster@watermaster.fi	Watermaster technology for reconstruction of shorelines in urban and suburban areas
Aquaminerals Finland Oy		x		11-25	Paltamo	2009	0.4 - 1	http://www.aquaminerals.fi	x	tuomo.pikkarainen[at]aquaminerals.fi	Production of heavy metal and metalloid sorbents used in waste water treatment
Aquator Oy			x	1-10	Oulu	2007	0.4 - 1	http://www.aquator.fi/etusivu	x	info@aquator.fi	Water treatment, reuse solutions
Aquazone Oy	x	x		1-10	Espoo	2009	1-2	www.aquazone.fi	x	jyri.koivisto@aquazone.fi	Consulting, waste water treatment & sludge
AQVA.IO	x			1-10	Pori	2017	*	http://aqva.io	x	sales@aqva.io	Water monitoring: remote reading services, watermeter
Arbonaut Oy		x		26-50	Joensuu	1994	2 - 10	https://www.arbonaut.com/en/	x	tuomo.kaurannne@arbonaut.com	Mobile env. data collection, data storaging and analyzing, monitoring; Natural resource remote sensing
Artasfin	x	x		1-10	Espoo	2015	0 - 0.2	http://fi.artasfin.fi	x	annika.michelsson@artasfin.fi	The core business is in the water, wastewater, biogas and air treatment.
Arvo-Tec Oy			x	1-10	Joroinen	1993	1-2	http://www.arvotec.fi	x	sales@arvotec.fi	Environmentally friendly production technology for fish farmers
Atomar Oy Ab Insinööritoimisto		x		1-10	Tampere	1977	0 - 0.2	http://www.atomar.fi		info@atomar.fi	Small scale waste water treatment units
Auramarine Oy			x	51-250	Lieto	1974	10-20	http://www.auramarine.com	x	sales@auramarine.com	Mechanical or industrial engineering (auxiliary unit production)

Awel Technologies Oy			x	1-10	Hämeenlinna	1990	0 - 0.2	http://awel-technologies-oy.rakentajalle.fi		awel@awel.fi	Steel and building materials
Bauer Watertechnology Oy		x		11-25	Vantaa	1996	2 - 10	http://www.bauer-wt.com	x	info@bauer-wt.com	Chemical-free water treatment solutions
Biolan Oy			x	51-250	Eura	1974	10-20	https://www.biolan.fi	x	info@biolan.fi	Environmental products: composters, dry toilets, waste water purifiers
Biower Oy			x	1-10	Varkaus	2008	1-2	http://www.nordicgreen.net	x	info@nordicgreen.net	Supplier of total solutions for biogas and waste water treatment plants
Biwatech		x		1-10	Vantaa	2014	0 - 0.2	http://biwatech.com	x	ari.jolma@gmail.com	Simulation, optimization, GIS, free open source software for data processing, analysis and visualization services in water management.
Bluet Oy Ltd		x		1-10	Helsinki	2016	0 - 0.2	http://en.bluet.fi	x	info@bluet.fi	Profitable waterfront development
Boildec Oy (Varo Teollisuuspalvelut Oy)			x	1-10	Vantaa	2011	0.4-1	http://varo.fi	x	timo.karjunen@varo.fi	Boiler water treatments
Clewer Group of companies	x			11-25	Turku	1989	0 - 0.2	http://www.clewer.com/	x	jouni.laine@clewer.com	Ecological wastewater treatment systems for industry and communities
Consti Talotekniikka Oy			x	250 +	Vantaa	2004	100-200	https://www.consti.fi/yhteystiedot/	x	asiakaspalvelu@consti.fi	Repairer of housing companies and tenement buildings
Data Rangers Oy			x	1-10	Helsinki	2004	0.4 - 1	http://www.datarangers.fi	x	info@datarangers.fi	Information Technology and Services: data analysis and sofware company
Dewaco Oy		x		26-50	Vantaa	2008	2 - 10	http://www.econetgroup.fi/econet-group/dewaco	x	info@econetgroup.fi	Complete sludge thickening, dewatering and removal system
Digicontrol Automation			x	1-10	Espoo	1987	0 - 0.2	http://www.digicontrol.fi		info@digicontrol.fi	Building automation services

Doranova Oy			x	11-25	Helsinki	1995	2 - 10	http://doranova.fi	x	office@doranova.fi	Solutions for remediating contaminatedd sites and producing renewable energy
Eco-Filtering Solutions (CLOSED)		x		51-250	*	2006	2 - 10	*	*	*	Ceramic membrane filters for micro- and ultrafiltration for autonomic snd plant usage
EcoFiSo OY		x		*	Lahti	2015	0 - 0.2	https://eco-filtering.com	x	info@eco-filtering.com	Solutions for problems in the field of e.g. drinking water purification and desalination, industry waters, oily waters, food and beverage industries.
Ecolator Finland Oy			x	CLOSED	*	*	*	*	*	*	*
Econet Oy	x	x	x	26-50	Vantaa	1999	10-20	http://www.econetgroup.fi	x	info@econetgroup.fi	Waterworks, wastewater treatment plants, project management, construction
EduCluster Finland Oy		x		51-250	Jyväskylä	2010	2 - 10	https://www.educlusterfinland.fi/en	x	online contact form	Gateway to Finnish excellence in education and an expert community creating educational capacity with partners.
EHP-Tekniikka Oy	x	x	x	11-25	Oulu	1987	1-2	http://www.ehpenvironment.com	x	sales@ehp-tekniikka.fi	Automatic, wireless and light monitoring systems and equipment
Ekolet Oy		x		1-10	Helsinki	1990	0 - 0.2	http://ekolet.com	x	info@ekolet.com	Odorless dry composting toilets for outdoor and indoor.
Ekomuovi Oy		x		1-10	Lahti	2001	0.4 - 1	http://www.ekomuovi.fi/cms/	x	info@ekomuovi.fi	Products from thermoplastics and special plastics: sinks, tanks, tubes
Endev Ltd.	x			1-10	Kotka	2011	*	www.endev.fi	x	endev@endev.fi	Cleantech solutions, such as ecologically sustainable processing technology for municipal sludge
Enviprobe Oy			x	CLOSED	*	*	*	*	*	*	*
ENviroCase, Ltd.	x			1-10	Pori	2013	0 - 0.2	www.envirocase.fi	x	info@envirocase.fi	individual or whole-sale packages on environmental research and risk assessment
Envitop Oy			x	1-10	Oulu	1996	0.2-0.4	http://www.envitop.com	x	firstname.lastname@envitop.com	Research and product development: R&D services, water treatment, reactive filters, sludge treatment

Envor Protech		x		1-10	Jyväskylä	2002	0.4-1	http://www.envorprotech.fi/en/	x	protech@envorprotech.fi	Business area in biogas technology, globally several successful references in industrial scale anaerobic digestion processes.
Evac Oy			x	51-250	Helsinki	2012	20-100	https://evac.com	x	evac.marine@evac.com	Provider of integrated waste, wastewater, and water management systems for the marine, offshore, and building industries
FCG International Oy		x		51-250	Helsinki	2012	2-10	http://www.fcg.fi	x	firstname.lastname@fcg.fi	Use of water resources, potable water, wastewater and waste treatment
Fenno Water Oy		x		11-25	Helsinki	2006	2 - 10	http://www.fennowater.fi	x	firstname.lastname@fennowater.fi	Water supply and sewerage engineering treatment plant projects
Ferroplan Oy		x		26-50	Orimattila	1988	10-20	https://www.ferroplan.fi	x	firstname.lastname@ferroplan.fi	Unit and mass conveyers, community and industrial water treatment options
FF-Automation Oy			x	1-10	Helsinki	1993	0.4 - 1	http://www.ff-automation.com	x	info@ff-automation.com	Complete solutions for remote monitoring
Finess Energy Oy	x			1-10	Kustavi	2011	0.2-0.4	http://www.finess.fi/fi/	x	info@finess.fi	Energy saving solutions
Flootech Oy	x	x		11-25	Turku	2008	2 - 10	http://www.flootech.com/	x	info@flootech.com	Water and wastewater treatment solutions
Flowrox		x		51-250	Lappeenranta	1970	10-20	http://www.flowrox.com	x	info@flowrox.com	Heavy duty valves, pumps and systems
Foreca Oy			x	26-50	Helsinki	1997	2 - 10	https://www.foreca.fi	x	info@foreca.com	Weather data and digital weather services
Gaia Group Oy / Gaia Consulting	x	x		26-50	Helsinki	2005	2 - 10	http://www.gaia.fi	x	info@gaia.fi	Sustainable energy and climate solutions, risk management, foresight studies
Goodwell InfraDev Oy		x	x	*	Vantaa	2012	0 - 0,2	http://www.goodwell.fi		firstname.lastname@goodwell.fi	Wastewater treatment & remote monitoring solutions; Wastewater treatment systems, small- and large-scale

HI-Automation Oy			x	1-10	Nurmijärvi	2008	0.2-0.4	http://www.hi-automation.com/fi/	x	online contact form	Electricity and automation services
Högförs Oy	x			26-50	Salo	2008	10-20	www.hogfors.com	x	hogfors.salo@hogfors.com	Valves for the energy and process industries
IndMeas Ab Oy		x		26-50	Espoo	1986	2 - 10	http://www.indmeas.com	x	online contact form	Industrial measurements
Insinööritoimisto Oy Rictor Ab	x		x	1-10	Helsinki	1978	0.4 - 1	http://www.rictor.fi	x	rictor@rictor.fi	Water purification, flotation technology
International Trade Alliances		x		*	*	*	*	*	*	*	Consultancy for renewable energies
IWT Päijät-Häme (Rakennusliike Vasara ja Vesuri)		x		1-10	Lahti	2010	0 - 0.2	*	*	*	Non-chemical water treatment solutions
J P Pavas Oy		x		1-10	Nurmijärvi	1995	0 - 0.2	http://jppavas.com	x	info@jppavas.com	Solutions for microbe-based problems especially in pulp and paper industry.
JCI Aurajoki / SHIFT Business Festival	x			*	Lieto	2009	*	http://aurajokijc.fi		pres@aurajokijc.fi	Federation of young leaders and entrepreneurs.
Kari-Finn Oy		x		1-10	Hollola	2008	1-2	http://www.kari.fi	x	info@kari.fi	Float switches for pump control and alarms
Kauko International Oy	x	x		1-10	Espoo	2012	0 - 0,2	https://www.kaukointernational.com	x	info@kaukointernational.com	Energy efficient technologies, professional electronics and applications
Kemijoki Aquatic Technology Oy			x	CLOSED	*	*	*	*	*	*	*
Kemira	x	x	x	250 +	Helsinki	1996	100-200	www.kemira.com	x	online contact form	Water chemistry, applications, Center of Water Efficiency Excellence (SWEET)

Keyflow Oy		x		1-10	Lappeenranta	1995	0.4 - 1	http://www.keyflow.fi	x	info@keyflow.fi	Capacity and valve sizing
Keypro Oy		x	x	51-250	Vantaa	2010	2 - 10	https://www.keypro.fi/fi/etusivu	x	keypro@keypro.fi	Network information management tools
Kierto Ympäristöpalvelut Oy	x			11-25	Järvenpää	2009	2 - 10	www.kierto.fi	x	online contact form	Waste exploitation solutions
KL Lampo Oy	x			26-50	Pirkkala	1992	2 - 10	www.kl-lampo.com	x	kl-lampo@kl-lampo.com	Water treatment services for industry, power plants and building systems
Korves Oy			x	11-25	Jyväskylä	1992	2 - 10	http://www.korves.fi		info@korves.fi	Chemicals for water treatment and energy services
KSB Finland		x		51-250	Kerava	1994	20-100	www.ksb.fi	x	myynti@ksb.fi	Water and waste water plants, pumping stations, pumps, valves, mixers
Labkotec Oy	x			51-250	Tampere	1964	*	www.labkotec.com	x	info@labkotec.fi	Measurement equipment manufacturer
Lahden Seudun Kehitys LADEC Oy		x		26-50	Lahti	1991	2-10	www.ladec.fi	x	info@ladec.fi	Cleantech technology center.
Lamor Oy / Lamor Corporation Ab		x	x	26-50	Porvoo	1982	20-100	www.lamor.com	x	info@lamor.com	Oil spill response and environmental solutions for a wide range of scenarios and climatic conditions
Leancom Oy			x	1-10	Espoo	2004	0 - 0.2	www.leancom.fi	x	info@leancom.fi	Develops and patents technologies for energy and environment sector
Liqum Oy			x	1-10	Jyväskylä	2005	0 - 0.2	http://www.liqum.com	x	info@liqum.com	Clean water assurance and liquid quality assurance
Lune Group Oy Ltd		x		1-10	Juupajoki	2005	2 - 10	www.lunette.fi	x	info@lunette.fi	Producer of menstrual cups as an alternative to pads and tampons.
Luode Consulting Oy		x	x	1-10	Parainen	2000	2 - 10	www.luode.net	x	online contact form	Waterway research and measurement technology
Masinotek	x	x		1-10	Vihti	2011	0.4 - 1	http://masinotek.com	x	info@masinotek.com	ICT systems and monitoring of environment & water plants

Mericon Oy			x	1-10	Helsinki	2007	0.4 - 1	www.mericon.fi		firstname.lastname@mericon.fi	Management, upkeeping and modelling the infrastructure data
Metsä Fibre Oy			x	250 +	Helsinki	1990	200 +	https://www.metsagroup.com	x	firstname.lastname@metsagroup.com	Wood and energy wood supply
MP-Microbe Oy			x	CLOSED	*	*	*	*	*	*	*
Mäkelä-Plast Oy			x	1-10	Kuopio	2003	1-2	http://makelat.fi	x	firstname.lastname@makelat.fi	Public utilities services, mainly water service products and pumping stations
Niras Finland		x		26-50	Helsinki	1992	10-20	https://www.niras.com	x	niras@niras.dk	Project support for social, environmental and economic development
North Capital Oy / Verus-Kodit			x	1-10	Oulu	2005	0 - 0.2	http://www.veruskodit.fi		info@veruskodit.fi	Rental property agency
Nwater Oy / UWater Oy			x	1-10	Tampere	2012	*	*	*	*	Architectural and engineering services, technical testing and analysis
OdorOff		x		1-10	Helsinki	2002	0.2-0.4	http://odoroff.fi	x	info@odoroff.fi	Odour removal equipment
Onninen Oy		x		250 +	Helsinki	1996	200 +	http://www.onninen.com	x	info@onninen.com	Material and information flow; Comprehensive materials services to clients and retailers
Oripään Vesi Oy	x			1-10	Oripää	2000	0 - 0.2	www.oripaanvesi.fi	x	tero.kuosa@oripaanvesi.fi	Bottled ground water
Oulu Water Alliance (OWA) / Owatec Group Oy		x		1-10	Oulu	2013	0 - 0.2	www.ouluwateralliance.fi	x	info@owa.fi	Online solutions: quality control & purification, optimization
Ouman Oy			x	51-250	Helsinki	2011	20-100	www.ouman.fi	x	sales.ba@ouman.fi	Automation and energy efficiency
Outotec Oyj	x	x	x	250 +	Espoo	1999	200 +	www.outotec.com	x	online contact form	Sustainable natural resource use technologies and services

Oy Arbonaut Ltd			x	26-50	Joensuu	1994	2-10	https://www.arbonaut.com	x	online contact form	Forest inventories, REDD+ and Climate Change, GIS, spatial analysis, expert services for natural resources management
Oy Faintend Ltd	x	x		1-10	Salo	1997	0 - 0.2	http://www.faintend.fi	x	faintend@faintend.fi	Fain-technology and special Fain-surfactant mixture; Technochem company, patented Fain-technology
Oy Indmeas Measurement Ab			x	26-50	Espoo	1986	2-10	www.indmeas.com	x	online contact form	Power and energy plants, paper and pulp mills
Oy Slamex Ab		x		26-50	Vantaa	1982	2-10	www.slamex.fi	x	slamex@slamex.fi	Part of Econet Group; design, water, waste water and sludge treatment
Oy Vevi - Va Ab			x	1-10	Lapinjärvi	1995	0.4 - 1	www.vevi.fi		kim.kokko@vevi.fi	Water and waste water system components
Ozonetech Oy	x			26-50	Helsinki	2007	0 - 0.2	www.ozonetech.com	x	info@ozonetech.com	Air purification and heat recovery services in commercial kitchens
PAC-Solution Oy			x	CLOSED	*	*	*	*	*	*	*
pH-Vetikko		x		*	Konnevesi	*	*	http://phvetikko.com		hannu@phvetikko.com	Small scale wastewater treatment systems for scattered settlements
Picus Advisors Ltd	x			1-10	Helsinki	2016	*	www.picus.fi	x	firstname.lastname@picus.fi	Business analysis, evaluation and advisory services for environmental and healthcare companies
PlanData Oy			x	CLOSED	*	*	*	*	*	*	*
Planora Oy		x	x	26-50	Kempele	1988	1-2	www.planora.fi	x	planora@planora.fi	Software for waste water treatment plants
Planpoint Oy		x		1-10	Helsinki	1994	0 - 0.2	*		*	Consulting services for developing markets.
Prizztech Oy			x	51-250	Pori	1989	2-10	www.prizz.fi	x	yrityksen.apuna@prizz.fi	Business development, research and project management
Profimeas Ltd		x		1-10	Vantaa	2004	0.2-0.4	www.keller-druck.com	x	myynti.sales@profimeas.fi	Pressure meters, telemetrics

Purgotec Oy			x	1-10	Nurmijärvi	2010	0 - 0.2	*	*	*	Water and soil resroration
Pythagoras Ltd		x		1-10	Helsinki	1989	0 - 0.2	www.pnet.fi	x	*	Wireless environmental monitoring.
Pöyry Management Consulting Oy	x	x	x	51-250	Vantaa	2009	10-20	www.poyry.com	x	firstname.lastname@poyry.com	The leading advisor of choice to the world's forest industry, energy and environmental sector decision makers and stakeholders.
Raita Environment Oy		x		*	*	*	*	*	*	*	Small scale environmental solutions for scattered settlements
Ramboll Finland Oy	x	x		250 +				www.ramboll.com	x	info@ramboll.fi	Water resources management, water supply, waste water, groundwater
Rapal Oy	x			51-250	Espoo	1990	2-10	http://rapal.fi	x	info@rapal.fi	Softwater and services for work environment developers and infrastructure cost managers
Relining Group International Oy	x			1-10	Turku	2015	1-2	https://www.relininggroup.com	x	sales@relininggroup.com	Pipe relining solutions for sewage and drain
remoteMX Oy	x			1-10	Turku	1997	0 - 0.2	http://www.remotemx.com	x	customerservice@remotemx.com	IT services
Renotech Oy	x			1-10	Turku	1994	*	http://www.renotech.fi	x	rt@renotech.fi	Fire- and sound proofing products and other construction industry products
Saffron Consulting International Ltd		x		1-10	Kangasala	2014	0 - 0.2	*	*	*	Consultancy for government agencies, private sector, international organization and NGO's.
Salmoncougar Oy			x	CLOSED	*	*	*	*	*	*	*
SansOx Oy		x		1-10	Iisalmi	2012	0 - 0.2	http://sansox.fi	x	info@sansox.fi	Energy-efficient oxidation.
Sasmetor Oy			x	11-25	Heinola	1985	2-10	http://www.sasmetor.fi/fi	x	smetor@sasmetor.fi	Manufacturer for surface treatment lines and devices in industrial products

Satel Oy	x	x		51-250	Salo	1987	10-20	https://www.satel.com	x	info@satel.com	Radio modems for remote control and real-time monitoring
Savaterra Oy		x		11-25	Rovaniemi	1997	10-20	https://savaterra.fi	x	savaterra@savaterra.fi	Sludge and waste treatment, purification of polluted soil.
Savcor Forest Oy			x	51-250	Mikkeli	1981	2 - 10	http://www.savcor.com	x	online contact form	Process diagnostics, forest information management, solid wood operational efficiency
Scatman Oy		x		*	Oulu	2013	0 - 0.2	http://scatman.fi/en	x	kenneth@scatman.fi	Electronic tools for collecting and visualizing environmental data
Senfit Oy		x	x	1-10	Oulu	2007	1-2	http://senfit.com	x	info@senfit.com	Microwave technology for industrial on-line sensors and analyzers
Sensowa		x		1-10	Kaarina	2011	*	http://www.sensowa.fi	*	website error	Sensible water management solutions, BioSmart products; Customer service and billing system for water supply, data monitoring
SHIFT Events Oy	x			*	Turku	2016	*	https://theshift.fi	x	alexander@theshift.fi	Conference and events
Silkkilu Business Consulting	x			1-10	Turku	*	*	http://silkkilu.com	x	qing.cao@silkkilu.com	Consulting services for internationalization process
Sito		x		250+	Espoo	2010	20-100	https://www.sito.fi/en/	x	firstname.lastname@sito.fi	Infrastructure, logistics, environment, land use and digital services consulting; surveys, measurement, modelling, planning
Sofi Filtration		x	x	1-10	Helsinki	2011	0.4 - 1	http://sofifiltration.fi	x	sales@sofifiltration.com	Automatic and energy efficient microfiltration solutions.
Soil Scout Oy		x		1-10	Helsinki	2013	0 - 0.2	http://soilscout.com	x	online contact form	Environmental monitoring for reducing irrigation water & energy use.
Solar Water Solutions		x		1-10	Espoo	2015	*	https://solarwatersolutions.fi	x	firstname.lastname@solarwatersolutions.fi	Solar powered desalination units
Stora Enso Oyj			x	250+	Helsinki	1996	200+	http://www.storaenso.com	x	info@storaenso.com	Renewable solutions in paper, packaging, wood products and biomaterials

Suomen Vesilaitosyhdistys ry			x	11-25	Helsinki	1978	*	https://www.vvy.fi	x	vvy@vvy.fi	Co-operation and member association of the Finnish water and wastewater utilities
Tampereen Teollisuussähkö Oy			x	CLOSED	*	*	*	*	*	*	*
Tapio		x		11-25	Helsinki	2014	2 - 10	http://tapio.fi		tapio@tapio.fi	Forestry and bioeconomy consulting, methods related to water resource management
Techcode Finland	x			*	Helsinki	2016	*	http://techcode.fi	x	finland@techcode.com	Facilitates Nordic startups to scale up and flourish globally
Tekninen Palvelu		x		1-10	Lahti	2010	0 - 0.2	http://www.teknikenpalvelu.fi		tomi.niemi@tekninenpalvelu.fi	Small scale water and wastewater treatment plants
Teollisuuden Vesi Oy			x	1-10	Mäntsälä	2003	1-2	http://www.teollisuudenvesi.fi	x	info@teollisuudenvesi.fi	Water treatment services, special expertise in process microbiology
TineCoin	x	x		1-10	Helsinki	2007	0 - 0.2	*	*	*	Consulting and expert services for water technologies.
Trimble Solutions Oy		x		250 +	Espoo	1966	20-100	https://www.tekla.com	x	online contact form	Software solutions for water and wastewater design and engineering
Turku Science Park	x			26-50	Turku	2002	2 - 10	www.turkusciencepark.com	x	firstname.lastname@turkusciencepark.com	Entrepreneurial services
UPM-Kymmene Oyj			x	250 +	Helsinki	1996	200 +	http://www.upm.com	x	info@upm.com	Paper and forest products
Uponor Suomi Oy			x	51-250	Lahti	1999	20-100	https://www.uponor.fi	x	infofi@uponor.com	Plumbing and indoor climate systems for the residential and commercial building markets
Vaisala		x		250 +	Vantaa	1944	200 +	http://www.vaisala.fi	x	myynti@vaisala.com	Environmental/industrial measurement: meteorology, controlled environments
Valmet Technologies Oy	x	x		250 +	Helsinki	1999	200 +	http://www.valmet.com/wastewater/	x	online contact form	Technology and services for different industrial sectors, incl. automation

Valmet Automation		x		250 +	Helsinki	1999	200 +	http://www.valmet.com	x	online contact form	Developer and supplier of technologies, automation and services for the pulp, paper and energy industries.
Vesi Eko Oy		x		1-10	Kuopio	2005	0.4 - 1	http://vesieko.fi		firstname.lastname@vesieko.fi	Software for nutrient balance and oxygen evolution
Vesiotec		x		*	Helsinki	2013	0 - 0.2	http://www.vesiotec.fi	x	info@vesiotec.fi	Cloud-enabled solutions for risk management and safety plan implementation
Vesita Oy			x	1-10	Vaasa	2013	*	http://www.vesita.com		myynti@vesita.com	Water supply and other water related services
Vesnom Oy			x	51-250	Helsinki	2013	2 - 10	http://www.vesnom.fi/vesnom		asiakaspalvelu@vesnom.fi	Heating, water and sewage renovations
VRT Vesirakennetutkimus Oy			x	26-50	Jyväskylä	2010	*	http://www.vrt.fi/fi/	x	kirsi@vrt.fi	VRT is specialized in underwater structural inspections using patented inventions in Multibeam Sonar and 3D Imaging Technology.
W-Rix Oy	x		x	1-10	Parainen	2012	0.4 - 1	http://www.waterix.fi	x	info@waterix.com	Develops and manufactures device for the treatment of municipal and industrial sewage and process water cooling
WA Technologies Oy			x	CLOSED	*	*	*	*	*	*	*
Water Eco		x		1-10	Kuopio	2005	0.4 - 1	http://vesieko.fi		firstname.lastname@vesieko.fi	Evaluation, treatment and restoration of natural waters
Watman Oy	x	x		11-25	Lahti	2011	2-10	http://www.watman.fi	x	info@pumppuohja.fi	Water filters, pumps, pump aggregates and water treatment equipment
Watrec Oy		x		11-25	Forssa	2003	2-10	http://www.watrec.com	x	forename.lastname@watrec.fi	Wastewater, process water treatment, consultancy, biowaste treatment
WIC Systems Oy			x	1-10	Turku	2002	1-2	http://www.wicsystems.com	x	petri.pursiheimo@wicsystems.com	Process chemistry; design and manufacturing of wastewater analysers for paper mills and other industries

Winflow Water Oy		x		1-10	Kotka	2012	*	http://wfw.fi	x	marko.lehtinen@wfw.fi	Wastewater treatment and biogas production
WRM Systems Oy	x			1-10	Oulu	2009	0 - 0.2	http://www.wrm-systems.com	x	info@wrm-systems.fi	Software for water supply companies
WSP Finland Oy		x		250 +	Helsinki	1992	20-100	https://www.wsp.com	x	firstname.lastname@wsp.com	Water management, water assets, environment, water in buildings
Yara Suomi Oy			x	250 +	Espoo	1993	200 +	http://www.yara.fi	x	contact online form	Crop nutrition solutions, nitrogen application solutions, environmental solutions
ÅF Consult Oy		x		51-250	Helsinki	2002	20-100	http://www.afconsult.com	x	info.fi@afconsult.com	Energy and environment, sustainable development, hydropower
IN TOTAL 169 COMPANIES	46	89	69								