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The Water Footprint

A Case Study of Water Management in Colombia

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I. Introduction

As globalization has increased the flow of goods and services across borders, fresh water has increasingly become a global resource. From field to end product, goods pass through multiple production stages, often located at different geographical locations, making water resources spatially disconnected from consumers. Hence, international trade has become associated with gigantic, but largely invisible water transfers. The global nature of water resources has been emphasized by the water footprint concept, which analyses water consumption and pollution along the whole production and supply chain. The fact that many goods, which require large amounts of water during production, such as agricultural products, are imported from water scarce regions in developing countries has put pressure on international firms to reduce their water footprint.

In 2009, the Swiss Agency for Development and Cooperation (SDC) launched a pilot project in Colombia involving five multinational corporations. The companies, including Alpina, Clariant, Holcim, Nestlé and Syngenta, have committed to reduce their water footprint at their production sites in Colombia. This paper will analyze the measures taken since the initiation of the project and will present further strategies for the companies to reduce their water footprint.

The first section will look at the looming water crisis facing many regions around the world. Water scarcity has had wide-reaching social, economic and political implications for many developing countries, which have been the primary victims of the crisis. Subsequently, the next chapter takes a closer look at the water footprint concept introduced by Hoekstra and Hung in 2002, who were looking for an indicator that could map the impact of human consumption on global freshwater resources.[1] The theoretical part will be followed by an insight into the project SuizAgua to illustrate the development and current state of the initiative. Additionally, the section will highlight the advantages for the participating companies. In the end, implications for the reduction of the water footprint will be given including several strategies such as water auditing or using reclaimed water. Besides these strategies, the chapter will focus on the cost curve and present the reader with new ways of creative water management.

[1] Hoekstra/Chapagain, 2008.

II. Water Crisis

Water is increasingly becoming a scarce resource around the world. More and more people are sharing a constant amount of water leading not only to the prevalence of water-related diseases but also to conflicts over water. The effects of water scarcity, also commonly referred to as the water crisis, are primarily felt by the already vulnerable, the poor in developing countries.

2.1 Drivers of the Water Crisis

The current water crisis has several drivers. On the one hand worldwide demographic developments, especially in developing countries, have increased the demand for food, which consumes large amounts of water during production. The agriculture sector alone is currently responsible for 70 percent[2] of the worldwide water consumption.[3] Since the world's population is expected to increase by another 40–50 percent in the next 50 years, the demand for water for agricultural use is likely to grow.[4]

Global economic expansion also affects water through growth in the number of consumers and through changes in their consumption habits, in the way goods and services are produced and in the location of activities.[5] The rise in living standards as a result of economic growth in developing countries has enhanced the consumption and production of goods and thereby increased the demand for water resources.[6]

The inefficiency in the way water often is used has had an adverse effect on the supply as well. Irrigation, for example, causes wastage on a prolific scale, with water trickling away or simply evaporating before it can do any good. Deficient distribution networks are further reducing the efficient use of the existing water supply. Due to inadequate infrastructure in many developing countries, resulting in leaks in the water channels, large amounts of water do not reach the end consumer.[7]

Pollution as a result of industrial activities and agricultural pesticides has further strained the supply of water. According to UNESCO, up to 500 million tons of heavy metals, solvents and toxic sludge slip into the global water supply every year.[8] In the developing world as much as 70 percent of industrial waste is dumped untreated into rivers and lakes.

[2] Industrial activities are responsible for 20% and household consumption make up another 10%.
[3] SDC, March, 2010, p.7
[4] WWC, 2010
[5] UNESCO, 2009, p.32
[6] UNESCO, 2009, p.18
[7] SDC, March, 2010, p.15
[8] UNESCO, 2010

Lastly, climate change has altered the water cycle producing more rain in humid areas and less in dry regions. Hence, tropical storms and droughts have become more frequent.[9]

As a result, according to the SDC, 43 countries are currently suffering from «water stress», meaning that the demand exceeds the existing supply.[10] In 2004, a third of the world's population lived in water-stressed countries. By 2025, this number is expected to rise to two-thirds.[11]

2.2 Consequences of the Water Crisis

Water-scarcity has manifold consequences not only for the natural but also for the social, economic and political environment. Since the majority of the countries suffering from «water stress» are developing nations, the victims of the water-crisis are primarily poor and rural people. Although considerable progress has been made in providing these people with an adequate water supply, almost 900 million people worldwide lack access to safe water supplies.[12] More than 3.5 million people die each year from water-related disease, the majority from diarrhea.[13] At any given time, half of the world's hospital beds are occupied by patients suffering from water-related diseases.[14]

Of the people with water supply, only half have access to water from a tap in their homes. In most cities in the southern hemisphere the water distribution network only covers the city centres and affluent neighbourhoods. The people living in slums are forced to buy their water from local merchants, who often charge 20-50 times the amount of what people, which are connected to the distribution network pay.[15] The sanitation infrastructure in many developing countries is even more cumbersome. 2.5 billion people live without access to improved sanitation - defined as a sanitation facility that ensures hygienic separation of human excreta from human contact - including 1.2 billion people who have no facilities at all.[16]

The water crisis also has vast effects on nations' economies. Disease and productivity losses linked to water and sanitation in developing countries amount to 2 percent of GDP, rising to 5 percent in Sub-Saharan Africa, which is more than the region receives in aid.[17] Water contamination from industrial effluents result in factory closures and relocation, while the depletion and contamination of groundwater compel industries to relocate.[18] Water is increasingly being viewed as a potential threat and constraint to economic growth. China's

[9] SDC, March, 2010, p.7
[10] SDC, March, 2010, p.7
[11] Kirby, 2004
[12] Water.Org, 2010
[13] Water.Org, 2010
[14] UNDP, 2006, p.45
[15] SDC, March, 2010, p.7
[16] Water.Org, 2010
[17] UNDP, 2006, p.22
[18] UNESCO, 2009, p.33

remarkable economic growth, for example, has been accompanied by serious environmental problems, most notably water shortages in the north and pollution from wastewater effluents across the country.[19]

Furthermore, there are social implications of water scarcity. In developing countries it is common that women and children are responsible for collecting water. Collecting water and carrying it over long distances therefore keeps millions of girls out of school, consigning them to a future of illiteracy and restricted choice. Spending up to four hours a day walking, waiting in queues and carrying water as well as caring for children made ill by waterborne diseases diminishes women's opportunity to engage in productive work.[20]

As the amount of water is reduced, competition for the scarce resource intensifies. Tensions have been rising between countries, which share rivers, lakes and ground-water occurrences. There have always between tension between states, which control the headwaters of river and states located at the lower reaches. This is particularly true for central Asia where Uzbekistan, Tadzhikistan and Kirgizstan have been in a constant feud since their independence in 1991.[21] The Pacific Institute shows that there were 49 conflicts over water resources between 2000 and 2009.[22]

[19] UNESCO, 2009, p.36
[20] UNDP, 2006, p.22-23
[21] SDC, March, 2010, p.14
[22] Pacific Institute, 2010

III. Water Footprint

3.1 Definition

Until the recent past, there has been little thought in the science and practice of water management about water consumption and pollution along the whole production and supply chain. The water footprint developed by Hoekstra shows that visualizing the hidden water use behind products can help to understand the global character of fresh water and to quantify the effects of consumption and trade on water resource use.[23] This improved understanding can form the basis for a better management of the globe's freshwater resources.

The water footprint of an individual, community or business is defined as the total volume of freshwater that is used to produce goods and services consumed by individuals or communities or produced by the industry.[24] The water footprint differs from the classical measure of water withdrawal in that it not only includes the consumption of surface and ground water resources but also the evaporation of global green water resources as well as the volume of polluted water associated with the production of goods and services.[25] By measuring water consumption over the full supply chain, the water footprint offers a wider perspective on how a consumer or a producer relates to the fresh water system. It furthermore includes the indirect use of water (the water use in a producer's supply chain) as well as the direct water use.[26]

The water footprint is a multidimensional indicator, showing water consumption volumes by source and polluted volumes by type of pollution.[27] Moreover, all components of a total water footprint are specified geographically and temporarily – where and when the water was used.

However, the water footprint is not a measure of the severity of the local environmental impact of water consumption and pollution. This largely depends on the vulnerability of a local water system as well as the amount of consumers and producers drawing water from the same system.[28]

3.2 Water Footprint Accounting

3.2.1 Comprehensive Introduction

In theory there is coherence between the different water footprint accounts. As figure 1 demonstrates, the water footprint of one single process step is the basic building block of all

[23] Hoekstra et al., 2009, p.7
[24] WFN, 2010
[25] Hoekstra et al., 2009, p.8
[26] Gerbens-Leenes & Hoekstra, 2008, p.5
[27] Hoekstra et al., 2009, p.8
[28] Hoekstra et al., 2009, p.9

water footprint accounts. The water footprint of an intermediate or final product is therefore the aggregate of the various process steps, which are relevant in the production of a product. The water footprint can be measured for (1) an *individual consumer* – water footprints of the various products consumed by the consumer –, (2) a *community of consumers* – e.g. the inhabitants of a municipality, province, state or nation –, (3) a *producer or whatever sort of business* or (4) a *geographically delineated area* – be it a province, nation, catchment area or river basin.[29]

«The total water footprint of humanity is equal to the sum of the water footprints of all consumers of the world, which is equal to the sum of the water footprints of all final consumer goods and services consumed annually and also equal to the sum of all water-consuming or polluting processes in the world»[30]. The problem that could arise by double counting of final products has been avoided due to the fact that process water footprints are always exclusively allocated to one final product. Further, a process of water footprint is divided over the different final products – when a process contributes to more than one final product.[31]

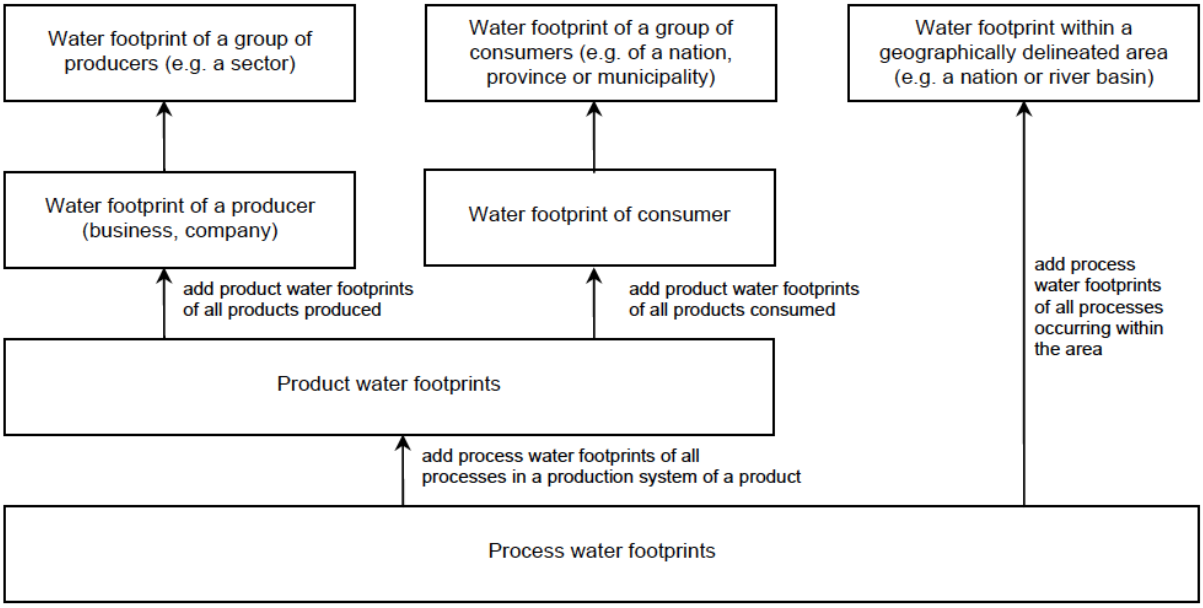


Figure 1: Process Water Footprints. Hoekstra et al., 2009, p.17

3.2.2 Water Footprint of a Product/Process

There are three different types of water footprints. The blue water footprint refers to consumption – or evaporation – of surface and ground water resources along the supply chain of goods and services. It constitutes the traditional statistical measurement of water use. The blue water footprint comprises a wide-range of «water consumption» patterns. Besides evaporation and the incorporation of water into products, the blue water footprint also covers water that

[29] Hoekstra et al., 2009, p.17
[30] Hoekstra et al., 2009, p.17
[31] Hoekstra et al., 2009, p.17

does not return to the same catchment area (e.g. it is returned to another catchment area or the sea) and water that does not return in the same period (e.g. it is withdrawn in a scarce period and returned in a wet period).[32] Although water is a renewable resource and therefore generally doesn't disappear, the water available in ground water resources in a certain period is always limited to a certain amount.

The green water footprint is the volume of water that evaporates from green water resources (rainwater stored in the soil as moisture). Green water refers to the precipitation on land that does not run-off or recharge the ground water but is stored in the soil.[33] The green water footprint is particularly relevant for agricultural and forestry products, where it refers to the water incorporated into the harvested crop or wood as well as the total rainwater discharged from plants and the soil.

The grey water footprint refers to the volume of polluted water associated with the production of goods and services. It is defined as the volume of freshwater required to absorb the load of pollutants to such an extent that the («polluted») water remains above existing water quality standards[34]. The grey water footprint only measures the pollutant load that actually reaches the surface or ground water. Solid waste e.g., which is stored in the soil, is not included.

Although it can be hard to make a clear-cut distinction between the different water footprints, the division is important since the environmental, hydrological and social impact as well as the economic costs differ widely between the water footprints.[35]

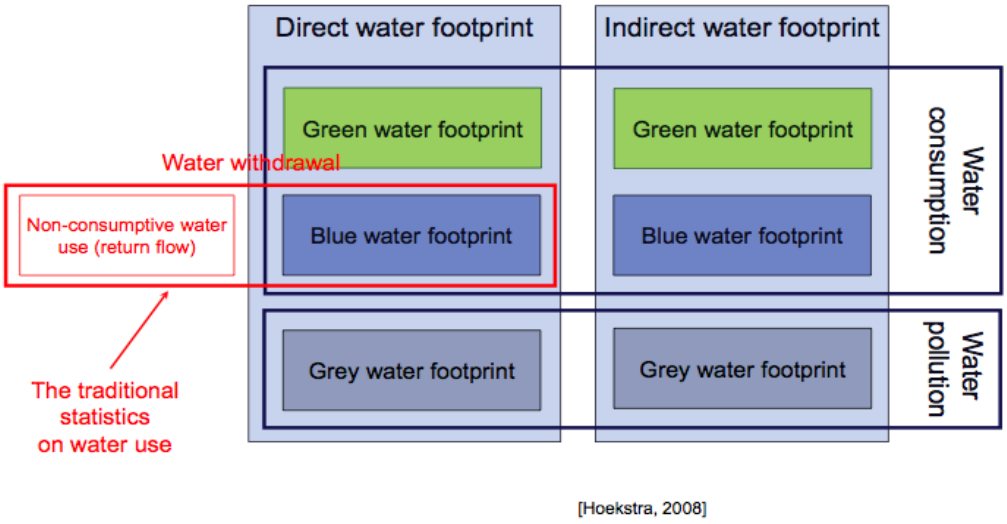


Figure 2: Components of a Water Footprint. Hoekstra et al., 2009, manual, p.8

[32] Hoekstra et al., 2009, p.20
[33] Hoekstra et al., 2009, p.21
[34] Hoekstra et al., 2009, p.22
[35] Hoekstra et al., 2009, p.21

3.2.3 Water Footprint of Individual Consumers

«The water footprint of an individual consumer is defined as the total volume of freshwater consumed and polluted for the production of the goods and services consumed by the consumer»[36]. Freshwater consumption constitutes the direct use of water and refers to the water used at home or in the garden. The pollution created during the production of goods and services is defined as indirect use of water. It refers to the water that was applied to produce goods such as food, clothes, paper, energy or industrial goods. Figure 3 illustrates a simplified example of the supply-chain of an animal product. When we focus on meat consumption, the direct water footprint refers to the volume of water consumed or polluted when preparing and cooking the meat. The indirect water footprint therefore depends on the direct water footprint of the retailer that sells the meat, the food processor that prepares the meat, the livestock farm that raises the animal and the crop farm that produces the feed for the animal. [37]

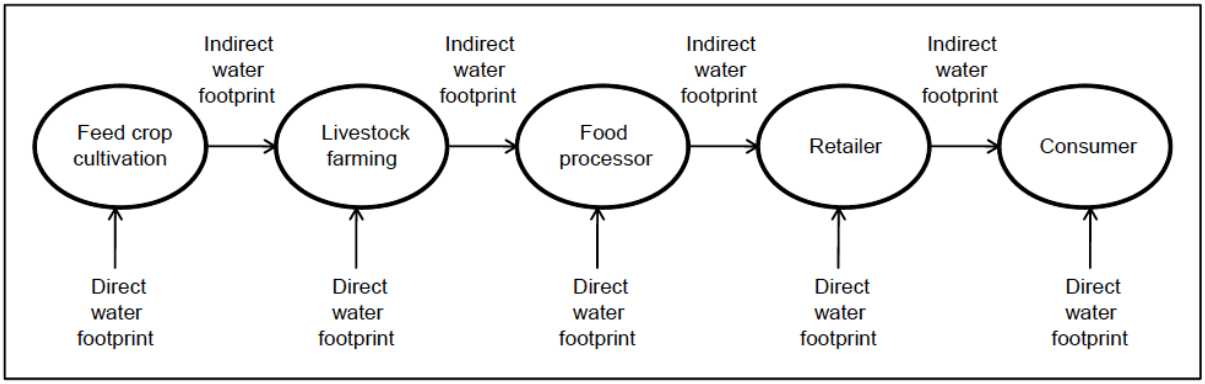


Figure 3: Direct and indirect water footprint in each stage of the supply-chain of an animal product. Hoekstra et al., 2009, p.18

The question now arises, what can consumers do, to reduce either their direct or indirect water footprint? Although the indirect water footprint is generally much larger than the direct one and a consumer has relatively less influence, there are still some plausible possibilities. To reduce the direct water footprint, an individual can install water efficient toilets, apply a water-saving showerhead, use less water in the garden or not dispose medicines, paints or other pollutants through the sink. To reduce the indirect water footprint, a consumer has basically two options. The first is to substitute a consumer product that has a large water footprint by a different type of product that has a smaller one – eat less meat or become vegetarian, drink tea instead of coffee, or even better, drink tap water –. A second option is to stick to the same consumption pattern but to select cotton, beef or coffee that has a relatively low water footprint or that has its footprint in an area that isn't affected by water scarcity. The problem that arises is that consumers need proper information in order to make the right decisions. Information on water consumption is generally not available in the world of today. When information is available on

[36] Hoekstra et al., 2009, p.36
[37] Hoekstra et al., 2009, p.36

the impacts of a certain article on the water system, consumers can make conscious choices about what they buy. [38]

3.2.4 Water Footprint of a Business

«The water footprint of a business is defined as the total volume of freshwater that is used directly or indirectly to run and support the business»[39]. It can be measured by two main components. The first measurement looks at the *operational* (or direct) water footprint and reflects the volume of freshwater consumed or polluted within the business itself. The second measurement is the *supply-chain* (or indirect) water footprint of a business and expresses the volume of freshwater consumed or polluted to produce all the goods and services that form the inputs of the business. In addition, a business may wish to determine the *end-use* water footprint of its product. This refers to the water consumption and pollution by consumers when using the final product – e.g. using of soap at home. The end-use water footprint is however not included in the business water footprint, but in the consumer's. [40] Figure 4 shows the direct and indirect water footprint of a business.

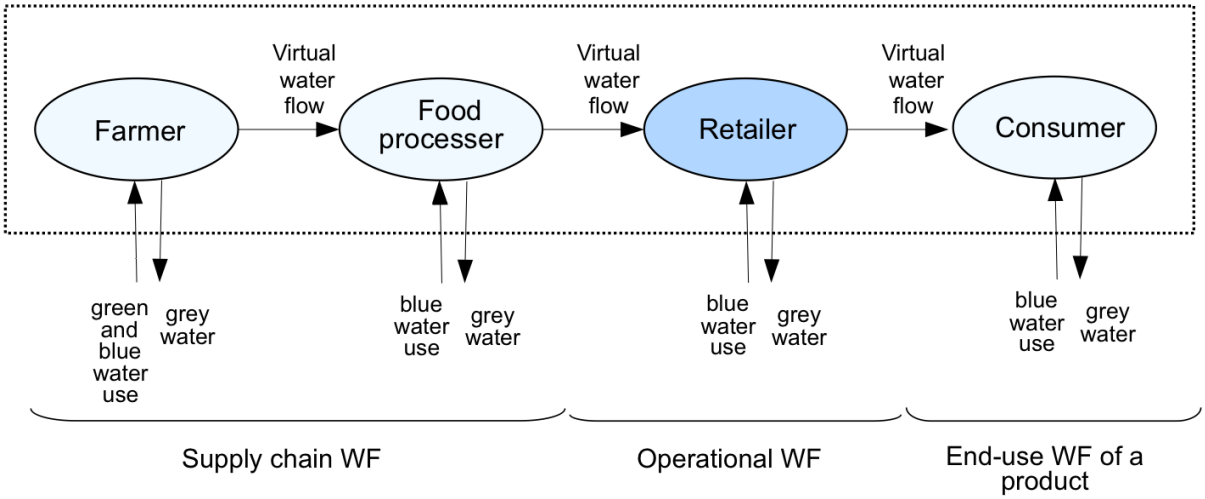


Figure 4: Direct and indirect water footprint of a business. Hoekstra, 2009, p.40

The term business is defined here as a coherent entity producing goods and/or services that are supplied to consumers or transferred to other businesses. It can be a private company or corporation, a governmental or non-governmental organisation, a consortium or joint venture of companies or organisations, but also any project or activity. In a nutshell, the term business can refer to all sorts of corporations, organisations, project and activities. Technically it is understood as any coherent entity or activity that transforms a set of inputs into one or more outputs.[41]

[38] Hoekstra et al., 2009, p.69
[39] Hoekstra et al., 2009, p.45
[40] Hoekstra et al., 2009, p.46
[41] Hoekstra et al., 2009, p.47.

The term «water neutrality» serves as a tool to reduce and offset the social and environmental impacts of a company's water footprint. The term can be misleading because most businesses will always have a residual water footprint. The idea is therefore to stimulate corporations to make their activities «water neutral» by investing in water-efficient technology, water-conservation measures, wastewater treatment and water supply to those who do not have proper water supply. A water neural business should meet at least two requirements: First, it must do all that is reasonably possible to reduce its water footprint, especially in regions where the impact of the water footprint is high – either where the consumption level is high, or where production circumstances are low. Second, companies must offset their residual water footprint by making investments and establishing or supporting projects. The best way businesses can reduce their *operational* water footprint use is through technology – reducing water consumption in their own operations. Another option would be by using their power to influence their suppliers to reduce their footprints as well. The water footprint of a *supply-chain* is usually much larger than that of the business itself. Improvement may be more difficult to achieve, but they may also be more effective. Examples would be making supply agreements standards, changing to another supplier, setting quantitative water footprint reduction targets, product labelling or certification and water footprint reporting.[42] A corporate strategy is therefore of great importance and the water neutral concept offers a useful tool to initiate a discussion.

3.2.5 Water Footprint of Nations

«The water footprint of a nation is defined as the total amount of water that is used to produce the goods and services consumed by the inhabitants of the nation»[43]. A nation's water footprint consists of the internal and the external water footprint. The internal water footprint refers to goods and services consumed by the national population, whereas the external water footprint of a country is defined as the annual volume of water resources used in other countries to produce goods and services imported into and consumed in the country considered. Figure 5 shows a visual representation of the national water footprint accounting scheme. Traditional statistics on water consumption stressed the water used within a country and lacked the accounting of virtual water import and export. The sum of virtual water import and water use within a country is equal to the sum of the virtual water export and the country's water footprint. This sum is called the virtual water budget of a country. [44]

[42] Hoekstra et al., 2009, p.70; Hoekstra, 2008, p.1 f.
[43] Hoekstra, 2009, p.29
[44] Hoekstra, 2009, p.31; Hoekstra/Chapagain, 2005, p.35 ff.; Hoekstra/Chapagain, 2008, p.54

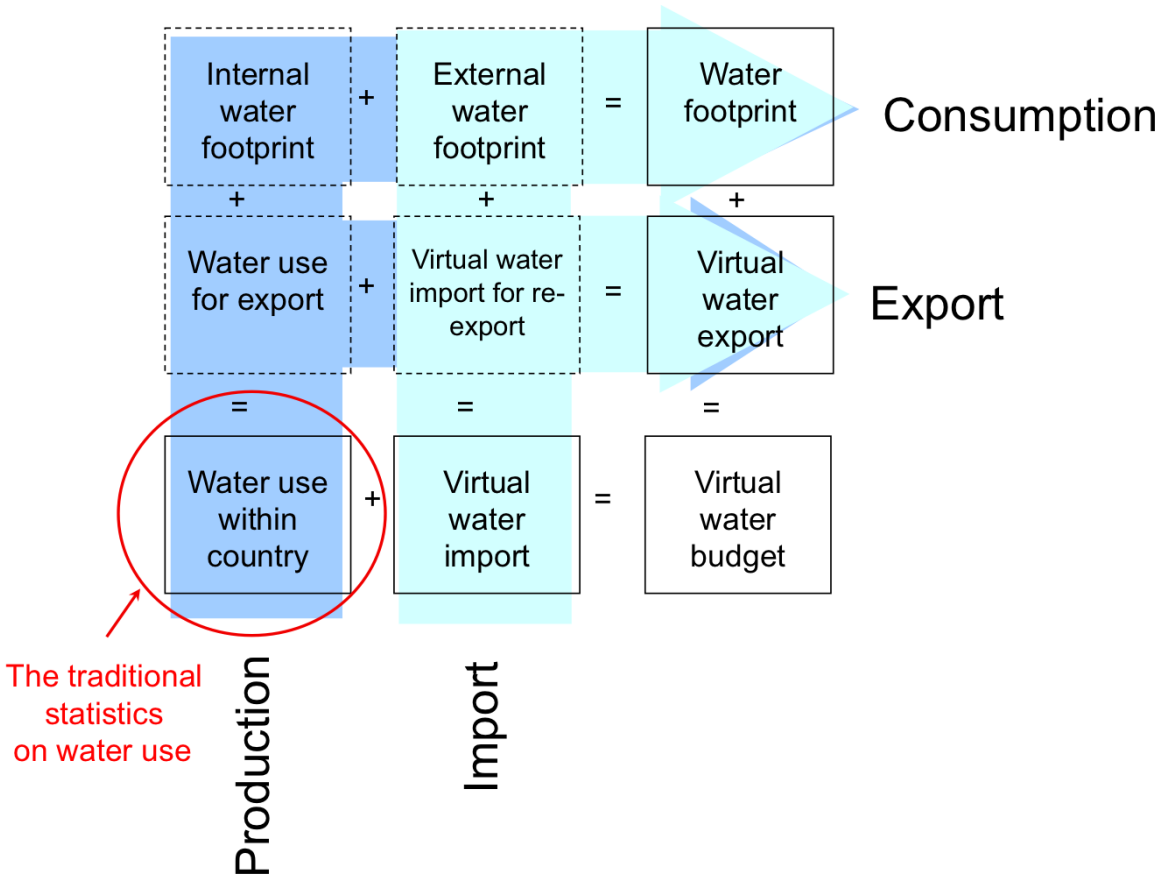


Figure 5: National water accounting framework. Hoekstra, 2009, p.31

Figure 6 shows the global average water footprint per capita. The global total water footprint 2008 was 7450 billion m^3/yr, which is 1240 m^3/yr per person on average worldwide.[45] In absolute terms India has the largest water footprint with 987 Gm^3/yr. However, in relative terms the USA has the largest water footprint with 2480 m^3/yr per capita, followed by southern European countries such as Italy, Greece and Spain (2300-2400 m^3/yr per capita). High water footprints can also be found in Nigeria and Thailand, because of inefficient water use. On the other side of the scale is China. With 700 m^3/yr per capita the Chinese have a relatively low water footprint. Switzerland lies above the average with 1682 m^3/yr per capita, mainly because of importing of external water footprint in agricultural (780 m^3/yr per capita) and industrial goods (555 m^3/yr per capita). The size of the global water footprint is largely determined by the consumption of food and other agricultural goods. The four major determining factors are (1) the volume of consumption, (2) the consumption pattern, (3) the climate and (4) the agricultural practices. The water footprint varies largely due of these major factors. In rich countries, where the volume of consumption (1) is high and the composition pattern is relevant (2), the water

[45] Hoekstra/Chapagain, 2008, p.55 ff.

footprint is high. In many poor countries it is a combination of unfavourable climate conditions (3) and bad agricultural practices (4) that contribute to a high water footprint.[46]

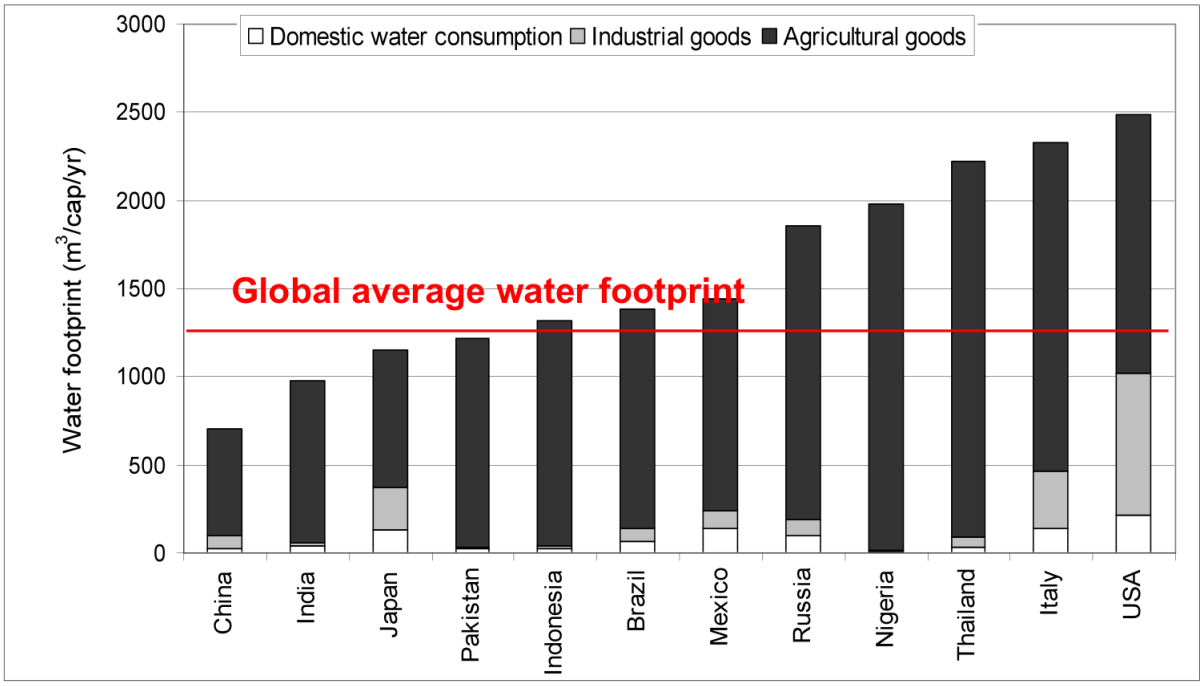


Figure 6: Water footprint per capita. Hoekstra, 2009, p.33

Not only consumers and producers have an environmental and social responsibility, but also nations. Traditionally countries formulate national water plans by looking at how to satisfy water users. But reducing water footprints can be achieved in various ways. One way is to break the link between economic growth and increased water use. This can be done quite easily, by adopting production techniques that require less water per unit of product. A second possibility is to shift to consumption patterns that require less water, which can be achieved by eating less meat. However, the worldwide trend has been for meat consumption to increase rather than decrease. A more subtler and broader approach would be by changing the pricing structure, raising the awareness or the labelling of products. A third method is increasing global water use efficiency, by shifting production from areas with low water productivity to areas with high water productivity. Therefore governments should engage with consumers and businesses to work towards sustainable consumer products.[47] «National water footprint accounting should be a standard component in national water statistics and provide a basis to formulate a national water plan and river basin plans that are coherent with national trade policy and national environmental policy»[48].

[46] Hoekstra/Chapagain, 2005, p.39 f.
[47] Hoekstra/Chapagain, 2005, p.1 ff.; Hoekstra, 2009, p.73.
[48] Hoekstra, 2009, p.31; Hoekstra/Chapagain, 2008, p.63.

IV. Case Study: SuizAgua

4.1. What is SuizAgua

Reducing water footprint is crucial in the light of the current water scarcity problem. However, water footprint reduction initiatives have only appeared in the last years and this mostly in isolated companies.

SuizAgua is an innovative project as it represents the first water footprint project on a multi companies and multi sector level. The project consists in a partnership between five Swiss companies, with operations in Colombia, and the SDC, with support from public and private entities. The project aims at reducing the water footprint of these companies in Colombia.

SuizAgua uses recently developed high-tech approaches, which is not common in most development projects. This project should lead to a new water footprint concept with the development of related ISO norms, which stresses the global relevance of this project. In choosing Colombia to execute this innovative initiative, SuizAgua will therefore place Colombia at the head of the water footprint reflection.

All the information in this chapter is based on the project description document of SuizAgua[49] as well as on an interview with Mr. Münger[50], Head of Water Initiatives Division at the SDC and supervisor of the project.

Following, this paper will give further insights on the goals of the project, the different phases, the participating actors and the underlying principles as well as on the success factors, obstacles and future perspectives of the project. In the fifth chapter, this work will consider SuizAgua on a company perspective. Finally some practical implications for companies will be described.

4.1.1 Goals

The project aims at reducing the water footprint of a group of Swiss companies working in Colombia, optimizing the use of this resource, improving the sustainability of the value chain of these companies and acting responsibly in performing actions of social and environmental responsibility.

This overall goal can be divided into three distinct parts:

- Swiss companies involved in the project additionally measure and reduce their water footprint, optimizing the use of water resources in their value chain
- Swiss companies involved in the project running additional social and environmental responsibility projects in their areas of intervention in Colombia

[49] SDC, 2009
[50] Münger, 2010

- The results of the process of reducing the water footprint and actions of social and environmental responsibility are widely disseminated throughout the country and internationally

4.1.2 Phases

The project is built on four distinct phases, which are running partly following each other, partly parallel.

The first phase consists in the settlement of the project. In this phase, a first decision is made on which object the water footprint should be measured: the first option is on a company product level, the second on a company plant level. The latter has been chosen, as it is hard to use the quantity of water for a certain product as a criterion to select one product over the other. Knowing that a ton of cement uses the same quantity of water as a ton of chocolate does not provide information about how well a company is doing in managing water, whereas knowing that a company follows processes that reduce at the maximum quantity of water used represents a more useful criteria. Further decisions are made regarding measurement and indicators. Companies agree on common standards and measurement protocols, which is not evident when companies are operating in different sectors such as chemistry, food industry or cement.

Once this decision is made, companies have to measure the quantities of water coming in and out of their plants in Colombia, which includes among others, the water evaporated, contaminated or the quantity of water used in their production process.

By means of this baseline, companies draw a balance and identify hotspots, where water use can be reduced with the least investments possible. Here, all the parameters are known and mastered by the companies, which makes the task easy.

The second phase, which should be executed by the end of the year, consists in companies doing projects of social and environmental responsibility related to water.

The third phase is the most critical: companies should reduce the water footprint in their supply chain. For example Nestle or Alpina should reduce the water consumption of milk producers, Holcim the quantity of water used in cement mines. The other participating companies have a supply chain where water consumption is less relevant. This phase is the most critical one, as there is currently no defined method on how exactly to calculate the water consumption of milk production by farmers for example. Therefore companies will have to be creative in order to find solutions.

Finally, the forth phase consists in the international communication of the project. The outcomes of the project should be communicated on an international basis once it is terminated. This will be done by the companies as they have communication specialists.

4.1.3 Actors

SuizAgua was launched by the SDC, which is one of the main actors in this project. It is a global leader in water issues through its Global Water Initiative. It contributes financially with CHF 450'000, providing facilitation mechanisms, knowledge management, actions of social and environmental responsibility, and staff.

Furthermore, the five Swiss companies participating in the project (Nestle, Clariant, Holcim, Alpina and Syngenta) have a crucial role in this project as they will be the actors reducing the water footprint: they each contribute with a minimum of CHF 150'000. More details will be provided about them in the companies' perspective part of this paper.

A further important actor in this project is Quantis, a Swiss-based company specializing in quantifying the impacts on the environment. It is responsible for developing an ISO standard for water footprints. It will transfer knowledge through the SDC and provide specialized technical support.

Moreover, the Colombian government plays a role in SuizAgua. The Ministry of Environment, Housing and Territorial Development (MAVDT) accompanies the project and tracks its performance. It is a member of the Advisory Committee. However it does not contribute financially.

Other actors are facilitating the project with contributions or knowledge, such as autonomous regional corporations, UNICEF, Institute of Research and Development in Water Supply, Sanitation and Water Resource Conservation, Center for Research on Sustainable Farming Systems and the National Center for Cleaner Production and Environmental Technologies.

4.1.4 Principles

SuizAgua is based on a number of principles, which form the basis of the cooperation between the different actors and brings legitimacy to the project. The main ones are the following:

- *Public-private partnership for development*: the project seeks to exploit synergies and common interests between business and the SDC, and between those two and government agencies involved in water issues, research centers, associations, organizations and communities.
- *Co-investment*: SuizAgua receives public funding from the Swiss government and private funding from Swiss companies, as well as contributions from other actors (communities, organizations, research institutions, public entities). Each participant has autonomy in managing its resources, and reports transparently to the directors of the project.
- *Diversity of actors*: the project uses the diversity available in the capacities of the actors to better attribute responsibilities and to achieve greater efficiency and effectiveness.

- *Ownership of the process and direct implementation by businesses, facilitation and coordination by SDC.*
- *Empowerment*: the project seeks to develop human and institutional capacities as long-term capital. It seeks as well to have sustainable processes in the hands of national, regional and local actors, which offer wide coverage and a high quality of services.
- *Consistency with national policies and global initiatives*
- Alignment: the project should meet the regulations and abide by the public policies that have been generated on the issue of water in Colombia.
- Harmonization: the project should encompass coordination and an open process of consultation between the SDC and the five Swiss companies, responding directly to the needs of the country and in line with global initiatives such as the Millennium Development Goals (MDGs), the Water Footprint Network (WFN), the Global Reporting Initiative (GRI) and the World Business Council of Sustainable Development (WBCSD).
- *Action without damage:* the project should aim at strengthening the positive and avoiding, repairing or mitigating possible negative effects. The SDC will organize awareness and training days for businesses and other actors involved.

4.2 SuizAgua Outlook

All five companies signed the agreement at the beginning of 2010. There is a functioning steering committee. A defined methodology and indicators were agreed upon, which basically consist in the methodology used by the Water Footprint Network. Further, a communication protocol has been signed, in order to agree on which information should be communicated to the exterior.

At the moment, the project is in the first phase, in which every company draws a balance of its water footprint. This is a quite easy task as companies master all the parameters.

The next phase, in which companies disclose and start projects of social and environmental responsibility has started and should be done by the end of 2010. In the first phase of the project, no major obstacles have been identified.

4.2.1 Success Factors

Three important considerations, which are facilitating the success of the project, need to be mentioned. Firstly, it is a project done by multinational companies, which are interested in doing their best to reduce their water footprint and have their own specialists in the area. Therefore motivation, know-how and financial resources are available. This would probably not be the case with smaller companies in which the knowledge and financial resources as well as the overall impact are limited, which in turn may reduce the motivation. Secondly, the working environment in Colombia is very positive because it is a country where things are moving fast,

where people are alert, animated, and dynamic and where know-how is available. Moreover there is no political tension regarding water. Thirdly, SuizAgua has the support of the Colombian government, which is important in a project including many local and international as well as private and public actors. The environment and the water ministries follow the project and are in the steering committee. They do not invest but they are very interested. Therefore the project has a very good standing within the government.

Regarding the success criteria of the project, a 10% reduction in the total water footprint of the companies and the active participation of at least four companies, one ministry and two related institutions were initially defined. The second criterion is fulfilled, however the first one is more critical. Indeed, most of the participating companies have already reduced their water footprint substantially before the start of the project and the remaining reductions are very expensive. Everything will depend on the water reductions in the supply chain of the companies, which is difficult to achieve, as companies do not master the parameters.

Furthermore, the description document of SuizAgua mentions that companies have to implement two social and environmental responsibility projects in order for the SuizAgua project to succeed. However, in this case it is rather the quality of the projects that will indicate the success of SuizAgua. The measurement of the social and environmental impact of such projects is however not yet defined.

4.2.2 Obstacles

Three major obstacles or difficulties can be identified in the execution of the project. Firstly, reducing the water footprint in the supply chain will be very difficult as there is no defined method in the area. The methodology, which the companies adopted to reduce the water footprint in their activities, was mainly given by the Water Footprint Network and Quantis. Neither of these actors do however have any methodologies for the supply chain of these companies, such as in the farming area. It will also be critical to convince farmers to reduce their water quantity because they do not pay for it. Therefore, participating companies and Quantis will have to show creativity to find solutions.

Secondly, the water footprint of the company and the water footprint of the supply chain, representing the total water footprint, will also be measured relatively to the index of exposition of the water pool (there are environmental indices about the fragility of the different water pools), and relatively to poverty indices. This means that the social and environmental impact of the project will be measured. Indeed, the richer a country is, the less it is affected by water footprints on a social level. And the less fragile the environment, the more it can absorb a high water footprint. However, measuring the social and environmental quality of an action is difficult as there are no commonly agreed on criteria.

Thirdly, the safety issue in Colombia is having an adverse effect on the project. It appears to represent the main obstacle in SuizAgua. It is very dangerous to do measurements in rural zones in Colombia. Moreover, employees of multinational companies are even more exposed because they are highly interesting targets. SuizAgua is therefore working with local organizations to effectuate such tasks.

Another potential obstacle is the reaction of civil society groups. Projects such as SuizAgua are often criticized by NGO's, which are anti-Nestle or anti private sector. They argue that companies are caring about water to hide their bad behavior in other areas. However, in this case, NGO's seem to be enthusiastic and supportive of the project. Indeed, everything is done so that SuizAgua is not perceived as a pretext for companies to hide from other bad behaviors. The companies are not willing to use the project as a marketing tool.

4.2.4 Future Perspective

The project is supposed to be terminated in mid 2012. After this date, if the project is successful, it will be renewed, with more Swiss companies in Colombia, or replicated in countries in South or Central America or Africa. There the configuration of companies is similar. Both options can as well be done simultaneously: the project can be replicated in Colombia with more companies as well as in other countries.

Indeed, if the multinational companies involved in the project are convinced of the benefits, they may replicate it in their other subsidiaries around the world, so the effect as well as the return on investment could potentially be huge. This is not the case with small local companies, where everything has to be started from scratch and where the effect is much smaller.

4.3 Company Perspective

The Project SuizAgua, together with its principles and goals, was introduced in the last chapter. In the following section the goal is to focus closer on the perspective of the companies involved and identify their possible profits arising from the project.

At the beginning of the project, foreign minister of the federal council of Switzerland, Mrs. Calmy-Rey, traveled to Colombia, where she noticed a general interest of different companies to work on the issue of reducing their water consumption. About 15 companies were involved at the onset, but after the requirements and necessities were made clear, the number of firms diminished quickly. In the end, only five companies, mainly the biggest ones, were left and accepted to participate actively in the project. The reasons for the refusals of the others were numerous. One of the main reasons was the bad timing of the project. The campaign was launched during the financial crisis in 2008/2009 when the general willingness to invest in secondary projects was quite low. The risk of spending time and money on a task that was not part of firms' core capacities was just too high. Another problem was the time-consuming

bureaucracy of some corporations, which forced the leaders of SuizAgua to start the project without waiting for further confirmations. The SDC wanted to avoid losing time and decided to start with the following five companies: Alpina, Clariant, Holcim, Nestlé and Syngenta. Even though only five firms have signed on to the project until now, there is still the possibility that other companies might join-in later on. Admission to the project is always possible, although for the moment other firms should wait until 2012, when the project will be terminated temporarily. Each participating company will contribute CHF 150'000 to the project, together with its assistance in the issues of reducing the water footprint and the social and environmental responsibilities.[51]

The chapter will be structured according to the five participating companies, while an additional chapter will examine the possible benefits for these companies resulting from their participation in the project. Each firm will be analyzed according to two criteria: company profile, and commitment towards social responsibility and water initiatives.

4.3.1 Alpina

Company Profile

The company's full name is Alpina Productos Alimenticios S. A. It was founded in 1978 in Colombia and has Swiss origins. It produces a wide variety of food products, ranging from beverages, milk and baby food, to desserts, cheeses, cream and butter, and finesse products, which are distributed in 34 countries. The company is based in Bogotá, Colombia, and it is the third largest dairy producing company in the country. Alpina has processing facilities in Colombia, Ecuador and Venezuela. Due to its annual sales of USD 275 million in 2006, Alpina is one of the largest private dairy companies in the Andean region.[52] One of its greatest competitors in the region is Nestlé, which, as already mentioned, is also involved in the project SuizAgua.

Commitment towards Social Responsibility and Water Initiatives

Alpina's corporate strategy was greatly influenced by its founder's philosophy, which combined a successful strategy with a work environment that values the needs of its stakeholders as the top priority. Hence the social initiatives have a long tradition in the organization's history. With the development of the company, the ownership structure changed, but the owners were still a small number of family investors. This led to a further expansion of social initiatives in different areas. Between 2002 and 2006 many actions in the field of social responsibility were taken by

[51] Münger, 2010; SDC, 2009
[52] Trujillo, 2009

the Human Resources department to show Alpina's willingness to accomplish a significant impact.[53]

One of these projects involved the NGO Oxfam. The goal was to develop a business model that would benefit small farmers in Colombia, by consolidating the activities of the four existing producers to achieve economies of scale and thus achieve a stronger market position. In addition to these actions, the project promotes women's empowerment, an inclusive private-sector model and favorable policies for small dairy farmers. All these aims were to improve the quality of the milk, and thus help them sell their products at better prices.[54]

Alpina has focused on water management in developing industry systems for monitoring or resources usage and established control mechanisms in the area of dumping. It is already working on the development of eco-efficiency indicators. The company also has wide-ranging experience in the field of reforestation and environmental management.[55]

4.3.2 Clariant

Company Profile

Clariant is one of the world leaders in the field of specialty chemicals. The portfolio of products distributed by Clariant is particularly strong in the following industries: textile, leather, paper, automotive, electronics and energy. The company is a market leader in the pigments and additives sector. It's headquarter is located in Muttenz, Switzerland. The company operates all over the globe on all continents and is represented by over 100 group companies. Clariant employs more than 20'000 people. The company recorded close to USD 7.5 million in revenues for the financial year of 2008. The operation profit accounted for nearly USD 160 million in the same year. Sales in 2009 amounted to CHF 6.6 billion.[56]

Commitment towards Social Responsibility and Water Initiatives

Clariant has built up a strong social responsibility program with several different projects. Throughout all these initiatives, Clariant commits itself to the principles of sustainable development in every aspect of their actions. Because of its leading position in the chemical industry, the company participates in multiple voluntary programs including the Global Charter Responsible Care and the Global Product Strategy.

One of the latest projects is the Energy 2010 program. Through energy audits at all major branches, Clariant managed to reduce its energy consumption per ton of product by more than

[53] Trujillo, 2009
[54] Oxfam, 2010
[55] SDC, 2009
[56] Clariant, 2010; Datamonitor, 2009

16 percent over a time period of four years until 2008. The rise in efficiency and annual savings in electricity saved up to CHF 1 million in energy costs.[57]

Besides the energy program Clariant also introduced different environmental protection projects. The initiatives contributed towards effluent reduction. One project worked towards a complete cessation of nitrogen component discharged into waste water. The resulting chemical substance was isolated and sold as a raw material for further purposes. Comparable programs can be found in the area of phosphate reductions in sites in Germany or reduction of air pollution at the headquarters in Switzerland. All these initiatives together resulted in an investment sum of more than CHF 20 million during the last few years.[58]

Additionally, Clariant has introduced control policies to manage their water consumption. The graph below shows how these policies have helped to diminish the use of water between 2005 and 2009 by almost ten percent. In Colombia, the company has only recently introduced its plants, which is why the developments in this area are not yet significant. Current investments are made in order to develop projects aimed at reducing the use of water and harvesting rainwater for plant operations.[59]

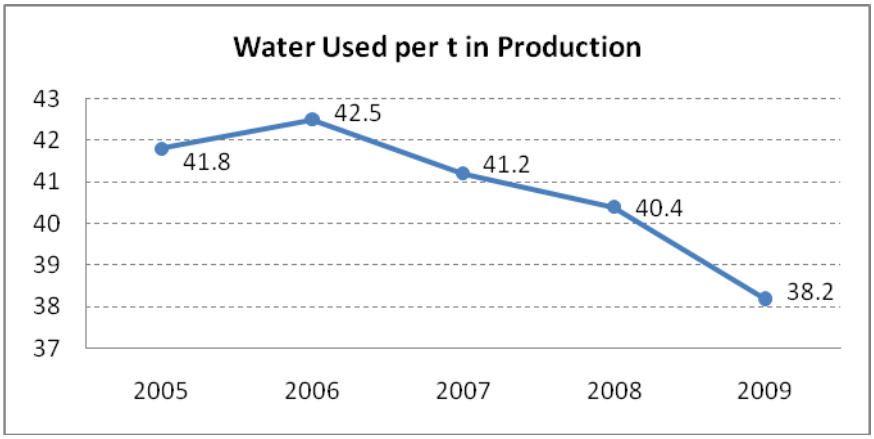


Figure 7: Water Consumption Clariant. Clariant, 2010

4.3.3 Holcim

Company Profile

Holcim was founded in 1912 in Switzerland and evolved into a leading producer of building materials such as cement, concrete and aggregates. Besides their core business they also offer consulting, research, engineering and other services. Holcim is a global company with approximately 80'000 employees operating in more than 70 countries. With this far reaching network, Holcim is more globally spread than any other enterprise. Its headquarters is placed in Jona, Switzerland. Thanks to the market-oriented structures and other decisions taken in the past, Holcim was able to record sales of over CHF 21 billion in 2009. During the financial year of

[57] Clariant, 2010
[58] Clariant, 2010
[59] Clariant, 2010; SDC, 2009

2008, the company was able to record revenues of USD 23'307 million and an operating profit of USD 3'113 million.[60]

In Colombia Holcim operates in over ten plants in the area of production of cement and aggregates; marketing of cement and other materials.; extraction and management of alluvial and limestone; as well as specialized transport and ecological solutions of industrial waste-processing.[61]

Commitment towards Social Responsibility and Water Initiatives

Holcim shows a clear commitment regarding its social responsibilities. Its guiding principles concerning sustainability, human rights, etc. are manifested in several treaties, including the Global Compact United Nations Organization and the Inter-American Network of Corporate Foundations and Development Base (RedEAmérica). In addition, the company has underlined its commitment in Colombia specifically by the active participation in local organizations like the CECOD (Centro de Estudios de Cooperación al Desarrollo).[62]

Holcim is very much aware of its dependency on long-term access to raw materials. As a result, the firm accurately plans and manages its material extractions and impacts on the natural environment. Furthermore, it has introduced many conservation and restoration projects such as the usage of rainwater for irrigation. The company recognizes the importance of water as a top priority, which is why it has developed processes allowing the reduction of its water consumption. Holcim requires water mainly for cooling purposes in the cement production process, but also to prepare slurry in wet process kilns.[63] To reduce the water consumption in these processes it installed closed-loop water cycles and settling tanks. To improve the monitoring of the water usage and the efficiency of water management, Holcim implemented water meters.[64]

A concrete project regarding the problem of water scarcity was introduced in India under the umbrella of the Ambuja Cement Foundation. Its goal was to manage the insufficient availability of water for the growing population. The solution was to establish the possibility of large-scale water harvesting and enable the change to less water-intensive cropping in combination with micro-irrigation. The project resulted in over 1,207 million cubic feet of ware harvested, benefiting over 10'000 farmers. As an additional consequence, farmers can now harvest three crops per year instead of one and the availability of drinking water increased significantly.[65]

[60] Holcim, 2010; Datamonitor, 2009
[61] Holcim, 2010
[62] Holcim, 2010
[63] Ovens that are used to dry or harden materials
[64] Holcim, 2010; SDC, 2009
[65] Holcim, 2010

4.3.4 Nestlé

Company Profile

Nestlé was founded in 1866 in Vevey, Switzerland, by Henri Nestlé. Today Nestlé is the world's leading nutrition, health and wellness company. The company employs approximately 280'000 people around the globe and has facilities in nearly every country. The company is the distributer of famous brands like Nespresso, Vittel or Mövenpick. In 2009 the sales of all these products summed up to CHF 108 billion and a net profit of CHF 10.4 billion. Their business principles are based on the long-term and sustainable creation of value for shareholders, employees, consumers and business partners.[66]

Commitment towards Social Responsibility and Water Initiatives

Nestlé shows a very strong commitment towards social responsibility and has therefore founded the initiative «Creating Shared Value». The project is structured in three pillars: water and environmental sustainability, nutrition, and rural development. In all these areas, the company spends vast amounts of money to secure the best possible results. To further underline its commitment towards a shared value it is a member of several global principles like the UN Global Compact, the CEO Water Mandate or the UN Millennium Development Goals.[67]

In the context of the sustainability of water resources Nestlé takes a leading role. Since the long-term success of the company depends on the supply of water and the support of livelihoods of suppliers and consumers, it puts great efforts into the reduction of water consumption and the effectiveness of water resource management. According to the CEO of Nestlé, Peter Brabeck, the main challenges on the water issue are the water security of the farmers and the quality of the bottled water. To achieve these goals Nestlé applied a life cycle approach to assess the impacts of their direct actions and value chain. The costs for all the investments are significant: in the area of environmental sustainability alone the company invested over CHF 220 million during 2009. Because of these investments the results are substantial. Ten years ago withdrawals were close to 5 liters per dollar of sales in 1999: today they are below 2 liters and there is still room for improvement according to Brabeck. The overall water consumption was reduced by 34.6% from 2002 to 2006, as is visible in the following graph. But the reduction of water consumption is not its only goal; Nestlé also contributes to the diminution of waste in the supply chain. Waste reduction translates into savings of 815 million to 1'375 million cubic meters of water each year.[68]

[66] Nestlé, 2010
[67] Nestlé, 2010
[68] Nestlé, 2006

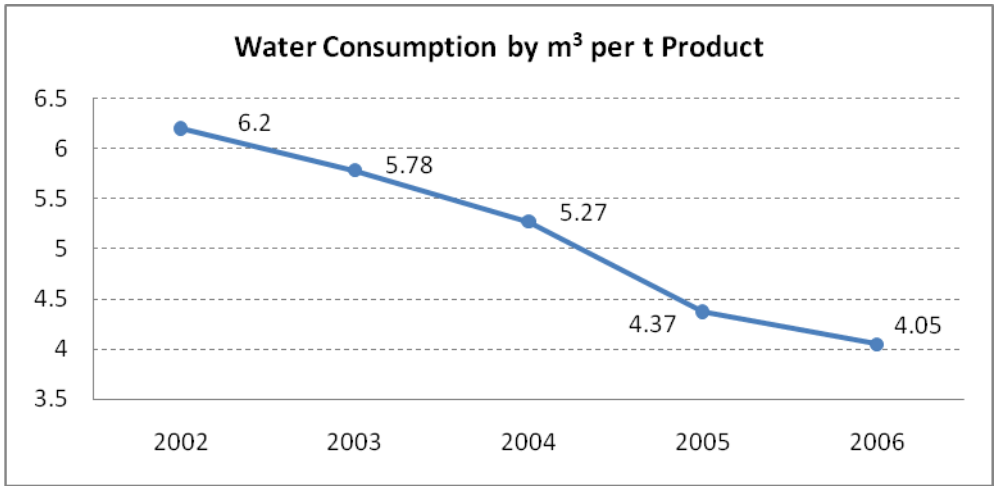


Figure 8: Water Consumption Nestlé. Nestlé, 2010

In Colombia, Nestlé has launched the Wastewater Treatment (WWTP) in the region of Caqueta. The aim of this project is to improve the sustainable development of milk production of small and medium farmers and to ensure improvements of wastewater collection from washing equipment and other utensils. Furthermore, the company will increase the amount of cooled milk storage to guarantee fewer losses in income for the farmers. Nestlé's president Juan Carlos Marroquin Cuesta thus aptly underlines the firm's long-term commitment in this region: «We continue to improve day by day our production processes to minimize time impact on the environment, thus ensuring a better future for the next generations»[69].

4.3.5 Syngenta

Company Profile

Syngenta was founded in Switzerland and still has its headquarters in Basel, Switzerland. It is one of the world's leading agrochemical and seeds companies. Syngenta is active in the area of discovery, development, manufacturing and marketing of products with the goal of improving crop yields and food quality. Furthermore it engages in the development of seed care, lawn and garden, professional pest management, vector control and public health. The company has sites in over 90 countries worldwide and employs more than 25'000 people. In 2009 Syngenta accumulated USD 10'992 million in sales.[70]

Commitment towards Social Responsibility and Water Initiatives

Syngenta's value creation is dependent on the integration of business, social and environmental performance; therefore it commits itself to maintain a high standard of corporate responsibility. It's Code of Conduct and its policies are in accordance with internationally accepted regulations such as the UN Global Compact or FTSE4Good index. The company's undertakings towards

[69] Nestlé, 2006
[70] Syngenta, 2010; Datamonitor, 2009

sustainable growth identify the efficient use of water as a top priority. Through monitoring systems and improvements in the production or the value chain, the company managed to diminish its water usage for processing and washing by 12 percent in 2009. However, at the same time total water consumption rose by three percent in the same year due to an increase in water usage for cooling. The amount of wastewater was reduced by ten percent. The water treatment plant allows Syngenta to use up to 80% of its water for the industrial process from rainwater and recycled water.[71]

Because of Syntega's close connection to agriculture, the biggest global water user, the company wants to contribute to an improvement of water usage in this sector. Around 40% of the water used for irrigation is wasted because of inefficient practices. Syngenta works together with specialists to develop irrigation systems that reduce the water consumption. To reduce the percentage of lost water, Syngenta also supports farmers with products that help to grow crops by using less water. In 2009 Syngenta invested USD 7 million in the area of resource efficient programs alone.[72]

Research has shown that each year vast amounts of crops are lost in rain-fed regions due to droughts; to reduce these loses, Syngenta is developing and has already introduced more resilient sorts of crops that can grow in areas with unstable and tough environments. The new crop protection product called Invinsa gives the farmer the possibility to grow strong field crops even during drought periods. Furthermore Syngenta developed non-selective herbicides to enable minimum cultivation agriculture, which improves the water absorption and makes the soil structure more resistant.[73]

4.4 Possible Advantages for Companies of SuizAgua

The participating companies differ in their level of financial and practical investments concerning the reduction of their water consumption. Nestlé, for instance, invested a large amount of money to actively increase the awareness of the water problem and implemented several initiatives to reduce its own water usage. It is also the only company that mentions the project SuizAgua on its homepage. Other corporations, such as Alpina do not publish their commitments towards the water problematic as extensively, which does not mean that they spend less effort on the reduction of their own water footprint. Even though the developments of the firms are extremely diverse, the project SuizAgua offers benefits for all the participating companies. One of the main reasons why firms can profit from participating in the project is the new measurement system that stands behind the water footprint.

[71] Syngenta, 2010; SDC, 2009
[72] Syngenta, 2010
[73] Syngenta, 2010

A first advantage arises from the public-private partnership between the firms and the Swiss Agency for Development and Cooperation. It strengthens the corporate social responsibility strategies of the companies, since they can profit from knowledge of other participating agencies and firms. This in turn results in an additional benefit of the project: companies can exchange knowledge and best practices with other business leaders on the issues of water management and related themes.[74]

Above all, the participating companies will hopefully achieve a reduction of their own water consumption and that of their suppliers in the value chain. As a result, they can achieve direct economic benefits because of lower costs in their production processes. The decreasing amount of water will also improve the often-mentioned sustainability of their operations, which constitutes a possible comparative advantage in the future.[75]

The support from the SDCs own division in the area of global water initiatives adds additional value to the project and can provide the companies with new knowledge and specific expertise on the water footprint subject. The companies, in turn, can use the human resources and financial investments of the SDC to leverage their own investments in their corporate social responsibility programs. [76]

Finally the corporations receive great national and international visibility as responsible companies since they are part of a structured project with measurable targets organized by a federal agency. The advantages of this project will be communicated, so as to replicate it in other countries or regions, thus saving time and money in the future.[77]

The benefits mentioned above must however be analyzed with a certain amount of precaution. Many companies that are involved in the project have already reached a maximum of their water footprint reduction. Therefore, further investments to reduce their water consumption can and will be very costly. According to Mr. Münger from the SDC, the potential for additional savings lies in the supply chain of the corporations.[78] How to implement such actions is a question that the project SuizAgua can perhaps answer to a certain extent. The subsequent chapter will elaborate possible ways of reducing the water footprint in the supply chain and of the company itself.

[74] SDC, 2009
[75] SDC, 2009
[76] SDC, 2009
[77] SDC, 2009
[78] Münger, 2010

V. Implications for the Companies to Reduce Water Footprint

As presented in the previous part, there are already continuous efforts of the involved companies to reach coordinated and forward-looking water strategies. These actions were not only taken due to increasing water costs, business disruption risks or growing stakeholder concerns. Moreover, the companies realised that many water sources are showing signs of stress due to rising pollution and withdrawal rates that go beyond replenishment rates.[79] Although the companies are not affected equally, we can see that all five corporations that joined the SuizAgua project are trying to position themselves in the new global business environment of scarce water.

Based on the water initiatives of the five companies in the SuizAgua project that were already shown, this chapter aims to present further implications of reducing the water footprint of the companies in their whole supply chain. Moreover, this section will shed some light on innovative strategies to reducing water by cooperating with local authorities and moving toward a more sustainable water policy in their operating regions.

In a first step, this part will focus on how important it is for large companies to consider the water use not only in their operational businesses but also in their whole supply chain. Second, the paper will deal with concrete strategies for saving water and increasing industrial water productivity with a closer look on water management in agriculture. Third, the problem of elaborating the cost of each action will be tackled with the presentation of the so-called water cost curve. In a further step, this chapter will concentrate on new creative water strategies for the companies. Therefore, together with local governments and NGO's, the companies can develop long-term and responsible water solutions.

5.1 Understanding the Water Use in the Value Chain

Water opportunities and risks are growing throughout the companies supply chains. Therefore, when the companies want to save water sustainably, it is crucial to consider their whole value chain.

Each of the five companies have already taken steps to include their supply chain in the water management strategies, especially in working with their agricultural suppliers, but still the efforts vary considerably among them.

Of course, the five companies have totally different value chains – from production inputs, raw materials and suppliers to ultimate service, product use and disposition. Nevertheless, they and their suppliers all rely heavily on clean water and will have to act jointly to prevent cost from rising or the breakdown of key production inputs, raw materials or energy due to a possible

[79] GEMI, 2002

water shortage.[80] For instance, if small farmers in the Colombian agriculture would face a sudden water scarcity, companies like Nestlé, Syngenta or Alpina would face serious problems with their supply chain and production cost. The importance of this issue is clearly shown in Figure 9: The lion's share of the water used in the production process of Foodco's is consumed in agriculture. Foodco is Australia's largest food and coffee franchising business retailer.

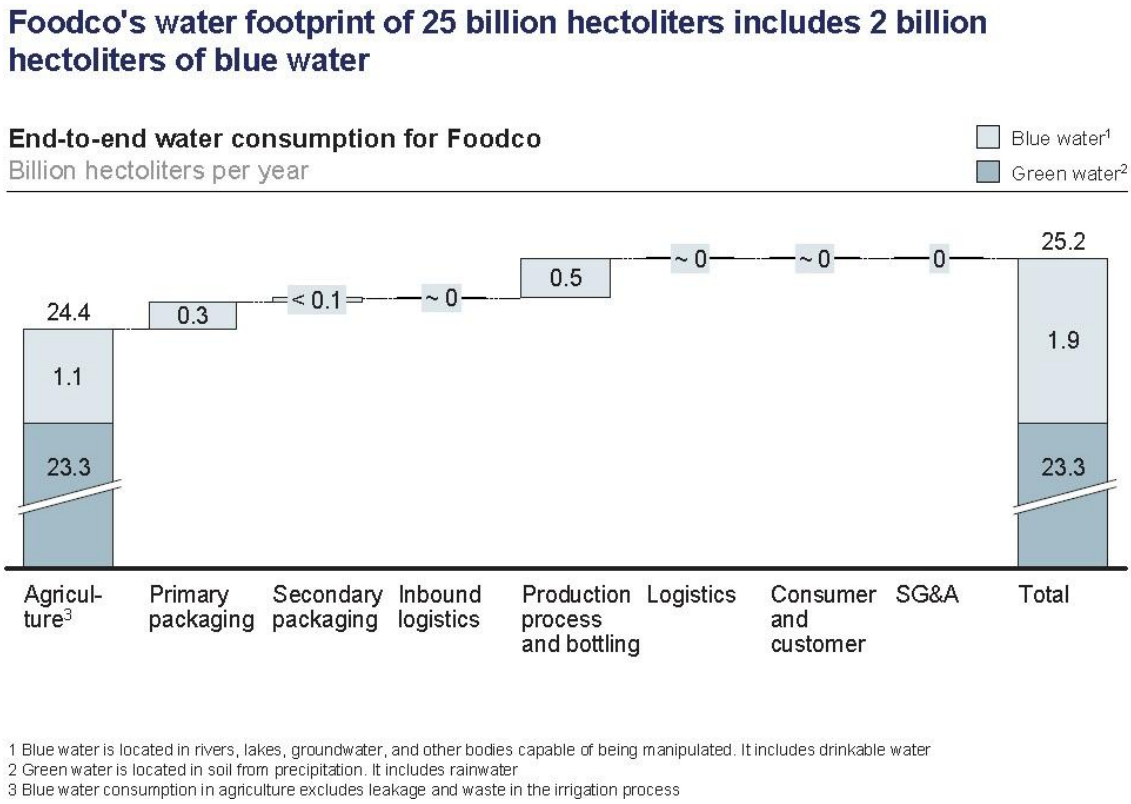


Figure 9: Foodco's Water Footprint. McKinsey, 2009

Not only can the early stages of the value chain have great affects on water resources. Also the final disposition of manufacturers' products or services could influence the water supply of the very same companies. Observing the complete value chain of a company will help to identify problems in the water supply, which may not have been obvious at first glance.

This will unquestionably require a coordinated focus across facilities and sites.[81] Here, the water footprint instrument could be a very useful tool to elaborate the total water use including the virtual water usage of the company.

5.2 Strategies for Saving Water and Increasing Industrial Water Productivity

Since environmental awareness and resource issues have become more and more important, many companies have improved their water efficiency and reduced their water footprint

[80] GEMI, 2002
[81] GEMI, 2002

considerably. Water consumption has dropped due to water conservation, reuse, recycling efforts and renewing priorities for water use.[82] When reducing the water footprint for a company, we must consider both the water quantity and quality. When observing the water quantity, it is important to concentrate on water productivity in terms of the industrial value added per unit of water used. High water productivity leads ultimately to a high value being placed on water.[83]

The following pages will take a closer look at water saving strategies and analyse their potential.

5.2.1 Water Auditing

Implementing a water audit for a production plant or facility gives an overview where the water is being used, and how much water each process consumes. Additionally, it shows where the water finally ends up.[84] As presented above, Alpina and Hocim have conducted water monitoring by developing industry systems and water meters.

Natural evaporation and rainwater that falls on the site should be considered when conducting the audit. If there is no risk of contamination, rainwater can be harvested. Clariant and Holcim are already using rainwater for irrigation and plant operations. In the following step, auditing, a company can draw a flow chart where the water balance across the plant is visualised.[85]

A water audit can help identify and quantify the necessary steps to reduce water usage and losses. Thereby, water can be traced from its entry point into the process to its disposition.[86]

5.2.2 Water Recycling and On-Site Reuse

Water recycling entails saving water in the industrial process by using wastewater for lower quality applications instead of discharging it. It is possible to do this several times and thereby increase water efficiency substantially and save large amounts of fresh water. Recycled water is often used in the manufacturing process for heating, cooling and quenching where the requirements on water quality are usually low. Additionally, water can be used as wash-down water and for irrigation.

There is similarly a potential in treating wastewater back to high quality, as the cost of doing so may be lower than getting fresh water. Especially in situations of scarcity, due to droughts or falling groundwater levels, is this option not only a question of saving money but can be seen as part of the company's risk management. The microchip manufacturer Intel, for instance, saved 35 percent of freshwater by recycling water and developing more efficient water systems.[87]

[82] GEMI, 2002
[83] UNESCO, 2006
[84] UNESCO, 2006
[85] UNESCO, 2006
[86] Shah, 2009
[87] UNESCO, 2006

5.2.3 Using Reclaimed Water

A more innovative way of recycling water requires reusing wastewater that has been discharged by other companies in the area. Likewise, used water can be treated to the matching water quality, if necessary. Using reclaimed water is most common in industrial cooling and power generation but also widespread for boiler feed and quenching. It can ease the pressure on water scarcity in water stressed regions. Irrigation in agriculture offers a significant opportunity for using reclaimed water. To prevent problems with water quality, the World Health Organisation has established guidelines for the use of reclaimed water in irrigation. Similarly in the construction sector there are possibilities for efficiency gains by using reclaimed water.[88]

5.2.4 Minimizing Virtual Water in Manufactured Products

Because the virtual water of a product represents the volume of water that was necessary to produce it, we have to consider the imports and exports of different products to measure the virtual water flows that enter and leave a region. Therefore, water stressed regions should concentrate on the production of products that use little water (high water productivity) and thus export a minimum of virtual water. On the contrary, goods and products that have low water productivity or are water-intensive such as aluminium and beer, should, if possible, be imported to such regions.[89]

5.2.5 Influencing Better Management of Water in Agriculture

Reforms dealing with water management are particularly urgent in agriculture. It is estimated that 70-80% of all developed water resources worldwide are used in agriculture. In arid regions with little rainfall, this percentage may go up to 90%. Additionally, many authorities subsidise their water supply and limit trade of freshwater.[90] Agriculture's demand for «blue water» is tremendous as mentioned above, as the amount of «green water» can't satisfy the need for sufficient crops. When dealing with «blue water» supply in agriculture, the goal is to improve the crop production per unit of irrigation with improved tillage, fertilizers and crop stress management. Thus, less «green water» have to be used for the same harvest.[91]

The companies involved in SuizAgua are already tackling this issue. As mentioned above, Holcim is involved in a water project in India for less water-intensive cropping in combination with micro-irrigation and Syngenta is very active in developing more resilient crops, thereby saving water. The large efforts of Nestlé for water security in agriculture have to be mentioned as well.

[88] UNESCO, 2006
[89] UNESCO, 2006
[90] Fraiture & Perry, 2004
[91] 2030 Water Resources Group, 2009

The following paragraph will shed some light on another, innovative technique of irrigation with promising potential: drip irrigation.

Drip irrigation is a «method of micro irrigation wherein water is applied to the soil surface as drops or small streams through emitters»[92]. It is highly efficient and superior to flood irrigation for fruits and vegetables. The water goes through plastic pipes (dotted with holes) that can be positioned along the rows of crops. Consequently, the evaporation is lowered and up to 25% of the water is saved compared to flood irrigation.[93]

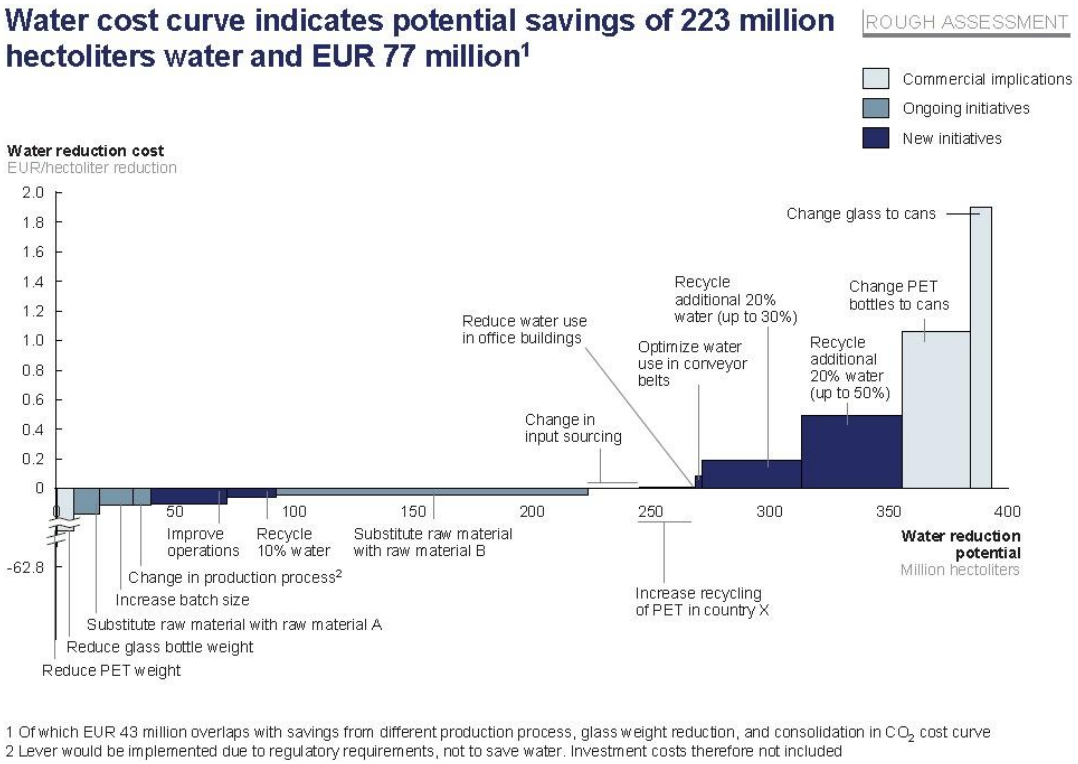
In Colombia, population growth will require more productive irrigation techniques, which can be achieved by adopting drip irrigation. Thus, revenues will increase and input cost can be reduced. Analyses by McKinsey have shown that drip irrigation can increase revenues in the Indian agriculture by $30 billion annually. Evidently, the savings potential of drip irrigation vary between regions depending on methods. If flood irrigation is implemented, the potential is much greater than where modern techniques as sprinkler irrigation are already in place.[94]

5.3 Elaborating the Cost: Creating a Water Cost Curve

When saving water, the companies could use the so-called «water cost curve» – a decision tool for saving water at the lowest possible cost. The instrument provides a microeconomic analysis of the cost and water reducing potential for a range of methods.[95] In the following section, we will shed some light on the instrument and discuss its implementation and potential.

Figure 10 shows the water cost curve for a major beverage company. The horizontal axis of the cost curve measures the water reduction potential (in million hectolitres). The vertical axis measures the reduction cost per unit of water released by each method (EUR/hectoliter reduction). The wider a method on the horizontal axis, the larger its saving potential. A method's height on the vertical axis, on the other hand, indicates it's financial cost (or savings) to the decision-maker.[96]

[92] University of Florida, 2010
[93] USGS, 2010
[94] 2030 Water Resources Group, 2009
[95] 2030 Water Resources Group, 2009
[96] 2030 Water Resources Group, 2009



1 Of which EUR 43 million overlaps with savings from different production process, glass weight reduction, and consolidation in CO_2 cost curve
2 Lever would be implemented due to regulatory requirements, not to save water. Investment costs therefore not included

Figure 10: Water Cost Curve. McKinsey, 2009

The cost curve measures only the cost basis, on which water reduction choices are made. Measuring the cost and technical potential of disparate methods however allow the measures to be compared and evaluated in a common context.[97] Further, the instrument does not represent what the plan for reducing water ought to be. It has to be seen as a tool to help companies understand and compare different options of reducing water.

5.4 Towards Creative Water Strategies

Industrial water management strategies as they were discussed in the previous pages try to minimize the water use and wastewater in the production process and increase water productivity for companies. On a company level water management occurs independently of other actors and often only aims to increase the profit of the enterprise.[98]

But water security and quality can't be seen as company issues any more. In order to create a sustainable economy, every business, community and ecosystem has to balance the competing water needs with coordinated efforts.[99]

Such external water strategies can be realised in the context of regional or national water management. National water conservation policies are extremely important considering that in some developing countries, the private industry can use and discharge water without charge because the water sector is still unregulated. Implementing the mentioned water cost curve on

[97] 2030 Water Resources Group, 2009
[98] UNESCO, 2006
[99] GEMI, 2002

an industry sector or even national level can be a useful starting point to realising long lasting water security.[100] Certainly, the formation of a national cost curve would presuppose partnerships with local communities where the public, private and civil society decision-makers engage with each other to solve water challenges.[101] According to the UNESCO report, examples for such strategies are:

- National water recycling and reuse policies
- Grouping of industries in a particular site (industrial parks) coupled with combined treatment methods
- Rationing the water use within industries, so that each process uses a defined quantity of water
- Applying economic instruments such as penalties, water charges, subventions, credits and grants[102]

It is not always obvious for business leaders to see the advantages of investing in sustainable water activities, especially if they are not profitable in the short term. But taking a leadership role will improve the relationships with customers, government regulators, shareholders, employees, community groups, or financial institutions for multinational companies. Companies that understand the signs and develop new creative water strategies will increasingly create shareholder value and a competitive advantage in the long run.[103]

[100] UNESCO, 2006
[101] McKinsey, 2009
[102] UNESCO, 2006
[103] GEMI, 2002

VI. Conclusion

In the 21th century, water scarcity has evolved into a global issue. The shortage of water resources also is getting more and more attention by multinational companies. Since the problem is global, international corporations have realized that is in their interest to tackle the topic of water security. To face this challenge they need to formulate coordinated and forward-looking water strategies. If they want to achieve their goal of using water more efficiently and reducing their water footprint, they will have to find new ways to break down the complexity of the water challenge.

One way of dealing with that problem is to implement concrete measurement and monitoring systems that can precisely show which product, plant or region consumes how much water. The water footprint, developed by Hoekstra and Hung, is one instrument that helps to understand the global character of fresh water in quantifying the effects of consumption and trade of water resources for a company. It differs from classical measurements because it not only includes the consumption of surface and ground water resources but also evaporation as well as the volume of polluted water in the production process.[104] It also separates itself because of its wider perspective by measuring water consumption over the full supply chain. – the so called indirect water use.[105]

Based on this instrument the SDC has started a project with five multinational companies with the goal of establishing private-public cooperation to reduce water consumption in Colombia called SuizAgua. Following an agreement of all the participating actors they have set up a plan to measure and reduce their water footprint in their value chain and additionally enhance efforts of social and environmental responsibility. The initiative should finally encourage the development of a related ISO norm, which stresses the global relevance of this project.[106]

The five corporations, Alpina, Clariant, Holcim, Nestlé and Syngenta, have already taken steps to include their value chain in the formulation of water management strategies. With a specific focus on agricultural suppliers, the actions vary considerably among the companies. The paper has presented additional strategies to reduce the water footprint in the companies and the relevance of taking the whole value chain in consideration. The strategies with the greatest potential involve efforts in water monitoring, recycling and reuse of gained water in the production process. Moreover, it is crucial to develop efficiency gains in the early production steps of their agricultural suppliers. The paper stated that the water issue cannot be simplified as a company problem itself. It is important to acknowledge that corporations should take other actors such as NGOs or local authorities into account when solving the water challenge.

[104] Hoekstra et al., 2009
[105] Gerbens-Leenes & Hoekstra, 2008
[106] SDC, 2009

Even though the overall picture and the outlook of the project are encouraging there are certain aspects that should be reconsidered. Firstly, even though the form of cooperation of SuizAgua was new to all the participating companies, the benefit of the project varies between them. This is mainly due to different present engagements in solving their own water challenge. Secondly, the further commitment towards social and environmental responsibility besides the reduction of the water footprint will depend on their future economic performance and their willingness to invest in such projects sustainably. Thirdly, it remains to be seen how the competing situation between Alpina and Nestlé will influence their contribution to the project. So far there have been no signs of negative impacts. Furthermore the leading committee will have to be aware of the security problems in the rural areas of Colombia when working with local farmers and suppliers. If security deteriorates and the rebellion movements destabilize the political situation, the overall success of the SuizAgua project could be at risk. Finally, the different orthodoxies of the private and the public sector could evolve into barriers against a successful cooperation and endanger the ongoing project.

Nevertheless, the SuizAgua project is a promising and innovative approach of cooperation between various actors to challenge the global problem of water scarcity. Because the project has started successfully and the financial and operational commitment of the corporations is encouraging, the signals towards a sustainable effect on the water resources in Colombia are clearly visible. Ultimately this project contributes to the solution of the global water problem.

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