University of St. Gallen – School of Management, Economics,

Law, Social Sciences and International Affairs (HSG)

# Mapping Complex Systems for Business Model Development

## Water Supply for Cocoa Farmers in Ghana

Master's Thesis

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# Abstract

Nestlé is reacting to their cocoa farmer's problem of insufficient access to safe water, hygiene and sanitation. Therefore, as part of its creating shared value [CSV] initiative, Nestlé in cooperation with the International Federation of Red Cross [IFRC] have started to implement water service delivery projects in Ghana for Nestlé's cocoa farmers. With these projects, Nestlé aims to create value for each party involved. On the one hand, the provision of safe water to cocoa farmer communities improves people's health and livelihood. On the other hand, Nestlé increases productivity, efficiency and quality of its suppliers, whereas IFRC gains access to funding in order to accomplish their target of providing water supply to underserved areas. In the context of Nestlé's CSV initiative, developing a business model for a truly sustainable water service delivery project presents a complex system. Various actors with different interests and motivations are involved and the success of the project is dependent on a large number of parameters. Out of the different water service delivery options, a water kiosk system can represent a suitable and sustainable solution to cocoa farmer's need for safe water and is used as the underlying concept in the thesis at hand. Therefore, with the help of the Business Model Canvas and a Human-Centred Design approach, a toolbox with parameters and questions was elaborated which assists in developing a water kiosk system. These parameters include securing critical physical, human, financial and intellectual resources and finding suitable local partners in order to develop, operate and maintain the water kiosk. Moreover, good relationships with customers and close cooperation with the cocoa farmer communities are crucial for the project's acceptability and adaptability. Additionally, the project must generate sufficient revenues to be self-sustaining and thus, achieve financial viability. Finally, the present thesis provides insights on potential risks and challenges associated with the development of a water kiosk project in rural and semi-urban Ghana.

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# List of Abbreviations

| | |
|---|---|
| ADB | Asian Development Bank |
| BMC | Business Model Canvas |
| BoP | Bottom of the Pyramid |
| Capex | Capital expenditures |
| CHF | Swiss franc |
| CIDA | Canadian International Development Agency |
| CONIWAS | Coalition of NGOs in Water and Sanitation |
| CSR | Corporate Social Responsibility |
| CSV | Creating Shared Value |
| CVM | Contingent Valuation Methodology |
| CWSA | Community Water and Sanitation Agency |
| Danida | Danish International Development Agency |
| DWST | District Water and Sanitation Team |
| EPA | Environmental Protection Agency |
| EU | European Union |
| FAO | Food and Agriculture Organization of the United Nations |
| FGD | Focus Group Discussion |
| GHS | Ghanaian cedi |
| GTZ | German Association for Technical Cooperation |
| GWCL | Ghana Water Company Ltd. |
| GWSI | Global Water and Sanitation Initiative |
| HCD | Human-Centred Design |
| IFRC | International Federation of Red Cross and Red Crescent Societies |
| IRC | International Water and Sanitation Centre |
| KfW | Kreditanstalt für Wiederaufbau (German development bank) |
| MLGRD | Ministry of Local Government & Rural Development |
| MMDA | Metropolitan, Municipal and District Assembly |
| MoU | Memorandum of Understanding |
| MSWR | Ministry of Sanitation & Water Resources |
| MWRWH | Ministry of Water Resources, Works and Housing Government of Ghana |
| NGO | Non-governmental organization |
| Opex | Operating expenditures |
| PURC | Public Utilities Regulatory Commission |
| RCC | Regional Coordinating Council |
| RWST | Regional Water and Sanitation Team |
| SDG | Sustainable Development Goal |

| | |
|---|---|
| SWN | Safe Water Network |
| UNICEF | United Nations Children's Fund |
| WASH | Water, Sanitation and Hygiene |
| WATSAN | Water and Sanitation |
| WD | Water Directorate |
| WHG | Water Health Ghana |
| WHI | Water Health International |
| WHO | World Health Organization |
| WRC | Water Resources Commission |
| WSDB | Water and Sanitation Development Board |
| WSTF | Water Service Trust Fund |
| WTP | Willingness-to-pay |

# 1 Introduction

In the following chapters, first the relevance of the topic and the associated research question are outlined. This is followed by the presentation of the research methodology before the chapter closes with the limitations of this master's thesis.

## 1.1 Relevance of the topic

> *"Businesses must reconnect company success with social progress. Shared value is not social responsibility, philanthropy, or even sustainability, but a new way to achieve economic success. We believe that it can give rise to the next major transformation of business thinking."* (Porter & Kramer, 2011, p. 4)

Nestlé has realised that addressing societal problems can increase their own productivity. More specifically, Nestlé is reacting to their cocoa farmer's need for safe water, hygiene and sanitation by implementing creating shared value [CSV] initiatives. (Nestlé, 2017b, p. 106) These CSV projects, as the name already indicates, create value for both cocoa farmers and Nestlé itself. The livelihood of cocoa farmers can be improved while Nestlé profits from a sustainable and productive supply chain. Therefore, since 2007 the International Federation of Red Cross and Red Crescent Societies [IFRC] and Nestlé are building together water supply systems as well as latrines and teach local people about hygiene and sanitation practices. These projects are dedicated to Nestlé's cocoa farmers and their communities, especially in Ghana and Côte d'Ivoire. (Nestlé, 2017b, p. 106) Throughout the project evaluation of the CSV projects in Côte d'Ivoire, which have been initiated prior to the activities in Ghana, certain problems were discovered. During an internal water quality evaluation in Côte d'Ivoire, IFRC detected water quality issues due to the appearance of E-Coli bacteria in the sample. On behalf of IFRC, Dr. Andreas G. Koestler and his company *Fontes AS* were asked to conduct an independent evaluation of the CSV water project. Koestler and Gertsch found out that the water quality at point of collection was not the issue but rather recontamination at point of use. (Gertsch, 2017, p. 1) Additionally, the lack of ownership and aspiration in the CSV project lead to insufficient maintenance and potential system failure. These systemic weaknesses of the established water provision system have to be overcome, otherwise the project will not be sustainable. (Gertsch, 2017)

Lack of sustainability are generally a problem in water infrastructure projects in the developing world. Many people do not have access to safe water because water systems are insufficiently maintained, which can lead to non-functionality. (Fisher et al., 2015, p. 8432; Adank et al., 2014, p. 1) This does not only cause billions of dollars of development investments being lost, but also implies a setback in health and quality of life for the local population. In 2015, 78% of the total and 66% of the rural population of Ghana used basic drinking water services[1] but only 27% of the total and 7% of the rural population actually used safely managed drinking water services[2] (World Bank, 2015a; World Bank,

[1] *Basic water services:* includes both people using *basic water services* and those using *safely managed drinking water services*. *Basic drinking water services* is defined as drinking water from an improved source, provided collection time is not more than 30 minutes for a round trip. (World Bank, 2015a)

[2] *Safely managed drinking water services:* "improved source that is accessible on premises, available when needed and free from fecal and priority chemical contamination. Improved water sources include piped water, boreholes or tube wells, protected dug wells, protected springs, and packaged or delivered water". (World Bank, 2015b)

2015b). The restricted access to clean water leads to various illnesses and can even have fatal consequences. Therefore, improving the water, sanitation and hygiene [WASH] situation will help foster "health, educational, environmental and economic outcomes in Ghana". (WHO, 2009 as cited in Cronk, 2013, p. 28-29) In order to avoid these sustainability issues associated with development projects in the WASH field and to develop a water service delivery system that provides long-term value for cocoa farmers, Nestlé and IFRC, certain measures must be taken. Gertsch (2017), already made propositions on how to improve the sustainability of water projects in Côte d'Ivoire. He suggested a reorientation towards a social business which operates a water kiosk system and focuses on service delivery rather than only hardware installation. Those findings from Côte d'Ivoire will be highly relevant for the thesis at hand while taking the situation of Ghana closely into account.

## 1.2 Objective

After having outlined the problems associated to water service delivery, the importance of finding a truly sustainable water service delivery system becomes evident. Therefore, the goal of the thesis at hand is to provide Nestlé and IFRC with a feasibility study for a truly sustainable water service delivery project in rural and semi-urban Ghana. The aim of the project is threefold. First, it must create long-term value for cocoa farmers by improving their livelihood and fostering community development. Second, the project should improve Nestlé's value proposition by increasing the sustainability and productivity of their cocoa supply chain. Finally, IFRC can gain access to funding in order to accomplish their target of providing water supply to underserved areas.

Since it was not possible for the author to travel to Ghana during the given timespan, the thesis at hand functions as a preliminary study. Together with the supervisors, Dr. Andreas G. Koestler and Dr. Urs Heierli, it has been decided to narrow down the study to identifying parameters and questions which must be evaluated when conducting a feasibility study for a water project in rural and semi-urban Ghana. Thus, the author provides a toolbox with different parameters and questions which have to be examined when developing and implementing a business model for water service delivery. Thus, the following research question stands at the centre of the thesis:

> *RQ: Which parameters are necessary to map a complex system for the business model development of a truly sustainable water project in rural or semi-urban Ghana for cocoa farmers?*

The identified parameters and associated questions shall then be addressed during the field visit in Ghana. They help the project team to more efficiently gather the inputs and information required for the development of a sustainable water project in rural or semi-urban Ghana.

## 1.3 Methodology

Since Nestlé's CSV approach is the underlying motivation for developing a water service delivery project, the concept of creating shared value will be introduced in chapter two. This provides an indication on how businesses can address societal problems and directly link it to their business practices. As Nestlé's CSV projects in Côte d'Ivoire started prior to the ones in Ghana, the findings and experiences from these projects are very helpful for the thesis at hand and will be incorporated in the analysis. In chapter three, the Business Model Canvas [BMC] and the Human-Centred Design [HCD] approach are explained in more detail in order to introduce these two important concepts used in the thesis. With the

help of the HCD approach, the desires and needs of the local community are kept at the core and a desirable, technically feasible and financially viable water service delivery can be developed. The BMC is a helpful tool to map the complex system of rural water service deliveries. The nine building blocks of the BMC, developed by Osterwalder and Pigneur, provide a good structure and guidance for the business model development. In chapter four, the BMC is applied to the water service delivery project in rural Ghana and each of the nine building blocks are discussed. Thereby, the master's thesis of Kaspar Gertsch (2017) builds an important source of information. To avoid facing the same systemic weaknesses and sustainability issues as in Côte d'Ivoire, Gertsch's suggestions for improvement build the basis for this thesis and the underlying value proposition. Additionally, relevant research papers and studies, conference papers, governmental publications or case studies as well as other theses related to water projects are used for the analysis. At the end of every building block, parameters and associated questions are outlined which help to answer the research question. Moreover, risks, challenges and unknown factors associated with the particular building block are identified at the end of each subchapter. Finally, a conclusion is drawn, limitations are outlined and an outlook for further research is provided.

## 1.4 Scope and limitations

As already briefly mentioned, Gertsch (2017) identified in his master's thesis that a reorientation towards a social business, that operates a network of water kiosks, can overcome the systemic weaknesses inherent to other water delivery systems.[3] Based on these findings, the thesis at hand focuses on delivering safe water to cocoa farmers in Ghana through a network of water kiosks. This implies that other water supply systems, such as hand pumps or water tank deliveries to households etc., are not considered. Hence, when addressing the water service delivery for cocoa farmer communities in Ghana, the author refers to a water kiosk system as the intended solution. This is based on the reason that this type of water service delivery has been identified as more sustainable and scalable than other water systems (Gertsch, 2017). Moreover, the focus of the study lies on rural and semi-urban areas. Thus, water service delivers for urban areas are not considered within this thesis because cocoa farmers mostly live in rural or semi-urban areas.

Furthermore, the thesis at hand focuses on developing water service delivery. Hence, the focus lies on the provision of safe water and the other WASH areas, sanitation and hygiene, are only considered marginally. Nevertheless, for a holistic community development also sanitation and hygiene issues must be addressed. However, as the scope of this thesis is limited and the field of safe water already provides a vast amount of information, these other two areas were not considered in more detail in the present thesis. Furthermore, the study conducted by iDE WASH Ghana (2016) provides a detailed market assessment of Ghana's rural sanitation and hygiene and should be consulted for further information.

Finally, the research is limited by the fact that a field visit was not possible during the given timespan. This means, that all the research was conducted remotely by analysing relevant literature. Thereby, locally specific characteristics and information were not available to the author. However, the parameters and questions identified in this thesis will help collecting the required data during the field visit.

[3] For more information please refer to the master's thesis of Kaspar Gertsch, 2017 (Rethinking a water development project as a social business: Nestlé's Creating Shared Value [CSV] activities in Côte d'Ivoire).

# 2 Creating Shared Value

The goal of the present thesis is to identify the parameters which are necessary for the business model development of a truly sustainable water project in Ghana. Thereby, it must be kept in mind that IFRC's and Nestlé's aim is to create shared value among the cocoa farmer communities in Ghana and the corporation itself. This means that all parties should benefit from a water project: cocoa farmers through improving their health as well as their livelihoods; Nestlé through increasing productivity, efficiency and quality of their suppliers; and IFRC through securing funding, which enables them to accomplish their target of providing safe water to underserved areas. The concept of creating shared value is rather new and only a few firms have yet implemented such projects. Therefore, the following chapter explains the emergence of this model and afterwards, Nestlé's CSV activities around the world and especially in Ghana are described. This provides the reader with an understanding of Nestlé's motivation to initiate this project and the company's role in the value proposition of the water kiosk project.

## 2.1 The theoretical concept of creating shared value

The concept of creating shared value has been elaborated by Porter and Kramer (2006) after having identified certain problems within the corporate social responsibility [CSR] approach. Many companies still adhere to the CSR mind-set (Porter & Kramer, 2011, p. 4). However, Porter and Kramer (2006, p. 83) argue that CSR places emphasis on the tension between society and business rather than on their interdependence. Furthermore, CSR is not connected to a company's strategy and operations or the locations in which the firm is active. Hence, the corporations often do not address the social issues in which it could achieve the biggest impact or the ones which matter the most. As a result, there are a lot of uncoordinated CSR and philanthropic projects, which are isolated from the firm's operations and without a meaningful social impact or without strengthening the company's long-term competitiveness. Therefore, Porter and Kramer (2006, p. 92) argue that companies must create shared value to advance CSR and to address its deficiencies.

Creating shared value means "creating economic value in a way that also creates value for society by addressing its needs and challenges" (Porter & Kramer, 2011, p. 4). CSV has the potential to foster economic and social development as well as to influence the way companies and society perceive each other (Porter & Kramer, 2006, p. 92). The concept of CSV acknowledges that not only the usual economic needs but also societal needs define markets. Addressing societal needs, harms or constraints must not necessarily imply costs for firms but rather serve as a source of innovation. By using new technologies, management approaches and operation methods companies can increase their productivity or expand their markets. Therefore, companies can enhance their competitiveness while concurrently advancing the economic and social conditions of the communities in which they are active. (Porter & Kramer, 2011, p. 5)

The concept of CSV is based on the idea that both economic and social progress should be addressed through value principles (Porter & Kramer, 2011, p. 6). Porter and Kramer (2011) define value "as benefits relative to costs, not just benefits alone" (p. 6). In the past, corporations hardly approached social matters from a value perspective. Businesses consider value creation as economic profit, which

are the revenues earned minus the costs incurred whereby societal issues mainly remain peripheral matters. For the social sector, it has also been unusual to think in value terms. Success is often only measured in the benefits achieved or the donations expended. As NGOs and governments start to think in value terms, they will be more interested in collaborating with companies. Thereby, the boundaries between for-profit and non-profit organization become less clear and through CSV activities the usual separation between the responsibilities of government or civil society and responsibilities of companies could be overcome. (Porter & Kramer, 2011, p. 6-12)

Companies can generate economic value by creating social value in three different ways: "reconceiving products and markets, redefining productivity in the value chain, and building supportive industry clusters at the company's locations" (Porter & Kramer, 2011, p. 7). In Ghana, Nestlé is creating shared value through increasing productivity in their value chain and improving farmers' livelihood. Nestlé has recognised that marginalized suppliers cannot increase or even sustain their productivity and quality. Through creating shared value, companies can enhance their supplier's productivity and efficiency (Porter & Kramer, 2011, p. 8-10) because the lack of proper WASH structures among cocoa farmers in Ghana, also affect Nestlé's value chain. How Nestlé is addressing these societal issues through creating shared value for the cocoa communities will be presented in the subsequent chapter.

## 2.2 Nestlé's way of creating shared value

Nestlé is pursuing a CSV agenda around the world, which is closely related to the 2030 United Nations Sustainable Development Goals [SDGs]. The company integrated the SDGs into their CSV approach and became active in the fields where they can add most value. Their ambitions are to "enable healthier and happier lives, [to] help develop thriving, resilient communities [and to] steward resources for future generations" (Nestlé, n.d., "Building on CSV"). Thereby, Nestlé focuses on the areas nutrition, health and wellness, water, rural development, environmental sustainability, human rights and their own employees. The CSV approach helps Nestlé to optimize the value creation for their shareholders and society. (Nestlé, n.d., "Building on CSV")

In Ghana, Nestlé is creating shared value by providing rural communities, especially in the Eastern and Ashanti region, with access to clean water, sanitation and hygiene. The communities selected for the WASH projects in Ghana are crucial to Nestlé's cocoa supply chain. (Nestlé, 2017a, p. 31; Nestlé, 2017b, p. 106) Nestlé's Cocoa Plan builds the basis for their focus on WASH for communities in the cocoa supply chain and is motivated by the need to secure the future supply of essential raw materials. Through the Cocoa Plan, Nestlé aims to increase productivity, enhance quality and foster the livelihoods of farmers. The plan encompasses various activities on different issues such as "training on farming activities, provision of seeds and plantlets, empowering women, action on child labour and WASH". (CEO Water Mandate, WaterAid, Water Witness International, & WBCSD, 2017, p. 1) Supporting farmers to become more productive is essential for Nestlé because the demand for chocolate has been growing significantly over the last years (Davidson, 2014, 17. November). Even though since 2016 the price of world cocoa has been dropping, prices are currently recovering and it is estimated that cocoa demand, especially in Asia, will continue to increase (Terazono, 2017, October 4; Nasdaq, 2018, April 18). Those imbalances between supply and demand are accompanied by the increasing consolidation in processing, manufacturing and retail which leads to large competition among powerful multinationals

to satisfy the growing cocoa demand. Furthermore, (Western) consumers are becoming more aware of the living conditions of cocoa farmers and the inefficient use of natural resources and hence stress on the importance of sustainable and ethical production. (Gertsch, 2017, p. 47) All those factors put pressure on Nestlé but also on other multinationals to engage in projects that improve the sustainability, productivity, efficiency and quality in their supply chain.

Nestlé's CSV activities in Ghana (and also Côte d'Ivoire) are executed in a partnership with the IFRC as part of IFRC's Global Water and Sanitation Initiative [GWSI]. The GWSI endorses a "common but adaptable approach amongst National Red Cross Red Crescent Societies to establish large-scale, long-term sustainable water and sanitation programmes" (IFRC, 2015). IFRC's goal is to improve the access to safe and adequate sanitation as well as to support the adaption of good hygiene practices and community water management. IFRC aims to reach 30 million people around the world with water and sanitation services by 2025. Thereby, more than 100 national Red Cross Societies are supporting and implementing various water and sanitation projects in 80 countries. The GWSI projects must meet certain criteria, such as promoting equity by targeting vulnerable communities and integrating gender issues in the planning and implementation process. The projects shall use appropriate, affordable and sustainable technology and must be environmentally sound. Furthermore, the initiatives shall foster community engagement as well as align with government water and sanitation policies. Finally, the GWSI undertakings shall promote large, long-term projects to achieve economies of scale as well as great and measurable impact in project regions. (IFRC, 2015) IFRC's partnership with a private sector actor, in this case Nestlé, helps them to contribute towards the achievement of the SDGs as well as its own goals formulated in the context of the GWSI. The collaboration between IFRC and Nestlé began in 2002 and has already existed as part of Nestlé's CSR programme in the WASH field. However, in the beginning of this partnership the focus was on the most vulnerable communities and driven by IFRC rather than by Nestlé's supply chains. (Nestlé, 2017a, p. 31; CEO Water Mandate et al., 2017, p. 1) Over time, the IFRC WASH programme and Nestlé's cocoa plan converged. Nowadays, Nestlé's supply chain and the local supplier communities determine the focus of the WASH operations. The WASH interventions developed from a philanthropic towards a more business oriented project with community support. (CEO Water Mandate et al., 2017, p. 1) Presently, the business case for local operations is the key driver for Nestlé's WASH activities. It is important to communicate the benefit of the WASH projects to the local businesses. Nestlé also stresses on the importance of integrating local business and community priorities into their projects as well as involving local co-operatives into the assessment and decision-making process. Furthermore, it is crucial to make some considerations regarding the sustainability of WASH interventions, such as funding and future maintenance or ensuring that good management structures, like water committees, are in place. Hence, for Nestlé it is important to implement sustainable, long-term WASH projects. (CEO Water Mandate et al., 2017, p. 4)

After having explained IFRC's and Nestlé's motivation to engage in WASH projects for cocoa farmer communities and how value can be created for all involved parties, the next chapter explains why the set-up of a water project in the context of Nestlé's CSV approach and IFRC's Global Water and Sanitation Initiative represents a complex system. Furthermore, two tools are presented which can help to map this complex system and identify the factors relevant for the business model development of a water project.

# 3 Concepts for Mapping a Complex System

To develop a sustainable water kiosk project in Ghana, a detailed understanding of the intended system has to be developed. As already indicated in the previous chapter, many factors and actors with different objectives and motivations influence the development and implementation of a CSV water project. Therefore, certain concepts are required that help identifying all parameters relevant for developing the business model of a water service delivery project. In the following chapter some of the actors and issues related to the water kiosk project are outlined, in order to gain a more detailed understanding of this system. Afterwards two helpful guiding concepts, namely the Human-Centred Design [HCD] approach as well as the Business Model Canvas [BMC], will be presented. Especially the latter one denotes a crucial tool for this thesis as it assists in defining the parameters and questions which are crucial to analyse when developing a sustainable water kiosk project.

## 3.1 The complexity of water service delivery

A system can be defined as "a set of objects and/or entities interconnected and organized according to a goal and immersed in an environment" (Massotte & Corsi, 2017, p. 5). A complex system refers to systems that can be in a vast number of states because they have various internal elements that interact with each other (Malik, 2016, p. 213; Rihani, 2002, p. 6). Additionally, it encompasses different actors which are interconnected and interdependent (Ramalingam, Jones, Reba, & Young, 2008, p. 8). Within complex systems a cause can lead to more than just one effect and if the process is repeated the outcome could be different (Rihani, 2002, p. 6). Therefore, proper research is necessary to understand the dynamics of local circumstances in which the system operates.

The set-up of a water service delivery project reflects a complex system because there are many actors from various sectors involved and they are all driven by different motivations. The success of the water kiosk project is dependent on different factors and it does not respond linear and predictable to a certain element or action. This becomes evident when looking at the project set-up structure. The underlying reason for this project is Nestlé's CSV approach with the aim to improve cocoa farmer's livelihood and health as well as to increase productivity, efficiency and quality of Nestlé's suppliers. Additionally, IFRC is involved by pursuing the Global Water and Sanitation Initiative with the help of its representative the Ghana Red Cross Society, which acts as the local partner for implementing the project. IFRC and Nestlé have both their own goals and objectives but through their partnership they have the potential to achieve much more, than by just pursuing individual strategies. Moreover, at the centre of the system, a local water kiosk enterprise is founded which is responsible for project implementation and operation. Apart from Nestlé, the local Red Cross, the community members and farmers, various governmental WASH institutions can influence and support the project. Furthermore, for the implementation of the water kiosk project a coordinating body as well as some mechanics are required, that ensure long-term functionality of the project. The water kiosk system and its diverse actors are illustrated in figure 1 below.

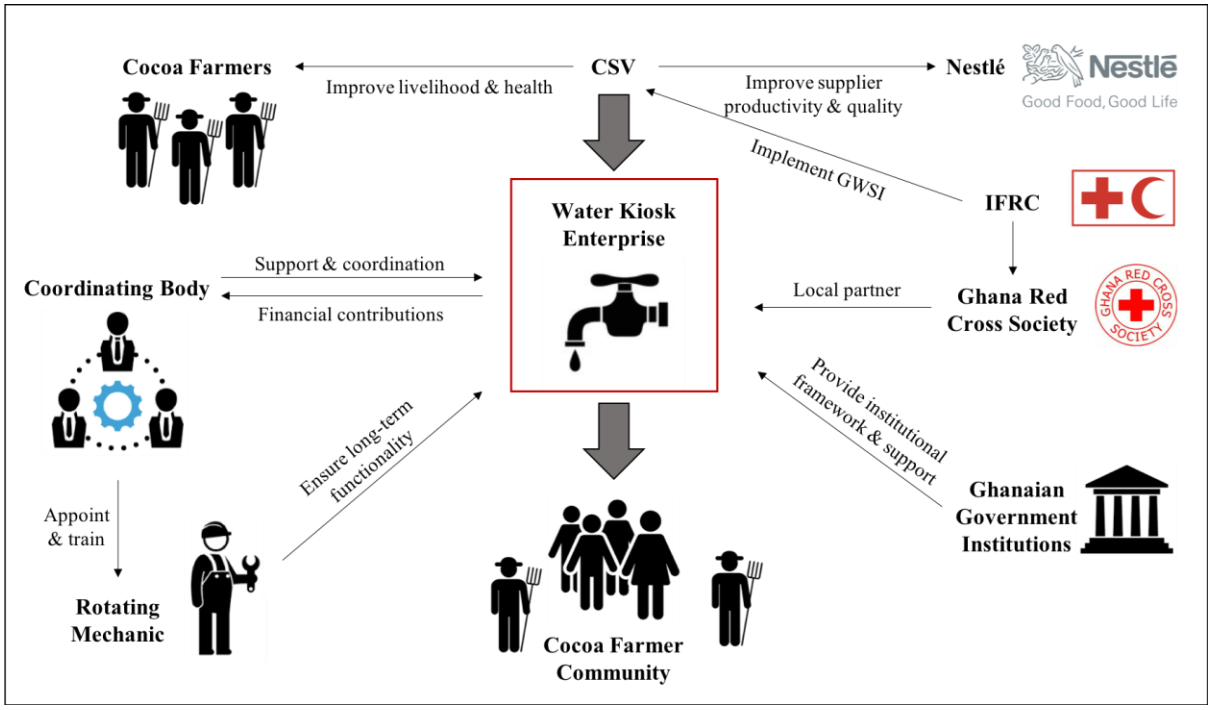


**Figure 1:** Complex system around the water kiosk enterprise
Source: own illustration.

## 3.2 Bringing human needs to the centre

The goal of this thesis is to identify factors which are necessary for creating a truly sustainable business model for a water service delivery. Thereby, the Human-Centred Design approach is a useful guiding tool. The HCD approach helps to solve complex development problems, such as poverty, gender inequality or access to safe water. HCD's mind-set implies that people who face such problems are also the key to the answer and therefore, the aim is to create innovative solutions together with communities. (IDEO.org, 2015, p. 9) Hence, the HCD is a helpful approach to address the problem of the cocoa farmer communities in Ghana who have not sufficient access to safe water.

Independently from the type of problem the HCD process always runs through three phases: inspiration, ideation and implementation. By following these three steps it is possible to build empathy with the people and learn from them. Based on those learnings innovative solutions can be designed, built and tested before they are finally implemented. IDEO.org[4] describes the three phases as follows:

- **Inspiration:** During the Inspiration phase the goal is to listen to people's desire and hopes, to observe their lives, to learn, to open up to creative possibilities and eventually ideas will evolve into the right solutions (IDEO.org, 2015, p. 29).
- **Ideation**: During the Ideation phase the learnings from the Inspiration phase are analysed and opportunities for project design are identified. Different ideas can be generated and some of them might be discarded again. Those ideas are then shared with the community members or other people from whom one can learn and receive feedback. (IDEO.org, 2015, p. 75)

[4] IDEO.org is a non-profit organisation that aims to address poverty issues by spreading the Human-Centred Design approach through the social sector (IDEO, 2011).

- **Implementation**: During the Implementation phase the solution will be brought to life and onto the market. The organisations build partnerships, refine the business model, pilot the idea and finally realize it. (IDEO.org, 2015, p. 133)

The HCD process is designed to generate solutions that are **desirable, feasible, and viable**. This means when looking for a solution to a development problem, one should start by listening to and integrating the humans concerned by that issue (see figure 2). By focusing on people's hopes, fears, and needs, one can quickly uncover what is the most desirable solution for them (IDEO.org, 2015, p. 14). This must also be kept in mind when developing a business model for a water delivery system in Ghana. The need for finding a desirable water provision system reasons the importance of community involvement and participation during project development and implementation. Desirability however, is only one aspect and it is crucial that the identified solution is also technically feasible and financially viable. Therefore, once a solution is determined, that could appeal to the concerned community, one can start evaluating whether the solution is also technically feasible to implement and how to make it financially viable. As can be seen in figure 2, finding an innovative solution to development problems, which is simultaneously desirable, feasible and viable, is a challenging task and many solutions might lack one of these requirements necessary for creating sustainable impact. However, when solving development problems it is absolutely necessary to design successful and sustainable solutions. (IDEO.org, 2015, p. 14) To do so, the needs and desires of the community members as well as the local circumstances have to be understood. Therefore, when developing a water project in Ghana it is important to follow a similar method as the HCD approach. As can be seen in the subsequent chapter, the Business Model Canvas, helps identifying and structuring all the factors which must be known and considered in order to develop a desirable, feasible and viable water service project in Ghana. Therefore, the concept of the Business Model Canvas is looked at next.

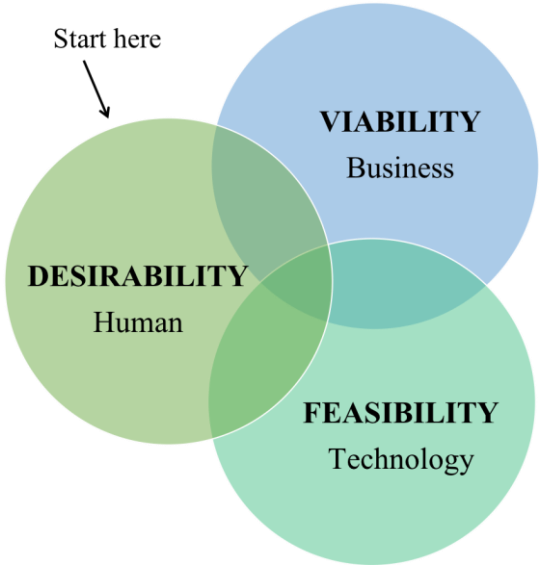


**Figure 2:** HCD – create real impact
Source: own illustration based on IDEO.org (2015, p. 14).

## 3.3 Mapping complex systems with the Business Model Canvas

In order to identify the parameters which are necessary for the business model development of a sustainable water service delivery it is crucial to map and deconstruct this complex system. Mapping and deconstructing a complex system can simplify it and provide a better overview of what kind of parameters and factors could influence the project success. A tool which helps simplifying and deconstructing complex systems is the Business Model Canvas. The BMC consists of nine basic building blocks (see figure 3): Value Proposition, Customer Segments, Key Activities, Key Resources, Key Partners, Channels, Customer Relationship, Revenue Streams, and Cost Structure (Pigneur & Osterwalder, 2010, p. 16-17). The building block "Risk" has been proposed by the supervisor of this thesis, Dr. Andreas Koestler, to be added as a tenth component, as every business model also faces certain risks (see figure

3). These building blocks provide a framework for the business model development of a water service delivery because they can deconstruct a complex system and divide it into subgroups. All of the building blocks together describe how a truly sustainable water kiosk project can be set up and what kind of parameters must be considered.

The three requirements (desirability, feasibility and viability) identified in the previous chapter, can be covered by the nine building blocks of the BMC (see figure 3). The building blocks value proposition (chapter 4.1), customer segments (4.2), channels (4.6) and customer relationships (4.7) help to identify how desirability of the project can be fostered. The parameters necessary for developing a technically feasible project are outlined in the building blocks key activities, key resources and key partners (chapters 4.3 – 4.5). Moreover, the financial viability of the project depends on the factors identified in the building blocks revenue streams and cost structure (chapters 4.8 & 4.9).

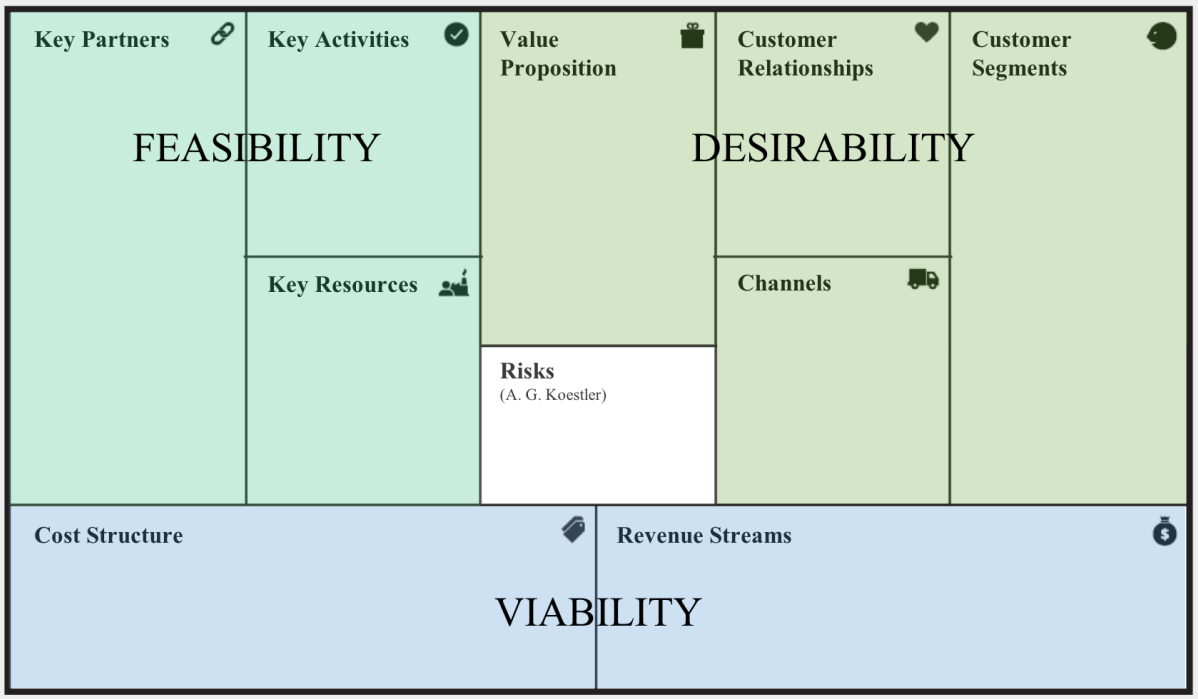


**Figure 3:** Developing a desirable, technically feasible and financially viable business model
Source: own figure based on Osterwalder & Pigneur (2010) & IDEO.org (2015).

Despite being a highly suitable tool for the business model development of a water project, the Canvas also faces certain weaknesses. For instance, the BMC does not provide clear instructions on how to set-up a water kiosk project. In contrast to a manual, which provides guidance for every step in the development and implementation of a project[5], the BMC rather gives an overview of what kind of building blocks are required to set up a project. Each design variable however, leaves room for interpretation and no clear instruction is given on what should be done in which order or in what way exactly (Bouwman et al., 2012, p. 237). Because the BMC is not a clear action plan, it is possible that certain parameters are repeated within the different building blocks. Furthermore, some of the nine building blocks overlap and intertwine (Coes, 2014, p. 82). Especially, the blocks customer relationships and channels as well as key activities and key resources can overlap in some areas. Certain factors related

[5] An example of such a manual: "Tools for safe water stations: a guide to providing clean water for healthier communities" from Safe Water Network, 2013.

to the development of a water kiosk project can be difficult to associate to one of the building blocks. Hence, it is possible that some parameters identified in different building blocks overlap, which might lead to confusion or repetition. Another weakness of the BMC is that it does not consider risks or external threats associated to each of the building blocks or the business model as a whole (Coes, 2014, p. 82). However, there are various risks, threats and unknown factors associated to the development of a water service delivery project in Ghana and therefore, the building block "Risk" has been added as a tenth component. To integrate this building block into the thesis at hand, potential risks and challenges are outlined at the end of each subchapter in chapter 4.

Despite those weaknesses, the BMC is still perceived as a highly suitable guiding tool for the present thesis, because the nine building blocks cover a very broad range of factors necessary for the business model development of a water kiosk project. Hence, the Canvas is appropriate to identify the parameters, which must be considered when planning and implementing a water kiosk project. Furthermore, because the BMC is not a clear action plan, it gives the implementers of the project freedom in deciding which tasks or activities should be done in what way and in which order. This is important because certain inputs for the business model development and implementation can only be acquired during a field visit.

# 4 Business Model Development of a Sustainable Water Project

As previously mentioned, the Business Model Canvas is used as a guiding tool to identify parameters necessary for the development of a sustainable water service delivery in Ghana. The building blocks help to think through the development of a business model and provide the structure for the following chapters. By deconstructing the whole business model, complexity can be reduced without oversimplifying the system and leaving important parameters or factors out. Subsequently, each of the building blocks is applied to the water kiosk project, followed by associated risks and challenges as well as an overview of relevant parameters and questions that must be considered and addressed when implementing the project.

## 4.1 Value proposition

First of all, it has to be identified what kind of water service delivery system will provide the greatest long-term value to the cocoa farmer communities. Thereby, it has to be kept in mind that the aim of the project is to create shared value among cocoa farmers and Nestlé itself. All parties should benefit from a water project, cocoa farmers through improving their health as well as their livelihoods, Nestlé through increasing productivity, efficiency and quality of their suppliers and IFRC by achieving the goals of its Global Water and Sanitation Initiative. In the following chapter the project's value proposition will be outlined, which builds the basis for the upcoming identification of all parameters necessary for delivering this value proposition.

### 4.1.1 Value proposition in the context of the water project in Ghana

Nestlé together with IFRC is reacting to the problem that many cocoa farmers in Ghana do not have reliable access to safe water. Therefore, the main value proposition is to establish an innovative, reliable and sustainable water service delivery. There exist many approaches to deliver safe water to a community, however, as outlined in the introduction, this thesis focuses on a network of water kiosks to provide safe water to cocoa farmers. The goal is to offer the communities a water kiosk system where they can fill jerry cans with clean water against the payment of a reasonable fee[6]. The water point will still belong to the community and the service of providing safe water itself will be done by community members. (Gertsch, 2017, p. 12-13) Additionally, it is intended to extend this infrastructure (as soon as possible) to also offer direct household connections through water taps installations. A direct household water connection offers an attractive solution for more affluent community members, who prefer greater convenience.

For a reliable service provision, it is important that the water kiosks are regularly open in order to fulfil community members' water demand. Hence, it must be assessed how many days per week and how many hours per day the water kiosk and household taps are operating. Besides, it shall be evaluated if the operating hours are limited due to regular maintenance work or in case of system breakdowns. Moreover, in order to offer this value proposition it must be identified whether the water kiosk system

[6] Reasonable fee in this context refers to a fee which is affordable for the local people but simultaneously also ensures cost coverage and financial viability of the water kiosk system.

is restrained by certain capacity limits. The water source as well as the infrastructure must be sufficient to serve a whole cocoa farmer community.

Safe water should be affordable for all community members and the costs of collecting water must be low. This means that collection time (e.g. walking distance to water kiosk and waiting time) as well as costs for additional equipment should be kept to a minimum. However, customers have to invest into their first jerry can but afterwards can exchange it for a full one and just pay the water fee. This helps establishing a sense of ownership for the jerry cans. In addition, the usage of jerry cans reduces recontamination during transportation and storage due to their narrow openings. (Gertsch, 2017, p. 12-13) To further prevent recontamination, it has to be evaluated whether kiosk employees clean the containers or if there is some cleaning area next to the kiosk offered, where customers can disinfect their jerry cans (SWN, 2013, p. 131).

Since the water, which is sold at the kiosk, needs to be safe for drinking, it will be treated by the kiosk operator. Depending on the source of contamination the water treatment must be done accordingly. Most likely the chlorination method will be used because it is the most common one, cost-effective, provides good protection against further recontamination and is relatively facile to procure or produce in rural areas. (Gertsch, 2017, p. 19) To ensure long-term functionality of the water kiosk a regular preventive maintenance service will be introduced. Local rotating mechanics regularly visit the water kiosks and execute maintenance or repair work. (Gertsch, 2017, p. 20) Since the water kiosk is set up as a social enterprise rather than being a charitable project, expenses have to be financed through own revenues. Water operations could be cross financed through additional value propositions, such as charging of electronic devices, opening a convenience store or selling excessive chlorine on the local market. However, it is important to not undermine local businesses with such additional services. (Gertsch, 2017, p. 13)

### 4.1.2 Risks, challenges and unknown

*Recontamination of water at point of use*

A great challenge or risk, which must be overcome, is the threat of water recontamination at point of use. During the evaluation of the CSV project in Côte d'Ivoire Koestler et al. evaluated the water quality at point of use in certain villages. Thereby, they discovered that water contamination at point of use was much higher than at point of collection. This can be explained by different potential contamination factors during collection, transportation and storage. A great issue is the usage of large open basins, where water contamination can occur easily through different factors (e.g. dust, air, etc.). Furthermore, the large water basins are often emptied by smaller buckets, cups or hands, which can lead to contamination within the larger storage basin. (Gertsch, 2017, p. 4) Therefore, it is crucial that customers use the jerry cans for water transportation and storage. In jerry cans the risk of water recontamination is lower due to the narrow neck opening of the container.

*Competition to the value proposition*

A major risk for the above described value proposition is the competition either by other water services and products or alternative behaviours. This means that on the one hand, there is a risk that potential customers prefer buying bottled water, water sachets or any other source of safe water and on the other hand, they could switch again to (or continue using) unimproved water sources (Bühlmann, 2014, p.

41; Ammann, 2012, p. 17). Bottled water is probably less a competition as this tends to be more expensive than water from a water kiosk. However, the competition of both bottled water or water sachets as well as the usage of traditional (unimproved) water sources or other water treatment technologies have to be analysed in detail regarding perceived costs, barriers and benefits (Ammann, 2012, p. 18). This gives an indication on how likely potential customers switch to competing products or exhibit competing behaviours.

This risk can be mitigated by reducing the barriers which prevent potential customers to perform the desired behaviour. For instance, by making the service aspirational, desirable and affordable people are less likely to switch to unimproved water sources. Through the usage of solar pumps (is perceived as an aspirational technology), the establishment of a strong brand as well as social marketing tools community members perceive the water provision as more aspirational and are more inclined to spend money on this service (Gertsch, 2017).

It is not only important to evaluate if there exists some potential competition to the service of the water kiosk but also the other way around. This means the values and services proposed by the water kiosk (especially the additional services) should not compete with an already established local business. This would not be beneficial for a holistic development of the region and could drive people out of the market or prevent them from having access to jobs. (Gertsch, 2017, p. 13)

### 4.1.3 Parameters for business model development

| **Parameter: Sustainable Water Kiosk System** | |
|---|---|
| **Parameter: sustainable water kiosk system**<br>- How to organize the water kiosk system in order to provide the greatest long-term value to cocoa farmers, Nestlé and IFRC?<br>- What are the water kiosk's operating hours?<br>- Is the system regularly closed for maintenance work?<br>- What is the water kiosk's capacity limit? | **Relevance / critical information**<br>Main goal is to develop and implement an innovative, reliable and sustainable provision of safe water to cocoa farmer communities (through water kiosks). |
| **Risks, Challenges and Unknown** | |
| **Parameter: recontamination at point of use**<br>- How can water recontamination at point of use be minimized? | **Relevance / critical information**<br>Water recontamination during transportation and storage seriously threatens the project's effectiveness. |
| **Parameter: competition**<br>- What kind of competing water sources (improved & unimproved) exist in the project area?<br>- In what way are these competing with the water kiosk / household tap?<br>- How does the water kiosk / household tap differentiate from existing solutions?<br>- Do the water kiosk's products or services pose a threat to already existing local businesses? | The water kiosk service can get competition either by other water services and products or alternative behaviours.<br><br>The water kiosk service (esp. additional services) should not pose a competition to well-established local businesses. |

**Table 1:** Overview of parameters concerning value proposition
Source: own table.

## 4.2 Customer segments

To identify parameters necessary for the business model development one has to examine the potential customer segments in detail because each of them has different characteristics, preferences and needs, which must be considered.

According to Heierli (2008, p. 72) it is a mistake to assume that all poor people are the same and therefore not to offer products for the relatively rich people[7]. Also, when defining the customer segments the focus should not only be put on the poorest population stratum in a community as this does not attract financially stronger customers and might lower the status of the service instead of making the project aspirational and desirable (Heierli, 2008, p. 12). Therefore, it is intended to install (as soon as possible) pipes that connect some households directly to the water kiosk system. People who can afford a direct household water connection would receive a tap and a water meter on their property. This implies that in the business model for this water service delivery system exist at least two different customer segments. In the subsequent chapter it is explained how different customer segments can be derived. Furthermore, according to the two different service levels offered, potential attributes of the two customer segments are identified.

### 4.2.1 Defining customer segments in the context of the water kiosk project

It is intended to serve at least two different customer segments. One segment would directly collect water at the kiosk whereas the other segment has a direct household connection to the water system. To effectively target the market with two service levels, the different needs and desires among consumer groups shall be identified. This facilitates the communication and delivery of the corresponding benefits to each segment. The customer segmentation can be done on the basis of four sets of criteria: geographic, demographic, psychographic and behaviour-related criteria (see table 2). (Keller & Kotler, 2016, p. 267-268)

| Geographic | Demographic | Behaviour-related | Psychographic |
|---|---|---|---|
| • Region<br>• Density<br>• Workplace | • Age<br>• Gender<br>• Family size<br>• Income<br>• Occupation<br>• Education<br>• Social Class | • Occasion<br>• Benefits<br>• Usage rate<br>• Loyalty status<br>• Buyer readiness<br>• Attitude toward product | • Lifestyle<br>• Personality<br>• Innovation (e.g. early adapters) |

**Table 2:** Examples of market segmentation criteria
Source: Kotler & Lee (2009, p. 84-85).

Not all of these criteria and categories are equally helpful to segment the market for potential water kiosk customers in rural Ghana. As the regions for project implementation are already predefined (rural or semi-urban areas of the Ashanti and Eastern regions, see figure 4) **geographic criteria** are less applicable. However, when choosing a location for the implementation of the water kiosk project it is important that population density as well as the market size is sufficiently high. Otherwise it is difficult

[7] Relatively rich in the context of this thesis refers to the upper quartile (third quartile) of income distribution. However, whether also people with lower income could afford a household connection should be assessed during the field visit.

to serve a critical mass that makes the project economically sustainable. Safe Water Network [SWN] (2013, p. 15) proposes that the ideal village population should consist of more than 4,000 inhabitants or more than 800 households in order to ensure a reasonable market size. However, Koestler (personal comment, May 5, 2018), did research on this topic by modelling the financials of water kiosk projects and recommends a minimum of 15,000 people to be needed for an economically sustainable business model. Since these two numbers deviate from each other, it is important to do some further financial modelling and forecasting, once more information on local circumstances is available. Also, a water source shall be located near the centre of a village and year round available (SWN, 2013, p. 15). It is important that customers live within relative proximity of the water kiosk in order to make it an attractive and feasible service. Adank et al. (2014, p. 2) argue that ideally users should live within 500 meters of the water station. Therefore, when defining the customer segment, it should be identified how many people live within 500 meters of the water kiosk and if citizens who are located further away would still consider using the water service. The boundary of the catchment area can be extended but it has to be clear if households, who live further away are still willing to use the water kiosk as their main water source. This is especially important for the customers, that pick up the water directly from the kiosk. Customers have to perceive the service as a convenient solution and costs for collecting water, such as walking distance, waiting time or equipment required, has to be kept low. If people perceive collecting water from the kiosk as a burden they might soon switch to other sources, which seriously undermines project sustainability. Besides, accessibility to safe water should be guaranteed to all people, also vulnerable groups, such as elderly, disable or women (Swiss Red Cross, 2014, p. 27). For clients with direct household connection, the maximum distance from the water source depends on the technical feasibility. Therefore, during the field visit it has to be assessed how far pipes can be placed from the central water tank as well as how far people are willing to travel to pick up safe water.


**Figure 4:** Ghana's Regions
Source: Ghana Photographers (n. d., Ghana's Regions).

Some of the **demographic criteria** are important to consider when defining customer segments for a water kiosk in Ghana. As the goal is to serve at least two different market segments, one that picks up water at the kiosk and one with direct household connection, the ability and willingness to pay will vary among those groups. Therefore, the criteria income, occupation and social class play an important role. A study of iDE WASH Ghana (2016, p. 27) shows that most rural Ghanaians earn the majority of their income through farming, which is unpredictable and seasonable. This is also the case for the project at hand, since the goal is to reach cocoa farmer communities. Even though Ghana has a fixed free on board price (FOB Price)[8] on cocoa, the income is still dependent on the season and on how rich the harvest was. Most of the income is earned during the two harvest seasons and farmers have to live of this income

[8] FOB price: Price per tonne of cocoa once it is loaded on a ship in the producing country (Cocoa Barometer Consortium, 2015, p. 30).

for a whole year (Cocoa Barometer Consortium, 2015, p. 30; iDE WASH Ghana, 2016, p. 28). Therefore, cocoa farmer's ability to pay is limited and it has to be assessed how many of them can afford a direct household water connection. Customers in the segment with household connection are likely to have a higher income than the ones who pick up water at the kiosk as they additionally have to pay a monthly fee for the installation of the water tap and probably also a higher per litre water tariff. It is also likely that customers from the two segments have different occupations or belong to distinct social classes.

Since the consumption of safe water from the kiosk is related to a change in customer's behaviour, the **behavioural-related criteria** play a crucial role for the market segmentation too. Not all people who use the service of the water kiosk expect exactly the same benefits from it. Both segments have a need for safe water, they realize the importance of consuming clean water and are also able and willing to pay for this service. However, the underlying motivation and the expected benefits may vary among the two segments. This could, for instance, mean that people who pick up water from the kiosk, might value most the water quality, improved health or that they benefit from a certain status if the kiosk can establish a strong brand. Whereas, customers with direct household connection might rather value the high service and convenience level or the status which comes along with having a water tap at home. The usage rate[9] among the two segments could also differ. Customers who have to pick up water at the kiosk and carry it home will probably consume less. Whereas, the usage rate of the segment with direct household water connection is likely to be higher since they do not have additional costs, such as time or energy expended, to collect water. The buyer readiness as well as the attitude towards the service and the behavioural change can also vary among the different community members. However, it is difficult to make an assumption regarding how the buyer readiness or attitude toward the service and the associated behavioural change corresponds to the two customer segments. An indicator to evaluate the attitude toward behavioural change is whether households are currently treating their drinking water (e.g. through boiling, filtering or other methods). Potential customers who already treat their water are aware of the importance to consume safe water and therefore, might have a higher buyer readiness as well as a more positive attitude toward the water kiosk.

The **psychographic segmentation criteria** are less relevant when differentiating the value proposition but should be considered for the project promotion strategy. Customers can be grouped into innovators, early adopters, early majority, late majority and laggards (Kotler & Lee, 2009, p. 85). In the beginning, it is important to focus on the innovators, early adaptors and early majority. Those are the people who will be convinced first to consume safe water and can eventually spread the service with word-of-mouth propaganda. Especially, innovators and early adaptors should be targeted when acquiring customers with direct household connection. Innovators and early adaptors might be more willing to take a risk of paying for the instalment of a water tap which is a completely new service level.

With the help of market segmentation criteria two potential customer groups are identified (see table 3). These groups and the corresponding attributes can be modified and still need input from the field assessment. Therefore, it is very important to keep the segmentation criteria in mind when doing a market assessment on the ground.

[9] Usage rate: litre of water used per person or per household per day.

| Segment 1: "pick up from water kiosk" | Segment 2: "household connection" |
|---|---|
| • **Need**: safe water<br>• **Affordability**: willing & able to pay for water<br>• **Location**: live within walking distance of water kiosk (e.g. 500m)<br>• **Income**: low to medium, irregular or regular<br>• **Occupation**: mostly farmers<br>• **Benefits**: water quality, status<br>• **Usage rate**: rather low, have to carry water home | • **Need**: safe water, convenience<br>• **Affordability**: willing & able to pay for water & monthly fee for household tap<br>• **Location**: live within technically feasible catchment area<br>• **Income**: medium to high, regular<br>• **Occupation**: farmers or other occupation<br>• **Benefits**: water quality, convenience, service level, status<br>• **Usage rate**: rather high, can just open tap at home, no additional cost for collecting water |

**Table 3:** Market segments and their attributes
Source: own table.

### 4.2.2 Defining aggregated water consumption

For the development of a business model it is not only important to know-how many people and which kind of customers belong to the market segment but also how much their aggregated water consumption is expected to be at a certain tariff level[10]. According to Heierli (2008, p. 18-19) minimum 20 litres of water per day are considered to be a human right. However, in many countries people use much less water per day because it is difficult to access. If there is not sufficient water available, minimum levels of domestic hygiene are not possible. Therefore, it has to be identified how much water people are currently consuming, if their consumption would increase if access to clean water was easier or decrease if they have to pay a fee and how much they would ultimately purchase at the water kiosk. Demand for water is determined by different factors such as the number and size of households, the household income and income distribution, costs of water presently used, costs of future water used, charges for water connection, availability and quality of service, availability of alternative water sources, present water consumption, population density as well as cultural influences (ADB, 1999, p. 50). Those factors should be assessed in order to get an understanding of how much water has to be pumped and treated per day to serve the needs of the customer segments.

### 4.2.3 Risks, challenges and unknown

*Overestimation of market potential*

During the planning process of a water kiosk the risks arises that consumer demand and market potential are overestimated. There exist certain norms and recommendations, such as minimum 20 litres of water per capita / per day or recommended distance of 500m between households and water kiosk. However, when planning the number of kiosks required to satisfy consumer demand in a certain area one should not only rely on those norms and recommendations. By doing so one neglects actual demand, which can negatively affect the water kiosks' efficiency and its financial viability. Also part of this risk or issue is that population density might be too low in the given project area. Since the project is implemented in rural areas, where cocoa farmer communities live, it is not sure how large the population density is. If people are located too far away from a kiosk, they might perceive it as a burden to visit the water station and fetch water from an unsafe source. Hence, the calculation of the required number

[10] The amount of water purchased from the kiosk might vary according to the water tariff level.

of kiosks in a certain project area must be based upon a detailed market assessment of the need for safe water. Thereby, also people's ability- and willingness-to-pay must be considered and based on these inputs it shall be decided if the operation of a water kiosk can be financially viable. (WSTF, n. d., p. 7)

*Lack of project adaptability*

Another major risk is that the services offered to communities are not sufficiently valued and desired by potential customers and that there is not enough demand in place to support the business model. If the local people are not convinced of the value proposition the project adaption is seriously endangered and the project's sustainability is undermined. To reduce this risk, a fundamental understanding of the customers including their needs, environment, daily routine, concerns and expectations is required (Pigneur & Osterwalder, 2010, p. 132). The Human-Centred Design approach as well as other studies showed that community participation during design, implementation, operation and maintenance of water projects increases the sustainability of such undertakings (for more information on community participation see chapter 4.7.1). Community participation and involvement helps to foster ownership of the water kiosk and therefore enhances the people's willingness to effectively manage the project after implementation (Mbabazize, Samuel, & Shukla, 2016, p. 142).

### 4.2.4 Parameters for business model development

| **Defining Customer Segments** | |
|---|---|
| **Geographic criteria** | |
| **Parameter: population size / market size**<br>- How large is the village population?<br>- How many households are located in one village?<br>- In principle, how many of these would be willing to purchase safe water? | **Relevance / critical information**<br>Certain population density and market size is required for the system to be financially and operationally viable. |
| **Parameter: location of water kiosk**<br>- Where is the water kiosk located?<br>- How many people live within a distance of 500m of the water kiosk?<br>- Are people who live further away still using the water kiosk service?<br>- How far from the water source can pipes be laid to connect households? | Central location necessary; population majority should live within 0.5km distance of the water kiosk to enable convenient access to safe water. |
| **Demographic criteria** | |
| **Parameter: income level**<br>- What is the person's / household's income level?<br>- How regular is the income? | **Relevance / critical information**<br>Ability-to-pay for water must be given. |
| **Behavioural-related criteria** | |
| **Parameter: needs, desires & perceived benefits**<br>- What is the need and desire of the potential customer?<br>- What benefit do potential customers expect? | **Relevance / critical information**<br>Perceived benefits to consume safe water can differ among customers. |
| **Parameter: usage rate**<br>- What is the customer's usage rate of water (how many litres of water are used per day)? | Amount of water used per day can indicate which service level will be preferred (tap or pick-up). |

| | |
|---|---|
| **Parameter: buyer readiness & attitude towards service**<br>- Are people already treating their water?<br>- How is the potential customer's buyer readiness and attitude towards the water kiosk service? | Certain population groups are easier to convince to use safe water. |
| **Defining Aggregated Water Consumption** | |
| **Parameter: aggregated water consumption**<br>- How much water is currently needed per capita / per day?<br>- How much water would be purchased at a water kiosk / at a household tap per capita / per day at a certain price level?<br>- Which factors influence demand for safe water? | **Relevance / critical information**<br>Gain understanding of how much water must be pumped and treated. |
| **Risks, Challenges and Unknown** | |
| **Parameter: overestimation of market demand**<br>- What is the community member's true demand for water? | **Relevance / critical information**<br>True demand shall not be overestimated by relying too much on certain sector norms and recommendations. |
| **Parameter: lack of project adaptability**<br>- Are people convinced of the value proposition?<br>- How can project adaptability be fostered? | If local people are not convinced of the project, its adaption is seriously threatened. |

**Table 4:** Overview of parameters concerning customer segments
Source: own table.

## 4.3 Key activities

Key activities describe the most important actions, which have to be executed by an organisation to make the business model work (Pigneur & Osterwalder, 2010, p. 40). Since the aim is to establish an innovative, reliable and sustainable provision of safe water to cocoa farmer communities, certain activities are required to ensure long-term functionality of the system. The key activities required to establish and maintain such a system are outlined in this chapter.

### 4.3.1 Key activities necessary to plan and develop a water kiosk

Before the water kiosk can actually be constructed and used, some preparatory measures have to be executed. First of all, the water kiosk location needs to be selected and approved by Nestlé and IFRC. Some criteria, such as minimum population size (see chapter 4.2.1) and availability of a water source, must be considered when choosing the project location. As soon as the project location is clear, it has to be assessed whether a local partner can be found to develop, implement and operate a water kiosk business. Since the project is partly initiated by IFRC, the local Ghana Red Cross Society should be nominated as a village partner (if possible). The village partner will support the design and implementation of the whole project. It will also be responsible for setting up further partnerships required for the project development and is in close contact with the local community. The village partner needs to be credible, capable of establishing local partnerships, assist with household penetration, cost recovery and the operation of the water kiosk (SWN, 2013, p. 13).

Once the location and a village partner has been selected, the coordinating body must be formally established. The coordinating body will be the principle decision-making body governing all aspects of the organization, preparation and establishment of the water kiosk as a viable social enterprise (SWN,

2013, p. 35). Moreover, a close relationship with the village leader (and maybe other influential villagers) must be set up. Village leaders must understand the aspects of the water kiosk's market operations. Therefore, the village partner or the implementing organisation holds trustful, transparent and collaborative discussions with community leaders, who should agree to pledge cash and other resources towards the project. Once the village leader agrees to the up-front commitment of local resources, the probability of a successful commercial operation and sustainable financial return of the water kiosk will be higher. (SWN, 2013, p. 35)

Furthermore, the water kiosk concept and financing method of the project must be introduced to the community (SWN, 2013, p. 13). Ghana's Community Water and Sanitation Agency [CWSA] (2010a, p. 13-14) puts great emphasis on a participatory planning approach. They highlight that the promotion, development and planning process should be organised in an interactive way to ensure that the villages are adequately informed about the whole project intervention. This can foster project adaptability and its long-term success (see chapter 4.7.1). The different governmental actors active in the WASH field (e.g. WATSAN committees, WSDBs or MMDA staff) (see chapter 4.5.2), community groupings, influential villagers, consultants and the community at large shall be involved into the participatory planning process. During this process the location of the water kiosk, possible pipe routing and tank positions should be determined. Additionally, the sources of water must be identified and the necessary land rights have to be secured. Also, the construction, operation and management of the water supply system must be organised in collaboration with the community (CWSA, 2010a, p. 13-14). Thereby, the government, the community and the organisation (e.g. Nestlé or IFRC) need to commit certain resources, such as a water source, buildings, land, or financial resources to set up the whole project. Therefore, it must be agreed upon which party contributes what kind of resources. This could be documented in a Memorandum of Understanding [MoU], which will formalize the commitments of each partner (SWN, 2013, p. 38). Besides, the villagers must comprehend that the water kiosk operator will collect money for the water sold in order to pay salaries, operation, maintenance and repair costs as well as to repay loans (SWN, 2013, p. 25). Moreover, community health education shall be integrated from the beginning on. If villagers do not realize the effect of consuming safe water on their health, they will not understand and use the water kiosk service. Also, social and commercial marketing activities to promote the water kiosk service shall be executed from the beginning on (see chapter 4.6). (SWN, 2013, p. 25) Apart from informing community members about the project development the village shall be analysed in more detail to gather the information concerning demographics (see chapter 4.2.1), available water sources and village structure (e.g. influential community groupings) (SWN, 2013, p. 27). The activities for a village assessment include household surveys and socio-economic studies where people can express their needs and desires related to water service delivery and state their willingness and ability to pay. When executing all of these community activities, emphasis should be placed on equal participation of men and women. Additionally, other marginalized groups, such as the poor, elderly, minority groups or the physically challenged shall be included.

Apart from collaborating with the previously mentioned stakeholders, other important relationships have to be established. There must be a close collaboration with different governmental institutions active in the WASH field and their endorsement is required to legally operate a water kiosk system (SWN, 2013, p. 27). Moreover, a network shall be built with partners and suppliers in order to acquire

the necessary resources and to deliver the value proposition. However, this will be examined in more detail in chapter 4.5 (key partners). Once the most important relationships and connections have been built, the water kiosk must obtain its legal status. This means that the required permits have to be obtained to install and operate a water kiosk. Additionally, it must be assessed whether and how the water kiosk enterprise can register as a legal business entity.

After having defined project location, key partners and who will contribute crucial resources, the whole water provision system can be set up. This implies the construction (or renovation) of the water kiosk facilities as well as the installation of the whole water pumping and piping system. Also, a borehole must be drilled and connected to the water system and the solar pump has to be installed. Furthermore, the employees of the water kiosk and the rotating mechanics have to be recruited and trained. The staff training should encompass amongst others some technical, entrepreneurial and product specific skills. The employees must acquire the skills and know-how necessary to execute all operating activities. It is also important to periodically repeat the employee training in order to refresh their know-how and to address uncertainties (CWSA, 2010a, p. 15). The training of community members responsible for operation and maintenance influences sustainability of water projects. Trained staff is more efficient as it leads to fewer mismanagement and unwarranted system breakdowns. Besides, maintenance is done more promptly and cheaply as when the community has to depend on externally hired skilled labour. (Mbabazize, Samuel, & Shukla, 2016, p. 142)

### 4.3.2 Key activities necessary to operate and maintain a water kiosk

Once all preparatory actions are conducted, the value proposition can be offered to customers. The operation of the water kiosks includes different activities that are necessary to deliver the value proposition. The water kiosk employees need to treat the water, sell it to customers and clean the jerry cans or provide a cleaning area next to the kiosk, where customer disinfect the containers themselves (SWN, 2013, p. 131). It is important to keep the water kiosk clean and to maintain good hygienic conditions, otherwise customers might not want to consume the water from the kiosk anymore (GTZ, 2009, p. 9). The water treatment will most likely rely on the chlorination method in order to remove pathogens. However, this must still be analysed when more information on the water quality in the respective project area is available. Chlorination is the most common disinfectant method as it is cost-effective, provides protection against recontamination and is relatively facile to procure or produce in rural areas (Gertsch, 2017, p. 19). However, it is important to get the dosage right. Too little chlorine does not oxidize all contaminants and does not sufficiently protect against recontaminations, whereas too much chlorine leaves water with an unpleasant taste (even though it is not harmful). To ensure the right dosage of chlorine, the treatment should be done at the water kiosk and not by individual households. Furthermore, chlorine has a limited shelf life and might not be available in rural areas. Therefore, an efficient and good chlorine supply chain has to be organised. (Gertsch, 2017, p. 19)

Besides, water kiosk employees are responsible for payment processing, bookkeeping and certain administrative tasks. Additionally, the staff has to register and instruct new customers, answer their questions and keep the water kiosk clean and in good appearance. Because the water kiosk operates in a relatively informal manner, it will be essential to introduce a simple and effective financial management system, for budgeting, accounting and banking practices. This allows the responsible employee or coordinating body to clearly track water and chlorine sales and to collect the corresponding shares

(Gertsch, 2017, p. 51-52). Establishing strict financial management practices, where all incomes and expenses are recorded, is very important. This can ensure transparency and enable the villagers to have faith and trust in the operation of the water kiosk. Moreover, future planning is easier with the help of good financial management because it provides up-to-date and accurate information on the water kiosk's economic performance. Financial management further enables external analysts to conduct audits, which confirm that all financial practices of the water kiosk operators are legal and accurate. (SWN, 2013, p. 145-147) Hence, it must be identified how the financial management can be set up in a simple way, that is still effective, transparent and accurate. For instance, the coordinating body or an employee of the coordinating body should establish a yearly (half yearly, quarterly or monthly) budget to plan and control expected income and expenditure. Budgets help to compare planned with actual income and expenditure and if necessary, differences between those two values can be addressed. (SWN, 2013, p. 150-151) To account for income and expenses properly, one person at the kiosk should be responsible for this task. Since it would be too much effort to issue a receipt voucher for every incoming payment, an alternative accounting system must be established. For instance, the cash received could be compared to the litres sold according to the water meters. Furthermore, all cash received at the water kiosk must be placed in the cash box or another safe place, before it is deposited in the bank at the end of the day or week. Also, all incomes should be recorded in the cash book. Making payments could be organised similarly. One person must be assigned who is responsible to authorize all payments, whereas expenditures shall be in line with the budget. Each payment must be documented with a corresponding invoice and a payment voucher is to be issued for each expenditure. The information of the payment voucher must also be registered in the cash book together with the incomes. Those entries shall then be regularly inspected for accuracy by a person not directly involved into the financial management of the kiosk (e.g. local representative of Ghana Red Cross Society or member of coordinating body) in order to prevent embezzlement. (SWN, 2013, p. 152-153)

To ensure long-term functionality of the water kiosk system as well as to ensure compliance and to improve performance, it is important to institutionalize certain maintenance and monitoring activities. One option is a regular preventive maintenance service. This could mean that rotating mechanics regularly visit the different water kiosks which are managed by the same coordinating body and execute the required maintenance and repair work. The rotating mechanics are contracted by a coordinating body. To ensure continuity of the service, it is important to accumulate financial reserves in case larger repairs are necessary. Therefore, a collective financing scheme is introduced, where each water kiosk pays a monthly contribution to the coordinating body, which can then cover the expenses for mechanics as well as maintenance and repair work. This system helps to spread the risk from an individual water kiosk to an independent organization which provides an insurance. This insurance service does not only cover the costs for maintenance and repair work but also the business interruption costs in case a pump breaks down. (Gertsch, 2017, p. 20)

Also part of the monitoring key activities is the regular water quality testing. This should be executed at the required frequency defined in Ghana Standards Board's water quality parameters (see chapter 4.4.1). Another important activity is to keep record of the amount of water (and chlorine) sold, the customer database and other crucial information. (CWSA, 2010a, p. 15-17) Hence, the member of the coordinating body, rotating mechanics or the water kiosk employees should regularly read the water

meters in order to record water sales (Gertsch, 2017, p. 51-52). In addition, there should be a regular financial and technical audit of the local partner, the coordinating body and the kiosk employees (CWSA, 2010a, p. 17). Financial records audits executed by independent parties should be encouraged because they foster transparency and can enhance the project's sustainability (Mbabazize, Samuel, & Shukla, 2016, p. 142). Furthermore, in order to increase customer satisfaction and to gain potential ideas for improvement, regular project evaluations should be executed. CWSA (2010a, p. 17) proposes to evaluate the project twice per year (mid-year and end-of-year reviews). Thereby, all relevant stakeholders should be considered in the project evaluation, which includes amongst others the community, kiosk operators and employees, coordinating body, local partners and government agencies (see chapter 4.5).

### 4.3.3 Risks, challenges and unknown

*Logistics*

The challenge of logistics affects both key activities as well as key resources. There must be efficient logistics activities in place in order to ensure that all key resources can be accessed in a timely manner. However, this might pose a challenge to the water kiosk operator because they often are located in rather remote areas. When organising the logistics of the spare parts or other resources, the operator must keep in mind that time constraints can occur or that sufficient transport capacity might not be available to bring the material to the water kiosk location (Koestler, 2016b, p. 5).

*System breakdown*

If for instance, the logistics challenge cannot be overcome, crucial spare parts might be missing. Furthermore, if maintenance and repair work is not executed regularly and in an efficient and prompt way, the risk of a system breakdown exists (Nedjoh, 2016, p. 5). System breakdown poses a great risk because it can be caused by various issues and has great implications on the whole community. Depending on the duration of the system breakdown customers might go back to using unsafe water sources, which can have serious implications on their health.

*Corruption of staff or coordinating body*

In the operation of the water kiosk corruption among employees can be a severe challenge (Birkholz, Köse, Rosenthal, & Willi, 2011, p. 15). This is especially the case if staff directly gets in contact with cash payments or is responsible for depositing money. Therefore, someone should often, however at irregular intervals, check the amount of cash and approve that it is in line with cash book records. It is very important that this person is not directly involved in the financial management of the water kiosk (e.g. representative from Ghana Red Cross Society). This kind of audits or inspections confirm the correctness of cash book records and prevent employees involved in cash management from embezzling funds or taking unauthorized loans for own use. (SWN, 2013, p. 152)

### 4.3.4 Parameters for business model development

| **Water Kiosk Planning and Development** | |
|---|---|
| **Parameter: choosing project location & water source**<br>- Which project location will be chosen? | **Relevance / critical information**<br>Project location(s) must be found that fulfils certain technical criteria and offers enough market demand. |

| | |
|---|---|
| - Is there a suitable project location available, that fulfils the required criteria (e.g. min. population size, availability of a water source)? | |
| **Parameter: establishing local connections** | |
| - Which local partner can support the development of a sustainable water project?<br>- How will the coordinating body be set up?<br>- How can a good relationship be established with the village leader?<br>- Does the village leader agree to up-front investment of local resources? | A village partner is required who will support the design and implementation of the whole project. Also, good connections with village leader(s) is important and a coordinating body must be set up. |
| **Parameter: community participation** | |
| - How will the local community be involved into the development and planning process?<br>- How can be ensured that marginalized groups, such as women and elderly people, are also integrated into the participatory planning process? | Community understanding of the project and community integration into project development can foster adaptability and long-term success. |
| **Parameter: resource commitment for water kiosk infrastructure** | |
| - What kind of infrastructure is required for the water kiosk system?<br>- Who will contribute which resources? | The government, the community and the organisation (e.g. Nestlé or IFRC) need to commit certain resources for the water kiosk installation. |
| **Parameter: obtaining legal status** | |
| - How can the water kiosks obtain legal status? | Obtaining a legal status is important for the water kiosks' legitimacy. |
| **Parameter: construction of the water kiosk** | |
| - What must be built in order to operate a water provision system? | If certain parts of the water kiosk system are already available, they should be used. |
| **Parameter: hiring & training staff** | |
| - Questions: see human resources, chapter 4.4.3 | |
| **Water Kiosk Operation and Maintenance** | |
| **Parameter: operation of the water kiosk** | **Relevance / critical information** |
| - Questions are under other chapters (e.g. chapter 4.4.1 physical resources) | |
| **Parameter: financial management** | A simple but effective financial management system is necessary to keep an overview of the kiosk's economic performance. |
| - How is the financial management of the water kiosk organised? | |
| **Parameter: maintenance service** | |
| - How is the maintenance service organised?<br>- How often should a rotating mechanic pass by each kiosk? | Through regular maintenance and repair activities system breakdowns can be avoided and long-term functionality is fostered. |
| **Parameter: audits** | |
| - What kind of technical and financial audits should be regularly conducted? | Audits foster transparency in water kiosk operations. |

| | |
|---|---|
| **Parameter: project evaluation**<br>- How can customer's satisfaction be evaluated?<br>- How can ideas for improvement be gained? | Project evaluation helps to identify where potential for improvement exists. |
| **Risks, Challenges and Unknown** | |
| **Parameter: logistics**<br>- How can an effective supply chain be organised in order to deliver all materials and spare parts in a timely manner to the project location? | **Relevance / critical information**<br>If there is no efficient supply chain in place it could lead to a system breakdown. |
| **Parameter: system breakdown**<br>- Which activities prevent system breakdowns? | In case of system breakdown, customers might have to use unsafe water sources. |
| **Parameter: corruption of staff or coordinating body**<br>- How can embezzlement among people involved in kiosk operation and financial management be minimized? | Employees who are in direct contact with cash, might engage in embezzlement. |

**Table 5:** Overview of parameters concerning key activities
Source: own table.

## 4.4 Key resources

In order to identify parameters necessary to develop the business model for the intended water kiosk project, it has to be evaluated what kind of resources are required to make the system work. Key resources can be categorised into physical, intellectual, human or financial resources and are either owned or leased by the company or acquired from key partners (Pigneur & Osterwalder, 2010, p. 38-39). In the following chapters, it will be analysed what kind of resources are required for the development and implementation of a truly sustainable water kiosk project and how these resources can be accessed.

### 4.4.1 Physical resources

The most crucial physical resources in the context of the water kiosk project include ground water (or another source of accessible water), water pump(s), pipes, water tanks, taps including water meters, jerry cans, resources for water disinfection as well as point-of-sale infrastructure.

Having access to sufficient water in the project area is crucial for the long-term success of the water kiosk. Hence, during the field visit the availability of ground water has to be assessed. The water yield can vary between different seasons, which has to be taken into consideration when planning such a project (Swiss Red Cross, 2014, p 8). Additionally, the recharge and discharge rates of ground water level have to be considered too. Not only the quantity of available water but also the quality of the water source has to be evaluated. Water quality concerns three different aspects: microbiological, chemical and physical. The water has to be free of microbiological contamination, especially pathogens of human and animal faeces. It is more likely that surface water sources are contaminated than ground water sources. However, for every source of water there exists the possibility of getting contaminated at the source, during collection, transportation or storage of the water. Also, chemical contamination either naturally or resulting from human activity, can lead to health concerns. Lastly, undesirable physical quality, such as colour, taste or odour, may not make the water unsafe but people perceive it as unacceptable to consume and hence, change to other sources which might be less safe. (Swiss Red Cross, 2014, p. 12) The Ghana Standards Board developed baseline water quality parameters, which have to be followed (CWSA, 210b). Hence, when implementing a water kiosk project, the water has to be tested

and it must be in accordance with the baseline water quality parameters. The water source has to meet all microbiological, physical and chemical parameters. After baseline parameters have been established, the water quality must be monitored regularly to ensure continuous safety (at least twice a year with seasonal variations). (CWSA, 2010b, p. 9-13) Some items must be available in order for accurate water quality monitoring to take place. The water kiosk must be equipped with a handheld meter that can measure "Total Dissolved Solids" and the pH value of water samples. Furthermore, the water kiosk operators must have access to a professional laboratory where exact water quality analysis can be conducted. (SWN, 2013, p. 51) The contamination of groundwater sources can be prevented by some simple measures. The water has to be protected during transport from the aquifer to the point of sale. Also, the well-head should be shielded from livestock access and disposal of septic wastes. (MWRWH, 2015, p. 45) Since the project is set up in an area where cocoa plantations are grown, the risk of groundwater contamination might be higher as pesticide use among cocoa farmers in Ghana is widespread (Denkyirah et al., 2016, p. 1). Therefore, particular attention has to be drawn on whether the water quality can be affected by nearby farming activities and how contamination due to pesticides can be avoided. When using ground water, the source development, ground water levels and water quality have to be assessed continuously. Besides evaluating quantity and quality of the water source, the ownership and rights of this resource should be assessed. Legal registration or documentation of the rights to the water source are a crucial first step when setting up a WASH project and can help avoiding conflicts. (Swiss Red Cross, 2014, p. 8, 32)

As previously mentioned, the water service delivery in this thesis will be provided through a network of water kiosks and direct household connection to the water system. One option to make this system work is through the usage of solar water pumps. However, there are also other solutions available to operate water kiosks but due to the limited scope of this thesis, the focus will be put on this specific system. The reasons for focusing on a solar powered water kiosk system is that this technology is considered as sustainable (uses renewable resources), cost efficient[11] and aspirational (Gertsch, 2017). Therefore, the water kiosk system described in this thesis will be motorized through a solar pump (see figure 5). The usage of a solar powered water pump can increase the resilience of the system and has the ability to cover the demand of a growing population (Gertsch, 2017, p. 15). A potential supplier for solar water pumps could be Ennos AG[12], a Swiss company. The solar pump, developed by Ennos AG, is portable and produces up to 15'000 litres per day or 55'000 litres if pumping hours are extended with a battery (Ennos AG, n. d.). Under the assumption that one person uses 20 litres of water per day, one solar pump could serve up to 750 respectively 2750 people. However, the pump's maximum capacity always depends on the available solar power (panel size and solar irradiance), suction depth and water lift as well as horizontal distance between water source and tank (Ennos AG, n.d.). It must be evaluated if more than one solar pump is required because 2750 customers might not be a market size large enough to establish a financially and operationally viable water kiosk system (see also chapter 4.2.1).

[11] A solar pump has mostly initial fixed cost but afterwards, operational costs are low. Depending on the lifespan of the pump, it can be a very cost-efficient technology. (Heierli, 2017, Lecture Slides)

[12] The solar pump of Ennos AG is used as an example. It should also be examined whether a solar pump from another supplier could serve as a suitable technology.

Dunmade (2002, p. 465) argues that a sustainable foreign technology must be adaptable in the specific country. Four factors help evaluating the adaptability of a foreign technology to a certain locality: technical, economic, environmental and socio-political sustainability. Technical sustainability implies that the pump must be serviceable by local people without long downtime between repairs and that spare parts are locally available. Thus, it must be evaluated what kind of instruction and training operators require in order to install, use and maintain the solar pump and the whole water system. Besides, it has to be identified if the necessary spare parts are available or how the supply chain of these goods is organised. Economic sustainability means that the technology has to be affordable, reusable and that servicing resources should be available locally (Dunmade, 2002, p. 464). Regarding the water pump's affordability, it has to be identified how much the technology costs and how it could be financed in the most efficient way. Also, the solar pump's estimated maintenance and repair cost must be evaluated. An environmentally sustainable technology should conserve resources, control its environmental releases as well as comply with environmental standards (Dunmade, 2002, p. 464). In case of solar pumps, this is given since they are using renewable energy sources, do not have any $CO_2$ emissions and have a long lifetime. Lastly, Dunmade (2002, p. 464) argues that a technology needs to be socio-political sustainable, which means that it has to be accepted by the local people and supported by government policies (also in the long term). Therefore, it must be identified if the local government for instance, imposes high taxes on this kind of foreign technology and how the local population judges the usage of solar pumps. By using a modern technology like the solar pump, the water kiosk service becomes more aspirational and desirable, which might attract more customers.

Water taps, water meters, pipes and large tanks are further key resources that are necessary to set-up a water kiosk project. Also, jerry cans have to be purchased which will be sold to the customers when they sign up for the water kiosk service. It has to be assessed where those resources can be accessed and if the material is locally available at sufficient quality. Poly Tanks Ghana Limited and Qualiplast are two companies from Accra that might be able to deliver both water tanks and jerry cans. The jerry cans need to feature a narrow opening, that is designed for easy pouring and that prevents hands and utensils from entering the container and contaminating the safe water. The containers should be easy to transport and carry, which means the shape should be convenient and they must incorporate a comfortable handle grip. Furthermore, it is important that the jerry cans are strong, sturdy, durable, leak proof and can be cleaned easily. Besides, they should all have an equal and appealing appearance with useful labels in order to build up a water kiosk brand. (SWN, 2013, p. 132) To reduce water contamination, some cleaning fluid is necessary to disinfect the jerry cans after each use (Birkholz, Köse, Rosenthal, & Willi, 2011, p. 29). Moreover, a point of sale infrastructure is necessary, which could either be built from scratch or must be contributed by the community, an individual or the local government (SWN, 2013, p. 15). If the facility is built from scratch, different resources are required. These include all construction materials, such as cement, wood, roofing materials, aggregates (e.g. sand or granite), steel and metal products, electrical materials, glass and paints. Whenever possible, all the required resources should be purchased in the project area in order to support the local economy and to ensure an efficient supply of spare parts. The individual parts of this water kiosk system are presented in figure 5 below.

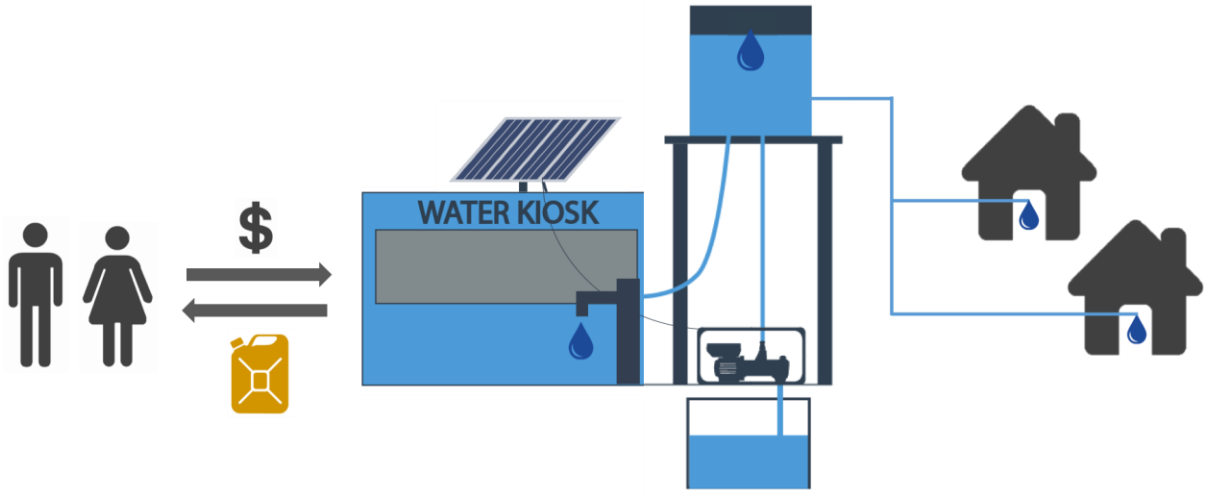


**Figure 5**: Components of the water kiosk system
Source: own figure based on Gertsch (2017).

Moreover, resources for the water treatment are necessary. Chlorination is an effective water disinfection method which prevents recontamination and can be produced relatively cheaply (Gertsch, 2017, p. 17-18). However, it has to be assessed whether chlorine is the most suitable water treatment option for the water source in the project area. Also, it must be evaluated how the chlorine supply chain will be efficiently and sustainably organised. According to Gertsch (2017, p. 18), in Côte d'Ivoire chlorine is only available in urban centres but not at local markets. Whether this is also the case for Ghana has to be assessed during the field visit. Instead of procuring chlorine from a wholesaler it could also be produced at the water kiosk itself since the production is fairly simple. For instance, The Swiss Antenna Foundation sells a safe and simple solar-powered machine (called WATA) to produce chlorine from a water and salt-solution. Gertsch (2017, p. 18-19) proposed to engage a local entrepreneur to set up a chlorine production facility and then deliver it to different water kiosks or other customers. Because chlorine cannot be stored for a long time (it starts losing its effectiveness after one month) it would be important to set up an efficient supply chain with regular chlorine deliveries (Aydogan, 2010, p. 41; Gertsch, 2017, p. 19).

### 4.4.2 Intellectual resources

In the case of the water kiosk, different intellectual resources will be required. First of all, establishing a strong and unique brand helps making the consumption of clean water more aspirational and desirable. This can enlarge and strengthen the customer base as well as increase customers' willingness-to-pay. For instance, Spring Health, an Indian social business which provides safe water, was successful in building up a strong brand identity. The local community is able to recognize and emotionally connect with the brand because Spring Health professionally designed a logo and put it on staff clothing, used uniquely branded jerry cans and put branded posters close to the water tank. A strong brand supports the purchase process as people are more inclined to buy a product or service that is familiar to them and comes with a certain status and brand image. (Ammann, 2012, p. 34) The goal is that the consumption of safe water from the kiosk should represent a status symbol for the community members.

Depending on Ghanaian laws and regulations, certain permits might be required in order to install and operate a water kiosk. It is possible that the water kiosk must be registered as a legal business entity, to

ensure that the operations of the water service station are legal and recognized by the local government. (SWN, 2013, p. 38) Therefore, it shall be assessed what kind of permits are required to legally operate a water kiosk. Furthermore, it can be helpful to attain a certificate from the local government or an audit committee, which shows that the water sold at the kiosk is of good quality. A water quality certificate can help establishing trust and attract more customers. As it has already been mentioned previously (see chapter 4.4.1) all drinking water has to be in accordance with the Ghana Standards Board's water quality parameters (CWSA, 2010a, p. 4). Besides, the Public Utilities Regulatory Commission [PURC] of Ghana is an independent body that regulates and oversees the provision of electricity and water services to consumers. However, PURC is mostly responsible for regulating the Ghana Water Company Ltd. [GWCL] which only provides water to urban and not rural area. (IRC & Aguaconsult, 2011, p. 9) Anyways, it should be assessed whether PURC or the Ghana Standard's Board provide community water operators with certificates regarding water quality. Apart from permits and certificates, other legal documents, such as contracts or memoranda of understanding, will be necessary to obtain. Moreover, a contract for the land rights where the water source as well as the water kiosk infrastructure is located on, must be secured with the responsible party. It has to be evaluated if the community itself will contribute the required land rights or how they can be assessed instead.

### 4.4.3 Human resources

In order to guarantee long-term success of the project, motivated, skilled and dedicated employees play an important role. The employees must be capable of operating and maintaining the whole water kiosk infrastructure. For the management of the water kiosk different types of staff are required. It has to be assessed what kind of positions must be occupied and if the people need some prior experience, a minimum level of education, certain skills or specific characteristics. For the operation of the water kiosk, for instance, a technical coordinator, an operator/caretaker and an accountant have to be hired (Obuobisa-Darko & Asimah, 2008, p. 207-208). The responsibilities among these employees could be divided as outlined in table 6. However, this is only a proposition and it is also possible that responsibilities are distributed differently or are managed by fewer or more than three employees.

| Technical Coordinator | Operator / Caretaker | Accountant |
|---|---|---|
| • Overall responsibility of the technical, financial and administrative staff<br>• Consolidation and interpretation of daily technical records and reports, presenting them to coordinating body<br>• Administrative tasks (office organisations, correspondence with different institutions and filing of documents/reports) | • Operation of pumps<br>• Identification of disruption and solution of minor problems<br>• Water quality testing<br>• Monitoring water source<br>• Establishing new service connections<br>• Stock keeping<br>• Attending customers<br>• (Cleaning of jerry cans) | • Making payments and receiving cash<br>• Collecting daily turnovers at each standpipe, monthly fees for house connection<br>• Keeping cash book<br>• Storing collected funds in the bank account<br>• Preparing financial and administrative reports |

**Table 6:** Responsibilities of water kiosk employees
Source: own table based on Obuobisa-Darko & Asimah (2008, p. 207-208).

In order to fulfil the previously mentioned responsibilities, the water kiosk employees need to have a broad range of skills and capabilities (see table 7). It shall not be expected that prospective employees

already fulfil all of them, but it must be ensured that they need to receive the respective training necessary for their position (SWN, 2013, p. 100). Furthermore, employee training must be regularly repeated and review meetings shall be held. This allows to evaluate the progress made in management and operations of the water kiosk project as well as to identify and address shortcomings or issues (Opare, 2011, p. 1033). The employee training can be done by the coordinating body, the village partner or other local partners and consultants.

| | |
|---|---|
| **Capacity to manage sophisticated technical operations** | • Hands-on experience in operating technical systems and being familiar with their functions, specifications, and possible difficulties<br>• Problem solving capability<br>• Familiarity with key water quality parameters<br>• Committed to following standard practices and protocols |
| **Ability to administer funds and paperwork** | • Interested in maintaining operational and sales records<br>• Ability in accounting, filing, and timely book keeping<br>• Capacity to deliver daily, weekly, and monthly written reports<br>• Mathematical skills<br>• Competence to handle money and report sales on a daily basis |
| **Capable to demonstrate and teach good hygiene** | • Recognize the importance of maintaining a hygienic water kiosk and readiness to be responsible for clean facilities<br>• Ability, knowledge and experience in communicating key hygiene behaviours and safe water practices (e.g. regular cleaning of jerry cans, safe water storage etc.) |
| **Capability to serve customers** | • Willingness to interact with individuals from all backgrounds without discrimination<br>• A natural promoter and sales person<br>• An outgoing, friendly, and trustworthy personality |

**Table 7:** Required skills and capabilities of water kiosk employees
Source: own table based on SWN (2013, p. 100).

Whenever necessary, the water kiosk employees shall be supported by the rotating mechanics, the coordinating body or the local partner (Ghana Red Cross Society). Furthermore, the services of skilled local artisans, like plumbers, electricians or mechanics, shall be procured if necessary (Obuobisa-Darko & Asimah, 2008, p. 207). The employees should be hired among local community members since they are trusted by them, can receive direct feedback from other villagers and it further extends the positive community impact (Gertsch, 2017, p. 13). Apart from people operating the water kiosk, the position of the rotating mechanic and the coordinating body need to be occupied. The rotating mechanic as well as the coordinating body will be responsible for various water kiosks simultaneously, whereas the operators are employed at one specific water kiosk.

For the success of the project it is crucial that all employees, including the coordinating body and the rotating mechanics, understand and implement the drinking water quality management at the water kiosk. The success of any water service delivery system can only be guaranteed if the water offered to consumers is safe. Hence, all employees must understand the organisation's drinking water quality policy. They also have to know potential sources of contamination and the strategies required to prevent any form of water contamination. Furthermore, employees have to be aware of how their behaviour and actions can impact the water quality. (MWRWH, 2015, p. 58)

After having outlined what kind of employees are required and which skills and capabilities they need to fulfil, the remuneration of these employees must be defined. To incentivize the employees (water

kiosk operators and rotating mechanics), it could be helpful to apply a wage system based on some performance indicators, such as litres sold, number of customers acquired or amount of maintenance work executed. It must also be evaluated, (if and) how much payment the members of the coordinating body receive. It will be motivational for them to receive a salary based on economic performance indicators of the water kiosks because their tasks can be quite demanding in terms of time and effort (Opare, 2011, p. 1033).

Apart from employees and members of the coordinating body, the village partner (e.g. representatives of the Ghana Red Cross Society), some influential community members and other local partners or groups can also be valuable human resources. For instance, prominent community members or certain local groups have the ability to support the health education and the promotion of the water kiosk. Their presence during water testing events, group sales meeting or other events can attract a greater number of potential customers and they might listen to what influential community members are saying. Hence, when implementing the project, it must be identified who the influential community members and groups are and in what way they can support the project.

### 4.4.4 Financial resources

The goal of this project is to create shared value between Nestlé and the cocoa farmer communities. Nestlé is the project initiator and therefore, it makes sense that they finance (at least partially) the pilot project in order to enable a decent livelihood and increase productivity of their cocoa farmers (Gertsch, 2017, p. 52). As it is not clear how much of the project is financed by Nestlé, other potential funding sources are outlined subsequently.

According to a study conducted by IRC and Aguaconsult (2011, p. 11) between 1990 and 2008 approximately 99% of all capital investments in Ghana's rural water sector came from donors, such as the World Bank, different Government Development Agencies (e.g. Danida, CIDA, KfW, GTZ) and the European Union. An issue is still that many social enterprises cannot finance themselves fully through sales or investments and are not profitable enough to get funding from traditional financial markets. This results in a financial-social return gap, where organisations create social value but the cost of private funding outweighs the monetary return of investors (Gertsch, 2012, p. 52). This lack of funding opportunities is one of the largest disadvantages social enterprises have to cope with. However, there are increasingly funds available for social enterprises. (Bugg-Levine, Kogut, & Kulatilaka, 2012) One option would be to apply for a grant or program-related investment through co-financing from within the international development community. This is offered by organisations such as the Bill & Melinda Gates Foundation or national funds such as Swiss Bluetec Bridge, funded by the Swiss Agency for Development and Cooperation. Moreover, partnering with another company, who has a particular interest in the topic or region, could attract further financial or in-kind contributions. Besides, in the last years crowdfunding has become an alternative to finance projects. Even though large sums of these investments have been dedicated to commercial start-ups and corporations, an increasing number of social businesses use crowdfunding. (Gertsch, 2017, p. 52)

To address the financial-social return gap Bugg-Levine, Kogut and Kulatilaka (2012) state that it is important that social enterprises can offer different risks and returns to different kind of investors instead of delivering a blended return to all investors. Thus, they propose an approach that is similar to

the way conventional businesses are financed, where one portion of the capital comes from equity investors and the other portion from a debt investor who seeks predictable returns. One part of the enterprise's required capital would be raised by an equity investor, such as a foundation, the second part could be raised through financial investors who would receive twice the initial return. For example, if an enterprise needs $100,000 to start their project and earns $5,000 a year, which would imply a 5% return on investment, this return would not be high enough to attract private funds. Therefore, the enterprise could ask a donor for only $50,000 and then offer 10% return to the financial investor. The donor would not get a return but could use the remaining funds (in this example $50,000) for another project. (Gertsch, 2017, p. 53) For instance, the Bill & Melinda Gates Foundation issues loan guarantees instead of direct funds to some enterprises, recognizing that this is an efficient way to leverage its donations and provide organizations with funding at a lower interest rate. These financing approaches can help social enterprises get access to commercial financial markets, which offers them funding as well as non-financial values like connections to a network or technical assistance. (Gertsch, 2017, p. 53)

Gertsch (2017, p. 53) further proposes to use contributions from within communities to acquire the funds needed to start the water kiosk in villages. This contradicts the common idea that poorer people have no possibility to invest in anything which is not essential for survival. Even though people living in relative poverty should be thoughtful about their spending and will evaluate critically a product's benefits, they do make strategic investments and pro-actively manage their finances. A study from Collins, Morduch, Rutherford, and Ruthven (2009 as cited in Gertsch, 2017, p. 53) states that if poor people have access to adequate financial tools, they can invest outside of daily expenses. Therefore, the provision of safe water could be financed through a shared investment between investor and users. Based on this idea, an agreement with the cocoa farmers would be elaborated where the project initiator (e.g. Nestlé) pays upfront for the first investment and villagers repay them through small amounts over a certain period of time. Another option is that the project initiator together with the community agrees on a sum that has to be contributed by local people in order to start the project. The community contributions could directly be deducted from the revenues they receive from selling cocoa to the cooperatives. This kind of financing mechanism empowers the local population to get access to safe water with their own means. Though, it is important to communicate clearly that the villagers still have to pay water tariffs and to define the terms of this cooperation mutually. (Gertsch, 2017, p. 53-56)

Another source of project funding has been highlighted by a study conducted on 30 community-managed piped water systems in the Ashanti region. The funding for those water projects came from the Government of Ghana, external support agencies and communities. The Government of Ghana together with external support agencies contributed 95% of the capital cost and the communities provided 5% of the funds for the water system. Therefore, a further possibility would be getting in contact with the Government of Ghana and examine if they are willing to contribute funds for the project's capital investment. (Nyarko, Oduro-Kwarteng, & Adama, 2007, p. 94)

Securing access to a financial institution belongs to the resources that are critical for the project success. Additionally, the water kiosk operators, the coordinating body or the village partner need to be able to open an account at a bank, post office or another financial institution with strong reputation, which offers checking and saving services. Without a bank account it is not possible to receive any funds, deposit revenues or make payments. Moreover, money kept at a bank is safer and can earn interest rates.

Hence, this must be done early in the project planning process. Furthermore, a cash box is required, where a small amount of money will be kept for short term needs. The coordinating body or the water kiosk accountant/operator must maintain an account register listing all transactions. Furthermore, it must be defined who has the ultimate responsibility and authorization over the financial account, whether this will be a member of the coordinating body, the water kiosk accountant/operator, a representative from Ghana Red Cross Society or any other actor. (SWN, 2013, p. 75-79; p. 149)

### 4.4.5 Risks, challenges and unknown

*Insufficient water sources*

A suitable water source that can be treated and sold as safe water is the most important project resource. However, it is unclear what kind of water sources are actually available in the project area and if they can be harnessed in a sustainable way. This means, the water sources should not be exploited but serve the community also in the longer term. Fluctuations in water source availability are another challenge, that can occur during dry season (December-March). There might also be the problem that water source levels remain somehow sustainable but their quality (e.g. salinity) can change over time (Koestler, 2016a, p. 7). Thus, securing a water source that can be harnessed sustainably might pose a challenge.

*Insufficiently skilled labour*

In order to operate and maintain a water kiosk the staff needs certain skills and know-how. For instance, the accountant needs basic financial management know-how or the rotating mechanic and operators require certain technical skills. Since the project is implemented in rural areas, where education level generally is lower (Opoku-Asare & Siaw, 2015), local people might lack the required skills. Therefore, in this context good and comprehensive staff training becomes even more important in order to guarantee a successful project implementation.

*Land rights*

Even though the existing legal framework in Ghana recognises and provides ways to enforce property rights, the process to attain a clear title over land is often difficult, complicated and long. Ghana's land tenure system is a difficult obstacle (Spillan & King, 2017, p. 21). This might pose also a challenge to this project since the successful implementation of the water kiosk project requires the rights to a water source as well as sufficient land to build the whole water kiosk infrastructure.

### 4.4.6 Parameters for business model development

| **Physical Resources** | |
|---|---|
| **Parameter: water source**<br>- What kind of water source is available?<br>- How much water is available per capita per day in the project area (during all seasons)? Is it enough for long-term needs?<br>- What is the distance between water source and the intended kiosk location?<br>- Who controls and owns the water resources?<br>- Will the community or entrepreneur contribute a bore well?<br>- How is the quality of the available water source (microbiological, chemical and physical)? | **Relevance / critical information**<br>A complete description of existing water sources will be critical in determining where to locate the station and which sources provide water throughout the year. |

| | |
|---|---|
| - Is the water quality compatible with the Ghana Standards Board's baseline water quality parameters?<br>- Are the necessary tools available to measure water quality?<br>- Is water treatment necessary? And if so, how is it done?<br>- Does there exist a contamination risk (e.g. upstream industry, nearby agriculture or livestock, surface faecal runoff)? | |
| **Parameter: solar pump** | |
| - What is the solar pump's maximum capacity under local circumstances?<br>- Is the water kiosk system (incl. pump) serviceable by local people? What kind of training and instruction do they require?<br>- How is the supply chain of the spare parts organized?<br>- Do local government policies support or prevent the usage of solar pumps?<br>- How do local people judge the usage of solar pumps? | The solar pump must be adaptable to local circumstances. This is fulfilled if the solar pump is technically, economically, environmentally and socio-politically sustainable. When fulfilling these criteria long-term sustainability of the system is more likely to be ensured. |
| **Parameter: water taps, meters, pipes, tanks & other construction materials** | |
| - Where can the construction material, pipes, tanks, taps and water meters be purchased?<br>- Does there exist a local supply chain for these goods?<br>- Will the community or water kiosk operator contribute a building suitable for the water kiosk or must it be built from scratch? | Resources should be purchased locally whenever possible in order to strengthen the local economy and to ensure availability of spare parts. |
| **Parameter: jerry cans** | |
| - Where can stable and sturdy jerry cans be purchased?<br>- How should the jerry cans be branded? | Jerry cans shall be used for water transportation and storage in order to minimize water recontamination. |
| **Parameter: water treatment (e.g. chlorine)** | |
| - What is the most suitable water treatment option?<br>- If chlorine can be used for water treatment, can it be purchased locally or should it be produced at the water kiosk? | Depending on the kind of water pollution, different water treatment might be required. |
| **Intellectual Resources** | |
| **Parameter: brand** | **Relevance / critical information** |
| - How will the water kiosk establish a unique and strong brand? | A brand makes consumption of clean water more aspirational and desirable. |
| **Parameter: permits & water quality certificates** | |
| - Are there some permits required in order to legally register and operate a water kiosk? Where can they be obtained?<br>- Is it possible/necessary to register the water kiosk as a business?<br>- Is it possible to obtain water quality certificates (e.g. from the Ghana Standards Board)? | Depending on Ghanaian laws and regulations, certain permits might be required to install and operate a water kiosk. |
| **Parameter: land rights** | |
| - Will the community or water kiosk entrepreneur contribute land? | Land rights where the water source and the water kiosk infrastructure is located on, must be secured. |
| **Human Resources** | |
| **Parameter: employees** | **Relevance / critical information** |

| | |
|---|---|
| - What kind of employees are required to operate the water kiosk (incl. rotating mechanics)?<br>- Who will occupy the positions of the coordinating body?<br>- Do the employees need some prior experience, education, skills or specific know-how?<br>- How and by whom are the employees trained?<br>- What kind of remuneration system will be applied? | To guarantee long-term success of the project motivated, skilled and dedicated employees, who operate and manage the water kiosks, are necessary. |
| **Parameter: local support** | |
| - Which local people/groups can support the project? | For a successful project implementation local support is required. |
| **Financial Resources** | |
| **Parameter: project financing** | **Relevance / critical information** |
| - What kind of funding opportunities are available to the kiosk?<br>- How much funding is provided by Nestlé?<br>- Is it possible to fund (parts of) the capital investment through community contributions?<br>- Is it possible to get funding from the Government of Ghana for capital investments? | Funding is required to finance capex[13] and initial opex[14]. |
| **Parameter: access to financial institution** | |
| - At which financial institution should a bank account be opened?<br>- Who has the authorization to access the bank account? | To receive funding, deposit revenues and make payments, access to a financial institution is crucial. |
| **Risks, Challenges and Unknown** | |
| **Parameter: insufficient water sources** | **Relevance / critical information** |
| - Is there a water source available, which serves in the long term and can be harnessed sustainably? | The water sources shall not be exploited and must be available long-term. |
| **Parameter: insufficiently skilled labour** | |
| - Do local people have the required skills to operate and maintain the water kiosk? | Rural population might not have the skills and know-how required to operate and maintain the kiosk. |
| **Parameter: land rights** | |
| - How can land rights and rights to a water source be secured? | Attaining the required land rights can be challenging. |

**Table 8:** Overview of parameters concerning key resources
Source: own table.

## 4.5 Key partners

In order to execute the key activities necessary for the development, implementation, operation and maintenance of a sustainable water project, different partners and suppliers are crucial. Since the goal is to develop a business model for a truly sustainable water kiosk, it is important that those are operated by a partner which ensures long-term functionality and financial viability of the system. Therefore, an organisation similar to a private enterprise should be set up which operates the kiosk in an economically sustainable way. This implies that the project initiator, Nestlé and IFRC, need to set up a "water kiosk

[13] Capex: capital expenditures
[14] Opex: operating expenditures

enterprise". Furthermore, they must look for a local partner(s), actors and stakeholder, which are pivotal for project development and implementation.

### 4.5.1 Setting up a water kiosk enterprise

Setting up a water kiosk enterprise is crucial for the long-term success of the project. However, at what level and in which way the enterprise will be established must still be defined and is dependent on local circumstances. Different options will be discussed in this chapter.

*Enterprise at kiosk level*

One option is to set up the water kiosk enterprise at the level of each individual water kiosk. This means that each kiosk is solely responsible for the operation and maintenance of its kiosk. Hence, the kiosk itself hires employees, does the financial management, secures access to financial institutions, organises a supply chain for required materials and executes other crucial tasks. However, the water kiosk enterprise must still have an agreement with the coordinating body about making payments in order to secure regular maintenance and repair work from the rotating mechanics. Furthermore, other local partners could be used to execute certain activities, such as employee training or health and sanitation education.

Setting up the enterprise at the kiosk level could bring the advantage of greater competition and incentives among individual kiosks, which could lead to more efficient operation. This would mean that those enterprises operating in a financially efficient way, would be able to open up another kiosk eventually. Hence, scaling of the water project could be advanced. However, the problem with this solution is that coordination is likely to be more challenging once the number of water kiosks, and thereby the number of enterprises increases. This could for instance impede the establishment of a unique brand and the delivery of a consistent water service of good and reliable quality. Furthermore, supply chain inefficiencies might occur because each water kiosk enterprise, unless otherwise agreed upon, is responsible to source the required materials on its own. Besides, operating inefficiencies might also appear. For instance, each enterprise might be responsible for its own chlorine production, the financial management and other key activities. Moreover, each kiosk needs some kind of initial financing for the required capital expenditure, which might be more difficult to acquire for such small entities.

*Enterprise at level of coordinating body*

Another option is to establish the water kiosk enterprise at the level of the coordination body. This implies that the coordinating body is the managing entity of the whole enterprise and the water kiosks are the individual divisions within the enterprise. The whole coordination of supply chain activities, employee hiring and training, financial management, and other crucial activities lies with the coordination body. However, the degree of freedom that each of the water kiosk entities keeps, must still be defined. The coordinating body would therefore also be the entity that must ensure a financially viable operation of the kiosk and that depends on the generated revenues of each of the water kiosks. Parts of the revenues are used at the kiosk level to pay operating expenditures (e.g. salaries) but the rest goes directly to the coordinating body, in this case the water kiosk enterprise.

This system could ensure that the previously mentioned inefficiencies, of each entity operating and purchasing on its own, are avoided. Furthermore, the intended maintenance and repair system with rotating mechanisms is more likely to succeed in this case because the coordinating body has better

overview of each kiosk's obstacles and issues. Besides, the establishment of a brand identity is easier if all the kiosks operate under the same coordinating entity, which also provides the branding. Moreover, the coordinating body could set up all the agreements with local partners who would for instance provide employee training or health and sanitation education to the staff as well as to the communities. However, the problem of this model is that the incentive of the individual kiosk entities or employee could be limited, though this depends on the remuneration system in place. The staff might be less inclined to operate efficiently because they know that most of the revenues anyways go to the coordinating body. Furthermore, the problem might arise that more efficient and successful kiosk entities cross-subsidize the less profitable ones. Another challenge could be the coordination among the different kiosks and to provide them with the required materials or necessary training accordingly.

*Franchising Model*

A combination of the previously mentioned options is also possible, which could result in a model similar to franchising. This implies that the water kiosk entities acquire the right from the coordinating body to operate their own kiosk under the brand of the coordinating body. Thereby, they must pay an upfront fee as well as regular royalties based on the generated revenues. Besides, the coordinating body receives a compensation for training, advisory, equipment or other resources from the water kiosk entities (Gabler Wirtschaftslexikon, n. d. b).

The advantage of this option is that the water kiosk entities could use the brand established by the coordinating body and operate according to a predefined management model. The coordinating body could for instance support and coordinate activities in the area of supply chain, financial management, employee training or health and sanitation education of the individual kiosks, while still leaving them certain activities for individual management. The kiosks can profit from the coordination bodies know-how and a distribution of the business risk. However, the kiosks are required to make a start-up payment as well as ongoing royalties, which could imply a financial burden to them.

When choosing the most suitable system for setting up a water kiosk enterprise, the previous evaluation provides good insights. However, local circumstances must be taken into consideration and can strongly affect the decision-making process. For instance, the existence of local governmental institutions in the WASH field at the different levels (local, regional, national) can have an influence because the water kiosk enterprise will need to cooperate with those institutions. Therefore, the next chapter provides an overview on the prevalent governmental institutions active in the area of water provision to rural areas.

### 4.5.2 Governmental actors in the WASH field

The governmental actors active in the WASH field are grouped into three levels: national, district/regional and local. Especially the local institutions will be crucial in the set-up of a water kiosk enterprise. As can be observed in figure 6, there exist a vast amount of WASH institutions in Ghana. A more detailed description of these can be found in appendix 1[15]. In this chapter, only the most crucial ones will be highlighted and additionally evaluated in which way they could serve as helpful partners in developing a sustainable water kiosk project.

[15] All the sources used for figure 6 are cited in appendix 1.

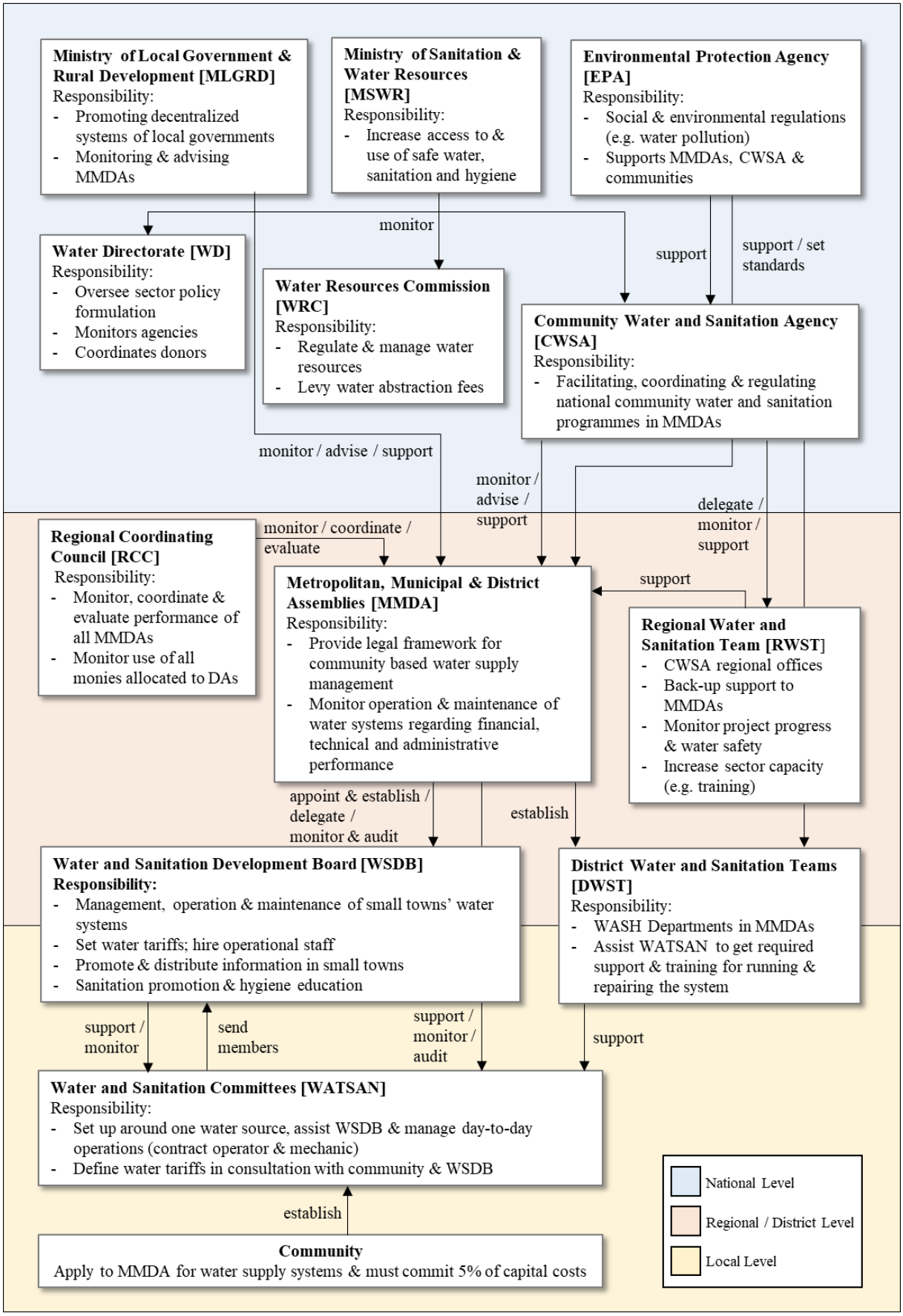


**Figure 6:** Governmental actors in Ghana's WASH field
Source: own illustration.

At the local level in Ghana, the WATSAN committee is set up around a single water source and is responsible for managing this source. This means, they would be on the same level as the individual water kiosk station. Hence, when developing a water kiosk in rural Ghana, a partnership with the local WATSAN committee will be required. Moreover, since it is planned to operate different kiosks in a certain project area, a partnership with the WSDB shall be organized. It has to be evaluated whether the WSDB could function as the planned coordinating body or at least provide support and assistance. The WATSAN committee and the WSDB are especially important when defining the water tariffs, since this lies within their area of competence. Besides, those institutions can assist community mobilisation, hygiene and sanitation promotion as well as participatory planning services in each of the beneficiary community. They can also help to set up a bank account as well as manage and account the project finances. (CWSA, 2010a, p. 7) Besides, the DWST is a beneficial partner in the area of maintenance and repair. The rotating mechanics could be hired from DWST members or the DWST itself could deliver helpful support to the mechanics, the coordinating body and the water kiosks itself. Therefore, in theory, the WATSAN committee, WSDB and DWST will be responsible to execute or support most of the key activities necessary to deliver the value proposition of the water kiosk. However, partnerships are only possible to establish if the corresponding institution is already existing in the project location. Hence, during the field visit it shall be assessed whether those institutions are already active in the respective area and how they can be integrated into the water kiosk project.

At the regional/district level, as can be seen in figure 6, the MMDAs play a crucial role in the implementation of water projects in Ghana and the coordinating body should build up a strong relationship with them. MMDAs prepare District Water and Sanitation Plans and monitor operation and maintenance of water systems regarding financial, technical and administrative performance. Moreover, MMDAs review water tariffs and ensure that water quality monitoring is in line with the requirements. (CWSA, 2010a, p. 6; World Bank, 2011, p. 14; Obuobisa-Darko & Asimah, 2008, p. 207) Additionally, the responsibilities and roles of other governmental institutions at national level, such as CWSA, EPA or the ministries, should also be considered. They can constitute highly valuable partners, facilitators or contributors for the project implementation.

### 4.5.3 Other key partners

*Civil society and international agencies partners*

Some civil society and international agencies actors can also be crucial in providing assistance in the project development and might be suitable partners for all kinds of activities. However, there is a vast array of civil society and international agencies stakeholders, wherefore not all of them can be listed and assessed in this thesis. However, some of these actors are briefly introduced and it is outlined in what way they could contribute towards project development or implementation.

Since the CSV project is initiated by IFRC in cooperation with Nestlé, the **Ghana Red Cross Society** should be considered as becoming a crucial partner. This organisation provides a good entry point into the project location, might help finding other partners and establish contacts with the local community. The organisation already has experiences with WASH projects in Ghana and therefore, can support the project promotion, the health, sanitation, and hygiene education, employee training as well as other key activities. (Ghana Red Cross Society, 2016) Since they will most likely not be directly involved in the

project operation, but rather provide support, they could also be a suitable institution for auditing the water kiosk activities.

The **village leader** together with i**nfluential village members or groupings** should also be considered as key partners in this project. Since these actors are having a great influence within the community, a close relationship with them can positively affect the project's acceptance within the community as well as its adaption and implementation success. They must also agree to dedicate certain resources and can assist project promotion as well as health and sanitation education.

**CONIWAS** brings all NGOs in Ghana's water and sanitation area together with the aim to promote and strengthen their position in the sector (IRC & Aguaconsult, 2011, p. 9). The purpose of CONIWAS is to form coalitions with a unified voice in order to mobilize actors capable of resolving sector issues. Providing the NGOs with one voice for lobbying has been one of the major advantages of the coalition. CONIWAS works closely with most of the donor agencies (e.g. Danida, CIDA, EU, WaterAid Ghana & UNICEF) as well as with various governmental institutions. (CONIWAS, n. d.) Therefore, CONIWAS could be a helpful focal point to get in contact with other NGOs working on related projects and dealing with similar issues.

**WaterAid** is an international NGO with focus on WASH and operates in 28 different countries. In Ghana, for instance, the NGO implemented a water kiosk project. Apart from hands-on projects in the field, WaterAid also influences governments to change laws, link policy makers with people on the ground, change attitudes and behaviours, pool knowledge and resources and rally support from people and organisations around the world. (WaterAid, n. d.) WaterAid might also be a suitable partner for the project implementation as they are active in Ghana, have already implemented a water kiosk project there and have great experience in the WASH sector around the world.

**Water.org** is an international non-profit development aid organisation. Its purpose is to deliver access to safe water and sanitation around the world through pioneering, innovative and sustainable solutions to the global water crisis. Presently, the NGO has also projects in Ghana's Volta and Upper East Regions. Water.org cooperates with local communities and partner organisations, such as Rural Aid, to construct wells, latrines and bio sand filters as well as to provide health and hygiene education. (Water.org, n. d.) Due to Water.org's experience and knowledge, it could be helpful to partner up with them. Additionally, they also provide successful hygiene and sanitation solutions to Ghanaian communities. Therefore, Water.org could complement Nestlé's and IFRC's engagement of providing safe water with hygiene and sanitation initiatives in order to guarantee a holistic WASH impact.

Various development partners such as multilateral agencies (e.g. World Bank, EU, UNICEF, African Development Bank etc.) as well as bi-lateral agencies (e.g. Danida, CIDA, KfW, GTZ etc.) are part of Ghana's Development Partners Water and Sanitation Group. They discuss (together with the Water Directorate) sector coordination, policy harmonization, the sector wide approach as well as other relevant topics (IRC & Aguaconsult, 2011, p. 9). Therefore, these organisations might also be valuable supporting partners in different kind of activities.

*Private sector partners*

The private sector stakeholders include local and international firms such as contractors, consultants, suppliers and competitors. Their functions include project management as well as consultancy in various areas and project stages (IRC & Aguaconsult, 2011, p. 9).

**WaterHealth International** [WHI] is a US based social enterprise. It is the global leader in providing "scalable, safe and affordable water solutions to underserved populations" (WaterHealth, n. d.). **WaterHealth Ghana** [WHG] was founded by WHI in 2008 and since then, WHG has established over 50 WaterHealth Centres across seven regions in Ghana (WaterHealth, n. d.). WHI operates decentralized water supply systems as a small scale, independent operator in partnership with local communities. The organisation functions as a support provider. In doing so, they manage the collection and accounting of user fees and train local community members in the operation and maintenance of the WaterHealth Centre. The water tariff level (GHS 5/$m^3$ in 2010) takes into account cost recovery of operation and maintenance. Ownership of the water system remains with the community and the service provider shall facilitate the implementation of the project, support operation and maintenance, provide capacity building and ensure recovery of investment. After a starting phase, the communities gets full responsibility for the system. (Tuffour & Adank, 2010 as cited in IRC & Aguaconsult, 2011, p. 16) WHG has already extensive experience with water projects in Ghana and as a private water service operator it works in a similar way as the project at hand. Therefore, WHG might be a suitable partner for the water kiosk enterprise. Partnering up with WHG could offer valuable insights into a successful water provision system and might deliver useful inputs regarding project design, implementation and operation.

**mWater** is an organisation that creates technologies for water, sanitation and health services. They developed an app that enables real-time collection of water system data, which can be easily received and analysed by the water kiosk staff and the head office. mWater also established an issue reporting system to track breakdowns and monitor the maintenance and repair structure to increase efficiencies and minimise downtime. (Sheldon, 2017) In addition, mWater facilitates the shift of surveys from paper to mobile phones, which makes the collected data actionable and sharable. Their apps are especially designed to work both on- and offline for regions with spotty internet service. (mWater, n. d.) It could be assessed whether a partnership with mWater might be beneficial for monitoring, maintenance and repair activities of the water kiosk. Real time data on system breakdowns and required repair work could help increase sustainability and efficiency of the system.

Moreover, partnerships with different suppliers must be established. For instance, as previously outlined, Ennos AG develops solar powered water pumps with the aim to cover the water needs of rural communities. Their pump is easily installed, used and maintained and could therefore be a suitable technology for the water kiosk project in Ghana. Hence, Ennos AG might be a potential supplier to deliver the solar pumps. However, when establishing supply chain relationships local suppliers should also be taken into account in order to ensure availability of spare parts and to enhance the project's positive community impact. Finally, partnerships will also be required to obtain financing or to open a bank account, to provide health and sanitation education as well as for other key activities. Therefore, for each of the key activities and key resources previously discussed it must be evaluated, who will be the key partner to provide it. However, due to the limited scope of this thesis, not all of those potential partners can be addressed in more detail.

### 4.5.4 Risks, challenges and unknown

*Weak governmental institutions*

Nedjoh (2016, p. 3) reports the issue that rural WASH is only a low priority of the MMDAs, which results in weak DWSTs, WSDBs and WATSAN committees. Hence, their ability to set about community outreach as well as to provide adequate governance and accountability systems is limited. Furthermore, there exists the challenge that those weak governmental institutions do not have the means and ability to cover the demand of Ghana's growing population or cannot offer a sufficient service level to the community. Therefore, a risk exists that the prevailing governmental actors in the WASH field do not possess sufficient means to support the development of the water kiosk project.

*Corruption of governmental institutions (and other actors)*

Apart from weak governmental institutions, there persists also the risk of corruption among governmental institutions as well as other actors. Corruption can hinder business in different ways. These include amongst others bureaucratic inefficiencies for obtaining permits, difficulties with cartels or bribe seeking governmental bodies as well as business practices based on tribal or personal interests rather than business acumen (Birkholz, Köse, Rosenthaøl, & Willi, 2011, p. 21). However, it can be argued that Ghana ranks relatively well in the corruption perception index (scores 81 out of 180 countries), especially when compared to other Sub Saharan African countries (Transparency International, 2017). Corruption is still a challenge that can never be fully avoided but a way must be found on how to deal with such practices.

*Uncertainties regarding local governmental institutions*

It is still unknown what kind of governmental actors in the WASH area actually exist on the ground. Even though, the literature gives an idea on what kind of institution should be in place, it is not clear whether they actually persist and what their effective responsibilities and tasks encompass. Furthermore, it is unclear in which way they are governed and how each of the individual institutions interact with others. Because of these uncertainties, there is a risk that the required governmental WASH actors do not exists or cannot be integrated into the project as described in the previous chapters. Moreover, it is not clear if missing institutions (e.g. if no WATSAN committee is available) can just be established or how the water kiosk project can be integrated into Ghana's water sector policies.

*Finding key partners*

In order to ensure a successful development and implementation of a sustainable water kiosk project, all proposed key activities and key resources must be backed up with a corresponding key partner. Especially, for the development of a water kiosk enterprise suitable local partners must be found, otherwise the project success cannot be guaranteed. As the scope of this thesis is limited and a lot of information will only be available after a field visit, it was not possible to identify key partners for all of these activities and resources. Therefore, an uncertainty prevails whether for each of the activities and required resources a partner can be found that delivers the required services at reasonable conditions. The number of suppliers and resources in rural Ghana is likely to be limited and therefore, it is unclear whether suitable partners can be found.

### 4.5.5 Parameters for business model development

| **Water Kiosk Enterprise** | |
|---|---|
| **Parameter: water kiosk enterprise**<br>- At which level and in which way could a water kiosk enterprise be set up?<br>- Who would be a suitable partner to set up this water kiosk enterprise? | **Relevance / critical information**<br>The water kiosk enterprise must ensure long-term functionality and financial viability of the system. |
| **Governmental WASH Partners** | |
| **Parameter: governmental WASH partners**<br>- Which governmental WASH institutions exist at the local, regional or national level?<br>- How can effective partnerships be built with them and how are they integrated into the project?<br>- How are responsibilities in the WASH areas distributed among the different governmental institutions? | **Relevance / critical information**<br>The WATSAN committee, WSDB and DWST as well as other governmental institutions could all be very enriching partners for the water kiosk and should be integrated into the project development. |
| **Other Key Partners** | |
| **Parameter: civil society and international agencies partners**<br>- Does there exist a local Ghana Red Cross Society within the project area? If so, how can they be integrated in the project?<br>- How should the partnership with village leader, influential villagers and community groupings look like? What can each of them contribute?<br>- Which NGOs have already experience with water projects in rural Ghana? Is a partnership with those actors possible?<br>- What kind of international agencies might be valuable partners for this project? | **Relevance / critical information**<br>Village leaders, local organisations and influential community members have the ability to foster project adaption and implementation.<br>There are various NGOs active in Ghana's WASH field. Their experience and know-how could be harnessed for this project. |
| **Parameter: private sector**<br>- Which partners can serve as suppliers?<br>- What kind of suitable, local suppliers are available?<br>- Which partner will provide project financing? | For all the key activities & key resources a key partner must be found to deliver it. |
| **Risks, Challenges and Unknown** | |
| **Parameter: weak governmental institutions**<br>- Do the existing governmental institutions have sufficient means to support the development of a water project? | **Relevance / critical information**<br>Rural WASH is only a lower priority of the governmental institutions. |
| **Parameter: corruption of governmental institutions**<br>- How does the water kiosk enterprise deal with corruptive practices? | Corruption can't be completely avoided but a way must be found to deal with it. |
| **Parameter: uncertainties on local governmental institutions**<br>- How can new institutions be built up in line with Ghana's water sector policies? | It is unclear if all required governmental institutions are in place and how they can be integrated in the project. |
| **Parameter: finding key partners**<br>- Do there exist partners to deliver the proposed key activities and key resources? | For all key activities & resources a partner must be found to deliver it. |

**Table 9:** Overview of parameters concerning key partners
Source: own table.

## 4.6 Channels

Since the objective of the thesis is to establish a toolbox that helps in the development of a sustainable water project, it must also be identified through which channels potential customers can be reached. In order to plan and implement a successful project, community members shall be integrated from the beginning on. Thereby, different channels can be established in order to draw customers' attention to the water kiosk service, to support them in the valuation of the service, to enable them to consume safe water and to support them after their purchase (Pigneur & Osterwalder, 2010, p. 31). Those channels will be presented subsequently and will help identifying the parameters necessary to consider when the water kiosk enterprise communicates the value proposition to its customers segments.

### 4.6.1 Awareness and evaluation

To ensure a large consumer base, community members need to be aware of the value proposition of the water kiosk. Therefore, certain channels must be built to help communicating the value proposition as well as the health benefits that come along with using safe water sources. To influence people's behaviour regarding safe water consumption, it is crucial to use both conventional and social marketing tools. The idea of social marketing has been elaborated by Kotler and Zaltman in 1971 (as cited in Heierli, 2008) to explain "the use of marketing principles and techniques to advance a social cause, idea or behaviour" (p. 73). The social marketing strategy has also emerged because products and services for poor people were mainly promoted as being affordable but not by making them desirable or aspirational. Moreover, water from pumps is often categorised as a charity product and not perceived as more desirable than water from unimproved sources. (Gertsch, 2017, p. 23)

A social marketing campaign is needed in order to raise awareness on the importance of consuming safe water. Community members need to understand that unimproved water sources are very likely to be contaminated and using them poses a threat to their health. The health education should additionally address common myths associated to water. For instance, some community members consider groundwater and water from natural streams as pure. Some villagers believe that water cannot cause illness because illnesses occur sporadic, whereas water is consumed daily or that using safe water occasionally can prevent health issues. Also, the myth that boiling water eliminates all contamination has to be addressed. (SWN, 2013, p. 124) Individuals also need to understand the relationship between using safe water, health and prosperity. Consuming safe water leads to less sick days and thereby to more productive working days as well as school days for children. Being less sick further results in fewer doctor visits and medical expenses. Moreover, families can save money from decreased fuel consumption because drinking water must not be boiled anymore. This means that using safe drinking water improves the overall health, prosperity and livelihood of a community. (SWN, 2013, p. 25)

The local communities need to understand the effect of safe water on their health. Moreover, cocoa farmers have to comprehend that consuming water from the kiosk can have a positive effect on their work efficiency as well as on their income and livelihood. Therefore, the village partner (e.g. Ghana Red Cross Society), other local partners and influential community members as well as water kiosk operators have to educate the potential customers on this topic. Comprehensive education is crucial for an effective implementation of the project and to minimize recontamination of water at the point of use,

for example by transferring water from jerry cans into other basins (Gertsch, 2017, p. 23). This education, for instance, could be provided by advertising the water kiosk services in public places, such as schools or health centres, and by simultaneously teaching people the benefits of safe water usage. The advertisement should use appealing signs that can be understood without a lot of text. Another option is to use plays or public performances to educate villagers about the importance of safe water (SWN, 2013, p. 194). These undertakings should be supported by influential persons, like the village chief or assemblymen, doctors, teachers, priests, leaders of women's groups or older community members (Ammann, 2017, p. 51; SWN, 2013, p. 125). If the service is not used by the "elites" of a village, there will not be an imitation effect and therefore, the influential and important people of a community have to be targeted first (Heierli, 2008, p. 90). In order to do so, however, it has to be figured out who those influential persons are in the communities of the Ashanti and Eastern Regions and afterwards engage those in the social marketing campaign (Heierli, 2008, p. 75).

So-called "water testing events" are another important tool to raise awareness of the water kiosk service and help people to evaluate the value proposition. This is an event where people can examine the water quality of their current sources compared to water from the kiosk. Ammann (2012, p. 36-37) observed water testing events in India where people could test the water they usually consume for bacteria and described how it works. A branded booth is set up in the village where water is put in a plastic Petri dish and stored for a few days. During this time, bacterial colonies and parasites grow and become clearly visible. Afterwards a water kiosk representative brings the Petri dishes back to the households, shows them the bacteria and parasites in the Petri dishes and explains the consequences of consuming contaminated water. Simultaneously, the representative points out that the water from the kiosk will not be contaminated if stored properly and asks the villagers if they would like to sign up for the service. This kind of demonstration helps people to evaluate the deviation in water quality between different water sources and is a good tool to raise awareness on the implications of using unsafe water sources. The water quality testing could be combined with the distribution of water samples, where villagers can taste the water. Furthermore, the village chief, assemblymen or other influential villagers should support those events and talk about their experience with the water kiosk and the benefits of consuming safe water.

The water quality testing events could be combined with group sales meetings. According to rural Ghanaians (iDE WASH Ghana, 2016, p. 250), group sales meetings are the best way to get a whole community to hear about a new product. To execute an in-person group sale, one needs the permission of the village chief and additionally, the Assemblyman should be invited to promote the service. It is also important to provide the potential customers with take home material and after the meeting, a follow up should be scheduled so that people get a chance to consult their families' opinion regarding the water kiosk service. The meeting should be held on a "day-off" when farmers stay home to ensure high attendance, and both men and women should attend the event as women and elderly people are key influencers in domestic purchases. (iDE WASH Ghana, 2016, p. 250-258) In the context of cocoa farmer communities however, it has to be assessed whether they regularly take a day off, especially during harvesting season. It should also be considered that the role of men and women in the household are different and therefore, their motivation to consume safe water can vary. Women on the one hand are seen as primary care giver of the family, responsible for food preparation and for all other household

duties (e.g. collecting water). They can be motivated by messages like drinking safe water prevents diseases among children, food tastes better and is safer to eat when cooked with clean water or the water kiosk is close and convenient. On the other hand, men are considered as head of the family, making all decisions on finances and household purchases and want to take pride in leading a prosperous household. Hence, they might be motivated by the fact that safe water and storage containers are affordable and of high quality, that safe water can reduce medical costs or that safe water results in regular school attendance and less missed working days due to illness. (SWN, 2013, p. 198-199)

Moreover, the water quality events and group sales meetings as well as signing up for the water kiosk service should be promoted during the "market day". Every district capital in Ghana has a market day where villages come to buy and sell goods. Hence, many people can be found in one place and in the mind-set to buy things. Customers often learn about new products on market days and the water kiosk should also take advantage of this to raise people's awareness. Furthermore, the water kiosk service could be promoted among self-help groups, micro finance women's groups or other community groupings because they provide a good entry point to raise awareness. Traditional advertising such as radio, television, flyers or billboards are also helpful tools. (iDE WASH Ghana, 2016, p. 250-258) However, with written slogans it has to be considered that the literacy rate is just around 70% in Ghana and in rural areas even lower (World Bank, 2010), which could limit the effect of such advertisement channels. Independently from the marketing or advertisement channel, the message delivered towards potential customers should always focus on the key reasons for obtaining safe drinking water. This encompasses, for instance, the shorter travel distance to fetch better quality water, saved energy and time since water boiling is not necessary anymore, health benefits and various other reasons (SWN, 2013, p. 124).

### 4.6.2 Purchase and delivery

Customers can purchase safe water through two different channels: pick-up with jerry cans at the water kiosk and water taps at home. Because no delivery service is intended, direct pick-up should be as attractive as possible. Thus, the water kiosk should have a nice and appealing design, should be centrally located and maybe serve as a community centre where also other activities take place (Dalberg, 2017, p. 36). For instance, the water kiosk could attract customers by offering charging service for electronic devices or opening a small convenience store. When people pick-up water at the kiosk, they directly get in contact with one of the employees. Customers who have direct household water connection do not get into daily contact with a water kiosk employee. They might have contact on a monthly basis when paying the service fees, however this depends on the payment system.

### 4.6.3 After sales

To ensure long-term sustainability of the project, some after sales channels should be established. Otherwise customer complaints or system malfunctions cannot be reported, which could lead to customer dissatisfaction, lack of maintenance and eventually system failure. There are different options to provide the customer with post-purchase support. First of all, regular surveys regarding customer satisfaction could be conducted for both segments. This helps to identify customer dissatisfaction and to indicate improvement possibilities. Furthermore, a hotline could be offered in case of complaints. This could be someone from the coordinating body that manages different water kiosks and can provide support. This

service is especially important for people with direct household connection as they do not get in daily contact with a water kiosk employee and need assistance in case of non-functionality.

### 4.6.4 Risks, challenges and unknown

*Behavioural change and customer's limited financial resources*

Selling a product to Bottom of the Pyramid [BoP] customers is difficult because they have to spend the little money available thoughtfully. Additionally, it is challenging to change the long-term behaviour of the target population because many poor people are not aware of the benefits of safe water and do not want to pay for it as long as they still have water in their well. (Ammann, 2012, p. 36) Hence, there exists a risk that people are going back to using unimproved water sources as soon as the health education is not that present anymore or if the community members are hit by an economic downturn.

### 4.6.5 Parameters for business model development

| **Awareness and Evaluation** | |
|---|---|
| **Parameter: health education**<br>- Are people aware that the water they are currently consuming might be contaminated?<br>- Are people aware that contaminated water has negative implications on their health, income and livelihood?<br>- How does the organization intend to raise awareness on the positive effects of consuming safe water?<br>- How can prominent myths on water consumption be overcome?<br>- Which local influential people could support health education campaigns? | **Relevance / critical information**<br>Many local people are not aware of the importance of consuming safe water. Hence, there must be sufficient education on the health issues that come along with using unsafe water sources. |
| **Parameter: advertisement of water kiosk service**<br>- How, where and how often does the water kiosk promote and advertise its service?<br>- How should the water quality testing events take place? (timing, placement, frequency etc.)<br>- How and when could a group sales meeting be organized?<br>- Should the marketing message differ between men and women? If yes, what are the different marketing messages?<br>- Who are influential persons in the communities who could be engaged into the (social) marketing campaign? | Since the water kiosk is a new service in the community, certain channels must be established to advertise the service and to attract new customers. |
| **Purchase and Delivery** | |
| **Parameter: purchase & delivery**<br>- How can direct pick-up at the water kiosk be organised attractively for customers? (e.g. additional services, distance etc.) | **Relevance / critical information**<br>Customers must perceive picking up water from the kiosk as convenient. |
| **After Sales** | |
| **Parameter: after sales**<br>- How can a good feedback service be ensured?<br>- How can customer satisfaction be evaluated?<br>- How can customers report complaints or non-functionality? | **Relevance / critical information**<br>Feedback is important for continuous improvement, to address systemic weaknesses and hence, to ensure a long-term sustainable service. |

| Risks, Challenges and Unknown | |
|---|---|
| **Parameter: behavioural change and customer's limited financial resources**<br>- How can it be ensured that people use the water kiosk service and change their behaviour despite limited financial resources? | **Relevance / critical information**<br>Selling products to BoP customers is challenging, due to limited financial resources. A behavioural change might be difficult to achieve. |

**Table 10:** Overview of parameters concerning channels
Source: own table.

## 4.7 Customer relationships

The sustainability of the water kiosk project can only be ensured if a large and loyal customer basis is established. This can be fostered by building up strong customer relationships that support the acquisition and retention of clients and that boost future sales (Pigneur & Osterwalder, 2010, p. 32-33). Subsequently, it will be described how strong customer relationships can be built in the context of the water kiosk project.

### 4.7.1 Establishing strong customer relationships

*Foster project acceptability and adaptability*

In order to enhance the project acceptability and adaptability good customer/community relationships have to be built up from the beginning on. Community participation during planning, implementation and operation of the water kiosk helps understanding customer's needs, desires and as expectations and therefore, contributes towards a more desirable solution (IDEO.org, 2015, p. 14). It also fosters community ownership, enhances people's willingness to manage the project after implementation and ultimately, increases the project's sustainability (MWRWH, 2015, p. 60). Participatory planning encompasses listening, being there, building trust, letting all people talk, consensus finding and no previous decision-making. It is a democratic process that harnesses diversity, builds trust and understanding between the stakeholders, keeps the project implementer open to different perspectives and creates shared responsibility for the water kiosk. (Koestler, 2016c, p. 2-3) Through a participatory approach perspectives and realities of the community members are accurately reflected. It enables different actors, especially those who otherwise might be marginalized, to articulate their needs, interests and expectations, to sort out disagreement and a long-term strategy can be developed. (Koestler, 2016c, p. 2-3)

Different factors must be addressed during the participatory planning process. First of all, it must be evaluated whether the community is willing to contribute towards the water kiosk project. Thus, it should be assessed if communities are willing to contribute land, a water source and maybe a building for the water kiosk. Furthermore, a group of villagers must be identified who operates the water kiosk. Finally, villagers must agree to pay a certain fee for the water in order to finance the whole project. (SWN, 2013, p. 25) If this community contribution is not given, project adaptability will most likely fail. Community contribution can generally be assessed through village meetings, focus group discussions [FGDs] or personal interviews (SWN, 2013). Both, village leaders and community members have to understand that their willingness to pledge certain resources determines the success of the water kiosk. It is very important to get the consent regarding community contribution and project implementation of the village leaders and other influential individuals or groupings. They must understand all aspects of the water kiosk's market operations. It is crucial that both sides, community leaders as well

as project implementers, demonstrate clarity as well as transparency and their relationship must rely on trust and collaboration. (SWN, 2013, p. 35) To achieve all of this, it is essential that the coordinating body, the water kiosk operators, village partner and leaders, influential community groups and the community members itself regularly engage in meetings, where each party can provide information, ask questions and express desires and concerns.

Such meetings should not only take place during project planning but also after implementation. Actively engaging local people in the project evaluation fosters ownership and increases the sustainability of the water kiosk's activities (Koestler, 2016c, p. 3). During regular get-togethers, customers' opinion on the project can be heard and taken into consideration. This could, for instance, be done by providing them with a questionnaire where they can rate their satisfaction (e.g. from highly satisfied to highly unsatisfied) regarding various aspects of the water kiosk (e.g. reliability, quality, cost, convenience, service level etc.). However, written questionnaires can be problematic because of the limited literacy rate among villagers. Another option would be to divide customers into smaller groups and conduct the survey in form of a focus group discussion, where individuals can express their satisfaction on different aspects of the water kiosk.

*Establishing trust among customers*

Another way to establish good customer relationships is to offer a personalised service. Barki and Parente (2010) conducted a study on consumer behaviour of bottom of the pyramid customers in Brazil. Even though the country settings may differ in Ghana, the findings are still interesting to consider and could help building strong customer relationships. Barki and Parente (2010, p. 18-19) found out that BoP customers highly value personalised relationships with the enterprise. BoP customers appreciate face-to-face contact because they mistrust large institutions. Furthermore, they lack formal education, which leads to limited ability to read and understand product information. Therefore, customers rely on vendor advice or word-of-mouth recommendations as the main sources of information. This implies that villagers demand a high level of personal service. This can be guaranteed relatively easy for the customer segment which picks up the water in jerry cans at the kiosk. Thereby, it has to be assessed what kind of training employees need in order to become trustworthy and competent water kiosk operators. However, offering a personalized service to customers with direct household connection is more challenging. Establishing a helpline for this customer segment could be an option. The helpline could be connected to the water kiosk employees or the coordinating body and customers could report problems or get information. BoP customers value trust among people much more than trust towards institutions. Thus, it is vital to establish trustful and personal relationships with the community members to acquire and retain many customers. Well established and close relationships between water kiosk operator and customers are also needed to guarantee support in case of non-functionality or other issues. Good reporting systems and close relationships between customers and operator ensure that in case of system non-functionality support is guaranteed, which enhances overall project sustainability.

*Sense of membership*

A further strategy to foster long-term relationships is to establish a sense of membership and to promote an exclusive service. According to Barki and Parente (2010, p. 15-16) BoP customers have high aspirations to feel socially included because they have to compensate a low self-esteem and dignity deficit.

If the operators can build up a water kiosk community among villagers, those people belonging to it, might feel socially included. To establish a water kiosk community, the operators could offer regular get-togethers or other festivities. For instance, the world water day, which always takes place every March, could be celebrated together with the whole water kiosk community. During such festivities special performances from local celebrities or speeches from politicians, representatives from the Ministry of Sanitation and Water Resources, organisation representatives as well as community leaders could be featured. During this kind of events old customers are rewarded, new customers can be acquired and the project success or milestones can be communicated even beyond community boarders. (SWN, 2013, p. 196) Besides, festivities, regular get-togethers can be organized exclusively for water kiosk customers. For instance, these could take place each quarter or each month and include speeches from village leaders, members of the coordinating body, water kiosk operators or certain customers. During these meetings, customers should have the possibility to ask questions, to report problems and exchange experiences with other customers. Furthermore, quizzes could be held on issues related to water and health in order to test people's knowledge in health education. Those answering most questions correctly would be rewarded. (SWN, 2013, p. 193) On the one hand, such events can help establish a water kiosk community, enhance customer's connection to the kiosk and promote a sense of membership and exclusivity. On the other hand, these occasions, especially the get-togethers, should be harnessed to get feedback from the customers and enable them to learn more on WASH issues. This helps to constantly improve the service and gives the customers the ability to actually influence the project.

*Customer loyalty programs*

Finally, customer relationships can be strengthened by offering customer loyalty programs. This means that monetary and non-monetary incentives are offered to customers who regularly purchase water at the kiosk (Gertsch, 2017, p. 24). For instance, every 20$^{th}$ jerry can is offered for free. Though, with this kind of programs the water kiosk has to keep record of every jerry can purchased from each customer or provide them with a loyalty card and after every purchase put a stamp on it, which is time consuming and creates additional effort. Likewise, a "bring-a-friend" benefit program, rewards customers who bring a friend or relative. They could receive a certain number of free recharges of a jerry can or a discount on their next month household tap connection. Customer loyalty programs can help establishing strong customer relationships. Customers feel that their loyalty towards the water kiosk is rewarded and hence, are less inclined to change their water source.

### 4.7.2 Risks, challenges and unknown

Many of the previously proposed measures imply a certain level of community participation or contribution. However, there exist various obstacles that can hinder community participation and thereby, undermine project success. Selective participation is one issue that could arise. Often the more vocal, wealthier and better educated groups are engaged as community representatives whereas less obvious partners are not identified. Because many community groupings are not democratically elected, the inclusion of local leaders often does not represent the views and opinions of the broader community. This can lead to problems since the needs at stake are defined by people who do not necessarily experience poverty by themselves. Another problem related to community participation can arise due to conflicting interest groups within communities. Some needs can only be accommodated at the expense of others. Consequentially, conflicts between community groupings can easily develop. Furthermore,

local elites often act as gate keepers in development projects. There exists the risks that decision-making within a community falls into the hands of a small and self-perpetuating group. This means, if a certain project could threaten the power of local leaders, they might oppose it. Finally, community participation is often undermined because of a lack of public interest of being involved. This can result from previous experiences where people had the feeling that their expectations were not fulfilled. (Botes & van Rensburg, 2000, p. 45-51)

Due to the complexity of community dynamics there are no clear and easy to apply recipes on how to improve participation. However, Botes and van Rensburg (2000, p. 53-54) identified certain guidelines that could help improving community participation and involvement. For instance, they highlight the importance of co-decision making when defining needs, goal-setting, formulating plans and implementation of these objectives. Various villagers, especially the more vulnerable, less vocal and marginalized, should be considered rather than only focusing on the most prominent community members and groups. This could, for example, be done by conducting individual household interviews or FGDs with a small number of people, where also less obvious and prominent community members are heard (Morgan, 1993, p. 147). It requires a lot of effort from the project implementers to ensure that the people who do not have the ability nor the desire to participate are included in the project design and implementation. (Botes & van Rensburg, 2000, p. 45-46).

### 4.7.3 Parameters for business model development

<table>
<tr><th colspan="2">Establishing Strong Customer Relationships</th></tr>
<tr><td colspan="2">Foster project acceptability and adaptability</td></tr>
<tr><td>Parameter: community contribution towards project<br>- How many households will contribute to establishing a water kiosk with cash, labour or other resources?<br>- Are some villagers willing to operate the water kiosk?<br><br>Parameter: community participation in project planning<br>- How is the information flow between coordinating body/water kiosk enterprise and the community guaranteed?<br>- In which way is the community directly involved into the planning process?<br>- Which community groupings/individuals have a direct influence on the project planning and implementation?<br>- How can it be avoided that only the most prominent and obvious community groups/members are involved in the process?</td><td>Relevance / critical information<br>Community contribution is crucial for a successful customer relationship from the beginning on as well as to ensure project acceptability and adaptability.<br><br>Community inclusion into the project design must be guaranteed to some extent, otherwise project adaptability and acceptability is not ensured.</td></tr>
<tr><td colspan="2">Establishing trust</td></tr>
<tr><td>Parameter: establishing trust<br>- How is personal service for each customer guaranteed?<br>- What training is needed in order to become a trustworthy and competent employee?<br>- Is it possible to establish a helpline for customers with direct household connection? If yes, what must be considered?</td><td>Relevance / critical information<br>BoP customers value personalized service and trust personal relationships more than large institutions. Hence, establishing trust among potential customers is important to build strong customer relationships.</td></tr>
</table>

| **Promoting a sense of membership** | |
|---|---|
| **Parameter: promoting a sense of membership**<br>- How can a consumer community be built up?<br>- How could festivities and regular get-togethers be organized in order to acquire new customers and reward existing ones?<br>- In which way can such events be used to get customer feedback and to give customers a sense of co-determination? | **Relevance / critical information**<br>Building up a consumer community has the ability to convey a sense of membership among customers. This fosters long-term customer relationships. |
| **Customer loyalty programs** | |
| **Parameter: offering customer loyalty programs**<br>- In what way can customer loyalty programs benefit long-term relationships?<br>- How could a customer loyalty program be implemented? | **Relevance / critical information**<br>Customer loyalty programs have the ability to increase customer's retention, acquire new customers and foster long-term relationships, which is beneficial for the long-term project sustainability. |
| **Risks, Challenges and Unknown** | |
| **Parameter: insufficient community participation**<br>- Which obstacles can hinder holistic community participation?<br>- What measures can be taken in order to overcome these obstacles? | **Relevance / critical information**<br>Insufficient community participation can hinder successful project adaptability. |

**Table 11:** Overview of parameters concerning customer relationships
Source: own table.

## 4.8 Revenue streams

In order to establish a truly sustainable water service delivery, the project needs to be financially viable and generate revenues to cover project expenditures. The revenue streams in the context of the water kiosk project will include all payments made by customers to purchase water, maybe a subscription fee as well as certain additional products or services. In the beginning, this amount might not be sufficient to cover all operational and capital expenditures. However, in the longer term the water kiosk's expenditures should be fully covered by customer revenues. Charging people for water is often seen as controversial because it is generally considered as a free resource and one that citizens should have unlimited access to (Gertsch, 2017, p. 49; Cominelli, Galbiati, Tonelli, & Bowler, 2009, p. 671). Nevertheless, sustaining the system on its own by charging an appropriate price is crucial for the long-term survival of the water kiosk. If water is offered for free or at a price too low, the project is dependent on external funding and fails if not enough funds can be acquired (Gertsch, 2017, p. 49-50). Using grant or philanthropic funding to cover an inefficient or failing business is an ineffective use of money and additionally, does not deliver a sustainable social impact (Burkett, 2013, p. 22). Furthermore, when offering something for free products and services can be considered as worthless and it affects consumers' dignity (Heierli, 2008, p. 72). Therefore, in the following chapters parameters associated to the water kiosk's revenue streams such as potential pricing mechanisms, customer segment's willingness- and ability-to-pay as well as potential payment systems are evaluated.

### 4.8.1 Pricing mechanisms

When defining prices for a certain service or product, Pigneur and Osterwalder (2010, p. 37) broadly distinguish between fixed prices and variable prices. Since 2010 the United Nations General Assembly recognizes water as a human right and therefore, it is essential that states and international organisations

help countries, especially developing countries, “to provide safe, clean, accessible and affordable drinking water and sanitation for all” (United Nations, 2014). As drinking water has to be affordable, it is crucial that tariffs are reasonable for the local population. Therefore, it is recommended to introduce a fixed price rather than relying on variable prices which could fluctuate if supply or demand changes. A fixed price can be defined by different pricing mechanisms. Either the product or service has a list price (each product or service has a fixed price) or the fixed price is defined according to product quality, customer segment or volume sold. When selling water from a kiosk, three different pricing mechanisms are possible. The water kiosk could apply a list price where all people pay the same price for a certain amount of water. It would also be possible to sell water at a lower price to the poorest people within a community or to adapt different prices according to the quantity sold. For example, customers who purchase a large quantity (e.g. a whole jerry can) could benefit from lower per litre rates than people who buy small quantities (e.g. a 5 litre can). Defining the price according to water quality would not make sense because all people must have access to safe drinking-water quality. Similar pricing mechanisms also apply to the customer segment with direct household connection. Those customers will probably pay a monthly fixed price for the installation and maintenance of a water tap on their property. Additionally, they have to pay a fixed fee per litre consumed.

### 4.8.2 Willingness to pay

If rural water projects are to be sustainable and scalable, a process is needed to obtain information on the value placed on different service levels by the customer segments (Whittington, Briscoe, Mu, & Barron, 1990, p. 294). The ability to put a value on environmental resources in the absence of markets and prices for these resources is a challenge but the Contingent Valuation Methodology [CVM] is a useful estimation tool (Perez-Pineda & Quintanilla-Armijo, 2013, p. 1750). Different studies have used CVM to determine optimal service levels or to define charges for community-level water service delivery projects (Bohm, Fox, & Essenburg, 1993 as cited in Perez-Pineda & Quintanilla-Armijo, 2013, p. 1750). CVM includes determining the maximum willingness-to-pay of potential customers for different water service delivery options, such as public kiosks or house connections (Wedgwood & Sansom, 2003, p. 1). The approach requests people to directly state their willingness-to-pay to obtain a certain good or service (FAO, n. d., p. 5). If customers are willing to pay for the full expenses of a certain service, it is a strong indication that the service is valued and hence, most likely will be used and maintained. This further implies that it will be possible to attain the funds required to maintain and even scale the project. (Whittington, Briscoe, Mu, & Barron, 1990, p. 294)

The CVM process normally starts with some general questions and is then followed by a description of the plan for the provision of a public good. The description can be supported with additional material such as graphs or photographs. Afterwards the payment question follows, which queries the interviewees about their WTP for the proposed service. The payment question can be formulated in different ways. In the past, people were often asked open-ended questions about their WTP such as: "What is the most you would be willing to pay for ...?". Nowadays, it is less often used because of respondent’s difficulty to answer the question. Another approach is the iterative bidding process, where the researcher starts at some initial monetary value and keeps raising (or lowering) it until the interviewee declines (or accepts) the offer. This approach however, tends to result in a starting bias as the ultimate offer is related to the initial bid value. Another method is to list different possible WTP values on a paper and then to

ask the respondent to choose the number which best represents its WTP. The most widely used approach is the so-called dichotomous-choice format. Such a question would ask if the respondent would pay X to use the service or obtain a good. This method imitates behaviour in regular markets where people purchase, or do not purchase, a good at the posted price. Though, it has to be considered that the dichotomous-choice approach does not directly identify WTP, it can only indicate if the respondent's WTP value is higher or lower than the bid value. To improve the estimates in this method, the researcher could ask a follow up question. One could ask if the respondent would be willing to pay Y (an amount higher or lower than the first one) or query an open-ended question: "what is the most you would pay for…?". (FAO, n. d., p. 10-11)

Merrett (2002, p. 157) has some critique on how CVM is applied to the WTP for water services in low income countries. The author (Merrett, 2002) states that "in economic analysis the demand for water can be defined as the relationship, at a given time and within a defined market, between price per unit of the service and the quantity in each time period that consumers would purchase at each price" (p. 160). Typically, demand is graphically represented in a downward sloped curve, that indicates the difference in quantity purchased at each price, with price on the vertical axis and quantity on the horizontal axis. The demand curve for safe water is most likely non-linear because the marginal value of water tends to decrease as the customer is consuming the safe water for constantly less valuable uses[16]. Hence, the customer's WTP for each increment of water will gradually be decreasing. (ADB, 1999, p. 43) Merrett (2002, p. 160) argues that the economic and cultural context of demand can be studied under three categories. The first encompasses tastes and habits of consumers, which is the need for the service or product. The second includes price, quality and availability of services and products that customers recognize as substitutes. Those categories together account for the customer's willingness-to-purchase. The third one involves the incomes, assets and access to credit of consumers, which is an indicator for the ability-to-purchase. When applying this demand theory to the CVM some problems arise including the use of a maximum WTP, the lack of clarity in the way affordability is dealt with, the treatment of substitutes and personal perceptions.

Merrett argues (2002, p. 161-163) the problem with using a maximum WTP price is that people will adjust down their demand if the payment is based on unit prices (e.g. certain fee per jerry can) and not on a fixed charge per unit time period for access to a service (e.g. fee for household connection per month). Thus, in the first case a maximum price has no meaning as the quantity would be adjusted downwards if the unit price increases. Moreover, the distinction between ability and willingness-to-pay is often not explicitly made and it is difficult to assess the amount a costumer is able to pay and also willing to do so. Besides, Nyarko, Oduro-Kwarteng and Adama (2007, p. 95-97) state in their paper that people often understate their income in surveys and that household expenditures are often higher than income. This is done because of fear of being taxed or having to pay higher bills. Therefore, apart from identifying people's WTP, also their ability-to-pay has to be known and this should not only be based on their stated income but also on their monthly expenditure. Furthermore, customer's WTP is influenced by the price, quality and availability of services and goods that they consider to be substitutes. This must also be taken into consideration when identifying people's WTP. Lastly, Merrett (2002,

[16] E.g. safe water is more important for drinking or cooking than for cleaning or washing clothes.

p. 166) points out that when consulting people on their willingness-to-pay, they are also driven by private agendas. Some individuals, the cynics, think this kind of research is a waste of time and hence, indicate an unreasonably low bid price. The strategists overestimate their power to influence the outcome. To hold down water tariffs, they are biased to low prices. Another set of people, the diplomats, want to please the interrogator, which they perceive to be foreign professionals. Hence, they give answers that they believe the interviewers want to hear and rapidly accept any hint of what a favoured response could be. Lastly, idealists believe that the survey can positively impact their family and local community. Consequently, they try their best answering all questions as accurately as possible. When assessing household's willingness-to-pay, one should not assume that all people are idealists but rather that the respondents are a set of reflexive actors composed of cynics, strategies, diplomats and idealists, with mixed affiliation. (Merrett, 2002, p. 166-167)

Those factors have to be kept in mind when evaluating the customer segments' willingness-to-pay. The price that people are willing to pay voluntary should be considered when establishing water fees that approximate the true economic value of this resource. The advantage of this approach is that a social demand (access to safe water) could be satisfied while simultaneously an opportunity for private investors, such as the water kiosk enterprise, who seek reasonable risk-return options is created. Offering water charges below their economic value or subsidizing them is clearly unsustainable in the long run, even though it is altruistically motivated. (Perez-Pineda & Quintanilla-Armijo, 2013, p. 1757)

### 4.8.3 Price level

Deciding upon the correct price level for safe water is challenging because there are different factors which have to be taken into account. First of all, water is considered as a human right by the United Nations. However, this does not mean free access has to be guaranteed. Additionally, prices have to cover the expenses of the water kiosk but cannot be too high because as previously identified people have a certain ability and willingness to pay. If the water fees are too expensive, this decreases the customers' nominal purchase power and eventually, they cannot afford sufficient water for an adequate level of hygiene and sanitation (Karnani, 2007, p. 97). The difficulty of setting a reasonable water price is further highlighted by the fact that poor people often pay more than those from rich countries and also an excessive share of their income is used for water (Heierli, 2008, p. 18).

According to the World Bank, households should not spend more than 5% of their monthly income on water but the affordability thresholds vary among different agencies (Dalberg, 2017, p. 5). Between October 2012 until October 2013 the mean annual household income in Ghana's forest area (to which the Eastern and Ashanti regions belong) was GHS 12,102.59 (CHF 2,592.65[17]) and the mean annual income per head GHS 3,816.30 (CHF 817.55) (Ghana Statistical Service, 2014, p. 150). Based on these numbers an average household from this area should not spend more than GHS 50.45 (CHF 10.80) per month on water and an average person not more than GHS 15.90 (CHF 3.40) per month. Under the assumption that one person needs at least 20 litres of water per day to maintain a minimum level of sanitation and hygiene, the aggregated monthly water consumption would account for around 600 litres per person. This implies that the tariff per litre should not exceed GHS 0.0265 (or 2.65 Pesewas / CHF

[17] Exchange rate from Oanda.com on the January 2nd 2018: GHS 1 = CHF 0.2142.

0.0057). Those calculations are summarised in table 12. However, it must be considered that the calculations are based on average numbers and should be repeated once the actual income and the amount of water need is known. Most likely, the average income of the cocoa farmer communities is lower because the average numbers used above include also people who live in urban areas such as the Kumasi metropolis and thus, might earn more. Furthermore, the 5 percent rule is an indication by the World Bank and has to be adopted to local circumstances. Ultimately, water tariffs must always be in line with customer's willingness- and ability-to-pay.

| | **Per household** | **Per person** |
|---|---|---|
| Mean annual income (2012-2013) | GHS 12,102.59<br>CHF 2,592.65 | GHS 3,816.30<br>CHF 817.55 |
| Mean monthly income (2012-2013) | GHS 1,008.55<br>CHF 216.05 | GHS 318.03<br>CHF 68.15 |
| Max. 5% of monthly income spending on water | Max. GHS 50.45<br>Max. CHF 10.80 | Max. GHS 15.90<br>Max. CHF 3.40 |
| Minimum water needed per month (based on 30 days and min. 20l per day) | 1900 l | 600l |
| Max. water tariff per litre | GHS 0.0265<br>CHF 0.0057 | |

**Table 12:** Calculations of water tariff level
Source: own table.

The CWSA policy from 2003 states that water tariffs should cover operations and maintenance, major repairs, replacements and extension to new areas. Hence, the water fees should recover the supply cost of the service, whereby cost elements include both operating and capital expenditures (through depreciation of the various assets). Furthermore, CWSA's policy from 2003 demands that tariffs do not exceed the cedi equivalent of 1 US$/m$^3$ (CHF 0.95[18]). (Nyarko, Oduro-Kwarteng, & Adama, 2007, p. 92-94) This implies that the previously calculated numbers would be too high, since 1m$^3$ of water would be GHS 26.54 (or approx. US$[19] 5.85 / CHF 5.70). However, since CWSA's guideline is from 2003 it is possible that the maximum tariff of 1 US$/m$^3$ is not valid anymore. The water tariff levels are set by the WSDBs or the WATSAN committees in accordance with communities. MMDAs review and approve the water fees. (CWSA, 2010a, p. 4)

Certainly, people with direct household connection would pay more because they also have to cover the monthly cost for the water tap installation. Whether their water tariff per litre is higher than the one at the kiosk has to be discussed. The household taps are armed with a water meter based upon which the monthly water fee is charged. Besides, it should be examined if different amounts of water could be purchased at the kiosk. For instance, this means that water could be purchased by litre instead of filling the whole jerry can. Finally, it shall also be examined whether poorer population groups should be subsidized by more affluent villagers or by the government. This could increase the customer base and also enable the poorest community members to get access to safe water. Revenues might be lowered if a loyalty program is offered as it has been proposed in chapter 4.7.1.

[18] Exchange rate from Oanda.com on the January 2nd 2018: USD 1 = CHF 0.9738.
[19] Exchange rate from Oanda.com on the January 2nd 2018: GHS 1 = USD 0.2201.

### 4.8.4 Payment system

For the water kiosk, it is proposed to use a "pay-as-you-fetch" method. It must still be defined whether fees at the water kiosk are collected in cash, through mobile phone, a "water credit card" or any other payment system. All of the solutions have certain advantages and disadvantages and must therefore be examined in detail (see table 13). Payments in cash is the easiest option to operationalize in the short term. However, when larger sums of cash are collected the problem of corruption, embezzlement and misappropriation arises (Morath, 2015, p. 25). Furthermore, very small amounts of Ghanaian cedi have to be available to hand out change. However, as one jerry can could cost less than the smallest available coin of the local currency this might cause a further problem for cash payment. Also, paying in cash takes some time, especially if customers do not have the correct amount at hand. Another option is using so-called water credit cards. These could either be charged at the water kiosk or through mobile payments. If they are charged at the water kiosk with cash, the same problem of embezzlement, corruption and misappropriation could arise. Moreover, people would have to make upfront payments in order to put water credits on their cards which is always a question of affordability. Besides, an additional effort is necessary to load water credits on the card and it might need additional employees to offer this service. It could also be possible to charge cards through mobile phones or to use a mobile payment system. In 2016, Ghana's mobile-cellular telephone subscription rate has been over 130%[20]. To make mobile payment work, a solution must be found with Ghana's largest mobile phone service providers, MTN, Vodafone, Tigo and Airtel. Establishing such a partnership with a mobile phone provider can be challenging and might take some time (Telecoma, 2016). Additionally, this implies that all customers need to possess a mobile phone in order to use the water kiosk service. However, using a water credit card or a mobile payment system would allow very fast transaction at the kiosk and in the future, the whole system could eventually be operated automatically through a water dispensing machine.

| | Advantage | Disadvantage |
|---|---|---|
| **Cash Payment** | • Simple to operationalize | • Risk of corruption, embezzlement and misappropriation<br>• Availability of small cash amounts<br>• Time consuming |
| **Water Credit Card** | • Fast transactions at kiosk<br>• Potentially no physical cash collection (if charged through mobile phone) | • Upfront payment for customers<br>• Upfront investment for kiosk<br>• Additional "infrastructure" required |
| **Mobile Phone Payment** | • No physical cash collection<br>• Fast transaction at kiosk | • Upfront investment for kiosk<br>• Partnership with telecom company required |

**Table 13:** Advantages and disadvantages of different water kiosk payment systems
Source: own table.

The aforementioned payment systems are applicable to those customers picking up water from the kiosk. For the customer segment with direct household connection, a successful mobile payment process from another project is presented in the subsequent paragraph.

[20] Total mobile-cellular telephone subscription in Ghana in 2016: 38,305,078 (ITU, 2016)
Total population in Ghana in 2016: 28,206,728 (World Bank, 2016).

Safe Water Network [SWN] operates water provision systems in Ghana and has successfully integrated mobile payment into their operations. Their experiences provide interesting insights and are valuable for the project at hand. SWN's customers can unlock household water taps with SMS codes triggered by mobile payments. This tackles the issue of arrears and physical collections of revenues which often occur with household water connections. With this mobile payment system, customers pay now for every litre upfront instead of receiving one water bill at the end of the month, which enables them to gain control over their water consumption. The water kiosk operator could profit enormously from this system as it reduced the time for collecting payments and overall, their revenues increased as fewer payments were missing. Hence, it should be evaluated if a similar system could be established for customers with direct household connection. Eventually, the system could also be extended to customers who pick up water from the kiosk. To set up such a payment system SWN established a partnership with the telecommunication company MTN Ghana, which might also be a valuable partner for the project at hand. (Waldron, Hwang, & Yeboah, 2018)

### 4.8.5 Additional revenues

Additional revenue streams can improve the project's economic performance. The sale of jerry cans generates an additional revenue stream for the project. Every customer is supposed to purchase at least one jerry can when registering for the water service. The jerry cans are all identical and branded with the water kiosk logo. Furthermore, it shall be evaluated whether people have to pay a one-time subscription fee for the water service when signing up in the beginning.

Along with selling water at the kiosk, the infrastructure could also be used as a retail shop or as a charging station for mobile phones, which would generate additional revenue streams to finance the project. It is important that these additional services do not stand in competition with other local businesses. Also, other enterprises or organisations could place advertisement against a certain fee at the kiosk. This could generate some additional revenues without a lot of effort because the kiosk is likely placed at a central location within the village where people frequently pass by and see the advertisement. Furthermore, the water kiosk will probably have an own chlorine production in order to treat contaminated water. The kiosk could produce extra chlorine which is sold in the project area to people who do not yet have access to safe water. Finally, if unused space is available at the kiosk, it could be rented out in order to generate additional revenues.

### 4.8.6 Risks, challenges and unknown

*Defining a sustainable price level*

As previously mentioned, defining customer's WTP can be challenging because the marginal utility of water tends to decrease. Hence, it can be difficult to identify people's maximum WTP for water because it always depends on how much water is consumed. Besides, there are other factors which can influence people's WTP, such as availability of substitutes (both safe and unsafe water sources). Those factors make it difficult to identify customer's WTP in practice. Furthermore, customer's willingness- and ability-to-pay alone cannot define the price level because ultimately, the project has to be financially viable. Thus, there exists a risk that customer's willingness- and ability-to-pay are lower than the price necessary to cover operating and capital expenditures, which would undermine the project's long-term sustainability and threatens scalability.

*Collection of revenues*

Another risk or challenge is that customers with direct household connection are unwilling to pay their water bills, which can result in huge accumulated debts. These customers continue using the service however, they do not pay the bills and hence, hurt the financial health of the water service delivery system. (Nedjoh, 2016, p. 3) Before SWN introduced mobile payment in their water provision system, they had problems with payments in arrears. Their water station operators spent up to 25% of their time chasing payments because property owners often did not have enough money or were not home at time of collection. SWN had missing payments of one third of the year's water consumption. (Waldron, Hwang, & Yeboah, 2018) Therefore, for people with direct household connection a reliable payment system as the one currently tested by SWN, must be introduced. Otherwise the financial sustainability of the water project cannot be guaranteed.

### 4.8.7 Parameters for business model development

| **Pricing Mechanism** | |
|---|---|
| **Parameter: pricing mechanism**<br>- What kind of pricing mechanisms should be applied?<br>- Should there be one fixed price or should the price vary according to quantity sold and customer segment? | **Relevance / critical information**<br>The general pricing mechanism should be defined before deciding on price levels. |
| **Willingness-to-Pay** | |
| **Parameter: willingness-to-pay**<br>- What is customer's willingness to pay (for pick-up/direct household connection)? How much would people be willing to spend on a certain amount of water (e.g. one jerry can)? How much would they be willing and able to spend per month on safe water?<br>- How much is the potential customers' monthly income and expenditure? Do they have sufficient and regular income available to pay for safe water from the kiosk?<br>- Are there competing water services or products available? How much do they cost? How is the water quality of these competing services and products? How is the availability of these products and services?<br>- In what way could the WTP answers from community members be biased? | **Relevance / critical information**<br>WTP is a crucial factor for determining the price level at the water kiosk. If customer's WTP is too low, the water kiosk cannot be operated financially viable. This leads to sustainability issues. |
| **Price Level** | |
| **Parameter: price level**<br>- How much do customers have to pay to purchase one litre or one jerry can at the kiosk?<br>- How much does the monthly household tap installation cost?<br>- How much do customers have to pay per litre consumed at their household tap?<br>- Is there a maximum price level set by the Ghanaian government?<br>- Are different price levels offered according to customer segment, social group or quantity purchased? | **Relevance / critical information**<br>Price level must be set according to customer's ability- and willingness-to-pay and should cover capex & opex. Also, World Bank's water tariff threshold of maximum 5% of household's monthly income should be considered. |

| **Payment System** | |
|---|---|
| **Parameter: payment system**<br>- Through what kind of payment system are revenues collected? | **Relevance / critical information**<br>Different payment systems are available which come with certain advantages & disadvantages. |
| **Additional Revenues** | |
| **Parameter: additional revenues**<br>- How much is charged for a jerry can (wholesale price or with mark-up)?<br>- Are customers required to pay a one-time subscription fee?<br>- What kind of additional revenue streams could be generated? | **Relevance / critical information**<br>Additional revenue streams can improve the project's economic performance but should not stand in competition with other local businesses. |
| **Risks, Challenges and Unknown** | |
| **Parameter: defining a sustainable price level**<br>- How can a sustainable price level be defined?<br>- How can it be ensured that the project is economically sustainable but still affordable for local people?<br>**Parameter: collection of revenues**<br>- How can payment arrears be avoided? | **Relevance / critical information**<br>Customer's WTP might not be sufficiently high to cover the whole project cost.<br><br>Especially for customers with direct household connection, payment arrears are a risk. |

**Table 14:** Overview of parameters concerning revenue streams
Source: own table.

## 4.9 Cost structure

The cost structure describes all costs which incur when operating a business model. Costs can be calculated after having defined key resources, key activities and key partners necessary to deliver the value proposition to the customer segment as well as channels and customer relationships. In the subsequent chapters, the capital and operating expenditure related to the water kiosk project will be outlined.

### 4.9.1 Capital expenditure

Capital expenditures [capex] encompass all investments for longer term assets, such as machines, buildings, initial equipment, vehicles etc. (Gabler Wirtschaftslexikon, n. d. a). Hence, capex include all costs which are associated with the installation of the water kiosk. It includes all the physical resources that are required to build the water kiosk infrastructure as well as the costs for installing the water kiosk system (see table 15).

| **Capex** |
|---|
| Acquisition of land rights<br>Borehole drilling<br>Solar pump & panels<br>Water kiosk system:<br>- *Pipes*<br>- *Water tank*<br>- *Water taps*<br>- *Water meters* |

Kiosk facility:
- *Construction material*
- *Decoration (e.g. painting)*

Installation of water system and kiosk facilities (salary for constructors)
Chlorine production:
- *Facility (e.g. WATA)*
- *Initial ingredients for chlorine production*
- *Installation of chlorine production*

Jerry cans
Maybe payment system set-up cost

**Table 15:** Capex positions
Source: own table.

### 4.9.2 Operating expenditure

Operating expenditures [opex] include all costs that are necessary to ensure the running of business operations (Gabler Wirtschaftslexikon, n. d. c). In order to ensure a financially viable business model all opex (see table 16) must be covered by the income received at the water kiosk (SWN, 2013, p. 146).

**Opex**
Salary of water kiosk staff
Training to kiosk employees & rotating mechanics (material & compensation)
Payments to coordinating body
- *Salary for rotating mechanics*
- *Vehicle for rotating mechanic*
- *Material for maintenance & repair*
- *Administrative work & expenses*

Infrastructure maintenance
- *Cleaning*
- *Material for small repair work (not executed by rotating mechanics)*

Borehole (or water source) charges
Chlorine production
- *Ingredients (salt-solution)*
- *Maintenance & repair of production*

Water quality testing
- *Material*
- *Laboratory tests*

Jerry cans
- *Cleaning fluid*
- *Replacement of jerry cans*

Customer feedback
- *Customer survey*
- *Helpline & complaint service (e.g. salary, phone)*

Social & commercial marketing (always material & staff compensation):
- *Market assessment (e.g. household survey)*
- *Branding of jerry cans / clothes / kiosk*
- *Health, sanitation & hygiene education*
- *Advertisement & mobilization in schools, health centres etc.*

| |
|---|
| - *Advertisement on billboards, flyers, TV, radio*<br>- *Group sales meetings*<br>- *Water testing events*<br>*Events for consumer community*<br>Operating certificates / water quality certificate<br>Administrative expenses (e.g. bank account)<br>Travel expenses<br>Insurance<br>Capital cost loan repayment<br>Taxes<br>Miscellaneous & unforeseen |

**Table 16:** Opex positions
Source: own table.

### 4.9.3 Risks, challenges and unknown

*Unsustainable cost structure*

As identified in the previous chapters, the cost structure seems relatively extensive compared to the revenue streams presented in chapter 4.8. Since the goal of this project is to develop a truly sustainable water project, this also implies financial sustainability. Therefore, the costs outlined in this chapter must be covered by the revenues generated through water sales and maybe additional revenue streams. Covering the capex already in the project set-up phase might not be possible. However, the opex should be covered through the kiosk's revenue stream. There exist the risk that the cost structure is too large in order to be covered by water sales only because ultimately, the water tariffs must be in line with customer's willingness- and ability-to-pay.

The operating cost coverage ratio (see Formula 1) provides a critical sustainability benchmark for water service providers in small towns (Nedjoh, 2016, p. 5). According to Sansom (2014, as cited in Nedjoh, 2016), "this ratio is expected to be >2 to enable investments in replacing old infrastructure and providing new infrastructure for an expanding population" (p. 5). Once the input values for the revenue stream and the cost structures are clear, the cost coverage ration can be calculated. If the ratio is too low, the sustainability of the water kiosk project cannot be guaranteed because the generated revenues cannot sufficiently cover future expenses.

$$Cost\ coverage\ ratio = \frac{total\ annual\ operational\ revenues}{total\ annual\ OPEX} \quad \textbf{(1)}$$

*Exchange rate fluctuations*

The risk of exchange rate fluctuations applies both to cost structure and revenue streams simultaneously. Revenues will be generated in Ghanaian cedi, whereas parts of the expenditures might accrue in a foreign currency. If the Ghanaian currency suddenly depreciates, the purchasing power for foreign goods or services is lowered. This means, that importing goods, such as spare parts or other resources from another country, can suddenly imply a higher financial burden for the water kiosk. As commonly known, foreign exchange fluctuations can be caused by various factors. For instance, import and export

(real economy) of a country, interest rate differences, capital movements or political events can all affect the exchange rates and therefore, also the project's financial performance.

### 4.9.4 Parameters for business model development

| **Capex** | |
|---|---|
| **Parameter: pricing mechanism**<br>- What kind of and how much capex are required to implement a water kiosk project?<br>- How can these costs be kept at a minimum level? | **Relevance / critical information**<br>Some initial capex are necessary in order to set-up and implement the water kiosk. |
| **Opex** | |
| **Parameter: willingness-to-pay**<br>- What kind of and how much opex are required to implement a water kiosk project?<br>- How can these costs be kept at a minimum level? | **Relevance / critical information**<br>Opex are constantly required to keep the water kiosk operating. |
| **Risks, Challenges and Unknown** | |
| **Parameter: unsustainable cost structure**<br>- Is it possible to cover at least the water kiosk's opex through water sales?<br><br>**Parameter: exchange rate fluctuations**<br>- How much can foreign exchange fluctuations affect the project's finances? | **Relevance / critical information**<br>The project must be financial sustainable and therefore, (at least) operating costs must be covered through own revenues.<br><br>Part of the supplies might be purchased from abroad, which leads to exchange rate exposure. |

**Table 17:** Overview of parameters concerning cost structure
Source: own table.

# 5 Conclusion

This final chapter summarises the findings of the present master's thesis and outlines the limitations of these findings. Finally, it closes with recommendations for further research.

## 5.1 Summary of the findings

Developing a business model for a truly sustainable water service delivery in rural and semi-urban Ghana reflects a complex system. Various actors from diverse sectors and all driven by different motivations are involved in the development of a water supply project. Central to this complex system are Nestlé's Creating Shared Value [CSV] activities which are also the underlying reason for the initiation of water supply projects benefiting Ghanaian farmers in Ghana. Through the implementation of CSV projects, cocoa farmers, Nestlé and IFRC shall benefit. The establishment of safe water supply systems for cocoa farmer communities improves the people's health and livelihood. Whereas Nestlé increases productivity, efficiency and quality of their suppliers and IFRC gains access to funding and accomplish their target of providing water supply to underserved areas.

When developing and implementing a water service delivery, various factors and parameters must be considered. With the help of the Business Model Canvas and a Human-Centred Design approach, whereby the desires and needs of the local community are kept at the core, a desirable, technically feasible and financially viable business model for a water supply system can be developed. These two concepts supported the establishment of a toolbox that assists in developing a water service delivery. At the centre of this system, a water kiosk enterprise is established with the help of the local Red Cross Society. The project's value proposition focuses on delivering safe water to cocoa farmer communities through a network of water kiosks powered by solar pumps. To deliver this value proposition to the customer segments, certain key activities, resources and partnerships are necessary. Furthermore, the water kiosk enterprise needs to create channels for reaching customers and establishing strong customer relationships. Finally, the enterprise has to generate sufficient revenues in order to be self-sustaining and thus, achieve financial viability. Throughout the thesis, for each of these building blocks certain parameters and questions were identified that must be addressed when developing and implementing a water kiosk project.

While identifying necessary parameters for a sustainable water kiosk business model, it has become evident that the project's success is dependent on various factors. First of all, to make the water service delivery desirable, community participation as well as comprehensive health, sanitation, and hygiene education have been identified as crucial parameters. This helps cocoa farmer communities to understand the importance of consuming safe water. Moreover, to foster project acceptance and adaptability, community contributions and the establishment of local connections with the Ghana Red Cross Society, the local governmental WASH institutions, as well as the village leaders and groups are important. Besides, a strong and unique brand can also enhance project desirability by making the water kiosk more aspirational. Technical feasibility has also been identified as a crucial factor in every development project. Here, the technical feasibility is dependent on the availability of different resources and suitable partners, which support the execution of key activities necessary for delivering the value proposition. Central resources for the project at hand are, for instance, a reliable water source and water treatment

possibilities as well as all components of a water kiosk system. Moreover, key partners, such as local governmental WASH institutions, the local Ghana Red Cross Society or other organisations, must be identified. Also, motivated, skilled and dedicated employees have to be hired and trained. Additionally, a coordinating body shall be established which ensures maintenance and long-term functionality of the system with the help of rotating mechanics. Finally, financial viability of the system must be guaranteed. This includes acquiring project funding and defining an accurate price level based on customers' willingness- and ability-to-pay, which can cover project expenditures. Additionally, an adequate payment system shall be identified to collect revenues efficiently.

When developing a business model for a water service delivery, not only certain success factors must be guaranteed but also potential risks and challenges have to be addressed. For instance, the project can be at risks if project acceptability or community participation lacks. Also, system breakdown resulting from insufficient maintenance poses a risk to the project. Moreover, some challenges such as recontamination of water at point of use or switching back to old behaviours (consuming water from unsafe sources) have to be overcome in order to develop and implement a sustainable water kiosk project. Besides, corruption of employees and other actors as well as weak governmental institutions might also imply challenges or risks.

## 5.2 Limitations of the study

The underlying concept of the water service delivery in this thesis focuses on a network of water kiosks and the connection of households to the water system. This implies, that other water supply systems (e.g. hand pumps or water tank deliveries) were not considered in the thesis at hand. Moreover, the focus only lies on the provision of safe water, whereby health and sanitation aspects were not covered in more detail. Furthermore, the research has been limited by the fact that a field visit was not possible for the author. Therefore, certain specific factors, which are only available through a field visit, could not be integrated into the parameters and questions of the developed toolbox.

## 5.3 Recommendations for further research

These limitations, however, provide inputs for further research. By compiling a toolbox for the development of a business model for a water kiosk system, the author of the present thesis pursued a broad research approach. Therefore, various aspects or parameters identified in the thesis at hand provide a basis for further research. For instance, the setting-up of a water kiosk enterprise should be examined in more detail. As previously outlined, there exist various possibilities on how to implement a water kiosk enterprise. However, depending on specific local conditions and more in-depth research, the most suitable solutions should be found. Furthermore, the identification of an adequate water tariff level is crucial for successful development of a sustainable water kiosk project. Additionally, it provides a highly interesting topic for future research because a sustainable price level is dependent on various factors such as customer's willingness- and ability- to pay, availability of competing water supply systems as well as the need for economic sustainability. Thus, it can be argued, that the provision of safe water to cocoa farmer communities still provides a vast amount of further research topics. However, when conducting a study on this topic, local conditions must always be taken into consideration.

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# Appendix: Governmental Actors in Ghana's WASH Field

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| Ministry of Sanitation & Water Resources [MSWR] | The MSWR has been established in 2017 under the new president (Dietvorst, 2017). Earlier the water supply mandate has been split between the Ministry of Local Government & Rural Development and the Ministry of Water Resources, Works & Housing [MWRWH]. (WB, 2017, p. 129)<br>The goal of the Ministry is to improve the living standards of Ghanaians through increased access to and use of safe water, sanitation and hygiene practices as well as sustainable management of water resources (MSWR, 2017, p. 4) |
| Ministry of Local Government & Rural Development [MLGRD] | The MLGRD promotes the establishment and development of a well-resourced decentralized system of local government for Ghanaians with the aim to ensure good governance and balanced development of the MMDAs (MLGRD, 2018). MLGRD is the key actor responsible for supervising local government in the form of MMDAs (IRC & Aguaconsult, 2011, p. 8). The ministry also provides management advisory services to the MMDAs, sets targets for them and monitors their performance (MLGRD, 2018). |
| Environmental Protection Agency [EPA] | The EPA regulates and enforces environmental quality laws, including regulations and policies on pollution of water resources (IRC, & Aguaconsult, 2011, p. 9) According to CWSA's (2010a, p. 11-12) sector guidelines the implementation of all interventions have to comply with EPA's environmental regulations. EPA also supports the MMDAs, CWSA and beneficiary communities to ensure compliance with all social and environmental regulations. |
| Water Directorate [WD] | The Water Directorate has earlier operated under the MWRWH but is now incorporated under the MSWR. They oversee the sector policy formulation. The Directorate also reviews, monitors and evaluates the agencies' activities and coordinates activities of donors. (World Bank, 2011, p. 14) |
| Water Resources Commission [WRC] | The WRC is set up under the new MSWR and was earlier under MWRWH (World Bank, 2017, p. 130). The commission regulates and manages water resources and levies fees for water abstraction (IRC, & Aguaconsult, 2011, p. 9) All water project implementations have to be in accordance with the EPA as well as WRC regulations (CWSA, 2010a, p. 3) |
| Community Water and Sanitation Agency [CWSA] | The CWSA is incorporated under the MSWR (World Bank, 2017, p. 130). It has been created in 1994 with the goal of coordinating and facilitating the implementation of the National Community and Sanitation Programme [NCWSP] in Metropolitan, Municipal and District Assemblies [MMDA]. Hence, CWSA is responsible for facilitating the national community water and sanitation programmes and also reports on attainment of national coverage targets. The agency does not directly construct, operate or maintain water supply infrastructures. CWSA rather acts as a facilitator, regulator and coordinator, provides guidelines and sets standards as well as professional back-up support to MMDAs. (CWSA, 2010a, p. 1-3; |

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| | IRC & Aguaconsult, 2011, p. 27) CWSA works in a decentralised way by cooperating with the Local Government Authorities, especially the District Water and Sanitation Teams [DWSTs], which are the WASH Departments of MMDAs (Nedjoh, 2016, p. 3). CWSA is also responsible for coordinating the work of different actors such as public and private sector organizations, beneficiary communities and NGOs (RCN Ghana, 2018).<br><br>CWSA has a head office and regional offices, whereby the first one is responsible for the above mentioned tasks as well as to provide support to the regional offices. |
| CWSA Regional Offices (Regional Water and Sanitation Team [RWST]) | The CWSA regional offices provide back-up support to MMDAs' staff in different areas, especially in the preparation and review of District Water and Sanitation Plans [DWSPs]. This encompasses different tasks such as monitoring the progress of the project cycle or to increase sector capacity by providing training opportunities to stakeholders at the local, regional and national levels. Besides, CWSA regional offices monitor the effectiveness of National polices, CWSA guidelines and standards and if necessary recommend review. Regional offices also enable water safety monitoring in accordance with the Water Safety Framework and ensure the required actions are implemented. (CWSA, 2010a, p. 5) |
| Metropolitan, Municipal & District Assemblies [MMDA] | MMDAs exercise executive and legislative functions and are responsible for the overall development of Ghana's districts, which includes rural and small town water and sanitation delivery. They provide a legal framework for community based water supply management. District Assemblies [DA] are the highest political authority at the local level and they are mostly responsible that water service delivery is sustainable. The CWSA and MLGRD build the technical and management capacity of the MMDAs to enable them to implement water and sanitation programmes. (IRC & Aguaconsult, 2011, p. 10)<br><br>MMDAs prepare District Water and Sanitation Plans and monitor operation and maintenance of water systems regarding financial, technical and administrative performance. They establish the District Water and Sanitation Teams [DWST] and the Water and Sanitation Development Board [WSDB]. Furthermore, they audit WSDB and WATSAN accounts, approve the bye-laws for the operation of those institutions and provide technical support to them. Assemblies also regulate, review and approve community tariffs and ensure that regular water safety monitoring on district water supply system are carried out in accordance with the Water Safety Framework. In addition, MMDAs publish information on water supply, sanitation and hygiene promotion. For the water infrastructure delivery the assemblies are assisted by the private sector and private operators as or communities are used for the management of those systems (CWSA, 2010a, p. 6; World Bank, 2011, p. 14; Obuobisa-Darko & Asimah, 2008, p. 207) |

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| Regional Coordinating Council [RCC] | In each of Ghana's regions a RCC has been established. Their mandate is to monitor, coordinate and evaluate the performance of all MMDAs. Furthermore, they should monitor the use of all monies allocated to the DA as well as review and coordinate public services in their region. Unlike the MMDAs, their character and roles are not defined in the constitution but regulated by the Parliament. (IRC & Aguaconsult, 2011, p. 9, 32) |
| Water and Sanitation Development Board [WSDB] | In small towns the DA delegates the responsibility of service delivery to a WSDB to support and implement the water services. WSDB is the standard model used for the majority of small-town water systems with inhabitants between 2,000 and 10,000. WSBDs are elected bodies who manage the piped water system on behalf of the DA and report to them regularly. They participate in the planning and support the implementation of water supply facilities. The bodies can be dissolved after political power changes at the national and DA levels, which can lead to conflicts between WSDBs and DAs. (IRC & Aguaconsult, 2011, p. 10-14)<br><br>The Water Board is the major decision making body regarding water supply and sanitation and responsible for the management, operation and maintenance of small towns' water supply systems. They set tariffs for standpipes and house connections, are responsible for hiring and assigning operational staff (e.g. trained manager, operator and financial/administrative staff), promoting and distributing information within small towns and ensuring that all community members are part of the decision making. The employees are remunerated by the WSDB through revenues generated from the operations of the water system. The boards further ensure proper financial management, sanitation promotion and hygiene education. The operations can either be delegated to private company or are the direct responsibility of WSDB. (Nyarko, Oduro-Kwarteng & Adama, 2007, p. 93; IRC & Aguaconsult, 2011, p. 14; 27)<br><br>The Water Board generally consist of three members from each WATSAN committee (minimum one women) it is overseeing as well as of two Assembly Members from the DA. |
| District Water and Sanitation Teams [DWST] | Service delivery responsibility lies mainly with the WSDB, however, there are elements of support that come from the DA through the DWST. DWST are the WASH Departments in MMDAs. They are the technical unit to implement the District's water and sanitation program and hence, support the delivery of water and sanitation services (Nedjoh, 2016, p. 3; IRC & Aguaconsult, 2011, p. 10; 27). They are important in the post-construction support system and consist of an engineer, hygiene expert as well as community mobilizer. They do not conduct the repair themselves but rather assist the WATSAN to get the required support and training for running and repairing the system, solving conflicts and planning new capital projects. On request, the DWST visit the WATSAN committees and assist them to find necessary spare parts and connect them to area mechanics. The DWST also visit communities on their own initiative to check on circumstances |

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| | and to provide training sessions. However, to carry out those activities DWSTs have limited financial resources and technical ability available. (Komives et al., 2008, p. 288) |
| Water and Sanitation Committees [WATSAN] | The WATSAN are set up around one water source (e.g. one water kiosk) and assist the Water Board in carrying out its tasks and facilitate communication between the water users and the WSDBs (Obuobisa-Darko & Asimah, 2008, p. 207). The committees normally consist of five to nine members and should be gender balanced. WATSAN committees manage point sources like hand-dug wells, standposts, boreholes (mechanised and non-mechanised) for communities with inhabitants between 75 and 2,000. In small towns, where various standposts are located, different WATSAN committees may also manage these but the members of the committees usually constitute the WSDB. (IRC & Aguaconsult, 2011, p. 10, 14)<br><br>The WATSAN committee (together with WSDB) define water tariffs in consultation with the community and with final approval from the DA. The collected water revenues are deposited in the committee's account and managed by the WATSAN treasurer. The committees also manage day-to-day operations of the water points, contract a mechanic, who is normally a trained local and executes system repairs if necessary as well as a pump operator, who is responsible for the day-to-day operations and maintenance of the pump and collection of tariffs. The operator is normally remunerated on a commission base according to sales made. (IRC & Aguaconsult, 2011, p. 10, 14, 22; Obuobisa-Darko & Asimah, 2008, p. 207) |
| Community | Communities apply to DA for new schemes for which they demonstrate their commitment by depositing funds to meet 5% of capital costs. They establish WATSANs to set tariffs, maintain accounts and manage day-to-day operations of water points. (WaterAid, 2005, p. 5) |

# Declaration of Authorship

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St. Gallen, 22nd of May 2018