Developing Business Models for Urban Water, a Startup Company in Copenhagen, Denmark

AN INTERACTIVE QUALIFYING PROJECT
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Submitted to Project Advisors:
Fabio Carrera, WPI Professor
Hugh Lauer, WPI Professor

Submitted by:
Thomas Chiudina
Brian King
James Taylor
Zebadiah Yap-Chung

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cp17-water@wpi.edu
https://sites.google.com/site/cp17urbanwater/home

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ABSTRACT

Urban Water, a startup company in Copenhagen, Denmark, has recently rolled out its innovative backwater valve designed to prevent flooding in homes. In order to become a successful and sustainable business, Urban Water requires a business model to explicitly define how the company will function. Our team helped Urban Water develop a business model that defines how Urban Water will work with its most promising customer groups. For the customer groups, we explored how Urban Water could target marketing within geographical areas that are prone to flooding both in Denmark as well as in the USA.
EXECUTIVE SUMMARY

Copenhagen, Denmark frequently experiences flooding following heavy rains and abnormal tides. Figure 1 shows two recent instances of flooding in Copenhagen. The first depicts the flooding following a cloudburst in 2011, where more than 6 inches of rain fell in less than 3 hours. The second depicts coastal flooding from early 2017 that was a result of abnormal tides and strong winds off the ocean. Each of these floods was said to be a “once-in-a-century” flood, yet they occurred 6 years apart. Floods like this are projected to occur with increasing frequency due to the effects of climate change.

Urban flooding events, such as the 2011 and 2017 floods, frequently cause backwater flooding. Backwater flooding is when sewage and wastewater are forced backwards through sewer pipes into the basements of homes and buildings. Following his experience with backwater flooding during the 2011 cloudburst, Flemming Lind, the CEO of our project sponsor, Urban Water, a startup company in Copenhagen, developed a mechanical valve designed to prevent backwater flooding in homes (Figure 2). The valve does not require electricity to function. During periods of flooding, the valve automatically closes, preventing sewage from flowing backwards from sewer pipes into the homes served by those pipes. In addition, the valve includes battery-powered sensors and transmitters that send text messages to homeowners to inform them when it closes during flood conditions and when it reopens after the flood risk has subsided.
The goal of this project was to help Urban Water to develop a business model for its most promising customer groups and to explore the use of targeted geographic marketing in flood-prone areas of Denmark and the United States. To accomplish this goal our team interviewed promising customer groups, researched competitors in Denmark, and investigated backwater flooding in the United States.

Following our interviews with promising customer groups, our team developed value propositions for each group. Value propositions are the first part of a business model. They define the needs and wants of customers, as well as how a company like Urban Water will fulfill them. A summary of each value proposition is listed below:

- **Engineering Firms**: Engineering firms are being contracted to build or renovate for climate adaptation. While their long-term goals of separating the sewers are at odds with Urban Water’s, they could still be sold on the idea in areas where sewer separation is too costly.
- **Insurance Companies**: Insurance companies want to reduce flood risks and Urban Water’s product does just that. The data collection service provides risks for backwater flooding exclusively, adding to current flood risk maps. With real world proof of the valve’s effectiveness this could be an easy sell.
- **Plumbers and Sewer Specialists**: The valve’s low price and quick installation increases profits for plumbers.
- **Property Owners**: The valve minimizes the chances of property and health damage from a flood. Owners of apartments are interested by the low price point while individual homeowners are less so.
- **Utility Companies**: The valve’s data collection service will help them identify problems in the sewers.

To complete the business model, our team incorporated the value propositions with the results of an analysis of Urban Water’s competitors. This analysis compared two main aspects of Urban Water and its competitors: their products, and their websites. Through this analysis, our team developed reasons why customers should choose Urban Water over its competitors. Using the value propositions, the competitor analysis, and additional information provided to us by Urban Water, our team developed a business model that accounts for Urban Water’s most promising customer groups, and defines the methods for Urban Water to reach those groups through marketing and sales.
In addition, our team developed an effective geographical targeting system for Urban Water by identifying correlations between surface flood risks, developed areas, and combined sewer systems connections. Through this, we concluded that the US is a viable market for Urban Water. The first steps are gaining a complete understanding of the high flood risk, target areas and adapting the product to fit in local sewers. Backwater flooding is a risk well known by cities in the Great Lakes region, such as Chicago, Milwaukee, and Cleveland. Most governments of the cities we investigated will install backwater valves in high risk homes. A partnership with one or more of these cities is possible.

In order to implement the business model our team created in the short-term, we recommend that Urban Water:

1. Target its marketing and sales to plumbers, property developers, and property owners in flood-prone areas
2. Create a portfolio of successful installations and testimonials
3. Use the portfolio to help convince insurance companies to bundle the Urban Water Backwater Valve with insurance policies.

To improve upon the business model our team created, our team recommends Urban Water complete these tasks, which we categorized under Customer Relations, Marketing, and Further Research/

Customer Relations:

1. Further develop the value propositions for plumbers and property developers
2. Gain a better understanding of climate adaptation solutions
3. Work with municipal governments to install backwater valves
4. Establish partners in America in preparation for market entrance

Marketing:

1. Develop thorough go-to-market strategies
2. Clearly define the Urban Water brand
3. Collaborate with plumbers for advertising
4. Update the website to improve customer experience

Further Research:

1. Redesign products to fit new applications
2. Research sanitary sewer systems and associated methods of backwater prevention
3. Research competitors within the United States

Urban Water is redesigning its backwater valve to better suit consumer needs. It is adding active pumping capabilities to the valve so homeowners can safely use their water fixtures during a flood. UW is also resizing its product for use in larger buildings which would appeal to engineering companies and property owners working in the older and denser parts of Copenhagen or other cities.
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AUTHORSHIP

Brian King, Thomas Chiudina, James Taylor and Zebadiah Yap-Chung all contributed to the research and writing of this report. All members were involved in the following aspects of the project:

- Research pertaining to the Introduction & Background
- Value Propositions
- Interview Questions
- Final Presentation
- Final edits and review of Project Report
- Business Model Deliverable

Brian King was a main contributor to the entire report, including both writing, editing, and formatting. Mr. King conducted two customer group interviews, and was heavily involved with the creation of the value propositions, business model, and competitor analysis. He also created the templates for both the value propositions and the business model, and wrote the overarching interview questions. He was responsible for email communication between the team and both the project advisors and all potential interviewees.

Thomas Chiudina was involved in the writing and editing of the entire report but was a main contributor to the following sections: Executive Summary, 3.1, 4.1, 4.2, and Chapter 6 as well as the following appendices: C, D, and G-K. Mr. Chiudina was also responsible to implementing the value proposition canvas. He conducted two interviews. Mr. Chiudina conducted the research of Urban Water’s competitors and put together the competitor analysis. His heavy involvement with the final business models came in the form of describing strategies to reach each customer group, as well as overall organization.

James Taylor was heavily involved in developing the geographic targeting methods used in Denmark and the US. He assembled Chapter 5 which covers that method and the relevant appendix. He was also instrumental in assembling the Executive Summary, Urban Water Background, and Interview Summaries. He participated in contacting potential interviewees over phone and email. Mr. Taylor conducted two interviews, one where he took notes and another where he directed the conversation. He developed the Value Proposition model infographic which was essential for our proposal presentation and communicating the idea of a business model. Mr. Taylor coordinated email correspondence with Urban Water to acquire essential information for the project.

Zebadiah Yap-Chung conducted the phone calls required to establish contact with the potential consumer groups. These phone calls also included scheduling of interviews, either through in person meetings, video calls or sending the questions over email. Mr. Yap-Chung also conducted two interviews, one as scribe and another as the interviewer. He was a part of the formulation of the interview questions and the Value Proposition spreadsheets. Mr. Yap-Chung wrote the sections on the Value Proposition Canvas and Further Research. He also contributed to the sections involving the formalized value propositions, finalized business models and Future Markets for Urban Water. Lastly Mr. Yap-Chung was a part of the development and finalization of the business model deliverable.
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- Mr. Flemming Lind, *Urban Water CEO*
- Professors Fabio Carrera and Hugh Lauer, *Project Advisors*
- Professor Melissa Butler, *Project Preparation Advisor*
- Professor Steven Taylor, *Project Site Director*
- Ms. Elsa Sahiti and all other Urban Water Employees
CHAPTER 1: INTRODUCTION

On July 2, 2011, Copenhagen experienced a cloudburst that released approximately six inches of rain over three hours, causing city-wide flooding (Gerdes, 2012). Backwater flooding, a condition in which sewage flows backwards into homes, caused extensive damage during this storm (Schmitt, Thomas, & Ettrich, 2004). This phenomenon is not unique to Copenhagen. Other cities, such as New Orleans, Miami, and Venice face an increased risk of flooding due to rising global sea-levels.

Our sponsor, Urban Water, a startup company in Copenhagen, has developed a mechanical valve designed to prevent backwater flooding in private homes without needing electricity. During periods of flooding, the valve automatically closes, preventing sewage from flowing backwards from sewer pipes into the homes served by those pipes. In addition, the valve includes battery-powered sensors and transmitters that send text messages to homeowners informing them when it closes during flood conditions and when it reopens after the flood risk has subsided (Urban Water, 2017). The mechanical simplicity of Urban Water’s backwater valve allows it to be produced and sold for a fraction of the cost of existing products. In order to sell its valve, Urban Water requires business models for each of its customer bases to improve its chances of success in a competitive market.

Business models define the internal and external structure of a company, the activities a company carries out, who carries out those activities, and how the company will maintain an edge over competitors. Prior to this project, Urban Water had only rudimentary business models for the types of customers it had identified, hindering its ability to market its products effectively.

The goal of this project is to help Urban Water develop viable business models, helping it to successfully extract value from its products. We accomplished this by working closely with Urban Water to:

1. Formalize the value propositions for each class of customer
2. Finalize business models for each customer group
3. Develop a geographic targeting method to identify new customers locally and internationally.

At the conclusion of our project, we delivered a set of business models for each customer base, along with a report on the feasibility of international expansion to Urban Water.
CHAPTER 2: BACKGROUND

This chapter provides an overview of flooding in Denmark and its associated problems, and the history of Urban Water, the project sponsor.

During **backwater flooding**, sewage and wastewater is forced backwards through sewer pipes into the **basements** of homes and buildings. Blockages within the sewer system are a frequent causes backwater conditions, since sewage and wastewater cannot travel through the sewers. Blockages can include kitchen debris, overgrown tree roots, or broken pipes. In addition, heavy rainfall or snowmelt in springtime can inundate sewer systems, giving wastewater nowhere to go but backwards, causing backwater flooding. In extreme cases, backwater flooding can be caused when a natural body of water, such as a river, lake, or ocean, overflows into sewer systems (Public Works & Environmental Services Department, 2017).

**Combined sewers are at a much higher risk** for backwater flooding. In a combined sewer system, both surface runoff and sewage are handled by the same pipes. This introduces the obvious risk of combined sewer overflows (CSOs) due to the sheer volume of rain traveling through the system during a storm. Figure 3 depicts a CSO outfall that is often put in place to ease the impact of CSO events.

![Figure 3: Combined Sewer System](Image)

Section 2.1 describes backwater flooding in Denmark and the problems that arise from backwater flooding, and steps that can be taken to mitigate flooding. Section 2.2 discusses Urban Water, its products, its competitors, and how it fits into the context of flooding in Denmark.

2.1. Backwater Flooding in Denmark

Denmark, a low-lying coastal country, has a history of flooding, a problem that is only worsening due to climate change. According to Kirsten Halsnæs of the Technical University of Denmark, once-in-a-century floods have become more common, with recent occurrences in 2006 and 2017 (W., 2017a). A prevalent issue during major floods is backwater flooding (Lind Anderson, 2017). This section explains backwater flooding, its societal impact in Copenhagen, and methods that can be employed to prevent it.
In Copenhagen, extremely heavy rainfalls known as cloudbursts are the most common cause of widespread backwater flooding, and Copenhagen’s combined sewer system exacerbates the problem (US EPA Office of Water, 2004). A study conducted in 2012, following the cloudburst discussed in Chapter 1, determined that “45% of Copenhagener fear damage from future downpours” (Gerdes, 2012), highlighting the concern regarding cloudbursts among Danish citizens. Additionally, a cloudburst during the summer of 2017 threatened serious flooding, with 15 millimeters of rain in under 30 minutes (W., 2017b). Figure 4, shown below, shows a broad flood risk map of the Greater Copenhagen Area. Areas covered in darker shades of blue are at a higher risk of flooding. An area with no risk of flooding would be shown in white (COWI, 2016).

2.1.2. Impacts of Backwater Flooding in Denmark

Poor preparation and inadequate responses to backwater flooding can cause serious repercussions for homeowners. Backwater flooding causes severe water damage to basements and belongings stored there. The costs to repair these damages are significant. Many residents rely on insurance to protect their homes and belongings in the event of flooding (Datamonitor, 2000). After the 2011 cloudburst in Copenhagen, Danish insurance claims spiked almost two billion Danish kroner ($315 million USD) above the average, as shown in Figure 5 (Forsikring & Pension, 2017). A study conducted by Jurgen Kropp, a scientist at the Potsdam Institute for Climate Impact Research in Germany, determined that larger floods resulting from climate change could increase the cost of floods by billions of Danish kroner (Hirji, 2016).
Backwater flooding also poses potentially life-threatening health risks. Flood waters of this sort are contaminated by sewage, which contains endotoxin-producing bacteria such as E. coli, Salmonella, and Helicobacter (Life Science Weekly, 2012; Public Works & Environmental Services Department, 2017). In addition, flooded basements, when not cleaned thoroughly, are perfect environments for explosive mold growth. Mold presents severe health risks, most notably allergic reactions and the potential for respiratory diseases (Adams, 2013; Sandink, 2017).

### 2.1.3. Backflow Prevention Methods

Backwater flooding can be easily prevented in vulnerable buildings by installing backwater valves in outgoing sewer lines. Backwater valves are a type of one-way valve that automatically closes when water starts flowing backwards, protecting homes and buildings from flooding. Typically, backwater valves contain a pump system designed to push sewage and waste water from the home into the sewer, even during times of flooding. This prevents a home from being flooded by its own waste. Additionally, backwater valves often contain sensors that either alert homeowners about backwater conditions, or shut off the home’s water supply to prevent inadvertent backwater flooding from the home’s own waste. Installing backwater valves and maintaining sewage lines adjacent to the home is paramount to properly preventing backwater flooding.

Separated sewers prevent overflows during rain events, such as Copenhagen’s cloudbursts. This mitigates the risk of backwater flooding tremendously but converting a combined system to a separated system is a costly venture in dense urban areas. Much of Copenhagen’s sewage and storm water is transported through combined sewer systems, leaving the city vulnerable to more severe backwater flooding during cloudbursts (Greater Copenhagen Utility, 2015).
2.2. Urban Water ApS

Urban Water ApS is a Danish startup company created after the catastrophic July 2011 cloudbursts in Copenhagen. Founder and CEO Flemming Lind was one of the many people affected by backwater flooding. In the aftermath of this event, Lind faced costs of over 100,000 DKK to repair his flooded home. Lind was determined he could resolve the issue of backwater flooding in a better, cheaper, and easier way: through prevention. Thus, he founded Urban Water in 2011 and developed a valve to solve the problem.

2.2.1 The Backwater Valve

To solve the problem of backwater flooding, Urban Water developed a backwater valve that is substantially less expensive and easier to install than existing solutions. The Urban Water backwater valve (Figure 6) contains two passive valves that automatically close during backwater flooding events. Due to its passive nature, the valve does not require electric power to operate, except for a battery powered alarm system. This means the valve still functions properly during power outages. In addition, the valve is Type 3 certified, signifying that it is suitable for use in blackwater systems.\(^1\) The valve is designed to be easily installed in standard inspection chambers found outside Danish homes.

\[^1\] Blackwater refers to wastewater contaminated with human feces or urine

Figure 6: The Urban Water Backwater Valve
Although this valve is functional, Urban Water believes the design needs to be improved. The current design is sufficient for single family homes; however, it will not work for the 31.4% of Danes living in apartments (Eurostat, 2017). To reach these customers, the valve needs to be able to function in multifamily buildings. According to Danish regulations, backwater valves in multifamily buildings must have a pump mechanism that allows sewage from the building to bypass the valve when closed, preventing inadvertent backwater flooding from within the home. In addition, some buildings have inspections chambers of different sizes. Currently, the Urban Water backwater valve only fits in a Ø315 inspection chamber, commonly found in single-family homes and small buildings.

2.2.2. Data Collection Service

The Urban Water backwater valve includes a set of onboard sensors that feed into Urban Water’s data collection service. This service uses IBM Bluemix to record data from the valve, including when the valve opens, closes, or requires maintenance. Once enough valves are installed, the data collection service could provide valuable data on instances of backwater flooding in a city’s sewers. In addition, the data collection sensors are linked with the battery powered alarm system. When the sensors are triggered by the valve, the alarm system sends an SMS message to the valve’s owners informing them of the status of their system.

2.2.3. Current State of Urban Water

Since its inception, Urban Water has received over 12 million DKK ($1.9 million USD) from multiple grants that enabled product development and expansion of its business (F. Lind, personal communication, 2017). However, when trying to enter the market, it realized shortcomings in its product and business model. Specifically, the Urban Water backwater valve can only function in a single-family home, which drastically limits Urban Water’s market potential. In addition, Urban Water’s business plan did not specify what customer groups to market their valve towards. Currently, Urban Water is focusing its resources on research & development, improving the product, and reinventing its business model.

To date, Urban Water has sold nine prototype valves. Five valves were purchased by sewer contractors familiar with Urban Water. The remaining four prototypes were bought by Køge Forsyning, the utility company in charge of water and sewer management for the town of Køge (F. Lind, personal communication, 2017).

Urban Water aims to increase its sales drastically in the coming years. Its goal for 2017 is selling 200 units. Urban Water’s long-term goal is international expansion (F. Lind, personal communication, 2017). Urban Water first aims to expand throughout the rest of Denmark before eventually taking advantage of its access to the 510 million potential consumers in the European Single Market by expanding into Scandinavia and Western Europe (European Commission, 2010; Lind Anderson, 2017). Urban Water has expressed interest in expanding to the United States but has yet to determine the feasibility of such a move. The United States spans various climatic regions, has different sewer regulations per state, and a vast range of flood risks. Therefore, the United States must be analyzed to assess where Urban Water can operate profitably while fulfilling its purpose as effectively as possible.

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² Commonly referred to as text messaging
2.3. Project Overview

The goal of this project was to help improve Urban Water's business structure to enable the company to successfully extract value from their backwater valve. Urban Water required business models for each of their customer bases to move forward into the market. To achieve this goal, our team identified the following three objectives:

1. Formalize the value propositions for each consumer base identified by Urban Water.
2. Finalize business models for each consumer base identified by Urban Water.
3. Develop a geographic targeting method to identify new customers locally and internationally.

Our team synthesized prior market research from Urban Water with our own customer interviews to solidify Urban Water’s value propositions for five of the identified consumer bases. From there, we examined competitors and developed a set of competitive strategies to complete our business models. Lastly, our team studied population and flood risk maps of Denmark and the United States to develop a scalable solution for focusing Urban Water’s marketing efforts.
CHAPTER 3: VALUE PROPOSITIONS FOR URBAN WATER

Urban Water requires business models for each of its potential customer groups. Any business model first must have a well-defined value proposition. Value propositions explicitly define the needs and interests of potential customers and how a company’s product fulfills them. Urban Water, prior to the arrival of our team in Copenhagen, identified potential customer groups, but did not formalize the value proposition for all of these groups. As a result, Urban Water has missed out on vital business opportunities. Urban Water produces two primary products, a backwater valve and a flood data collection service, each corresponding to one or more customer groups. These groups are:

1. **Architectural Firms** — Primarily interested in the backwater valve. This group designs new structures and has a deciding role in what backwater prevention systems are installed, if at all.
2. **Engineering Firms** — Primarily interested in the backwater valve. This group is responsible for the installation of Urban Water’s backwater valve on a large scale, for example, an entire residential subdivision.
3. **Insurance Companies** — Interested in both the backwater valve and the data collection service. This group is responsible for covering damage costs due to flooding and accurately assessing flood risks.
4. **Plumbers and Sewer Specialists** — Primarily interested in the backwater valve. This group is responsible for the installation of Urban Water’s backwater valve in single-valve installation projects.
5. **Property Owners** — Primarily interested in the backwater valve. This group includes homeowners and property management services.
6. **Utility Companies** — Interested in both the backwater valve and the data collection service. Municipal entities, such as HOFOR and its subdivision CALLCopenhagen,³ are involved with green initiatives and flooding prevention.
7. **Wholesalers** — Primarily interested in the backwater valve. Wholesalers are an intermediate customer between Urban Water and Plumbers/Sewer Specialists.

This chapter explains what a value proposition entails, and describes the steps our team took to create value propositions for Urban Water’s potential customers. Section 3.1 defines the Value Proposition Canvas, a comprehensive visual framework for developing value propositions. Section 3.2 presents the results of the interviews our team conducted with potential customers of Urban Water. Section 3.3 presents the value propositions our team developed after carrying out the methods described in Section 3.2.

### 3.1. The Value Proposition Canvas

The Value Proposition Canvas is a tool created by Strategyzer, a business-oriented website dedicated to helping companies develop their business structure. The Value Proposition Canvas⁴ not only outlines what a company or product can bring to its customers, but delves deeper by helping to visualize, design, and test how value is created for customers. The entire process is split into two main components: The Customer Profile and The Value Map (Strategyzer, 2017b).

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³ HOFOR is the largest water utility in the city of Copenhagen. CALLCopenhagen is a branch of HOFOR specifically focused on the development and implementation of green solutions within municipal infrastructure.

⁴ The Value Proposition Canvas feeds into the Business Model Canvas, which we discuss in Section 4.1.2
The **Customer Profile** is broken down into **three parts:** **jobs, pains, and gains.** Jobs are tasks that a customer hopes to complete. They can be functional (i.e. commuting to work), social (i.e. meeting new friends), or emotional (i.e. gaining peace of mind). Pains are the negative outcomes that a customer hopes to avoid while completing jobs. Gains are the way in which a customer will measure the success of a completed job. They are positive outcomes such as concrete results or saving money. The more a business learns about its customers, the clearer the Customer Profile will become (Strategyzer, 2017b).

The **Value Map** also consists of **three parts,** each relating directly to a part of the Customer Profile. The first part, **products and services,** describes what a company will provide to customers to help them complete jobs. The second part, **pain relievers,** describes how the products or services provided will minimize or eliminate pains that customers experience while completing a job. **Gain creators,** the third part, describes how a product or service will maximize desired gains, or even create new gains, for the customers (Strategyzer, 2017b).

Thorough Value Maps and Customer Profiles create a clear connection between the needs of customers and how the features of the products and services of a company will fulfill those needs.

### 3.2. Customer Group Interviews

To create a value proposition for each customer group, our team created a template based on the Value Proposition Canvas (Appendix G). Urban Water provided our team with most of the information required to develop a Value Map for each customer group.

To develop Customer Profiles, our team **contacted members of each customer group,** the methods of which can be found in Appendix A. We conducted **semi-structured interviews** with those willing to be interviewed. These interviews filled gaps in Urban Water’s understanding of the needs and interests of each customer group. Our team developed a list of generic questions to be asked in each interview to create consistency among interviews (Appendix B). For each interview, our team modified the generic questions slightly to be more relevant to the interviewee. Our team conducted interviews in person or via Skype when the interviewee had time available to do so. If interviewees were unavailable for an in-person or Skype interviews, our team conducted the interview via email. Two members of the team conducted each interview, with one asking questions and the other recording the responses of the interviewee. Responses were not recorded verbatim. Appendix C, Appendix D, Appendix E, and Appendix F contain analyses, questions, and answers for each interview our team conducted. Our team came to these conclusions from our interviews with the following groups:

- **Architectural Firms** (Mr. Rob Marsh of C.F. Møller) are not a viable consumer group because they outsource plumbing design work to engineering firms.
- **Engineering Firms** (Mr. Søren Gabriel of Orbicon) are a viable but hesitant consumer group. Our interviewee doubted the capabilities of the valve. Their long-term goal of separating all sewers does not help Urban Water sell their valves.
- **Insurance Companies** (Mr. Kim Nissen of Tryg) are a viable consumer base because they are open to bundling the valves with insurance policies if sales improve. Their goal of risk reduction can be achieved through Urban Water; emphasizing this is recommended. Flood data licensing is unlikely because the high flood risk zones are already mapped and documented.
- **Property Owning Companies** (Mr. Jonas Nilsson of Hotel Nine Små Hjem) are a viable consumer base because the cost is reasonable for apartment buildings and hotels.
• **Property Owning Individuals** (Mr. Jonas Nilsson of Hotel Nine Små Hjem) will be the most skeptical consumer base because the valve is expensive and insurance covers the damages. It will be beneficial to target homes in areas with a high chance of flooding.

### 3.3. Formalized Value Propositions

This section presents the **value propositions** that our team developed for each potential customer group of Urban Water at the end of the interviews. Our team created a spreadsheet containing the value propositions, with a separate page for each customer group. The value proposition template can be found in Appendix G.

Urban Water provided **product brochures** and a **general business plan** that contributed to our broad perception of the value that Urban Water produces. These materials, along with Urban Water’s initial customer research, allowed us to develop initial value propositions in the spreadsheet. Our **interviews** allowed us to **refine each value proposition.**

We were **not able to reach every customer group** for an interview, limiting our value proposition. Our team found it very difficult to reach **plumbers** and **construction companies** who a) spoke English well enough to communicate with us, and b) were willing to take time to sit for a brief interview. The latter issue would likely be solved if our team were **fluent enough in Danish** to accurately explain the purpose of the interviews. As such, our team recommends that Urban Water continue to **develop the value propositions** for **plumbers** and **construction companies** by conducting interviews designed to determine the value these groups see in the backwater valve. The value propositions can be found in Appendix H, and a summary of each value proposition is listed below.

- **Engineering Firms:** Engineering firms are being contracted to build or renovate for climate adaptation. While their long-term goals of separating the sewers are at odds with Urban Water’s, they could still be sold on the idea in areas where sewer separation is too costly.
- **Insurance Companies:** Insurance companies want to reduce flood risks and Urban Water’s product does just that. The data collection service provides risks for backwater flooding exclusively, adding to current flood risk maps. With real world proof of the valve’s effectiveness this could be an easy sell.
- **Plumbers and Sewer Specialists:** The valve’s low price and quick installation increases profits for plumbers.
- **Property Owners:** The valve minimizes the chances of property and health damage from a flood. Owners of apartments are interested by the low price point while individual homeowners are less so.
- **Utility Companies:** The valve’s data collection service will help them identify problems in the sewers.

Our team originally considered architectural firms as a viable customer base, but removed them entirely following our interview with Mr. Marsh of C.F. Møller. He explained to us that **architectural firms do not deal with the infrastructure** of buildings. Instead, they work alongside **external engineering** and contracting firms that are responsible for developing plumbing and sewer systems.
Wholesalers initially seemed to be a promising customer group. We quickly learned that Urban Water would need to raise the price of their backwater valve to comply with the business model of wholesalers. Wholesalers make profits by selling products at reduced prices, and the price of Urban Water’s product cannot be raised while maintaining Mr. Lind’s desire to sell a low-cost backwater valve. Wholesalers present a valuable customer group and distribution method, but their business model and the desires of Urban Water are currently incompatible.
CHAPTER 4: BUSINESS MODELS FOR THE URBAN WATER VALVE

The value propositions presented in Section 3.3 are the starting point for Urban Water’s business models. Business models are the conceptual frameworks that companies develop to articulate how they will “create and deliver value to customers” and how they will create revenue from that delivered value (Teece, 2010). In other words, business models explain how a company does business (Amit & Zott, 2012). Many successful companies do not invent new business models, but instead modify existing models to better suit their needs (Teece, 2010).

4.1. Business Model Frameworks

Several methods for creating business models have been developed, however no one method is universally accepted (Chesbrough & Rosenbloom, 2002). The two methods presented here are the Value Proposition Method, which focuses on structuring a business, and the Business Model Canvas, which provides a template for all facets of a business model.

4.1.1. The Value Proposition Method

The Value Proposition Method (Figure 7) identifies six primary concerns that a successful business model must consider: Value Proposition, Market Segment, Value Chain, Cost Structure & Profit Potential, Value Network, and Competitive Strategy. Each of these concerns stems from the introduction of a new product to an existing market (Chesbrough & Rosenbloom, 2002).

Figure 7: The Value Proposition Method

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5 Our team uses this name for the sake of convenience. The referenced article by Chesbrough and Rosenbloom does not provide a specific name for the methods they define for creating a business model.
Developing a business model through the Value Proposition Method first requires the creation of a value proposition (see Section 3.1) based on the new product. This entails the definition of the product itself, as well as the features that benefit customers. The value of a product is derived from its ability to solve a problem or its ability to open new possibilities. Following this, a business model must describe the market segment or customer base that will benefit from the value proposition. In addition, the market segment describes the source of income or payment. Methods can include upfront sales, renting, licensing, etc. (Chesbrough & Rosenbloom, 2002).

Once the product and its target customers are defined, the business model must identify the value chain of the business. The value chain encompasses the internal structure of the business required to create and distribute the product. Defining this structure allows the business to estimate the cost structure and profit potential of its product(s) by considering the value proposition and the costs incurred within the value chain. Each of these steps can be further developed by the value network, which describes the business in relation to other entities, including suppliers, manufacturers, distributors, advertisers, etc. (Chesbrough & Rosenbloom, 2002).

The final concern addressed by the Value Proposition Method is the competitive strategies that give the business an edge in the market. Developing these strategies can only be done once the previous five concerns have been addressed (Chesbrough & Rosenbloom, 2002). Competitive strategies can be divided into four main categories:

1. **Novelty** — New activities, methods of relating them, or methods of governing them
2. **Lock-In** — Methods that entice outside entities to remain involved with the business model
3. **Complementarities** — Activities that provide more value in tandem than separately
4. **Efficiency** — Reducing transaction costs by simplifying processes.

These categories provide a framework for companies to examine both how to optimize the value-creation of other aspects of their business model and how to gain and maintain customers (Amit & Zott, 2010; Amit & Zott, 2012).

### 4.1.2. The Business Model Canvas

The Business Model Canvas (Appendix I) is a tool created by Alexander Osterwalder, the founder of a business oriented website called Strategyzer. This template divides the business model into nine sections that organize every aspect of a company. It is designed to fit all business types, from startups to established corporations. The sections are: customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partners, and cost structure.
Similar to the Value Proposition Method, customer segments and value propositions define target customers and how a company will produce value for those customers. Channels outline how proposed value will be provided to the customer. Customer relationships details the type of relationship a company wishes to create with its customers. Revenue streams describe how a company will capture value from its products and services, including price structures. Key resources detail the material resources and infrastructure required for a company to function successfully. Key activities describe what functions need to be performed in order to produce and capture value. Key partnerships, like the value network of the Value Proposition Method, and define structures and resources that a company cannot carry out or produce itself. Cost structure elaborate upon the revenue stream to include the cost of infrastructure to determine more completely how a company can capture value. When filled out completely, the Business Model Canvas maps out the complete business model of a company (Strategyzer, 2017a).

4.2. Analyzing Competitors of Urban Water

In order to complete Urban Water’s business models, our team examined its competitors by analyzing each one with respect to the four main categories of competitive strategies (See Section 4.1.1). For convenience, this paper refers to this examination as a NICE analysis, which stands for the four categories: Novelty, Lock-In, Complementarities, and Efficiency. Urban Water has four major competitors with well-established products and business models: ACO Building Drainage, Grundfos, Kessel, and Napan. The results of this analysis are presented in Appendix J.

The NICE analysis was sub-divided into two major components. First, our team compared the products of Urban Water and its four competitors. We examined various aspects of the products, including pricing, installation methods, operation type, and certification type. Figure 8 and Figure 9 show results of the product analysis.

![Figure 8: Comparison of Backwater Valve Features](image)
Second, our team analyzed the websites and marketing techniques of each company by conducting a heuristic evaluation of the websites of Urban Water and its competitors. Heuristic evaluations require evaluators to examine websites through the eyes of a customer, attempting tasks a customer would carry out regularly. This put no emphasis on the technical aspects of products and instead focused on the customer experience. Our analysis examined various aspects of each company’s websites, including keyword prioritization, ranking of importance (of aspects of their websites), online reputation, and the usability and content of their websites.

We first applied this analytical practice to our sponsor. Urban Water already provides novelty through its SMS alarm system. Immediate SMS alerts are unique within the backwater prevention industry. The alarm system allows for up to ten users to be notified when the backwater valve is in operation or needs maintenance. In order to create more novelty, Urban Water needs to stay updated with the constantly changing regulations in Denmark. Providing the most up-to-date product is the best way to supply novelty. Urban Water can lock-in its customers in a few ways. First, it should take advantage of the yearly service law that Denmark requires for all backwater systems. Urban Water can lock-in plumbers as well as valve-owners through this law. A partnership with insurance companies would also help by creating a greater incentive to purchase a valve because it would reduce insurance premiums. Complementarities are all of the features of Urban Water’s valve. It should emphasize to its customers that its valve includes all aspects expected of a backwater valve (type 3 certification, 2 valves, and an alarm system). Urban Water already creates efficiency through its simple installation and passive system. It can provide more efficiency if its customer service is improved, making the most painless experience possible for its customers.

### 4.3. Finalized Business Model

The business model our team arranged for Urban Water is a jumping off point for the company. The business model created by our team outlines how Urban Water can reach the customer groups identified in Interviews. It is built upon the value propositions our team created in Section 3.3 and the results of the NICE Analysis conducted in Section 4.2. The full business model can be found in Appendix K. It is the baseline for what Urban Water will use to present to new stakeholders. Our document defines Urban Water in these areas:

1. **Products:** Descriptions of what Urban Water’s products are, pricing plans, and how they get to customers.
2. **Customer Group Overviews:** The strategies to reach each customer group built from our value propositions and competitor analysis.
3. **Employee Responsibilities:** What Urban Water’s employees must do to succeed as a business.
4. **Suppliers:** Companies Urban Water is working with to produce their product.

5. **Expansion:** Takes our procedure developed in Chapter 5 and turns it into an actionable strategy for focusing marketing efforts.

The limitations of this document are in its presentation and content depth. Because of time shortages and limited access to high quality design software, this document lacks the graphics to convey key points of Urban Water’s business model and brand. We aimed to create full go-to-market plans for each customer group within the business model, creating a comprehensive and actionable description of Urban Water. Time limitations prevented this from coming to fruition as we were limited in how deeply we could analyze and strategize for each customer group. As a result, we have developed recommendations for Urban Water to carry out either on its own or with the assistance of a future IQP team. These recommendations contain objectives and details about how to achieve them and can be found in Chapter 6.
CHAPTER 5: TARGETING FLOOD-PRONE MARKETS

For Urban Water to gain a solid footing in Denmark it must know where its customers are. It is still a small company with limited resources to invest in determining this and capitalizing on it. Luckily by cross referencing census data with publicly available flood risk surveys this process is easy to implement. This is a scalable process for Urban Water, useful even when it goes international with its product.

5.1. Mapping Flood Risk and Potential Customers

To get a consistent idea of where Urban Water's customers are, our team focused on flood risk, of the backwater variety. Accurately assessing this requires correlation of the presence of three factors in an area: surface flooding, combined sewer system connections, and occupied buildings. Locally, combined sewer systems serve much of Copenhagen (Greater Copenhagen Utility, 2015). Figure 10 shows that surface flooding is prevalent in Denmark (COWI, 2016).

A broad view is interesting, but not useful, for Urban Water. To focus advertising efforts, a more in-depth evaluation is needed as demonstrated in Figure 11. By using publicly available maps of flood risks and building locations, our team identified areas for Urban Water to market to, down to single buildings.
5.2. Expanding into the US Market

We continued this to assess Urban Water’s prospects in America. We investigated the prevalence of combined sewer systems and found that they **serve over 40 million Americans** in 860 cities and towns (US EPA, 2004). Our team was unable to investigate every one of these cities and only looked at the most flood prone. We defined flood proneness by the volume of untreated sewage these cities are capable of expelling, roughly indicated by the number of CSO outfalls, untreated drainage pipes for excess sewage. The cities we identified are mapped above and listed below, and can be found in Figure 12:

1. Chicago, Illinois
2. Kansas City, Missouri
3. Pittsburgh, Pennsylvania
4. Cincinnati, Ohio
5. St. Louis, Missouri
6. Wheeling, West Virginia
7. Indianapolis, Indiana
8. Cleveland, Ohio
9. Milwaukee, Wisconsin
10. Louisville, Kentucky
We further investigated these areas using FEMA’s “Stay Dry” utility, a flood risk overlay for Google Earth. For each of the ten cities, our team produced map samples (Figure 13) of areas of overlap between flood risk and buildings to get an idea of where Urban Water’s customers are. The map samples for each city can be found in Appendix L.
5.3. Locating Customers in Other Geographic Areas

Our team found an effective method to localize future marketing methods. Our team recommends that Urban Water research the prevalence of SSOs in the. Unfortunately, this method cannot be done for free, at least in Denmark because, of restriction on use of publicly available flood maps for businesses. We strongly advise that Urban Water purchase this data for themselves and avoid a costly legal proceeding. Furthermore, while this method works to identify flood risk in cities served by combined sewers, it cannot predict backwater flooding in sanitary sewer systems. We recommend Urban Water come up with a similar method to identify high risk areas for sanitary sewer systems if possible.
CHAPTER 6: RECOMMENDATIONS

This chapter outlines the work our team believes Urban Water should carry out in order to both improve and implement the business model our team created in Chapter 4. To begin short-term implementation of the business model, our team recommends that Urban Water:

1. **Target its marketing** and sales to plumbers, property developers, and property owners in flood-prone areas

   Since the Urban Water Backwater Valve has the most value in flood-prone areas, Urban Water should expand its presence in these areas. For both Denmark and the United States, customers in flood-prone areas can be identified using a combination of flood-risk data and census data. Urban Water should immediately purchase a full backwater flooding risk survey from COWI.

2. **Create a portfolio** of successful installations and testimonials

   This portfolio should record the location and date of installations completed by Urban Water, as well as the performance of installed valves after their first backwater flooding event. Each bit of data will help Urban Water build a stronger marketing presence and a stronger brand.

3. Use the portfolio to help **convince insurance companies** to bundle the Urban Water Backwater Valve with insurance policies.

   Insurance companies will not bundle their insurance policies with an unproven product or company. The portfolio described above will provide insurance companies with clear-cut evidence of both the capabilities and quality of the Urban Water Backwater Valve.

While implementing these short-term recommendations, Urban Water will have time to improve other aspects of the business model before implementing them. Due to limitations our team encountered with regard to language barriers, publicly-available information, and time to complete the project, our team developed recommendations to help improve our business model for full implementation. These recommendations are listed below, and are separated into two categories: Customers Relations, Marketing, and Further Research.

**Customer Relations**

1. Further develop the value propositions for **plumbers and property developers**

   Our team was not able to conduct interviews with either of these customer groups both due to language barriers (on the part of plumbers), and time constraints (on the part of property developers). As such, the value propositions for these groups are not fully identified. Meeting with these groups to determine their needs and wants with regard to back water flooding will provide a base on which to develop their value propositions.
2. **Gain a better understanding of climate adaptation solutions**

Climate adaptation has no single solution. Backwater valves address the problem of backwater flooding, which is only a small portion of climate adaptation. In order to successfully partner with companies working on climate adaptation, Urban Water must fully understand other available solutions. This will allow Urban Water to adapt their marketing and products to fit the demands of climate adaptation.

3. **Work with municipal governments to install backwater valves**

Municipal governments may be receptive to working with Urban Water to promote their backwater valve as a climate adaptation product. Some municipalities, such as Copenhagen, have provided citizens with products such as waste bins that promote environmental sustainability. This means there may be an existing precedent for municipality-funded backwater valve installations.

4. **Establish partners in America in preparation for market entrance**

In order to expand to the United States several years down the road, Urban Water should begin reaching out to potential distribution and installation partners in the United States, targeting those who can serve the Great Lakes Region first.

**Marketing**

1. **Develop thorough go-to-market strategies**

Go-to-market strategies address the methods by which a company will actually leverage its position in a market. They are a combination of information and plans from business models and a company’s marketing plan, taking into account factors such as the target consumer, the value proposition, pricing, sales, and branding. Developing go-to-market strategies will require the creation or improvement of several facets of Urban Water’s business, including branding, marketing, and sales strategies.

2. **Clearly define the Urban Water brand**

A brand includes not only logos and slogans, but all aspects of a company that contribute to the external image of a company. This includes the values of the company, how they wish to be perceived by customers, and long-term goals. A complete brand definition of Urban Water will allow for the creation of effective marketing strategies, and further on, sales strategies. In addition, the website and social media accounts of Urban Water should be updated to match this brand, since they are the most visible portions of the brand. In order for the business models created by our team to be effective, these aspects of Urban Water’s business must be developed.
3. **Collaborate with plumbers** for advertising

Word-of-mouth is a powerful form of advertising, especially coming from an enthusiastic person. Since plumbers are the most involved customer group with the valve itself, their recommendations will carry the most weight. Urban Water should persuade plumbers to help spread the word about its valve.

4. **Update the website** to improve customer experience

Urban Water’s current website is good for informing people about the basic elements of their valve. If customers are to begin buying more valves, the website needs to be tailored towards them. The dimensions of the product are a vital piece of information for any contractor or engineer looking to implement it. Urban Water’s internet image would also benefit from a blog-type application to easily broadcast customer reviews, new products and features, advancements in climate adaptation, etc.

**Further Research**

1. **Redesign products to fit new applications**

Our analysis does not account for the technical specifications of sewers. For example, the United States, unlike Denmark, does not have standardized national building codes. Instead, each individual state is responsible for creating its own. This creates the possibility for each state to have different sewer systems, pipe sizes, inspection chamber requirements, etc. In addition, Urban Water should research design changes that may be required to install the backwater valve in larger inspection chambers, larger residences (such as apartment complexes), and businesses.

2. **Research sanitary sewer systems** and associated methods of backwater prevention

The Urban Water Backwater Valve is made for combined sewer systems. While Denmark has a large number of combined sewers, sanitary sewers are becoming more common as a result of climate adaptation. In addition, many more communities in the United States have sanitary sewer systems instead of combined sewer systems. In order to reach all markets, Urban Water should consider modifying their marketing approach for use in sanitary system.

3. **Research competitors** within the United States

Since backwater flooding is obviously a problem in the United States, Urban Water will likely have many competitors. Our team discovered one: Mainline Backflow Products. Due to time constraints, our team was unable to thoroughly research them, or to discover any additional competitors.
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APPENDICES

Appendix A: Introduction and Preamble for Interviews

Introduction:
— To be used when scheduling interviews over the phone —

Hello, I am a part of a group of four American university students working with Urban Water. We are researching potential markets for Urban Water’s backwater valve in Denmark. Would you be willing to schedule a brief interview with us?

Preamble for Verbal Interviews:
— To be used at the beginning of each interview —

Thank you for agreeing to meet with us! We are a group of university students from WPI in Massachusetts working with Urban Water. Urban Water is a small company that has developed a passive backwater valve designed to prevent backwater flooding in buildings without using electricity. We are examining potential markets for their valve, and we have a few questions for you. Your participation in this interview is completely voluntary and you may withdraw at any time and you are not obligated to answer any questions.

Preamble for Email Interviews:
— To be used at the beginning of each interview —

Thank you for agreeing to answer our questions over email. We are a group of university students from WPI in Massachusetts working with Urban Water. Urban Water is a small company that has developed a passive backwater valve designed to prevent backwater flooding in buildings without using electricity. We are examining potential markets for their valve, and we have a few questions for you. Your participation in this interview is completely voluntary and you are not obligated to answer any questions.

Appendix B: Generic Interview Questions

1. How is your company involved with flooding protection/response?
2. What services do you provide?
3. Are backwater valves a part of any services?
4. Are you familiar with backwater valves? [If “no,” we explain what they are]
5. Urban Water has developed a backwater valve that prevents backwater flooding and is easy to install in standard inspection chambers. In addition, the valve contains onboard data collection that can record when the valve is active during flood conditions and once the flood conditions have subsided. How would these products fit into your business?
6. Do you use similar products already?
7. If so, why?
8. What made you choose the ones you are using over others on the market?
9. What features of this product do you find interesting or valuable?
10. What features or services could Urban Water provide to make these products more appealing?

Appendix C: C.F. Møller Interview

Interviewee: Mr. Rob Marsh
Interviewers: James Taylor and Jake Chiudina
Date: September 18, 2017

Analysis:

Our team interviewed Mr. Rob Marsh, the Head of Sustainability for the Danish architectural firm C.F. Møller. As head of sustainability, Mr. Marsh makes sure his firm is meeting the sustainability standards set by customers, legislation, and regulation. C.F. Møller has little consideration for flood prevention in most cases but Marsh informed us that the high flood risk zones in Copenhagen are well known throughout the construction industry. These areas have been mapped and are available on www.klimatilpasning.dk. The other important aspect that C.F. Møller is aware of is the presence of a combined sewer system. On the edges of Copenhagen, new sewers have been laid into the ground, they are separated, though within the older central city, this development has not been applied. Although they are informed about these matters, architects outsource the design work for backwater prevention to dedicated engineers. From this interview, we learned that architectural firms are not a viable customer group for Urban Water because backwater valves are a negligible part of their direct design processes.

Questions and Responses:

1. How does your company involve flooding prevention in your designs?
   C.F. Møller’s service does not include flood prevention techniques.
2. How does environmental sustainability factor into your company’s decision making with respect to design choices?
   This depends on how much money the client is willing to spend on an environmentally sustainable building.
3. How does environmental sustainability factor into your company’s decision making with respect to business decisions?
   He was more concerned about keeping their designs up to date in terms of Danish regulations. The standards in this area are constantly changing and it is part of Marsh’s job to stay ahead of them.
4. What does your company gain from implementing sustainable design?
   [NOT ASKED]
5. Are you familiar with backwater valves?
   No. [The interviewers explained what backwater valves are.]
6. Urban Water has developed a backwater valve that prevents backwater flooding and is easy to install in standard inspection chambers. In addition, the valve contains onboard data collection that can record when the valve is active during flood conditions and once the flood conditions have subsided. How would these products fit into your company’s projects?
   This product does not fit into C.F. Møller’s projects. He stated that older, combined sewer systems are becoming less prevalent. The best approach to mitigate flooding is the construction of water basins to absorb the overflow of water.
7. When do you implement backwater valves in your designs? Specifically, for residential projects? He builds mostly big buildings on the outskirts of town so the valve wouldn’t be relevant with the separate sewer system.

8. What dictates when you would incorporate a backwater valve into a design? [NOT ASKED]

9. What made you choose the ones you are using over others on the market? [NOT ASKED]

10. (if they don’t) What factors dictate not using backwater valves in your designs? [NOT ASKED]

11. What features of this product do you find interesting or valuable? [NOT ASKED]

12. What features or services could Urban Water provide to make their products more appealing? [This led further into an open discussion.]

Marsh explained that there is strict division between engineers and architects. Flood prevention would fall onto the mechanical engineers or in a smaller project onto the contractor. A lot of single family houses are in the suburbs and they have separated sewers. There are maps that show where flooding is the most problematic: Klimatilpasning.dk. He advised us to contact engineering firms. Another interesting point was that he knows where the flooding happens and what kind of sewer system he’s building on. Therefore, when people build new houses, they usually know if this kind of product would be necessary.

Appendix D: Orbicon Interview

Interviewee: Mr. Søren Gabriel
Interviewers: Brian King and Jake Chiudina
Date: September 25, 2017

Analysis:

Orbicon is a Danish engineering company that keeps a main focus on sustainability when it comes to their designs. Our team was put in contact with Mr. Søren Gabriel, the development manager for climate sustainability at Orbicon, and as per his request the questions were sent prior to the scheduled interview.

After the cloudburst in 2011, Orbicon began to fixate on and eventually work frequently with climate adaptation, especially in relation to water. They deal with many aspects of building protection and are currently working on changing the sewer system. A larger goal that they have is to change the entire wastewater system. The aim is to separate the combined sewer systems and handle storm water on the surface as opposed to in the sewers. A project that they have done as a step in this direction is the Water Basin/Skate Park Combo, a rainwater collection basin remodeled to double as a local recreational area. They developed cloudburst valves that divert rainwater from the sewers and towards surface channels that flow into the basin.

Valves and pumps play a vital role in the solution to climate change, but can’t solve the problem on their own. Landscape architecture is just as important and Orbicon aims to educate the various organizations and persons that they work with of this.
As it pertains to the role of backflow valves, Orbicon ensures that they at least meet code and regulation, and then consider other factors such as economy and pricing. Mr. Gabriel expressed to us the appeal that Urban Water’s product had due to its low cost and ease of use, but he believes that it would not be accepted because it does not meet design regulations. However, our sponsor has discussed with us many times, the various regulations and certifications that the valve has met. This conflict may be partly due to Mr. Gabriel not thoroughly analyzing Urban Water’s website while at the same time stemming from Urban Water’s website not being as “user friendly” as it could be.

Orbicon is currently working with utility companies to learn and test the limits of the sewers and how certain products fit and affect the system. We have confidence in our sponsor’s product and hopefully, after their tests, Orbicon will too. Although Orbicon may have their doubts, after this interview it was much easier to conclude that targeting engineering companies as a consumer group is a viable option.

Interview questions were sent to Mr. Gabriel as per his request and so the video call was mainly a discussion led by the interview questions, but not strictly adhered to. This allowed for more natural responses, but meant that some questions were not answered or skipped over in the process.

Questions and Responses:

1. How does your company involve flooding prevention in your designs?
   They work frequently with climate adaptation, especially with respect to water. After the cloudburst in 2011, Denmark started to fixate on climate adaptation. They work on many aspects of protecting buildings/houses. They are also trying to change the sewer system. A larger goal of theirs is to change the entire wastewater system. They want to separate the combined sewer systems; handle storm water on the surface as opposed to in the sewers.

2. What services do you provide?
   They focus on changing sewer system to improve city life.
   **Projects:** Skatepark/Water Basin combo. Rainwater collection basin remodeled to be a local recreational area. They have developed a cloudburst valve that goes under gutter pipes to divert rainwater away from sewer, towards surface channels/receptacles. They provide guidelines about avoiding basement flooding.

3. How does environmental sustainability factor into your company’s decision making with respect to design choices?
   They want synergy in the products. Valves only solve part of the problem.

4. How does environmental sustainability factor into your company’s decision making with respect to business decisions?
   Their challenge is to educate the people that they work with, to show them that pumps and valves are not the only answer and that landscape architecture is important. They work with architects, engineers, municipalities to teach them about every possible answer to the problem.

5. What does your company gain from implementing sustainable design?
   [NOT ASKED]

6. Are you familiar with backwater valves?
   [NOT ASKED]

7. Urban Water has developed a backwater valve that prevents backwater flooding and is easy to install in standard inspection chambers. In addition, the valve contains onboard data collection that can record when the valve is active during flood conditions and once the flood conditions have subsided. How would these products fit into your company’s projects?
   [NOT ANSWERED]
8. When do you implement backwater valves in your designs? Specifically, for residential projects?

   UW’s valve wouldn’t be accepted because you need two separate valves (mechanical and manual). Urban Water’s current product can only be used in single family homes and you can’t use water when it is deployed. Installing a valve into an inspection chamber isn’t the best idea because if water enters the system in between the inspection chamber and the house, the valve will have no effect. He will send information about other products and regulations.

9. What dictates when you would incorporate a backwater valve into a design?

   They need to look at the terrain to determine the flood risk. If there is a high risk of flooding a backwater valve will not solve every possible type of flood event.

10. What made you choose the ones you are using over others on the market?

    They need to fit the regulations in order to be considered. Economy and pricing is another major factor. Every device they incorporate needs to be automatic with an alarm device.

11. What factors dictate not using backwater valves in your designs?
    [NOT ASKED]

12. What features of this product do you find interesting or valuable?
    [NOT ANSWERED]

13. What features or services could Urban Water provide to make their products more appealing? [This led further into an open discussion.]

    It is appealing because it’s simple, cheap, and easy to use. They are collaborating with utility companies to learn and test the maximum capacity of the sewer and how certain products would affect the system. Utilities are the best way to test a product. It is hard to get established in the market. Make sure product will work within the regulations. He is getting us in touch with a “grand old lady” in the world of backwater valves.

Appendix E: Tryg Interview

Interviewee: Mr. Kim Nissen
Interviewers: James Taylor and Zebadiah Yap-Chung
Date: September 19, 2017

Analysis:

Our team interviewed Mr. Kim Nissen of Tryg, a Danish insurance company. He works as a liaison between Tryg and startups, mainly by selling insurance policies to them. He occasionally negotiates deals in which the products of startups are included alongside a Tryg insurance policy. His company considers flood prevention a priority because reducing costs from claims is a priority. All flood insurance policyholders pay into, and draw from a nationwide money pool for natural flooding. Two years ago, a price reduction for homeowners with backwater valves was discussed, but he was unsure about its implementation.

As a company, Tryg lacks a comprehensive plan to deal with increased claim rates from increasing flooding. Trygg’s current practice is to raise premiums for policies insuring property in known flood prone areas and impose special conditions such as requiring all shop inventory be stored 35 centimeters above ground. In more extreme cases, insurance companies have been willing to contribute to public works projects, as they did when the town of Roskilde built a diversion path for excess storm water (Stinson, 2013). Mr. Nissen recommended that we speak with more insurance companies and with Tryg’s product development team.
The most important conclusions our team drew from this interview are: (a) that insurance companies bundle their policies with physical products, and (b) are willing to contribute to the public projects to reduce flooding risk. **Urban Water should approach insurance companies with the purpose of reducing the flood risk to their clients; therefore, reducing the risk taken by insurance companies.**

Questions and Responses:

1. **How is your company involved with flooding prevention/response?**
   
   Tryg insures many companies against flooding. For individuals, everyone pays 20dkk per policy per year to a storm flooding fund that all policies draw from. The customer doesn’t have to pay anything more if insured. Flood prevention is a priority to Tryg because reducing costs is a priority. Despite this, they don’t have a plan to deal with increasing flooding.

2. **How does having a backwater valve affect a home insurance policy holder?**
   
   A discount was discussed two years ago but he was not sure if it went through because he didn’t have enough information on it.

3. **Do policyholders receive any discounts?**
   
   [NOT ASKED]

4. **Urban Water has developed a backwater valve that prevents backwater flooding and is easy to install in standard inspection chambers. This valve has onboard data collection that records when the valve is active during flood conditions and once the flood conditions have subsided. How could this data collection service benefit your firm? How does your company incorporate data collection into its business?**
   
   Tryg has lots of data but it’s more important for them to have good data. They already incorporate publicly available flood risk data to adjust flood insurance premiums.

5. **What made you choose the data collection service(s) you are using over others on the market?**
   
   [NOT ASKED]

6. **What features of Urban Water’s data collection service do you find interesting or valuable?**
   
   Giving an opinion on this was outside his expertise. He directed us to get in contact with Tryg’s product team which handles partnerships and bundling deals with outside companies. Though if climate change continues as it has, insurance companies are likely to be more interested in Urban Water’s product and data collection service.

7. **What features or services could Urban Water provide to make their service more appealing?** [This led further into an open discussion.]
   
   As an insurance company, Tryg is concerned about liability. If Urban Water can get their valves into the homes of their high-risk policyholders, a commission deal with Tryg is possible. This would not be the first-time insurance companies used their money to actively reduce risk in Denmark. In Roskilde, there was large amounts of flooding, and a smaller town closer to the coast couldn’t handle the water. To solve this, the community built a diversion path. The insurance companies financed a large portion of this project. He directed us to look into Ribe and other coastal towns affected by flooding in Jutland. The Copenhagen half marathon last weekend was cancelled due to flooding and the injury of three people. Many people close their businesses in Denmark after flooding. While Tryg insures business owners against this, they have special terms and conditions for policyholders such as requiring all inventory be stored higher than 35 cm above ground.
Appendix F: Hotel Nine Små Hjem Interview

Interviewee: Mr. Jonas Nilsson
Interviewers: Brian King and Zebadiah Yap-Chung
Date: September 19, 2017

Analysis:

Mr. Jonas Nilsson is a receptionist at Hotel Nine Små Hjem. He represented two types of property owners: homeowners and apartment complex owners. Hotel Nine Små Hjem felt the effects of backwater flooding the day before the interview. It took nine hours to clean up approximately 10 centimeters of backwater flooding in a building Hotel Nine Små Hjem owns in Nørreport.

When asked his opinion of Urban Water’s backwater valve, Mr. Nilsson expressed that he thinks it is a great idea, especially due to its passive nature. He believes the cost is reasonable for apartment buildings and hotels such as Hotel Nine Små Hjem, however for the average homeowner the valve is too expensive. From the perspective of the homeowner, it is less expensive to let backwater flooding occur and deal with the damage costs through insurance claims. Additionally, the yearly maintenance would be a problem for homeowners. It would be a hassle for the average working person to take off time from work while the sewer specialist serviced the backwater valve.

After completing the interview with Mr. Nilsson, it was clear to see that for the average homeowner the valve itself is too expensive, but the concept of flood protection is very important. If insurance companies could become involved in a manner that would allow for the subsidizing of valves or the synthesis of valves with their existing policies, it would be a “no-brainer” to purchase. It would give more incentive to the homeowner to purchase this valve while easing the financial burden.

Questions and Responses:

1. Have you ever experienced water damage due to flooding, particularly in your basement?
   Yes. They had flooding just yesterday in a building that they own in Nørreport.

2. Was any of this damage due to backwater from the sewer?
   Yes. There was about 10 centimeters of water and it took over 9 hours to clean up.

3. A backwater valve is a device designed to prevent sewage and wastewater from being forced backwards into homes. Urban Water has developed a backwater valve that prevents backwater flooding that does not require electricity, and is cheaper and easier to install than competitors. In addition, the valve contains onboard sensors that inform homeowners when the valve is active during flood conditions and once the flood conditions have subsided. Is this product something that you think would be useful in your [property]?
   He thinks that it is a good idea. It’s great that it acts passively and that it is so easy to install.

4. Do you have a similar product installed already?
   No. He doesn’t have these problems where he lives.

5. What features of this product do you find interesting or valuable?
   He really likes the passive nature of the valve and how easy it is to install and maintain. Additionally, he likes that it is cheaper than the other valves that exist.
6. What features or services could Urban Water provide to make these products more appealing?

It’s a simple product for something that is not so common. Although it is cheaper than the competition, for the average homeowner it is still a large expense. He would rather let the flooding occur and then let his insurance take care of damages. He suggested that maybe instead of having people purchase the valve at face value, to sell it at a reduced cost through the insurance company and some type of agreement with policies. The yearly checkup could be a problem for private homeowners. It would take time from the average working person’s day to supervise the individuals who come to inspect the chambers.

Appendix G: Value Proposition Template

- A title comprised of the name of the customer group
- A list of jobs the consumer wants to accomplish and corresponding products and services provided by Urban Water help them complete it
- A list of gains the customer wants and corresponding gain creators provided by Urban Water’s products
- A list of pains the consumer wants to avoid and corresponding pain relievers provided by Urban Water.

![Figure 14: Value Proposition Template](image)
Appendix H: Value Proposition Spreadsheets

Engineering Firms

<table>
<thead>
<tr>
<th>Engineering Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer Jobs and Proposed Products &amp; Services</strong></td>
</tr>
<tr>
<td>Tasks the customer must carry out and the products &amp; services Urban Water will provide to help complete those jobs</td>
</tr>
<tr>
<td><strong>Jobs</strong></td>
</tr>
<tr>
<td>Design sewer systems that can withstand backwater flooding</td>
</tr>
<tr>
<td>Acquire more customers/project contracts</td>
</tr>
<tr>
<td><strong>Products and Services</strong></td>
</tr>
<tr>
<td>The backwater valve prevents backwater flooding</td>
</tr>
<tr>
<td>The backwater valve is a high quality product that firms can use to promote their dedication to climate adaptation</td>
</tr>
<tr>
<td><strong>Customer Gains and Proposed Gain Creators</strong></td>
</tr>
<tr>
<td>Things customers hope to gain and how Urban Water will help them achieve those gains</td>
</tr>
<tr>
<td><strong>Gains</strong></td>
</tr>
<tr>
<td>Sustainable designs</td>
</tr>
<tr>
<td>Adapt projects to climate change</td>
</tr>
<tr>
<td><strong>Gain Creators</strong></td>
</tr>
<tr>
<td>The valve is a green, environmentally friendly product because it reduces resource use in cleaning up after a flood</td>
</tr>
<tr>
<td>The valve will make the building more resistant to flooding due to climate change</td>
</tr>
<tr>
<td><strong>Customer Pains and Proposed Pain Relievers</strong></td>
</tr>
<tr>
<td>Concerns customers have and how Urban Water can address them</td>
</tr>
<tr>
<td><strong>Pains</strong></td>
</tr>
<tr>
<td>Designs must meet regulations</td>
</tr>
<tr>
<td>Adaptation of designs for the valves</td>
</tr>
<tr>
<td><strong>Pain Relievers</strong></td>
</tr>
<tr>
<td>The valve is made to fit existing, standard inspection chambers. It is Type 3 and VA certified</td>
</tr>
<tr>
<td>Valve specifications will be readily available on Urban Water’s website allowing for its accommodation</td>
</tr>
</tbody>
</table>

Figure 15: Engineering Firm Value Proposition

They often work in tandem with architects in the design of buildings. Engineers are responsible for the interior structure of the building, including the plumbing. Climate adaptation is the main focus of engineering firms that work with sewer and storm water in Denmark. **Engineering firms are being contracted more often to either build or renovate areas that can withstand flooding in a sustainable way.** In addition, the valve’s low price-point makes it an economical choice for firms doing large-scale projects such as housing developments.

Insurance Companies

<table>
<thead>
<tr>
<th>Insurance Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer Jobs and Proposed Products &amp; Services</strong></td>
</tr>
<tr>
<td>Tasks the customer must carry out and the products &amp; services Urban Water will provide to help complete those jobs</td>
</tr>
<tr>
<td><strong>Jobs</strong></td>
</tr>
<tr>
<td>Insure clients against flooding damage</td>
</tr>
<tr>
<td>Reduce amount of risk taken on by policies</td>
</tr>
<tr>
<td>Accurately assess flood risk</td>
</tr>
<tr>
<td><strong>Products and Services</strong></td>
</tr>
<tr>
<td>The valve is a form of insurance/protection that adds to monetary insurance</td>
</tr>
<tr>
<td>The valve will result in fewer people experiencing flood damage and making subsequent insurance claims</td>
</tr>
<tr>
<td>The data collection service can provide data needed to help assess backwater flooding risks</td>
</tr>
<tr>
<td><strong>Customer Gains and Proposed Gain Creators</strong></td>
</tr>
<tr>
<td>Things customers hope to gain and how Urban Water will help them achieve those gains</td>
</tr>
<tr>
<td><strong>Gains</strong></td>
</tr>
<tr>
<td>Low risk policyholders</td>
</tr>
<tr>
<td>Get useful data</td>
</tr>
<tr>
<td><strong>Gain Creators</strong></td>
</tr>
<tr>
<td>Backwater valve reduces flooding chance in high flood risk areas</td>
</tr>
<tr>
<td>Backwater valves installed on the edges of high flood risk zones could track the movement of these areas over time giving the subscriber accurate information immediately</td>
</tr>
<tr>
<td><strong>Customer Pains and Proposed Pain Relievers</strong></td>
</tr>
<tr>
<td>Concerns customers have and how Urban Water can address them</td>
</tr>
<tr>
<td><strong>Pains</strong></td>
</tr>
<tr>
<td>Large pay out of claims when flooding occurs</td>
</tr>
<tr>
<td>Added expenses when paying for portions of the valve</td>
</tr>
<tr>
<td>Customers taking advantage of the flood prevention discount</td>
</tr>
<tr>
<td><strong>Pain Relievers</strong></td>
</tr>
<tr>
<td>Backwater flooding prevention minimizes the need for policyholders to make claims after heavy rainfall</td>
</tr>
<tr>
<td>Valve is not only cheaper than most competitors’ valves, but also much cheaper than the claims that they would have to cover per customer</td>
</tr>
<tr>
<td>The valve can track if required maintenance is performed and the discount can be revoked if the valve is not maintained</td>
</tr>
</tbody>
</table>

Figure 16: Insurance Company Value Proposition
Insurance companies are responsible for covering the cost of repairing damage following flooding events. Urban Water’s backwater valve reduces the risk of damage in buildings by preventing backwater flooding. While reducing risk does not guarantee that flooding cannot occur, low risk buildings are a “safer bet” for insurance companies. In addition, Urban Water’s data collection service provides information that insurance companies can use to more accurately assess flood risks.

Urban Water plans to work with insurance companies to create deals in which policyholders are either: a) granted a discount on their insurance premiums when they install backwater valves, b) granted a discount on the valve itself by the insurance company, or c) both. While each of these deals presents an upfront cost to insurance companies, the decreased risk of backwater flooding in protected homes presents the opportunity for increased profits in the long run.

Plumbers and Sewer Specialists

<table>
<thead>
<tr>
<th>Plumber and Sewer Specialist Value Proposition</th>
</tr>
</thead>
</table>

Urban Water aims to sell many backwater valves directly to plumbers. According to Danish regulations, a license is required to perform any work on sewer systems. This presents an opportunity for plumbers and sewer specialists. They are licensed to install Urban Water's backwater valve, which allows them to **make profits from the installation of the valves**. In addition, Urban Water’s valve takes about five minutes to install, saving the plumbers time. Other valves on the market require renovations to the building’s sewer system or foundation, which makes for a much more complicated installation.
Property Owners

<table>
<thead>
<tr>
<th>Customer Jobs and Proposed Products &amp; Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks the customer must carry out and the products &amp; services Urban Water will provide to help complete those jobs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Jobs</th>
<th>Products and Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protect their property from backwater flooding</td>
<td>The backwater valve prevents backwater flooding</td>
</tr>
<tr>
<td>Keep building occupants happy</td>
<td>The backwater valve prevents backwater flooding and the SMS service keeps building occupants informed of flood risks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Customer Gains and Proposed Gain Creators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Things customers hope to gain and how Urban Water will help them achieve those gains</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gains</th>
<th>Gain Creators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peace of Mind</td>
<td>The backwater valve will protect buildings passively, so property owners need not worry about backwater flooding</td>
</tr>
<tr>
<td>Reduced home insurance premiums</td>
<td>Insurance companies might provide discounts for policyholders that install backwater prevention devices</td>
</tr>
<tr>
<td>Free Time</td>
<td>No need to call a plumber or spend hours cleaning up flood water from basement after heavy rainfall</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Customer Pains and Proposed Pain Relievers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerns customers have and how Urban Water can address them</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pains</th>
<th>Pain Relievers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Damage</td>
<td>The backwater valve prevents backwater flooding, which prevents property damage and prevents sewage exposure. Additionally, the valve prevents the stress of dealing with flooding damage, and provides peace of mind during storms</td>
</tr>
<tr>
<td>Health problems from sewage exposure</td>
<td>The valve can be easily installed by plumbers and sewer specialists, and can be removed equally as easily for maintenance and repair</td>
</tr>
<tr>
<td>Stress</td>
<td>Urban Water can provide alternate payment options, such as installment plans or rental options</td>
</tr>
<tr>
<td>The hassle of installing this apparatus</td>
<td>The hassle of taking time off once per year for to maintain the valve is far less than that of dealing with cleaning up backwater flooding</td>
</tr>
<tr>
<td>Severe maintenance may damage the valve</td>
<td></td>
</tr>
<tr>
<td>Paying a large amount upfront</td>
<td></td>
</tr>
<tr>
<td>Wasting time, i.e. leaving to take time off from work for valve maintenance</td>
<td></td>
</tr>
</tbody>
</table>

Figure 18: Property Owner Value Proposition

Property owners have a vested interest in protecting their property from flooding. Homeowners often have belongings stored in their basements, and many apartment complexes have basement tenants. In addition, both homeowners and apartment complex owners have a desire to know when their properties are at risk of flooding. Urban Water’s backwater valve and its SMS messaging service fulfills both these jobs.

While apartment complex owners are primarily concerned with protecting their buildings from flooding, homeowners are much more concerned with the cost of doing so. Often, homeowners would prefer to let flooding occur and pay for the damages through insurance. As such, it is important that Urban Water does two things: a) create pricing plans that reduce “sticker-shock” such as monthly installments or a rental method, and b) create agreements with insurance companies to either provide discounts on flood insurance premiums or reduce the cost of the valve to the homeowner.
Utility Companies

Figure 19: Utility Company Value Proposition

Utility companies are responsible for ensuring that sewer systems are in proper working order. Urban Water's backwater valve helps to accomplish this task by keeping waste from flowing the wrong way. In addition, the backwater valve's data collection service can provide utilities with vital information about the state of sewer systems. They would also help create a more accurate map of flood risk, aiding them in their goals of climate adaptation.
Appendix I: The Business Model Canvas

Figure 20: The Business Model Canvas

Appendix J: Urban Water Competitor Profiles

Kessel:

Kessel is a very large company with only a moderate focus on backwater prevention. Their backwater products use the same base valve with supplemental add-ons differentiating each model. About half of their valves are passive and half require electrical power. Most of them include an alarm system or can be modified with one as an add-on. All of their valves are Type 3 certified and one of their products includes a pump. Kessel boasts simple, interior installation for their valves, but unless the home has exposed sewer pipes, significant basement renovations would be required.

Figure 21: Kessel Backwater Valve
ACO Building Drainage:

ACO Building Drainage is just as large as Kessel, but their focus on backwater prevention is even smaller. Their valves are designed for industrial, commercial, and residential use, resulting in more flexible installation methods, but a much higher price (twice as much as Urban Water). Two of their valves are passive and the other, an active system, is the only one that is Type 3 certified. None of ACO’s valves include a pump. They are still a major competitor because of their reputation as a drainage company.

![Figure 22: ACO Building Drainage Backwater Valve](image)

Grundfos:

Grundfos is the largest of Urban Water’s competitors with the most extensive range of products. The only backwater valve they produce is the most reliable valve on the market. It includes an alert system and a pump, and is intended for exterior use. The pump does not operate passively and is therefore not functional during power-outages. This is also the most expensive valve on the market.

![Figure 23: Grundfos Backwater Valve](image)

Napan:
Napan is the most similar company to Urban Water. They are a small company that deals mainly in backwater prevention. Their prices are similar to Urban Water’s, but their valve is neither passive nor does it include a pump. It has Type 3 Certification and can be installed on the exterior or interior of the home. Even though this company has been in operation for almost half a century, their products do not meet the standards of backwater protection. Their Type 3 device has only one valve, “making the product a flexible solution that is especially cost-effective when mounted on an existing installation”. This means that it is meant to be supplemental. Napan seems to be the most immediate competitor to Urban Water so it would be valuable to learn from their achievements and shortcomings.

Figure 24: Napan Backwater Valve
Appendix K: Business Model Deliverable

Business Model for Urban Water ApS
The structure required for Urban Water to conduct business with its various stakeholders.

Mission
The mission of Urban Water is to produce and sell low-cost, high-quality backwater prevention technology to reduce the risk of backwater flooding in homes and buildings.

Products
The Urban Water Backwater Valve
The Urban Water Backwater Valve is a Type 3 certified backflow preventer designed for installation in Ø315 inspection chambers. This valve activates when the water level of a sewer rises above a certain point, and de-activates once the water level drops below that point. The valve contains a sensor that records the state of the valve. The valve contains an alarm system that alerts the valve’s owner when it is activated and deactivated.

Pricing:
Passive System (Without Pump): 22.695 DKK
Active System (With Pump): 38.795 DKK

Distribution:
The Urban Water Backwater Valve is available for purchase through Urban Water.

Urban Water Data Collection Services
This service is not ready for launch yet because not enough valves have been installed. The Urban Water Backwater Valve is equipped with a sensor to detect valve activation. When activated, this data is transmitted to Urban Water and is distributed to the owner via automated text message. The data collected will be valuable in evaluating the status of the sewer systems.

Pricing:
[TBD]: suggestions include a yearly subscription

Distribution:
We suggest the data be made available through an online application.
Customer Group Overview

Property owners
This group of private homeowners and property management services experiences backwater flooding. The Urban Water Backwater Valve is the solution to their backwater flooding problems. Urban Water is planning on marketing to property owners living in high flood risk areas. The valve can be installed and inspected within a single day instead of multiple days, giving it a key edge over competing products. Urban Water will focus its advertising on property owners living in high backwater flooding risk areas.

Plumbers and sewer specialists
This group is responsible for single-valve installation projects. To accelerate sales, Urban Water will take a two-pronged approach, combining direct networking and word of mouth recommendations with pressure from property owners interested in the valve. Urban Water has asked for testimonials from prior customers to foster word of mouth advertising and an image of product reliability. [Suggestion] Urban Water is willing to sell their valve at a loss in the present to facilitate future sales.

Property Developers
This group commissions and temporarily owns new property developments. Their interest in the valve lies in negating property value losses from flood risks and protecting current holding until the point of sale.

Engineering firms
This group is responsible for multi-valve installation projects. This group will be sold Urban Water Backwater Valves to install in residential developments, summer home developments, and other large building projects. Urban Water will establish contacts with engineering firms working with climate adaptation and housing developments.

Utility companies
This group is responsible for maintaining a functioning sewer system. Data from Urban Water’s valve helps them accomplish this by quickly identifying blockages. Urban Water has sold valves to utilities companies interested in solving chronic backwater flooding. This group will be sold Urban Water Backwater Valves to ensure proper function of sewer systems. [Suggestion] Urban Water is open to collaboration with and selling their sensor suite to competing backwater valve suppliers to create a comprehensive sewer data logging system.

Insurance companies
This group is responsible for paying out damage claims due to backwater flooding. They want to reduce the chances of this happening as much as possible. This group will be convinced to discount premium costs for property owners that install an Urban Water Backwater Valve. Urban water will initially sell their valve to flood insurance policy holders. The combination of property owner interest, flood prevention and the subsequent data will provide insurance companies with enough certainty to bundle these valves with their flood insurance.
Employee Responsibilities

Urban Water will dedicate employees to fulfill all of the functions listed below. Each function does not necessarily require a dedicated employee.

1. Establish contact with customers
2. Develop SMS alarm system
3. Create and maintain a marketing strategy
4. Develop data collection system
5. Research and Development
   a) Different valve sizes for different inspection chambers
   b) Pump system
   c) Battery system
   d) Cheaper production (i.e. simpler design, different materials, etc.)
   e) Valve system for separated sewers
6. Secure funding
   a) Grants, investors, etc.
7. Manage accounting
   a) Payroll
   b) Expenses
8. Manage inventory
   a) Storage location
9. Manage production
   a) Contact with manufacturers
10. Sales
   a) Contract negotiation with customers
11. Distribution
    a) Sales
    b) Product Delivery
12. Educate installers
13. Develop strategies for climate adaptation projects
    a) Learn how Urban Water can fit into separated sewers/landscape redesigns
14. Customer Care

Suppliers

Key partners are external entities that are vital to the successful implementation of Urban Water’s mission. The following list includes each company involved in the production of the Urban Water Backwater Valve and the parts they provide.

1) Processing, assembly, testing, and packaging - Lykkegaard, LV
   Lykkegaard will manufacture the mechanical steel part at an acceptable price with a monthly capacity of 1000 units. Lykkegaard has more than 30 employees including certified welders.
   a) Various sub-suppliers of steel
2) Electronics & Suppliers
3) Control Units - C.B. Svendsen
4) Ferrite Magnet - Lika, DK  
a) SIM Card - Telia, DK  
5) Parts & Suppliers  
a) Valve Seals - Gummiartikler, DK  
b) POM bushing - KIFA, DK  
c) Pipe Gasket - Klinger/Gravlund, DK  
d) Pipe Gasket - Betech, DK  
e) Packaging - Antalis, DK  
f) Labels & Manuals - Elefantprint, DK  
g) Tubing - Scankab, DK  
h) Sensor - Mender Electronics, DE  
i) Wire & Wire Clamp - The Wire Shop, UK  
j) Floaters - Vesimentor, EE  
k) Pump - Sulzer Pumps, NL  

Expansion

By geographically targeting new customers Urban Water will accelerate its expansion into the market, first locally, then internationally. This method entails correlating developments with high flood risk and combined sewer connections using both licensed and publicly available geographic surveys. By acquiring and acting on this information with effective marketing, Urban Water will gain a strong foothold in Denmark. After accomplishing this, Urban Water will continue this strategy throughout the European Union and, later, in the United States. To test the effectiveness of geographic targeting abroad, the Urban Water investigated the United States further and found over 40 million potential customers living mostly in the Great Lakes Region. To capitalize on this large potential market, Urban Water’s main product for the United States will come with a pumping system because no identified competitor has a similar system. Urban Water plans on implementing a focused marketing campaign showing its product as the solution to free homeowners from backwater flooding.
Appendix L: American Flood Risk Profiles

City: Chicago, IL
Population: 2,704,958 (Bureau, 2016a) Population: 2,704,958 (Bureau, 2016a)
Metro Population: 9,512,999 (Bureau, 2016b) (Bureau, 2016b)
Risk Areas: Most in Northwestern and Southern suburbs of Chicago

Figure 25: Chicago High Flood Risk Area 1

Figure 26: Chicago High Flood Risk Area 2
Figure 27: Chicago High Flood Risk Area 3

Figure 28: Chicago High Flood Risk Area 4
City: Kansas City, MO
Population: 481,420 (Bureau, 2016a) Population: 481,420 (Bureau, 2016a)
Metro Population: 2,104,509 (Bureau, 2016b) (Bureau, 2016b)
Risk Areas: Most along Kansas and Missouri rivers

Figure 29: Kansas City High Flood Risk Area 1

Figure 30: Kansas City High Flood Risk Area 2
Figure 31: Kansas City High Flood Risk Area 3

Figure 32: Kansas City High Flood Risk Area 4
City: Pittsburgh, PA
Population: 303,625 (Bureau, 2016a) Population: 303,625 (Bureau, 2016a)
Metro Population: 2,342,299 (Bureau, 2016b) (Bureau, 2016b)
Risk Areas: Along Allegheny and Ohio rivers

Figure 33: Pittsburgh High Flood Risk Area 1

Figure 34: Pittsburgh High Flood Risk Area 2
Figure 35: Pittsburgh High Flood Risk Area 3

Figure 36: Pittsburgh High Flood Risk Area 4
City: Cincinnati, OH
Population: 298,800 (Bureau, 2016a) Population: 298,800 (Bureau, 2016a)
Metro Population: 2,165,139 (Bureau, 2016b) (Bureau, 2016b)
Risk Areas: Most lie on Mill Creek, North of the city

Figure 37: Cincinnati High Flood Risk Area 1

Figure 38: Cincinnati High Flood Risk Area 2
Figure 39: Cincinnati High Flood Risk Area 3

Figure 40: Cincinnati High Flood Risk Area 4
City: St. Louis, MO  
Population: 311,404 (Bureau, 2016a)  
Metro Population: 2,807,002 (Bureau, 2016b)  
Risk Areas: In the Missouri suburbs

Figure 41: St. Louis High Flood Risk Area 1

Figure 42: St. Louis High Flood Risk Area 2
Figure 43: St. Louis High Flood Risk Area 3

Figure 44: St. Louis High Flood Risk Area 4
City: Wheeling, WV
Population: 27,375 (Bureau, 2016a) Population: 27,375 (Bureau, 2016a)
Metro Population: 142,982 (Bureau, 2016b) (Bureau, 2016b)
Risk Areas: Along Wheeling Creek

Figure 45: Wheeling High Flood Risk Area 1

Figure 46: Wheeling High Flood Risk Area 2
City: Indianapolis, IN

Population: 855,164 (Bureau, 2016a) Population: 855,164 (Bureau, 2016a)

Metro Population: 2,004,230 (Bureau, 2016b) (Bureau, 2016b)

Risk Areas: Evenly distributed through city

Figure 47: Indianapolis High Flood Risk Area 1

Figure 48: Indianapolis High Flood Risk Area 2
Figure 49: Indianapolis High Flood Risk Area 3

Figure 50: Indianapolis High Flood Risk Area 4
City: Cleveland, OH
Population: 385,809 (Bureau, 2016a) Population: 385,809 (Bureau, 2016a)
Metro Population: 2,055,612 (Bureau, 2016b) (Bureau, 2016b)
Risk Areas: Along the Cuyahoga River

Figure 51: Cleveland High Flood Risk Area 1

Figure 52: Cleveland High Flood Risk Area 2
City: Milwaukee, WI
Population: 595,047 (Bureau, 2016a) Population: 595,047 (Bureau, 2016a)
Metro Population: 1,572,482 (Bureau, 2016b) (Bureau, 2016b)
Risk Areas: Most in undeveloped floodways

Figure 53: Milwaukee High Flood Risk Area 1

Figure 54: Milwaukee High Flood Risk Area 2
Figure 55: Milwaukee High Flood Risk Area 3

Figure 56: Milwaukee High Flood Risk Area 4
City: Louisville, KY  
Population: 616,261 (Bureau, 2016a)  
Population: 616,261 (Bureau, 2016a)  
Metro Population: 1,283,430 (Bureau, 2016b) (Bureau, 2016b)  
Risk Areas: Large sections around tributaries to the Ohio River

Figure 57: Louisville High Flood Risk Area 1

Figure 58: Louisville High Flood Risk Area 2
Figure 59: Louisville High Flood Risk Area 3

Figure 60: Louisville High Flood Risk Area 4