



university of  
 groningen

faculty of spatial sciences

# Water footprints in a changing climate



*'How can awareness of the water footprint influence consumers in Groningen  
 their willingness to reduce the water footprint?'*

Sabine Dieben

S2733692

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Human Geography and Urban and Regional Planning

University of Groningen | Faculty of Spatial Sciences

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## Abstract

The WF is defined as the total volume of freshwater that is directly or indirectly used to produce a product or service. Although the WF is a relatively new concept, there is a growing interest in the concept of the WF and increased awareness of consumers their impact on freshwater resources. The objective of this study is to identify how awareness of the WF influences consumers in Groningen their willingness to reduce the WF. A literature review was combined with a survey, which was shared amongst consumers in Groningen. Even though consumers in Groningen are aware of their WF, there is a need for more information on sustainable practices and the WF. One of the methods that can be implemented to raise awareness and enhance sustainable practices is product transparency. This has a positive influence on the choice of consumers, as a significant amount would choose a more sustainable product when the WF of products is shown. Additionally, the results of the research show that consumers who think certain lifestyle changes would help in reducing the WF are also more willing to adopt these lifestyle changes. This especially holds for lifestyle changes that have a direct impact on the daily life of consumers. Based on the findings of this study, it is concluded that consumers their willingness to reduce their WF is positively influenced, when there is an increased awareness of the WF. The most important limitation of this research is that it misses contextualization. Future research should include a wider range of aspects of the WF, to gain a better understanding of why and how it should be reduced. The main strength of the research is that it shows the value of increased awareness of the WF, as it improves sustainable water consumption and thus reduces the WF.

# 1 Introduction

## 1.1 Background

All around the world, freshwater resources are under pressure. This is not only induced by climate change, as warmer temperatures, extensive rainfall and extreme weather raise the demand for water (Hogeboom, 2020), but also due to a growing population (UNESCO, 2020). Water use has been growing at more than twice the rate of population growth in the last century (FAO, 2013). As laid down in many legal systems, access to freshwater is a basic human right, which is now threatened to be interfered (Lambooy, 2011). Due to the extended impact of the use of services and products, the quality and quantity of the available water for basic human needs is affected, while most consumers are not even aware of the impact of their total water consumption on global water resources (Ridoutt & Pfister, 2010). Consumers take on a simple point of view by only looking at their direct water consumption while neglecting the indirect water consumption that is used for producing final products or services. A concept that can be used to look at the direct and indirect water use is the Water Footprint (WF). The WF is defined as the total volume of freshwater that is directly or indirectly used to produce a product or service (Hoekstra et al., 2011). According to Hoekstra et al. (2011), many studies about the awareness of the WF have already been conducted, in which the standard for the definition of the WF is set globally and widely adopted. The next challenge is to refine the standard and translate it into practical guidelines for consumers, as the WF can be an activating tool for implementing more responsible behavior in water consumption. This is shown in the research of Gómez-Llanos et al. (2020), in which they state that the WF is understood as a realistic measure of water consumption by citizens, that it is an adequate indication to highlight knowledge about sustainable water use and that consumers show positive attitudes towards WF information. In the study of Nauges & Weeler (2017), they conclude that households who are more concerned about climate change, are positively influenced to take actions to save water and energy. Actions that can be taken by consumers are, amongst other things, eating vegetarian, reduce waste and change their consumption patterns (Hoekstra et al., (2011). As the WF is understood as a realistic measure of water consumption, becoming more aware of the WF could be a mean in enhancing sustainable water consumption. To see how awareness of the WF influenced the willingness of consumers to reduce their WF on a local level, this research focused on the consumers in Groningen, a city in the northern part of the Netherlands. To assess this group of consumers, they were surveyed about their daily water use and which choices they would make regarding different aspects of the WF.

## 1.2 Research problem

This research aims to investigate how awareness of the WF of consumers in Groningen influences their willingness to reduce the WF. The main question that is answered in this research is:

*'How does awareness of the water footprint influence consumers in Groningen their willingness to reduce the water footprint?'*

Three sub-questions were added to the research as well. By means of a literature review and obtaining primary data by sending out a survey, answers are given to the sub-questions. Based on the results of the survey and the literature review, the research question is answered.

The sub-questions that support the main question are as follows:

1. *How aware are consumers in Groningen of their water footprint?*
- 1 *Which initiatives can be used to increase awareness of the water footprint?*
- 2 *Which lifestyle changes are consumers in Groningen willing to adopt to increase sustainable water consumption?*

## 1.3 Reading guide

This thesis has five chapters. In chapter one, the topic is introduced, the aim of the research is explained and the research problem is defined. Chapter two includes the theoretical framework, in which core concepts are defined. It is followed by the conceptual model and the expectations for the results of this research. Chapter three proposes the methodology. This includes an elaboration on the research method and how the data is collected. Chapter four presents the results of the research and chapter five contains the conclusions, in which the research questions are answered. It also includes a discussion and the limitations of this research.

## 2 Theoretical framework

### 2.1 The Water Footprint

The concept of a footprint is not new in modern society. As a part of a larger family of footprints, the WF is yet another measure for showing the overuse of natural resources or pressure on the environment by human beings (Hoekstra et al., 2009). Ecological and carbon footprints are widely used terms in the public debate about the threat of global climate change and the depletion of (non-)renewable resources (Wiedmann & Minx, 2008; Ewing et al., 2010), and from the existing literature it seems there is a growing interest in the concept of the WF as well. This raises the question of what consumers can do to reduce the pressure on freshwater resources, as they become more aware of the impact they have and recognize that changes have to be made (Hoekstra, 2020).

After considering several sources, such as Hoekstra et al. (2009), Wiedmann & Minx (2008), Ewing et al. (2010) and Hoekstra (2020), it becomes clear that there is an agreement about the definition and calculation of a WF. In this research, the definition of Hoekstra et al. (2011) will be used. They define the WF of a consumer as the total volume of freshwater consumed and polluted for the production of goods and services used by the consumer. The components that are included in this research are the direct WF of consumers and the indirect WF of consumers. The direct WF of a consumer is linked to water use at home such as in the kitchen, bathroom or garden and the indirect WF of a consumer is linked to the production of the goods and products that the consumers consume, such as food, electronica and clothing (Hoekstra & Chapagain, 2006).

### 2.2 Awareness

In the research conducted by Gómez-Llanos et al. (2020) is concluded that consumers are less aware of the indirect impact their daily choices have on water resources, as they are predominantly confronted with their direct water use and not or little with their indirect water use. However, the indirect water use of consumers is larger than the direct water use of consumers (Hoekstra et al., 2011). Creating or increasing awareness of the direct and indirect water use and consumers their WF can therefore be an essential mean in improving sustainable practices amongst consumers. Furthermore, Gomez-Llanos et al. (2020) state that, although the water footprint is a relatively new and unknown concept, many consumers quickly understood the importance of knowing how much water is consumed for producing goods and services once it was explained to them. This is complemented by the results of Vanham (2018) which concluded that, as water is a very recognizable resource in terms of quantity, the WF is a valuable tool for communication and awareness-raising of water use related to goods.

Nauges & Weeler (2017) investigated the relation between climate change concerns and mitigation behavior and concluded that households with higher concerns about climate change are positively influenced to change their behavior regarding water and energy use. Emphasizing environmental awareness and the benefits of taking more action are, according to Nauges & Weeler (2017), some of the best ways to change and increase responsible behavior.

One of the methods that can be used to increase awareness of the WF amongst consumers is product transparency, mentioned in the research from Aldaya & Hoekstra (2011). Product transparency can be created by adding a label to a product, displaying the WF of that product. Aldaya & Hoekstra (2011) say that product transparency could be the first requirement for consumers to be able to make well-informed decisions on what to buy, by showing the WF on the label of a product. Showing the WF creates awareness about the amount of water that is used to produce the product the consumer wants to buy.

## 2.3 Reducing the WF

The WF consists of direct water use and indirect water use, and to reduce both considerably several lifestyle changes that can be made by consumers:

### **Direct water use**

Although the direct WF is a lot smaller than the indirect WF, reducing the water use at home in the kitchen, bathroom and garden is certainly worthwhile according to Hoekstra et al. (2011). They also provide effective examples of what can be done in day to day life to reduce total water use. The same examples also come back in the research conducted by Gómez-Llanos et al. (2020). Prime examples are installing a water-saving toilet, using a water-saving showerhead, harvest rainwater and turning off the tap during teeth-brushing.

### **Indirect water use**

As the indirect water use is much larger than the direct water use of consumers, lowering this would be more effective for the overall reduction of the WF (Hoekstra et al., 2011). To do so, a consumer has multiple options, such as changing their consumption patterns, eat vegetarian, reduce waste or buy locally.

### *Consumption pattern*

Hoekstra et al. (2011) state that consumers can change their consumption pattern in two ways: by replacing a product that has a large WF for a similar type of product that has a low or lower WF or by replacing certain products that have a high WF for completely different products. This could mean that consumers that eat meat regularly become vegetarian, that they buy clothes that are made of sustainable fabrics such as hemp or bamboo (Hoekstra et al., 2011), or do smaller things like replacing their coffee for water. Making this shift would not be an easy task, but the idea of Aldaya & Hoekstra (2011) about product transparency could be the start for consumers to make more conscious choices.

### *Eat vegetarian*

According to Vanham et al. (2018), a vegetarian diet utilizes from 35 up to 55% less water than a diet containing meat, meaning consumption of water resources is substantially reduced if consumers would start eating vegetarian. It could be difficult for consumers to make this shift, but reducing the number of meat-based meals or reducing the portion size would already benefit the WF. Choosing 'better' meat, meaning with a lower WF, would also be effective. Mekonnen & Hoekstra (2012) explain and show that various animal products and crops have different average water footprints (table 3.1) with significantly different impacts on water resources.

*Table 3.1: The global average WF of animal products versus crops (Mekonnen & Hoekstra, 2012)*

<b>Animal product</b>	<b>Liter/kg</b>	<b>Crop</b>	<b>Liter/kg</b>
Bovine leather	16,600	Rice	3400
Beef	15,500	Groundnuts	3100
Sheep meat	6100	Wheat	1300
Cheese	5000	Maize	900
Pork	4800	Apple or pear	700
Milk powder	4600	Orange	460
Goat meat	4000	Potato	250
Chicken	3900	Cabbage	200
Eggs	3300	Tomato	180
Milk	1000	Lettuce	130

### *Reduce food waste*

Schanes et al. (2018) explain in their report that one-third of all food produced for human consumption is lost or goes to waste every year. They also say that, even though food waste occurs in all stages of the supply chain, households have been identified as key contributors to food waste. EPA (2020) explains that by reducing waste and managing food sustainability, consumers can play a big role in conserving resources such as freshwater for future generations.

### *Buy local*

Stancu et al. (2018) explain how buying products that are made locally and foods that are grown close to home not only support local economies but also reduces the pollution that is involved in transporting, manufacturing and selling the food and products and reduces the amount of water used in transport.

## 2.4 Expectations

Ridoutt and Pfister (2010) state that most consumers are not aware of their total water consumption. Gómez-Llanos et al. (2020) show that the WF is unknown to many, as the concept is relatively new. As such, the first expectation is that the current awareness of consumers in Groningen of their WF is low.

In the research of Aldaya & Hoekstra (2011) is explained how product transparency is a useful method to increase awareness of the WF amongst consumers. By showing the WF of a product, more conscious choices can be made as it creates awareness about the amount of water used. Vanham (2018) state that water is a useful tool to increase awareness of water use related to goods. Based on this, the second expectation is that product transparency and awareness of the WF positively influence the choices of consumers to go for a more sustainable option when buying products.

According to Nauges & Weeler (2017) households that have higher concerns about climate change are more likely to mitigate behavior regarding water and energy use. Aldaya & Hoekstra In chapter 3.3, several lifestyle changes are presented. As they seem to be successful ways to lower the WF, it would be expected that consumers in Groningen are willing to adopt these as well. However, these would depend on how helpful consumers think these lifestyle changes would be. The expectation will therefore be that the more helpful consumers think a lifestyle change is, the more they are willing to adopt it.

## 2.5 Conceptual model

From the concepts discussed earlier, it is possible to create a conceptual model for this research. This model clarifies the relationships between the theories used and provides a clear view of the research.

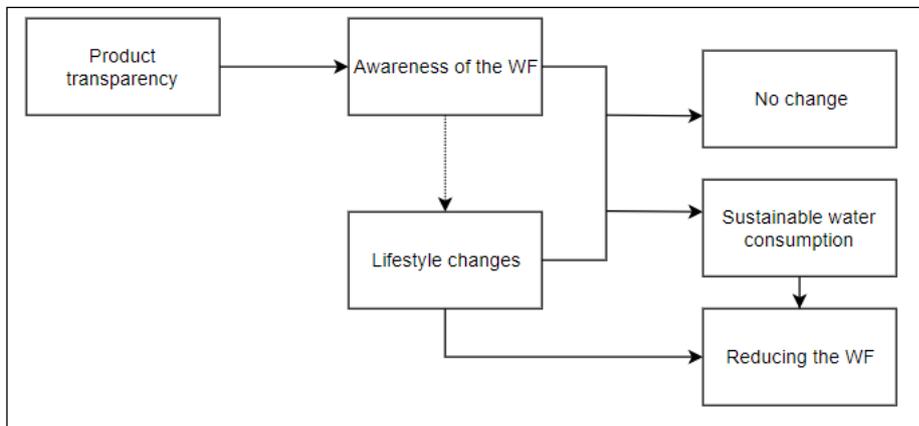


Figure 3.1: Conceptual model

According to Aldaya & Hoekstra (2011), product transparency is one of the methods that can be used to increase the awareness of consumers about the WF. As consumers are mostly confronted with the direct water use and not or little with their indirect water use (Gómez-Llanos et al, 2017), showing the WF on a label of a product creates awareness of the amount of water that is used to produce that product, which could then help consumers in making well-informed and possibly more sustainable decisions. Therefore, product transparency leads to a bigger awareness of the WF, which leads to an increase in sustainable water consumption. Improving responsible behavior and stimulate lifestyle changes can be done by emphasizing environmental awareness (Nauges & Weeler, 2017). Awareness of the WF therefore has a positive influence on the lifestyle changes consumers take, as well as on sustainable water consumption. As found in the literature and elaborated on in chapter 3.3, several lifestyle changes that can be made by consumers to improve sustainable water consumption and thereby reducing their WF. However, these lifestyle changes are not only influenced by awareness of the WF but can also be made for other reasons. Therefore, lifestyle changes can reduce the WF without increased awareness of the WF. It is possible that consumers who are or become aware of the WF, do not make lifestyle changes or decide not to increase sustainable water consumption. Therefore, it is possible that awareness of the WF and lifestyle changes do not lead to a reduction of the WF but to no change.

## 3 Methodology

### 3.1 Data collection

Within this research, a combination of research methods has been used, being a literature review and a survey. An overview of the used methods for the research questions is presented in figure 4.1.

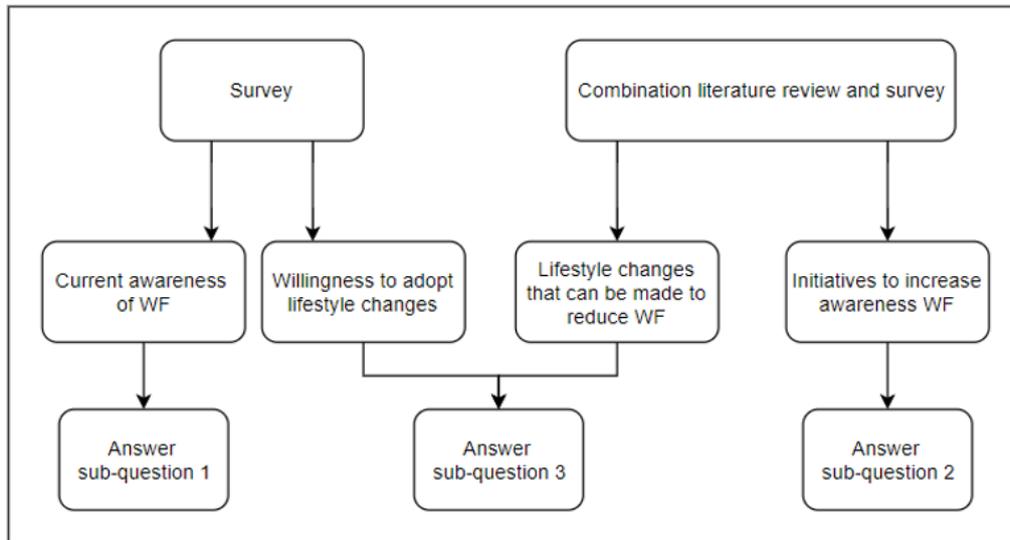


Figure 4.1: Data analysis scheme

#### 3.1.1 Literature review

First, a literature review has been conducted to identify and build an understanding of theoretical concepts that were relevant for this research. This was done via search engines provided by the Rijksuniversiteit Groningen, such as Google Scholar and SmartCat. The literature review provided knowledge on the initiatives that can be used to increase awareness of the WF and additionally, it was used to gain insight on which actions could be taken in day-to-day live to reduce the WF. The lifestyle changes that were found in the literature laid the foundation for the questions asked in the survey, of which further elaboration can be found in paragraph 4.1.2. With a combination of the literature review and the survey, an answer to sub-question 2 and 3 was given.

#### 3.1.2 Survey

To gather primary data for this research, a web-based survey was developed in the Qualtrics software and shared with consumers in Groningen. It was conducted in November 2020 and December 2020. For this research, the aim was to receive 100+ respondents and sending out a survey made it possible to do research on such a large scale, at it could easily be spread out via the internet and social media channels. The survey can be found in the appendix of this document.

To get respondents for the survey, it was shared via social media channels like Facebook, LinkedIn, Instagram and WhatsApp. By asking a close network to share the survey as well, it was possible to reach more respondents. Due to the COVID-19 pandemic and the regulations made by the government to stay inside and avoid contact as much as possible, it was not responsible to collect data physically. Fortunately, an online survey made it possible to gather enough respondents.

The selection of respondents has been done through convenience sampling, which is a non-probability sampling method. This method is a type of sampling where the first available primary data source will be used for the research and where advantage is taken of cases, informants, events or situations that are close at hand (Punch, 2014). Due to a big available network in the city of Groningen, many suitable respondents could be reached.

Within the survey, closed-ended questions were asked. The respondents could choose from a provided list of possible answers, making it easier for the respondents to fill it in. An exception was made for multiple answer questions, where the respondent had the option to provide an answer in their own words in case they did not see the answer they want to give in the options. Multiple respondents made use of this, meaning it was of value to add this option.

The survey was divided into three sections. Section one focused on general information of the respondents and their awareness of the WF. Section two focused on ways to increase awareness of the WF, specifically on the method of product transparency. This section is relevant as proven by Aldaya & Hoekstra (2010), who mention that product transparency is a requirement to make well-informed decisions by consumers on what to buy. Showing the WF of a product could therefore help increase the awareness of the WF. The last section was about possible ways to reduce the WF and the willingness of the respondents to make lifestyle changes to reduce their own WF. Based on a literature review, best practices to do this were chosen and used in the survey.

### 3.2 Data analysis

A total of 169 respondents started with the survey, of which 61 did not complete it. This means a result of 108 useful respondents. To analyze the data, Qualtrics software in combination with the program SPSS was used. As it differed per respondents what or how much was missing, the decision has been made to remove the incomplete surveys from the results as it was partly unusable. Furthermore, 9 respondents did not answer the question for which they had to calculate their own WF. This means there were 99 valid responses left for this question. Because this is only a small part of the research and all other questions were answered by the 99 respondents, it has been decided to use all remaining answers in the data analysis.

To see if product transparency influences the choice that respondents would make, the McNemar test was used. This is a non-parametric used to determine if there is a change in proportion for paired data (Pembury Smith & Ruxton, 2020).

#### 3.2.1 Quality of the data

The socio-demographics of the respondents are presented in figure 4.2 till figure 4.4. What can be seen is that the respondents are fairly young and there are a lot of highly educated respondents, and based on the net income of the respondents most of them are students. The distribution of age and income are both right-skewed and education level is left-skewed. With the network of the researcher consisting of mostly younger and academically schooled respondents, choosing a convenience sample has consequences on the quality and representation of the data.

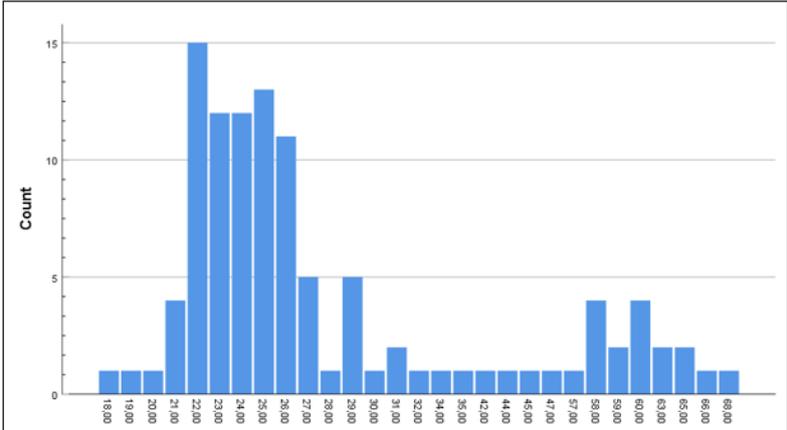


Figure 4.2: Age of the respondents

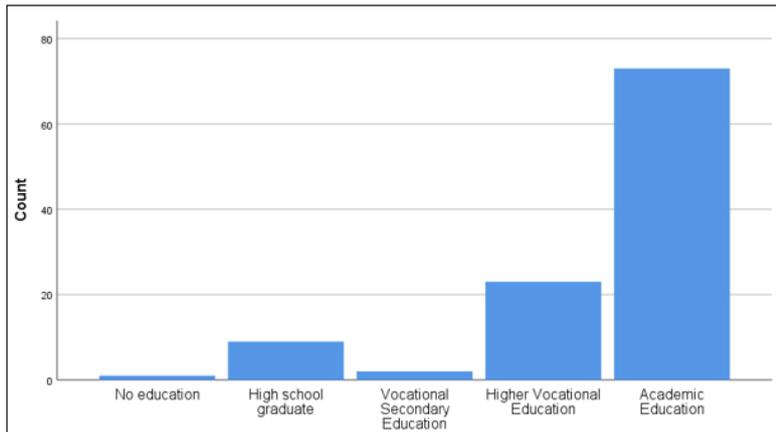


Figure 4.3: Education level of respondents

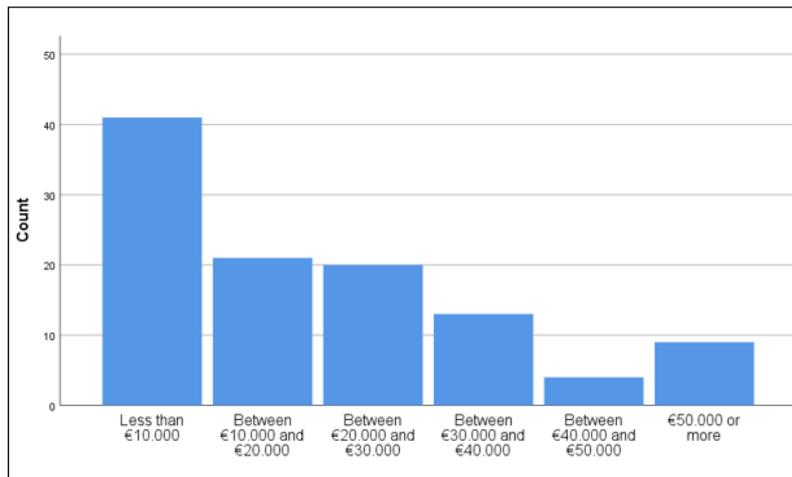


Figure 4.4: Net income 2019 of respondents

### 3.3 Ethical considerations

For the respondent to make an informed judgment about whether or not they wished to participate, the survey started with a short introduction. This introduction stated who the research benefits, how many questions the respondents could expect and how long the survey approximately would take. The respondents were also given information about the content and purpose of the research. Participation in the survey was completely voluntary and respondents could withdraw at any point. To avoid any discomfort, questions that were more personal could be skipped. The results of the survey are processed anonymously and will be removed automatically after 6 months. The information derived from the survey will not be used for any other purpose than this research. By participating in the survey, the respondent consented to the use of their answers in the research, which was explicitly stated at the bottom of the introduction.

## 4 Results

### 4.1 Awareness of the WF

To see how aware consumers in Groningen were of the WF, they were asked if they have heard of the WF before or not. In total, 66.7% of the respondents have heard of the WF before, which is also shown in figure 5.1.

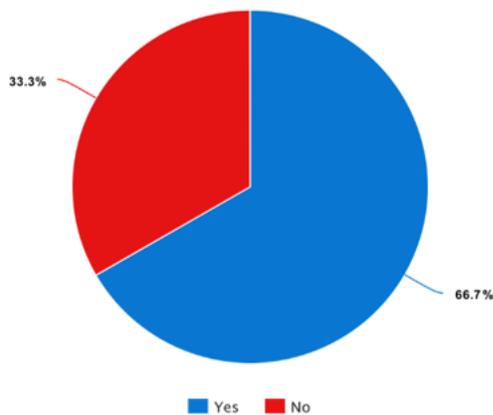


Figure 5.1: Percentage of respondents that heard about the WF before

The outcome of the WF of the respondents is shown in Table 5.3. The average WF of consumers in the city of Groningen is 1034,75m<sup>3</sup>, which is 433,48m<sup>3</sup> lower than the average WF of consumers in the Netherlands (1466m<sup>3</sup>).

Table 5.3: Average WF of respondents

N	Valid	99
	Missing	9
Mean		1034,7475
Std. Deviation		677,93258
Range		3741,00
Minimum		259,00
Maximum		4000,00

In Figure 5.2 can be seen what the expectation of the respondents of their WF was, compared to the average WF of consumers in the Netherlands (1466m<sup>3</sup>). Out of the 109 respondents, 30,3% thought their WF would be below the average of consumers in the Netherlands, 52,5% thought their WF would be the same and 17,2% thought their WF would be above average. In Figure 5.3, the actual outcome of consumers their WF in Groningen is shown, compared to the average in the Netherlands. Overall, consumers in Groningen expected their WF to be higher than it was.

Of the 99 respondents, 44.4% expected their WF to be higher than it turned out to be, 15,2% expected it to be lower than it was and 40,4% had the right expectation of their WF being the same as the average of the consumers in the Netherlands.

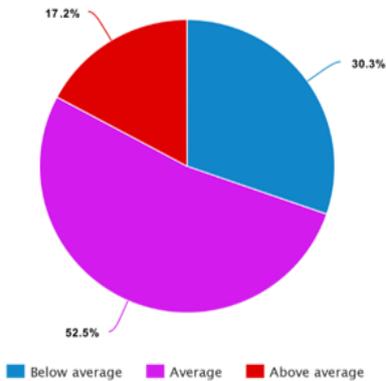


Figure 5.2: Expectations of respondents their WF

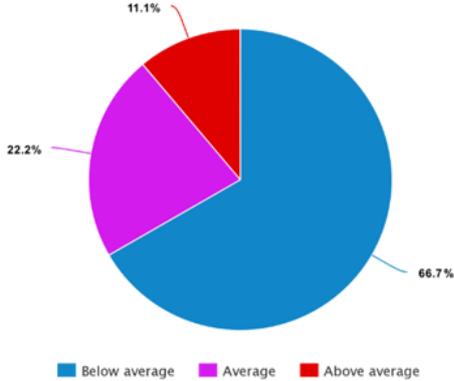
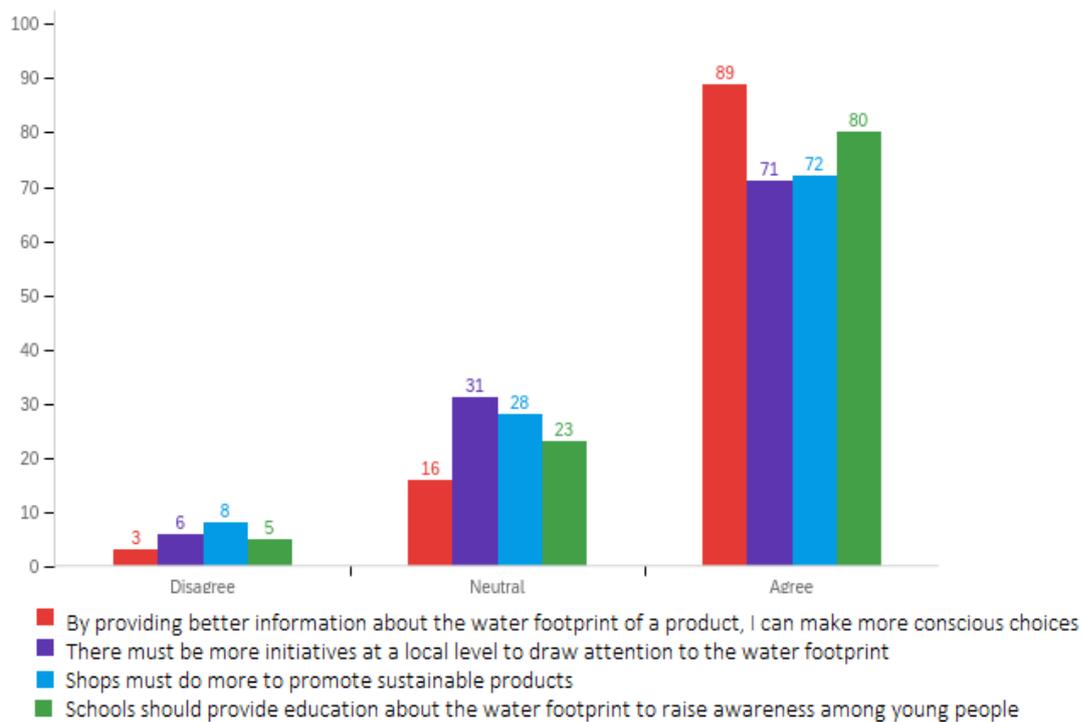


Figure 5.3: Outcome of respondents their WF

As Ridoutt & Pfister (2010) stated that most consumers were not aware of their water consumption and Gómez-Llanos et al. (2020) concluded that the WF is unknown to many because it is a relatively new concept, the outcome of consumers their awareness of the WF is higher than first expected. 66,7% of the respondents had heard from it before and 40,4% had the right expectation of what their WF would be. A possible reason for this outcome could be that most of the respondents are students, based on the results of age and income. With the increased popularity of sustainable knowledge and practices in the last few years, students nowadays are more aware of the importance of sustainability, and the concept of WF can already be used for educational purposes.

Increasing awareness of the WF can be an essential mean in developing sustainable practices amongst consumers and even though the result of the awareness of the consumers in Groningen was higher than expected, improvements can be made. To see what methods could be used to increase awareness, respondents were also provided with several statements about this and asked to what degree they agreed with it or not. These statements were: by providing better information about the water footprint of a product, I can make more conscious choices; there must be more initiatives at a local level to draw attention to the water footprint; shops must do more to promote sustainable products; schools should provide education about the water footprint to raise awareness among young people. In figure 5.4, the results are presented. The great majority agrees with all statements, meaning the need for extra information is quite high.

Figure 5.4: statements on how awareness of the WF can be increased



## 4.2 Product transparency

As stated in chapter 3, increasing awareness of the WF through product transparency could help consumers to make a well-informed decision about what to buy (Aldaya & Hoekstra, 2011). To see how product transparency affects the choice of consumers in Groningen, an intervention was designed.

Respondents had to choose between two similar products, first with only knowing the price and secondly with knowing the price and WF of the product. A positive change was made when consumers switched to the product with the lower WF and thus the more sustainable option, and a negative change was made when consumers switched to the product with the higher WF. The products that were used for this intervention were a normal showerhead and a water-saving showerhead, a steak and a soy burger, a cotton shirt and a hemp shirt and cane sugar and beet sugar.

### Normal showerhead vs water-saving showerhead

In figure 5.4 can be seen that, when only the price of the product was shown, 49% choose the normal showerhead and 51% choose the water-saving showerhead. In figure 5.5 is shown that 27% of the respondents choose a normal showerhead and 73% choose a water-saving showerhead when not only the price but also the WF was shown. Assuming the normal showerhead uses 14,5 liter per minute and a water-saving showerhead uses 5 liter per minute, the water-saving showerhead is the most sustainable choice.

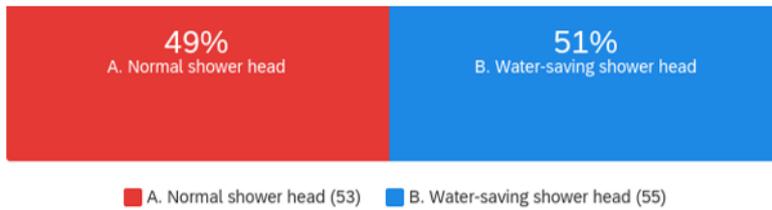


Figure 5.5: Choice of respondents when showing price- normal showerhead vs water-saving showerhead

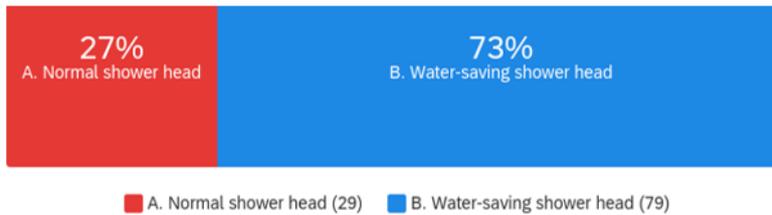


Figure 5.6: Choice of respondents when showing price and WF - normal showerhead vs water-saving showerhead

In table 5.1 can be seen what effect the intervention had on the choice that consumers made. Of the 108 respondents, 23,1% switched to a water-saving showerhead when the price and WF were shown, while they choose a normal showerhead when only seeing the price. This is seen as a positive change, as consumers switched to the more sustainable option. 0,9% of the respondents preferred a normal showerhead when the price and WF was shown, while choosing a water-saving showerhead when only the price was shown.

Table 5.1: Choice of respondents before and after the intervention – normal shower head vs water-saving shower head

		Which choice do you make? (after intervention)		Total
		A. Normal shower head	B. Water-saving shower head	
Which choice do you make? (before intervention)	A. Normal shower head	25,9%	23,1%	49,1%
	B. Water-saving shower head	0,9%	50,0%	50,9%
Total		26,9%	73,1%	100,0%

In table 5.2, the results of the McNemar's test are presented. As  $p = 0,000$ , the test determines there is a statistically significant result. The proportion of respondents that choose the more sustainable product before and after the intervention is significantly different. This means that the change in answers is not random, but that product transparency influences the choice of respondents when it comes to choosing between a normal showerhead and a water-saving showerhead.

Table 5.2: Result McNemar test - normal shower head vs water-saving shower head

Chi-Square Tests		
	Value	Exact Sig. (2-sided)
McNemar Test		,000 <sup>a</sup>
N of Valid Cases	108	

a. Binomial distribution used.

### Steak vs soy burger

When giving consumers the choice between a steak and a soy burger when only the price was given, the number of respondents that choose a steak was the same number of respondents that choose a soy burger, as can be seen in Figure 5.6. When showing the price and the WF, the number of respondents that choose a steak went down to 41% and the number of respondents that choose a soy burger went up to 59%, as can be seen in figure 5.7. Assuming steak has a WF of 14513L per KG and a soy burger has a WF of 1053L per KG, the soy burger is the most sustainable choice.

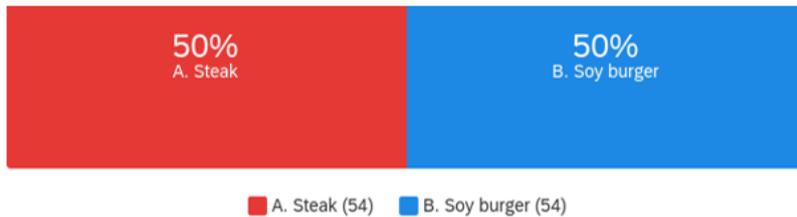


Figure 5.7: Choice of respondents when showing price - steak vs soy burger

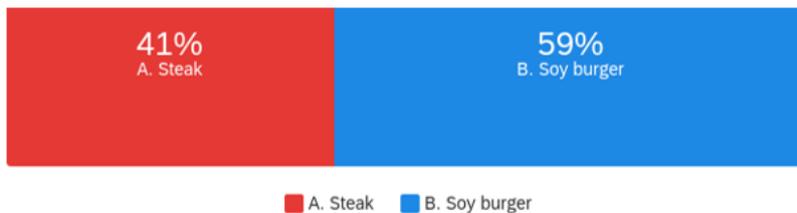


Figure 5.8: Choice of respondents when showing price and WF - steak vs soy burger

In table 5.3, the result of the choice that respondents made between a steak and a burger pre- and post-intervention can be seen. In total, 90,7% of the respondents stuck to the choice they made when first seeing price and after seeing the price and the WF. 9,3% of the respondents made a positive change, going from the steak to the soy burger, and 0% of the respondents made a negative change.

Table 5.3: Choice of respondents before and after the intervention – steak vs soy burger

		Which choice do you make? (after intervention)		Total
		A. Steak	B. Soy burger	
Which choice do you make? (before intervention)	A. Steak	40,7%	9,3%	50,0%
	B. Soy burger	0,0%	50%	50,0%
Total		40,7%	59,3%	100,0%

In table 5.4, the results of the McNemar’s test are presented. As  $p = 0,002$ , the test determines there is a statistically significant result. The proportion of respondents that choose the more sustainable product before and after the intervention is significantly different. This means that the change in the answers is not random and that product transparency has an influence on the choice of respondents when it comes to choosing between a steak and a soy burger.

Table 5.4: Results McNemar test - steak vs soy burger

Chi-Square Tests		
	Value	Exact Sig. (2-sided)
McNemar Test		,002 <sup>a</sup>
N of Valid Cases	108	

a. Binomial distribution used.

### Cotton T-shirt vs hemp T-shirt

In figure 5.8 and 5.9, the choices of respondents between a cotton T-shirt and a hemp T-shirt are shown. 91% of the respondents first choose a cotton T-shirt and 9% choose a hemp T-shirt when only the price was shown, while this shifted to 39% respondents that went for a cotton T-shirt and 61% respondents that went for a hemp T-shirt when the price and the WF were shown. Assuming that the water used to produce a cotton T-shirt is 2500L and the water used to produce a hemp T-shirt is 800L, a hemp T-shirt is the most sustainable choice.

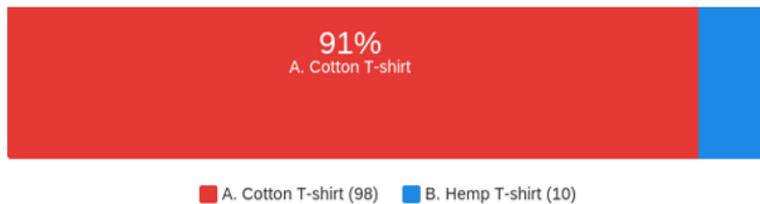


Figure 5.9: Choice of respondents when showing price - cotton T-shirt vs hemp T-shirt

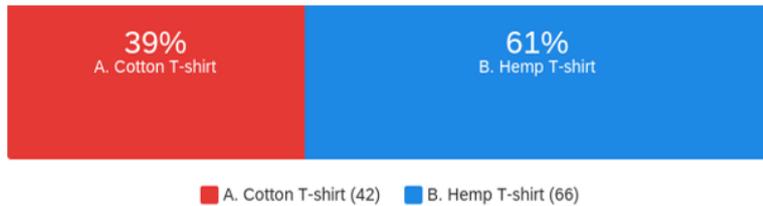


Figure 5.10: Choice of respondents when showing price and WF – cotton T-shirt vs hemp T-shirt

In table 5.5, the choice of the respondents before and after the intervention is shown. A little over half of the respondents decided to make another choice after the intervention. 0% of the respondents first choose a hemp T-shirt before the intervention and a cotton T-shirt after the intervention, meaning there are no negative changes.

Table 5.5: Choice of respondents before and after intervention - cotton T-shirt vs hemp T-shirt

		Which choice do you make? (after intervention)		Total
		A. Cotton T-shirt	B. Hemp T-shirt	
Which choice do you make? (before intervention)	A. Cotton T-shirt	38,9%	51,9%	90,7%
	B. Hemp T-shirt	0,0%	9,3%	9,3%
Total		38,9%	61,1%	100,0%

In table 5.6, the results of the McNemar test are presented. As  $p = 0,000$ , the test determines there is a statistically significant result. The proportion of respondents that choose the more sustainable product before and after the intervention is significantly different. This means that the change in the answers is not random and that product transparency has an influence on the choice of respondents when it comes to choosing between a cotton T-shirt and a hemp T-shirt.

Table 5.6: Results McNemar test - cotton T-shirt vs hemp T-shirt

Chi-Square Tests		
	Value	Exact Sig. (2-sided)
McNemar Test		,000 <sup>a</sup>
N of Valid Cases	108	

a. Binomial distribution used.

### Cane sugar vs beet sugar

When choosing between cane and beet sugar, 89% of the respondents choose can sugar and 11% choose beet sugar when only the price was presented to them, as can be seen in figure 5.10. When the price and the WF of both the products were presented, 50% decided to go for cane sugar and 50% went for beet sugar (Figure 5.11). Assuming that the WF is 900L per KG for cane sugar is 900L and 450L per KG for beet sugar, beet sugar is the most sustainable choice.

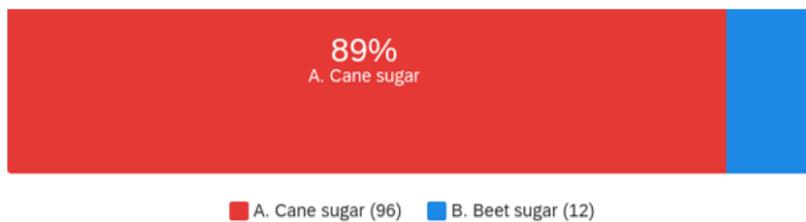


Figure 5.11: Choice of respondents when showing price – cane sugar vs beet sugar

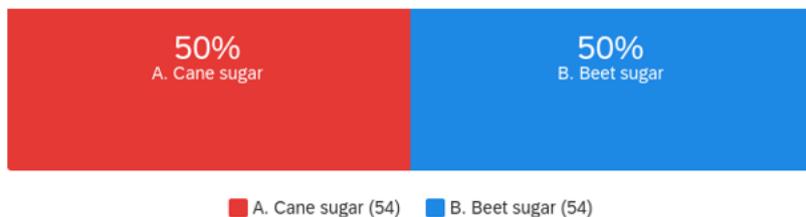


Figure 5.12: Choice of respondents when showing price and WF – cane sugar vs beet sugar

Table 5.7 shows the choices of respondents before and after intervention for beet and cane sugar. 40,7% of the respondents preferred another option after the intervention. 39,8% of them made a positive change, going for beet sugar after knowing the price and WF of the products while going for cane sugar when only knowing the price of the products.

Table 5.7: Choice of respondents before and after intervention – cane sugar vs beet sugar

		Which choice do you make? (after intervention)		Total
		A. Cane sugar	B. Beet sugar	
Which choice do you make? (before intervention)	A. Cane sugar	49,1%	39,8%	88,9%
	B. Beet sugar	0,9%	10,2%	11,1%
Total		50,0%	50,0%	100%

In table 5.8, the results of the McNemar test are presented. As  $p = 0,000$ , the test determines there is a statistically significant result. The proportion of respondents that choose the more sustainable product before and after the intervention is significantly different. This means the change in the answers is not random and that product transparency has an influence on the choice of respondents when it comes to choosing between cane sugar and beet sugar.

Table 5.8: Result McNemar test – cane sugar vs beet sugar

Chi-Square Tests		
	Value	Exact Sig. (2- sided)
McNemar Test		,000 <sup>a</sup>
N of Valid Cases	108	

a. Binomial distribution used.

For all products, the outcome of the McNemar test is statistically significant, meaning product transparency influences the choice of the respondent pre- and post-intervention.

What can be seen in table 5.1 and 5.7 is that negative changes are made, meaning the respondent initially preferred the most sustainable option pre-intervention and then changed to the less sustainable choice post-intervention. The less sustainable choices are assumed to be cheaper and this could be a reason for the respondent to go for the less sustainable option. But overall, the biggest changes that are made are positive changes and therefore it can be concluded that product transparency positively influences consumers in making more conscious choices.

In the research of Aldaya & Hoekstra (2011) was explained that consumers could change their consumption pattern to reduce their WF, of which one of the examples was to start eating vegetarian. When having to choose between steak and the soy burger, only 9,3% of the respondents made a different choice pre- and post-intervention, which seemed like a small number. It was therefore expected that this would not be a significant change in the choice of the respondents, also because becoming vegetarian is not an easy shift to make and has a lot to do with personal preferences and the eating pattern of the respondent (Aldaya & Hoekstra (2011)).

Nonetheless, the significant result of the McNemar test for the change of choice between a steak and a soy burger and the significant results of all other McNemar tests supports the statement made by Aldaya & Hoekstra (2011), being that product transparency positively influences consumers in making more conscious choices. It also reinforces the research of Vanham (2018), who concluded that the WF is a valuable tool for communication and awareness-raising of water use related to goods. Showing the WF positively influences consumers' choices when it comes down to buying products.

### 4.3 Lifestyle changes to reduce the WF

In the survey, respondents were asked to what extent they thought paying more attention to direct water use in the kitchen bathroom and garden, eating vegetarian, buying locally, reducing food waste, buying sustainable clothing and harvesting rainwater would help in reducing the WF. Next to that, they were asked to what extent they were willing to adopt those lifestyle changes to reduce their own WF. The following section will elaborate on the results of how helpful consumers think the lifestyle changes would be and how willing they are to adopt these lifestyle changes themselves.

#### Pay more attention to water use in the kitchen, bathroom and garden

The extent to which respondents think paying more attention to water use in the kitchen, bathroom and garden would help in reducing the WF and the willingness of respondents to do this to reduce their own WF is shown in Figures 5.12 and 5.13.

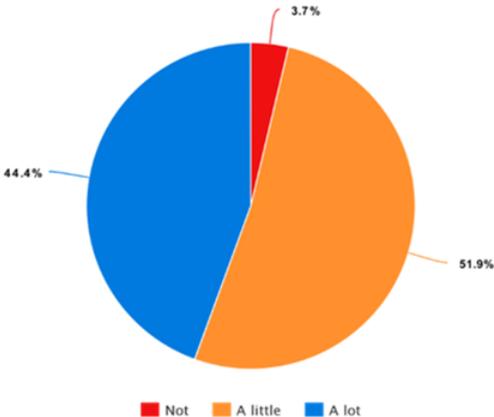


Figure 5.13: Helpful to pay more attention to direct water use in kitchen, bathroom and garden for reducing WF

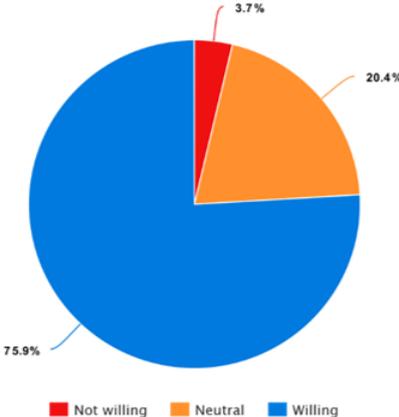


Figure 5.14: Willingness to pay more attention to direct water use in kitchen, bathroom and garden to reduce WF

Table 5.9 shows the willingness of respondents to pay more attention to direct water use in the kitchen, bathroom and garden, in combination with the answer they gave on the question of how helpful they thought it would be. It shows that 0,9% of the respondents that thought paying more attention to direct water use in kitchen, bathroom and garden would not be helpful, is also not willing to do so. 75% of the respondents think it would help a little or a lot and is also willing to adopt this lifestyle change.

Table 5.9: Helpful and willingness to pay more attention to direct water use in kitchen, bathroom and garden

		To what extent are you willing to pay more attention to direct water use in kitchen, bathroom and garden			Total
		Not willing	Neutral	Willing	
To what extent do you think paying more attention to direct water use in kitchen, bathroom and garden helps in reducing the WF	Not (% of total)	0,9%	1,9%	0,9%	3,7%
	A little (% of total)	2,8%	13,9%	35,2%	51,9%
	A lot (% of total)	0,0%	4,6%	39,8%	44,4%
<b>Total</b>		<b>3,7%</b>	<b>20,4%</b>	<b>75,9%</b>	<b>100%</b>

The respondents were also asked to provide other ways that could be helpful to reduce the WF and most of the answers given on this question were focused on the reduction of water use in kitchen, bathroom and garden. This seems to make sense, as consumers are predominantly confronted with their direct water use (Gómez-Llanos et al., 2020) and therefore, are more focused or more informed about how to lower this. Examples given by the respondents were: do not take a bath; do dishes with the hand; pee multiple times before flushing; pee during showering.

Following the results, it can be concluded that consumers in Groningen are very aware of how helpful paying more attention to direct water use in kitchen, bathroom and garden would be one and that it is one of the lifestyle changes that consumers in Groningen are willing to adopt.

## Eating vegetarian

The extent to which respondents think eating vegetarian would help in reducing the WF and the willingness of respondents to do so to reduce their own WF is shown in Figure 5.14 and 5.15.

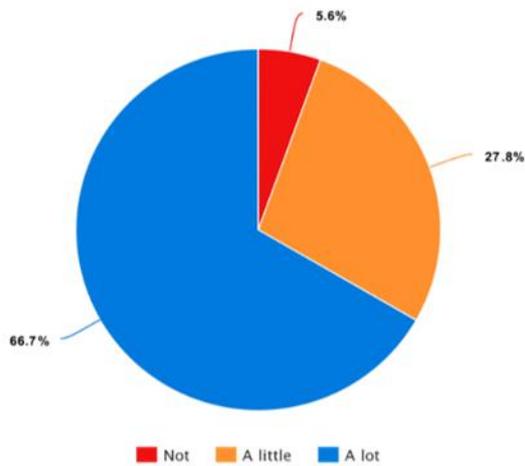


Figure 5.15: Helpful to eat vegetarian

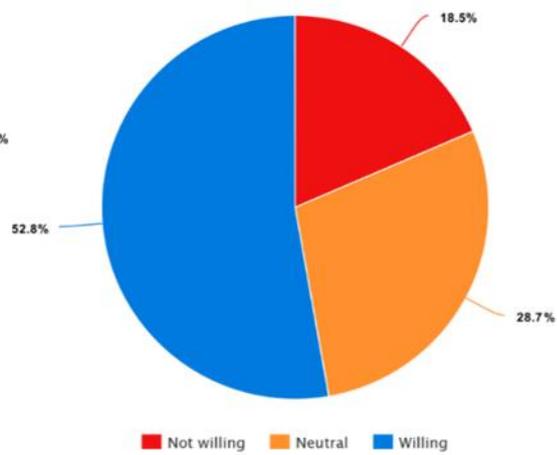


Figure 5.16: Willingness to eat vegetarian

Table 5.10 shows the willingness of respondents to eat vegetarian, in combination with the answer they gave on the question of how helpful they thought it would be. 94,5% of the respondents think it would help a lot a little or a lot. Even though this is a high number, only half of the respondents are willing to do so. A reason for this is indicated in the research from Aldaya & Hoekstra (2011), who state that becoming a vegetarian is a difficult shift to make, as eating meat could for example be part of a regular eating pattern

Table 5.10: Helpful and willingness to eat vegetarian

		To what extent are you willing eat vegetarian to reduce your WF			Total
		Not willing	Neutral	Willing	
To what extent do you think eating vegetarian helps in reducing the water footprint?	Not	1,98%	12,8%	0,9%	5,6%
	A little	8,3%	14,8%	4,6%	27,8,%
	A lot	8,3%	11,1%	47,2%	66,7%
Total		18,5%	28,7%	52,8%	100%

## Buy local products

The extent to which respondents think buying locally would help in reducing the WF and the willingness of respondents to do so to reduce their own WF is shown in Figures 5.16 and 5.17.

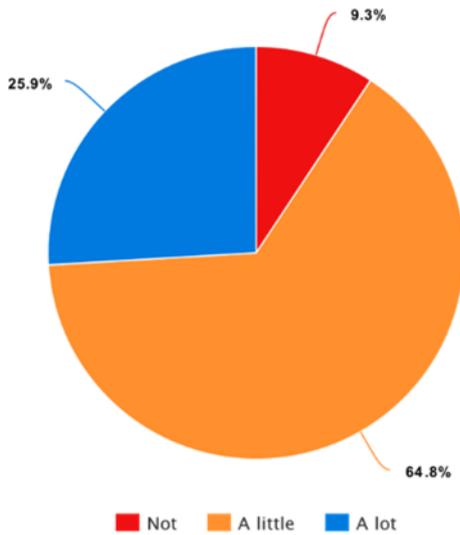


Figure 5.17: Helpful to buy local products

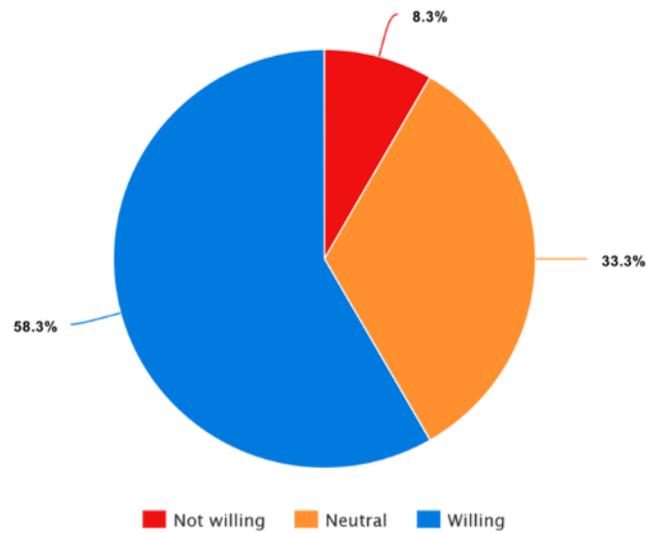


Figure 5.18: Willingness to buy local products

Table 5.11 shows the willingness of the respondents to buy locally, in combination with the answer they gave on the question of how helpful they thought it would be. Two-third of the respondents think buying locally would only help a little for reducing the WF and 25,9% of the respondents think it would help a lot. Nonetheless, a little more than half of the consumers in Groningen is willing to buy locally to reduce their own WF.

Table 5.11: Helpful and willingness to buy locally

		To what extent are you willing to buy locally to reduce your WF			Total
		Not willing	Neutral	Willing	
To what extent do you think buying locally helps in reducing the WF	Not (% of total)	3,7%	1,9%	3,7%	9,3%
	A little (% of total)	3,7%	23,1%	38,0%	64,8%
	A lot (% of total)	0,9%	8,3%	16,7%	25,9%
Total		8,3%	33,3%	58,3%	100%

## Reduce food waste

The extent to which respondents think reducing food waste would help in reducing the WF and the willingness of respondents to do so to reduce their own WF is shown in Figure 5.18 and 5.19.

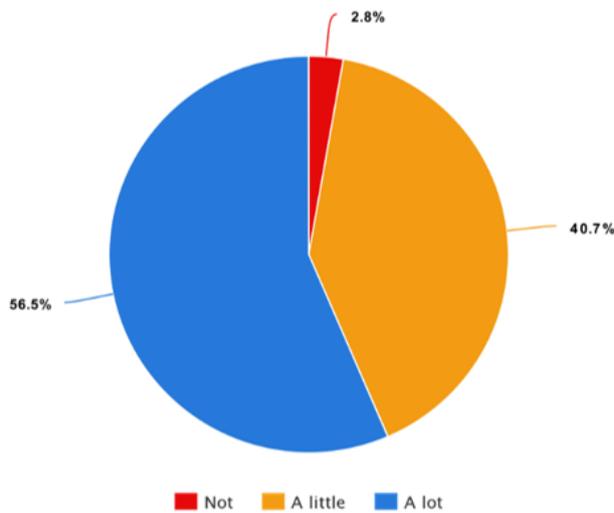


Figure 5.19: helpful to reduce food waste

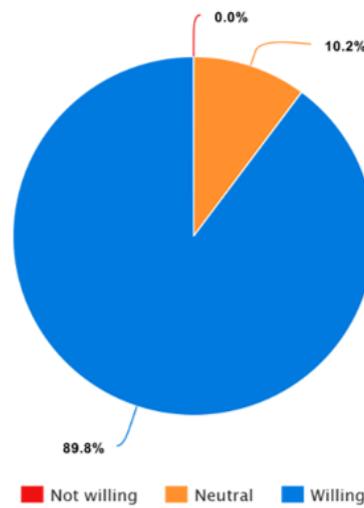


Figure 5.20: willingness to reduce food waste

Table 5.12 shows respondents their willingness to reduce food waste, in combination with the answer they gave on the question of how helpful they thought it would be. What stands out is that 0% of the respondents are not willing to reduce food waste, and a very small percentage of the respondents think it would not help. 97,3% of the respondents think it would help a little or a lot and 89,9% of the respondents are willing to reduce food waste to reduce their own WF. It can be concluded that consumers in Groningen are very aware of the benefits of reducing food waste and that it would be one of the lifestyle changes that consumers in Groningen are willing to make.

Table 5.12: Helpful and willingness to reduce food waste

		To what extent are you willing to reduce food waste to reduce your WF			Total
		Not willing	Neutral	Willing	
To what extent do you think reducing food waste helps in reducing the WF	Not (% of total)	0,0%	0,9%	1,9%	2,8%
	A little (% of total)	0,0%	6,5%	34,3%	40,7%
	A lot (% of total)	0,0%	2,8%	53,7%	56,6%
Total		0,0%	10,2%	89,9%	100%

## Buy sustainable clothing

The extent to which respondents think buying sustainable clothing would help in reducing the WF and the willingness of respondents to do so to reduce their own WF is shown in Figure 5.19 and 5.20.

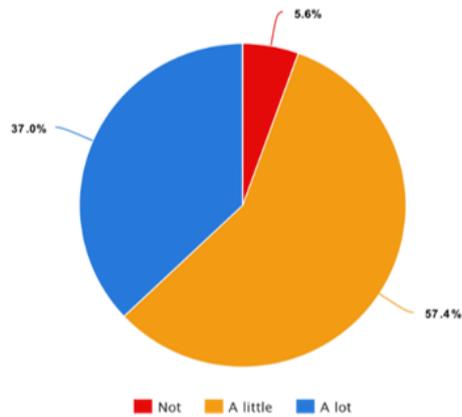


Figure 5.21: helpful to buy sustainable clothing

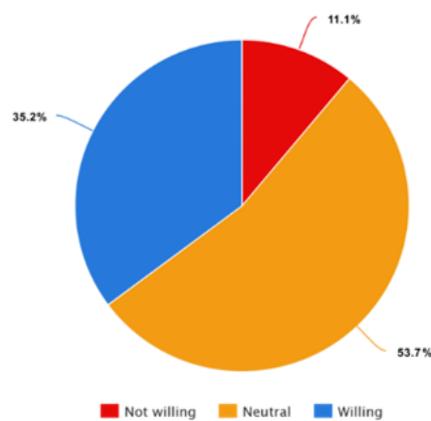


Figure 5.22: willingness to buy sustainable clothing

Buying sustainable clothing would be one of the things consumers can do in changing their consumption patterns. When it comes to sustainable clothing, consumers can start buying clothes that are recycled or made of sustainable fabrics with a lower WF. Table 5.13 shows respondents their willingness to buy sustainable clothing, in combination with the answer they gave on the question of how helpful they thought it would be. What can be seen is that the biggest part of the respondents think it would only help a little and that the biggest part of the respondents is neutral about whether they are willing to buy sustainable clothing. Taking the example of the cotton T-shirt and the hemp T-shirt and the statistically significant difference in choice of respondents, using product transparency for clothing could help consumers in their awareness of how helpful buying sustainable clothing can be in reducing the WF and with that, increase their willingness to do so.

Table 5.13: Helpful and willingness to buy sustainable clothing

		To what extent are you willing to buy sustainable clothing to reduce your WF			Total
		Not willing	Neutral	Willing	
To what extent do you think buying sustainable clothing helps in reducing the water footprint?	Not	2,8%	1,9%	0,9%	5,6%
	A little	7,4%	35,2%	14,8%	57,4%
	A lot	0,9%	16,7%	19,4%	37,0%
Total		11,1%	53,7%	35,2%	100%

## Harvest rainwater

The extent to which respondents think handing in textile would help in reducing the WF and the willingness of respondents to do so to reduce their own WF is shown in Figure 5.23 and 5.24.

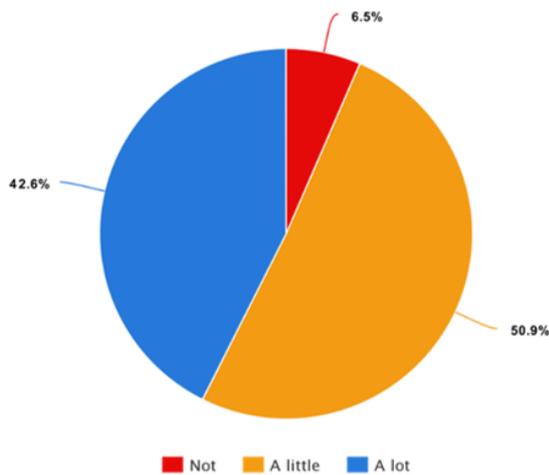


Figure 5.25: helpful to harvest rainwater

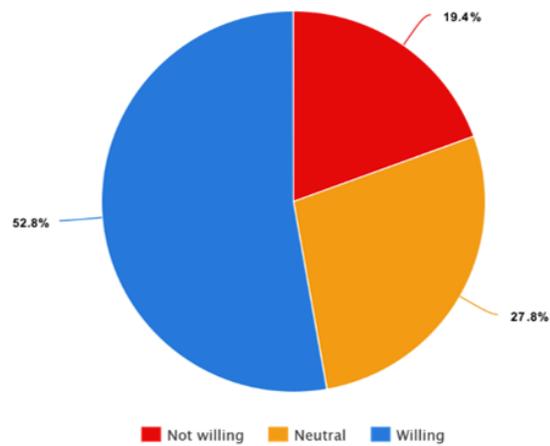


Figure 5.26: willingness to harvest rainwater

In table 5.14 is presented what respondents their willingness is to harvest rainwater in combination with the answer they gave on the question of how helpful they thought it would be. Harvesting rainwater is one of the ways to reduce direct water use, mentioned in the research of Hoekstra et al. (2011). The water that is collected can be used to provide drinking water, as water for the livestock or to irrigate crops and plants inside and outside the house. (Hoekstra et al. 2011). 93,5% of the respondents think harvesting rainwater will help a little or a lot. Even though this is a high number, only half of the respondents are willing to do so. What becomes clear is that the awareness of how helpful this would be in reducing the WF is bigger than the willingness to do so.

Table 5.14: Helpful and willingness to harvest rainwater

		To what extent are you willing to harvest rainwater to reduce your WF			Total
		Not willing	Neutral	Willing	
To what extent do you think harvesting rainwater helps in reducing the WF	Not (% of total)	2,8%	2,8%	0,9%	6,5%
	A little (% of total)	12,0%	19,4%	19,4%	50,9%
	A lot (% of total)	4,6%	5,6%	32,4%	42,6%
<b>Total</b>		<b>19,4%</b>	<b>27,8%</b>	<b>52,82%</b>	<b>100%</b>

## 5 Conclusion

The WF is the total volume of freshwater consumed and polluted for the production of goods and services used by the consumer. Findings in earlier studies gave the impression that the WF is not commonly known and that awareness of the WF is not expected to be high. Contrastingly, research shows a growing interest in the concept of the WF, resulting in an increased awareness of consumers and their impact on freshwater resources. The results of this study align with this assumption, as it shows that 66,7% of the consumers in Groningen are familiar with the concept of the WF and that 40,4% of consumers have the right expectation of what their WF is. However, even though the majority is acquainted with the WF, the need for extra information and awareness-raising is still there. Consumers agree that they can make more conscious choices when more information about the WF of a product is available and that shops must do more to promote sustainable products. Consumers also believe that there should be more initiatives at the local level to draw attention to the WF and that schools should provide education about the WF to raise awareness among young people. These are all practical guidelines that could be implemented. Furthermore, the results show the need for more information on sustainable practices and of the WF. One way to increase awareness of the WF amongst consumers is product transparency, as argued by Aldaya & Hoekstra (2011). Adding a label to a product that displays its WF would be the first requirement for consumers to make well-informed decisions on what to buy and would probably encourage consumers to make more conscious choices. The findings in this study support this argument, as there is a statistically significant result that product transparency has a positive influence on the choice of consumers in Groningen, meaning a significant number of consumers went for the more sustainable product when the WF of a product was shown. This was the case for all choices that the respondents had to make, so for the choice between a normal showerhead and a water-saving showerhead, a steak and a soy burger, a cotton T-shirt and a hemp T-shirt and cane sugar and beet sugar.

This study also investigated the extent to which consumers thought several lifestyle changes would help in lowering the WF and how willing they were to adopt these lifestyle changes to lower their own WF. An analysis of the results shows that when respondents thought a lifestyle change would help in lowering the WF, they were more willing to do adopt this lifestyle. This aligns with the research of Nauges & Weeler (2017), who concluded that higher awareness and concern of climate change positively influence households to change their behavior regarding water and energy use. Consumers were mostly willing to pay more attention to direct water use in the kitchen, bathroom and garden and to reduce food waste, and less willing to eat vegetarian, buy locally, buy sustainable clothing and harvest rainwater.

This outcome seems logical and in accordance with Gómez-Llanos et al. (2020), who concluded in their research that consumers are predominantly confronted with the direct impact of their daily choices and therefore mostly focused on lowering that.

## 5.1 Discussion

The findings of this research are in line with the existing literature and show that increased awareness has a positive influence on consumers their willingness to reduce the WF. Additionally, it contributes to it by providing insights in how awareness of the WF can be raised and how the concept of the WF can be translated into practical guidelines for consumers. This research has also shown that the WF indicator can be a very powerful tool in realizing increased responsible behavior when it comes to sustainable water consumption but misses contextualization. This endorses the need for further research, in which a wider range of aspects of the WF should be considered. For a start, localizing the WF of products or consumers while linking it to places with freshwater scarcity, could improve the understanding of shared responsibility in reducing the WF where it is most necessary.

## 5.2 Limitations

Limitations of this research are that it does not take into account all variables that could explain and affect the behavior of consumers when it comes to reducing the WF and that rough estimations were used to indicate the price and the WF of the products used to measure the effect of product transparency. Therefore, results are partly based on assumptions. Consequently, the results of this research should be interpreted considering this limitation and with caution. For future research, it would be recommended to include variables that could have an influence on respondents their behavior. Examples that can be included are for example income, the presence of a garden or the place of residence. The main strength of the research is that it shows how important increasing awareness of the WF is for improving sustainable water consumption and reducing the WF.

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## Appendix 1

### Water Footprint in a changing climate

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Dear participant,

First of all, I would like to thank for participating in this survey.

I am a student of Human Geography and Urban and Regional Planning at the University of Groningen and I am doing research into consumer awareness with regards to the water footprint. The goal is to gain insight into the current awareness of the water footprint and to what extent consumers are willing to reduce it. During the research, you will be given the opportunity to calculate your own water footprint as well.

The online questionnaire will take about 10 minutes to complete. Your response will be kept completely confidential and the results will be processed anonymously. Your participation in this research is voluntary and you can withdraw at any point.

If you have any questions or comments, please feel free to contact me via [s.dieben@student.rug.nl](mailto:s.dieben@student.rug.nl)

*By filling in this survey, you consent to the use of your answers in the above mentioned research*

---

Q1 What is your age (answer in years)

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Q2 What is the highest level of education you have completed?

- No education (1)
  - High school graduate (2)
  - Vocational Secondary Education (3)
  - Higher Vocational Education (4)
  - Academic Education (5)
- 

Q3 What was your net income in the past year

- Less than €10.000 (1)
- Between €10.000 and €20.000 (2)
- Between €20.000 and €30.000 (3)
- Between €30.000 and €40.000 (4)
- Between €40.000 and €50.000 (5)
- €50.000 or more (6)

In the next section, the concept of the water footprint will be further discussed

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Q4 Have you ever heard of the water footprint?

Yes (1)

No (2)

---

The **water footprint** is the total amount of freshwater used to produce all of the goods and services consumed by a person. A distinction is made between direct and indirect water consumption. The **direct** water consumption is water that is used in the household, for example for showering, for the toilet, for washing or for cooking. **Indirect** water consumption is water used to produce the food we eat, the clothes we wear, and other consumer goods we buy.

---

Q5 The average water footprint of a resident of the Netherlands is 1466 m<sup>3</sup>. What do you expect yours to be?

Below average (1)

Average (2)

Above average (3)

---

For the next question you can calculate your own water footprint. You can do this via the official website: [waterfootprint.org](https://waterfootprint.org) (open in a new tab). This website is in English and uses the American measurement system for some questions.

---

Q6 What is your water footprint in m<sup>3</sup>?

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Q7 Which choice do you make?

- A. Normal shower head (1)
- B. Water-saving shower head (2)



€  
**70**



€  
**40**

---

Q8 Which choice do you make?

- A. Steak (1)
- B. Soy burger (2)



€  
**30,65**  
per KG



€  
**13,95**  
per KG

---

Q9 Which choice do you make?

- A. Cotton T-shirt (1)
- B. Hemp T-shirt (2)



€  
**10**



€  
**25**

---

Q10 Which choice do you make?

- A. Cane sugar (1)
- B. Beet sugar (2)



€  
**1,49 per**  
**500G**



€  
**2,50 per**  
**500G**

---

In the next section you will see the same examples, with the addition of the water footprint per product. Again, make a choice as you would make it in the store.

---

Q11 Which choice do you make?

- A. Normal head shower (1)
- B. Water-saving head shower (2)



€  
**70**  
5L water pm



€  
**40**  
14,5L water pm

---

Q12 Which choice do you make?

- A. Steak (1)
- B. Soy burger (2)



€  
**30,65**  
per KG  
14513L water per KG



€  
**13,95**  
per KG  
1053L water per KG

---

Q13 Which choice do you make?

- A. Cotton T-shirt (1)
- B. Hemp T-shirt (2)



€  
**10**  
2500L



€  
**25**  
800L

---

Q14 Which choice do you make?

- A. Cane sugar (1)
- B. Beet sugar (2)



€  
**2,50** per  
**500G**  
450L water per 500G



€  
**1,49** per  
**500G**  
900L water per 500G

Q15 To what extent do you think the following ways could help reduce the water footprint?

	Not (1)	A little (2)	A lot (3)
Pay more attention to direct water use in kitchen, bathroom and garden (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat vegetarian (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Buy local products (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduce food waste (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Buy sustainable clothing (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Harvest rainwater (by, for example, a rain barrel) (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q16 Are there other ways that could help lower the water footprint that are not mentioned above?

*If you do not have an answer, you can proceed to the next question.*

---

Q17 To what extent are you willing to apply the following methods to lower your own water footprint?

	Not willing (1)	Neutral (2)	Willing (3)
Pay more attention to direct water use in kitchen, bathroom and garden (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat vegetarian (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Buy local products (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduce food waist (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Buy sustainable clothing (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Harvest rainwater (by, for example, a rain barrel) (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q18 Are there other ways that you are already using or are willing to apply to lower your water footprint, that are not mentioned above?

*If you do not have an answer, you can proceed to the next question.*

---

Q19 To what extent do you agree with the following statements?

	Disagree (1)	Neutral (2)	Agree (3)
By providing better information about the water footprint of a product, I can make more conscious choices (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There must be more initiatives at a local level to draw attention to the water footprint (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shops must do more to promote sustainable products (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Schools should provide education about the water footprint to raise awareness among young people (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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This is the end of the survey. Thanks again for your cooperation!

If you have any questions or comments, please feel free to contact me via [s.dieben@student.rug.nl](mailto:s.dieben@student.rug.nl).