

Assessment of price policies and non-price policies to manage the water demand at the household level in the city of Leeuwarden, the Netherlands.

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# Abstract

This thesis examines the role of policies in water demand management in the urban household, using the city of Leeuwarden in the Netherlands as a case example. Pressures on water resources have made water demand management an urgent policy concern. The effectiveness and social acceptance of the policies is an important part of the impleme

Using desk research and survey, this thesis assesses the effectiveness and social acceptance of policies for water demand management in the city of Leeuwarden. It is argued that the policies in place are not good enough to reach the goal set by the municipality and Vitens unless more policies provided more pressure to save water, even if it comes at a social acceptability cost. The policies in place in Leeuwarden are a start but need to increase the number of policies to properly manage the water demand in normal conditions and emergencies.

Keywords: Water Demand Management, water supply, governance.

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# 1 Introduction

Water resources are finite, even if they are renewable (K.-R & W.-Y, 2014). It is estimated that global water availability for 2050 will be 4380 m<sup>3</sup> per person per year (K.-R & W.-Y, 2014), as shown in Figure 1. Water resources are an essential public need for all sectors of society (K.-R & W.-Y, 2014). Because of these, increasing scarcity, competition between different uses, and rising environmental concerns put water resources in danger, in response to these, the European Union established the Water Framework Directive (WFD).

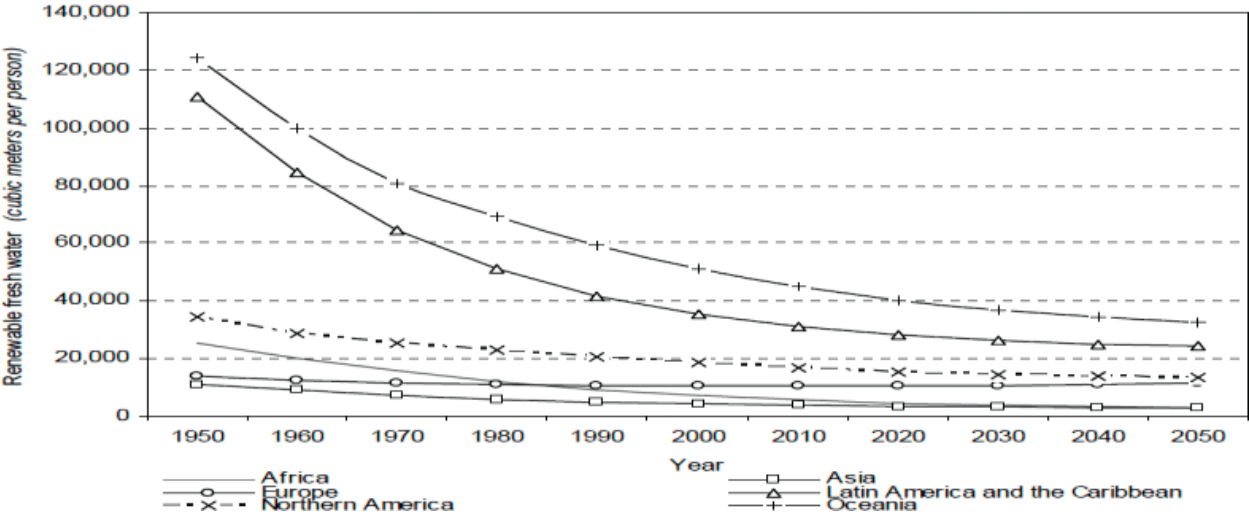


Figure 1 Water available per capita (Hassan & Tularam, 2018, page 11)

Due to the increase in global population and limited water availability, there is a need to increase rational consumption to avoid or delay the need for rationing measures (Botelho et al., 2021). According to Botelho et al., (2021) “rational consumption depends on a personal decision that is distinct from the consumption to meet rationing targets”, these rationing targets are imposed usually by a governmental authority to extend the water available during drought events.

Even if the current levels of consumption per capita remain the same, the total water demand is expected to increase due to population growth. (Botelho et al., 2021). It is necessary to add to the population growth, the trends in water pollution, and the scarcity of quality water sources (Botelho et al., 2021). According to the IPCC,(2021), there is also an increase in extreme climate events expected, which will redistribute precipitation and surface water availability around the world. Which can also influence the replenishment of groundwater aquifers. Concerning precipitation, the pattern will change geographically as well as temporal, over the four seasons. Periods of droughts and related water scarcity can be reinforced. Taking all this into account, water utilities have put more effort into influencing the habitual behavior of consumers towards reducing volumes consumed (Novak et al., 2018).

In the wider context, we have possible futures for The Netherlands due to climate changes, we have to add the salinization process that will continue and can be sped up due to freshwater extraction from the ground. The dutch people generally believe that they use half the water that they use, putting this in number means that the dutch believe that they use 60 l/d/person when in reality they use 120/l/d/person (Klip, 2019). Also, the recent increase in energy prices might be a factor of influence, if the end-user is aware of the price of heating drinking water.

Policies and strategies for reducing the household's demands can be analyzed into two categories. The first category relates to factors that the suppliers are in control of, such as price, and the non-price demand management programs (restriction of use, rebate programs). The second category relates to factors that water suppliers cannot control, such as climate, weather, demographics, economy (Ferraro & Miranda, 2013; Kenney et al., 2008), and household metabolism. About the second category water suppliers can only indirectly influence, depending on sectoral policies. This thesis focused on the water suppliers, their policies, and the behavior of water consumers.

Household water demand functions are available for several countries in Europe, but according to the European Environment Agency (2013) the most recent references for this data date back 10 or 20 years in the Netherlands.

The water consumption in the Netherlands have been reduced by 0.29% in 2010 in comparison to 2009 and 0.94% from 2010 to 2011 with an increase in the price of 2.27% from 2009 to 2010 and 0.72% from 2010 and 2011 (European Commission. Joint Research Centre. Institute for Environment and Sustainability., 2015). Over these years, the price increase is not far from average price depreciation as shown in Table 1.

Year	Water consumption (m3 per capita per year )	Water price (euros per m3)
2009	48.093	1.365
2010	47.955	1.396
2011	47.503	1.406
Average	47.849	1.389

*Table 1 Water statistics in the Netherlands (European Commission. Joint Research Centre. Institute for Environment and Sustainability., 2015, page 164)*

In Figure 2 can be seen how the consumption per person has been reduced using but we see a change in the behavior, since 2014 we see a trend upward in the consumption per person, and total water consumption the trend behave the same, with a general reduction from 1995 until 2014, with some small peaks, but since 2014 the consumption has been an increase.

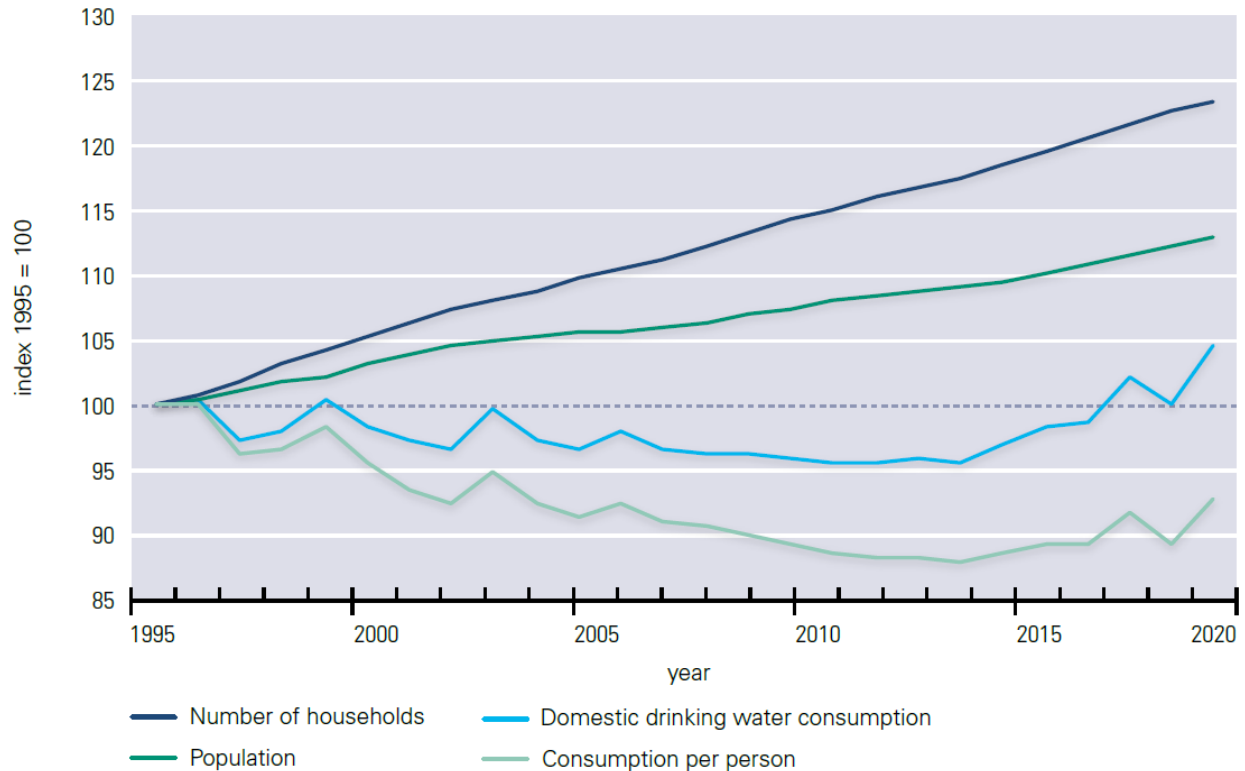


Figure 2 Water consumption Netherlands (Vewin, 2022, pag 59)

Water is a natural resource that is hard to price, as is a worldwide natural resource that is used by everyone during all human activities, activities that relate to household level processes, industries, agriculture, transport, commerce, and tourism (K.-R & W.-Y, 2014). The concept of water pricing is compromised mostly by the value in the currency of the processing and distribution cost of the water used, not taking into account environmental externalities and conservancy activities (K.-R & W.-Y, 2014). As of now the water pricing mechanisms that are being implemented, are not effective in redistributing income due to the low prices of water and its use, but still, some governments have an interest in increasing water availability for certain sectors (K.-R & W.-Y, 2014).

The methodologies used to assign a price to water are not direct and do not have a clear approach, this is why there are many methodologies with different pros and cons. Most of the methodologies take into account the principle of total cost recovery and should include environmental and resource costs, it should cover 3 objectives; efficient use, resource sustainability, and social equity (K.-R & W.-Y, 2014)

Because of the vital importance of water in all human activities, it is important to achieve universal access. Water security for all comes with complexities about the steering, the appropriateness, and the fairness of water supply and water use. One way to achieve water security is through the management of water demand, for which rational use it's a fundamental principle (Botelho et al., 2021). Rational water use is associated with "meeting needs with minimal environmental impact"

(Botelho et al., 2021). It's a subjective concept, which impacts directly on how household water demand management is difficult to implement and measure (Botelho et al., 2021). The inherent complexity of all this is sometimes reduced to a dichotomy: necessary and desired; necessary used refers to uses that meet physiological needs such as drinking, cooking, and bathing, and the desired category refers to uses that go beyond physiological needs, such as recreation (pools) (Botelho et al., 2021)

The WFD gives a solid legislative basis for long-term IWRM in the EU. Article 9 calls for the strengthening of water efficiency. The EU-WFD acknowledges the use of price policies (henceforth: PPs) and non-price policies (henceforth: NPPs) as valuable strategies to create strong incentives toward more efficient water use (European Environment Agency, 2017) all these to achieve coordinated objectives, in a specific timeframe (Wilby et al., 2006). This is achieved by integrating water quality, water resources, physical habitat, river management, and flooding. (Wilby et al., 2006). But at the moment the WFD does not contemplate the risk posed by climate change and how to react to them to achieve the objective in place (Wilby et al., 2006). The WFD is mostly used in defense of PPs following the Pigouvian tradition (Berbel & Expósito, 2020).

To achieve the objectives of the EU-WFD a roadmap has been introduced under the “Flagship Initiatives of the European 2020 Strategy”. Adding to this, a lot of other EU legislation relate directly or indirectly to water demand management, for instance, water use is a theme addressed by the Energy Efficiency Directive, the Energy Labelling Directive, the Ecodesign Directive, and the Ecolabel Regulation (European Commission. Joint Research Centre. Institute for Environment and Sustainability., 2015). All of these legal frameworks have in common that they ensure the promotion of efficiency and environmentally friendly products (European Environment Agency, 2017). Water use is acknowledged as a priority aspect in all the previous legal frameworks.

Increasing supply to meet future growth demands has its limits (Datta et al., 2015). Because of this, demand management is an important component of water managers (Datta et al., 2015). In this thesis, the scope is on domestic water use in urbanized settings, and the water used in households. Household consumption is the bulk of the water consumption inside the urban landscape, therefore reducing the consumption in the households is an important lens for the policy makers (Datta et al., 2015). To achieve these reductions in water demand at the household level there are 2 main currents, the economist who proposes the management of water resources as a free market focusing on pricing, and the environmentalist who propose the use of a wider range of policies and instruments from technological innovation to awareness campaign, restriction and prohibitions (Barrett, 2004).

In general, policymakers have two currents to achieve a reduction in the water demand, they can attempt to directly reduce consumers' demand for water at a given public expense (i.e. use of non-pricing policies), or increase the price consumers pay for water (i.e. use of pricing policies) (Datta et al., 2015). With the almost fixed supplies and general scarcity of water resources, the use of pricing policies (PP) has been supported by many scholars and international organizations such as the UN and World Bank ((K.-R & W.-Y, 2014). It is important to remember that the NPP



has expenses associated with its implementation (Datta et al., 2015), because of these the NPP is deemed efficient only when its benefits exceed costs (Barrett, 2004).

It is known the relationship between the price and water consumption, mostly is inelastic (Reynaud, 2013), but even with this information, PPs are seen by public authorities as the most direct economic policy to promote water conservation behaviors (European Environment Agency, 2017; Reynaud, 2013). NPPs have shown a significant impact on household water demand, but the precise relationship between the policies and consumption has not been studied adequately (Reynaud, 2013).

PPs and NPPs have difficulties, expenses, and limited effectiveness to reduce water consumption means that identifying and testing different approaches should be a research and policy priority (Datta et al., 2015). The success of the PPs and NPPs to achieve a reduction in water demand depends on public support and how the behavior can be a push to change (Gilbertson et al., 2011). Small price elasticity of water consumption refers to empirical observations of water prices that are considered modest, for a steep increase in the prices, little political and societal support is expected, and because of this such policies are not feasible to implement (Datta et al., 2015) Adding to the discussion between the defenders of PPs and the defenders of NPPs they point out that PPs are more efficient costing less but the NPPs are more effective, most of the time these discussions leave the equity issue aside (Barrett, 2004) Now in the literature, the debate between economists and environmentalists has mostly died down as the PP and NPP have been implemented side by side but despite their use, most of NPP have remained relatively understudied by scholars (Datta et al., 2015).

A salient in the application of any demand management policy is the information on consumption that the consumer receives, as it can provide ways to follow through with their intention (Datta et al., 2015).

This thesis focuses on water supply and water consumption, and consumer behavior in the Netherlands, in the area to which Vitens drinking water company supplies drinking water, with a focus on the city of Leeuwarden.

## 1.1 Problem statement

According to the climate change models for The Netherlands 2050, the percentage of precipitation will increase by an average of 4.3% in 2050. This is the prediction for all 4 climate change scenarios assessed. This precipitation will be mostly distributed during winter and spring. During summer in the warmer scenarios, a reduction in precipitation with an average of -11% is predicted (KNMI, 2014) or -14.5% on average (Arnold et al., 2009) depending on the scenarios taken into account. Taking this into account is important for countries to find ways to improve the management of the water demand. As it is likely that there will be severe water scarcity for at least 1 month during the year (Mekonnen & Hoekstra, 2016). This information is relevant since it was observed that climate change comes with geographical and temporal variety,

Botelho et al. (2021) mention that the rational use of water is one of the demand management strategies hard to measure and implement due to its subjectivity of it. According to Botelho et al. (2021), the objective of rational consumption depends on personal decisions that are distinct from consumption to rationing targets. One way to face this challenge has been the use of policy and policy instruments to reduce the demand for water at the household level. This can include an increase in the water price, development of tariff blocks based on consumption, awareness campaigns with different methods of implementation, subsidies for efficiency improvements, rainwater harvesting, separating the rainwater drainage from the wastewater, and some more. In this research, these instruments will be assessed and categorized as PP and NPP policy instruments.

Vitens is the largest drinking water company in The Netherlands. They provided service to 5.6 million people and companies in the provinces Flevoland, Fryslân, Gelderland, Utrecht and Overijssel and some municipalities in Drenthe and Noord-Holland (*Vitens*, 2021b). Since 2019 Vitens has launched a campaign on social media, for instance on Facebook and Instagram with tips on how to reduce the water demand from the drinking water system by recirculation water inside the home, gathering rainwater, and discounting the rain drainage from the sewer system (Klip, 2019). Also, the municipality of Leeuwarden has participated in at least 2 projects to find solutions related to the overuse of water (Startup in Residence, 2022). In Startup in Residence, (2022) they post problems they want to find solutions to, such as creating water-neutral residences, and solutions to reduce the water demand by 5% by 2050. The reduction seems small, though in practice this would also include tipping the upward trend.

Regarding some of the subsidies in place by the municipality, it has been observed that these have not received the social acceptance as expected by the municipality, with reactions questioning the usefulness of the subsidy and looking at it as a waste of money (Leeuwarder Courant, 2022).

The effect on residential water demand management price policies has been studied by a large body of empirical economic literature (Reynaud, 2013) but the impact of non-price policies has not been addressed yet adequately but is starting to grow in interest (Reynaud, 2013). It has been argued that the non-price policies may have an impact on the demand of the households (Reynaud, 2013). The non-price policies often appear more socially acceptable than increasing the prices of the water (Reynaud, 2013). Both types of policies might interact and reinforce each other if noticed by the end-user.

There is a lot of research done on the subject of social acceptance in the field of wind farms (Aitken, 2010; Bessette & Crawford, 2022; Bidwell & Affairs, 2015; Firestone et al., 2009; Rand & Hoen, 2017; Schmidt et al., 2022), and implementation of the use of recycled water (Faria & Naval, 2022; Li et al., 2020; Moya-Fernández et al., 2021; Vila-Tojo et al., 2022). But to assess many policies/instruments and comparing them against each other have not been done. All the previous studies point to using different factors to evaluate social acceptance, depending on the main topic of the evaluation the factors are different for example for the use of recycled water some of the factors are: health risks (Guo et al., 2022; Moya-Fernández et al., 2021; Vila-Tojo et

al., 2022), income level (Faria & Naval, 2022), education background (Faria & Naval, 2022; Li et al., 2020), climate (Faria & Naval, 2022), culture (Faria & Naval, 2022; Guo et al., 2022), benefits (Vila-Tojo et al., 2022), trust (Guo et al., 2022; Moya-Fernández et al., 2021; Vila-Tojo et al., 2022), environmental awareness (Moya-Fernández et al., 2021). This research didn't consider the role that awareness has over the potential decisions regarding the use of water by the user. Most of these developed their model based on the specific need of the study, there is no formal model to interpret the concept of social acceptance.

## 1.2 Key Concepts

Water Demand Management: “any method — whether technical, economic, administrative, financial or social — that will accomplish one (or more) of the following five things:

- (1) Reduce the quantity or quality of water required to accomplish a specific task.
- (2) Adjust the nature of the task or the way it is undertaken so that it can be accomplished with less water or with lower quality water.
- (3) Reduce the loss in quantity or quality of water as it flows from source through use to disposal.
- (4) Shift the timing of use from peak to off-peak periods.
- (5) Increase the ability of the water system to continue to serve society during times when water is in short supply.” (Brooks, 2006)

Household: a social unit composed of those living together in the same dwelling (Merriam-Webster, n.d.-b)

Social acceptance: Support or opposition to policies from the population or society (Guo et al., 2022; Witte, 2021)

Effectiveness: “measures the extent of water conservation” (Barrett, 2004)

Water Governance: “range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society” (Garcia Quesada, 2011)

Steering strategies: “a purposive attempt to bring a system from one state to another by exerting influence on its dynamics of development” (Voß et al., 2007)

Water supply: “a source, means, or process of supplying water usually including reservoirs, tunnels, and pipelines” (Merriam-Webster, n.d.-a).

Water security: “The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-

related disasters, and for preserving ecosystems in a climate of peace and political stability” (UN-Water, 2013)

Policy Instrument. “linkage between policy formulation and policy implementation.” (Ali, 2013)

### 1.3 Objectives

This research identified and assessed the impact on the decision-making of water use in the short term of the household from non-economic and economic measures.

The main objectives of this research were:

- To identify the current household-level water demand management policies and instruments in Leeuwarden and to identify the potential measures that could be added.
- To assess which policies and instruments are both effective in reducing the water demand at the household level and socially acceptable for the citizen of Leeuwarden.
- To assess implementation characteristics and issues of the measures implemented in Leeuwarden.
- To propose measures that could improve the reduction of water demand in Leeuwarden.

### 1.4 Research Questions

Based on the problems affecting the sustainability of water resources all over the world, and the inheritance problems at the moment to try to manage the demand and reach the sustainability goals. Because of these, the following research questions were formulated to find provided additional information regarding water demand management at the household level.

Main research question:

- What is the most effective way to reduce water consumption at the household level in the short term?

To answer this question the following sub-questions were formulated, reviewing what it is placed, how it views from the point of view of the population that the policies are directed, the actual effectivity of what it is placed, and how to improve it to reach the most effective combination possible to reduce the water demand at the household level.

Sub-questions to answer the main research question:

1. What are the policies and instruments currently implemented to reduce the water demand at a household level?
2. What other policies and instruments are compatible with the ones implemented in Leeuwarden to reduce the water demand at the household level?
3. How socially acceptable are the policies and instruments for water demand management at the household level implemented in Leeuwarden?
4. How effective are the policies and their instruments at changing behavior to reduce the water demand at the household level in Leeuwarden?

5. How can the implementation of the policies and instruments for water demand management be improved in the different governance domains?

## 1.5 Thesis Layout

In section 1 an introduction to the topic is presented, the problem that's been studied it's been deepened in one of the subsections, next the key concepts on which the research is grounded are presented, the objectives set for the research and the main research questions that will be answered. Section 2 presents the literature review and provided an answer to the question. Section 3 presents the methodology used in the research and how the research question is going to be answered. Section 4 provides an answer to each research question. Section 5 presents the conclusion and discussion of the result.

## 2 Literature Review

As reported a literature review was carried out to contextualize the research, and to get grip on relevant concepts, trends, research questions, and appropriate methodologies. Some information from the literature review was used in the introduction, this section reports on the policy matrix and available policy instruments, both PP and NPP instruments.

### 2.1 Policy Matrix

The implementation of a policy implies stages of selection, application monitoring, and adjustment (Ali, 2013), to implement the right instruments that will reach the goal sets in the policy. In the case of water demand management the European Environment Agency, (2017) said that is needed to find the right policy mix of PPs and NPPs. The policymakers have many options of instruments inside the PPs and NPPs as shown below in Figure 3.

Using Markets	Creating Markets	Regulations	Engaging the Public
Subsidy reduction	Property rights/ decentralisation	Standards	Public participation
Environmental taxes	Tradeable permits/rights	Bans	Consultation
User fees		Permits/quotas	Information disclosure
Deposit-refund systems			Informal negotiation
Targeted subsidies			Community pressure
			NGO involvement

Figure 3 Policy Matrix (Barrett, 2004, page 272)

Policies for water management can be categorized into 3 main groups: public education, technological improvements, and water restrictions (Kenney et al., 2008). At the moment in Leeuwarden, the policies in place fall into the “Using Markets” via targeted subsidies, user fees, environmental taxes (Gemeente Leeuwarden, 2020, 2021); and engaging the public via information disclosure by Vitens (Klip, 2019). There is also a subsidy scheme related to water technology innovation that does not directly contribute to the goal set by the municipality and Vitens to reduce water consumption by 5%, that is the Innovation Fun Scheme (Gemeente Leeuwarden, 2020), in which the municipality provided support for start-up ideas that can develop new water-saving technologies.

To achieve the most reduction is better to implement a mix of policies, that are pragmatically applied and that take into account efficiency and equity (Barrett, 2004), is not recommended to only apply one type of policy but a combination that takes into account the context where they would apply them (European Environment Agency, 2017). Many case studies researched by the European Environment Agency, (2017) show that the implementation combinations of PPs and NPPs have been effective in managing the household water demand.

Mixtures of policies have been implemented in many countries like Brazil, Canada, France, Spain, the UK, and the USA, with different rates of success in mixing PP and rationing (Rauf & Siddiqi, 2008). It's important to remember that the more intense it is is harder to keep in place (Rauf & Siddiqi, 2008), for these types of NPPs that act as command and control, the behavior has to be stipulated, well defined, and penalties for not compliance have to be set (de Sousa & Dias Fouto, 2019).

## 2.2 Water Pricing Policies

Price is an important awareness-raising tool which to get environmental and economic benefits and at the same time stimulate innovation in water-saving technologies (European Commission. Joint Research Centre. Institute for Environment and Sustainability., 2015)

The PP includes all market-based regulations. Their effectiveness relies on the assumption that the consumer will react motivated by the law of supply and demand, which indicates that water consumption should be inversely related to the price (Datta et al., 2015; Kenney et al., 2008). Non-pricing policies (NPP) refer to all the non-market-based programs that seek to increase the efficiency of the water use inside the household.

These types of policies are supported by many international organizations such World Bank, UNESCO (K.-R & W.-Y, 2014), and EEA (European Environment Agency., 2013). According to Rauf & Siddiqi, (2008) existing demand patterns are modified through the policies to achieve various objectives; the 3 main objectives that the PPs try to achieve are cost recovery, conservation, and equitable allocation of water among different income groups. To use PPs there need to be some base conditions. The water supply system has to function (at least partially) as a market, giving all the information to the consumers regarding how the service function and what

is the real cost of the service, the service provided must be able to recover supply cost (European Environment Agency, 2017). It is also needed the implementation of an NPP, which is the installation of metering devices in all the houses connected to the service, as it allows to set a price over the volume consumed (European Environment Agency, 2017).

As the price of water is often set via governments rather than market mechanisms, as a way to guarantee access to all-income households (Datta et al., 2015). Because of these, the price of water does not include externalities such as pollution and quantities available, if the externalities were internalized the price would change and it will behave more like a market rising and falling based on supply and demand (Barrett, 2004). The tariff appears as an important factor in determining reductions or increases, but given the essential nature of water, there is a debate about how much cost can influence consumption (Botelho et al., 2021). This is because low-income households consume less per capita than high-income households as they have fewer consumption points and lack financial access to activities that consume a large amount of water (Botelho et al., 2021). Policymakers that want to adopt demand-side policies need to consider adding mechanisms that protect water users from possible inequitable consequences of the implementation of PP (Garrone et al., 2020) as high prices may jeopardize smaller consumers to get enough water, as they are likely to be from lower-income households (Garrone et al., 2020).

In general, environmentalists said that the PPs are ineffective and inappropriate to control the use of environmental resources due the water service does not work as a market and that the demand is mostly inelastic (Barrett, 2004; European Commission. Joint Research Centre. Institute for Environment and Sustainability., 2015); on the other hand economist view PPs as the most efficient way of controlling demand of natural resources due to its low administrative costs and congruence of consumer between the cost of the resources and the willingness to pay for said resources. (Barrett, 2004). One topic that is left out during the implementation of PP is the issue of equity (Barrett, 2004), as PPs generally work only for low-income households and not for the wealthy, who in general have the highest rates of consumption (Ferraro & Miranda, 2013).

To address the equality concerns the Increasing Block Tariff (IBT) pricing structure has been proposed. The structure consists of at least 1 threshold of consumption in which the price per volumetric unit consume changes to a higher price (Dahan & Nisan, 2007). One of the difficulties to implement an IBT structure is determining the lower consumption block, which is the cheapest and is supposed to provide water to all basic needs in a household (Dahan & Nisan, 2007). These difficult as how this calculation is done can be done via a fixed amount or as a function of the household size (Dahan & Nisan, 2007). Both methods have their advantages and disadvantages due to changes in households sizes, the tendency that the lower-income household usually are the bigger ones, and the possibility of overconsumption if the block is too big (Dahan & Nisan, 2007)

There is a general call to raise prices for residential water, the amount varies accordingly to the authors but they are up to a 30% increase (Barrett, 2004). The price elasticity of the household is negative which means that with a price increase households will react by decreasing their consumption, but is pretty inelastic, which means that an increase of 1% in price will decrease

less than 1% in the consumption (European Commission. Joint Research Centre. Institute for Environment and Sustainability., 2015). Is estimated by the European Commission. Joint Research Centre. Institute for Environment and Sustainability., (2015) that in the Netherlands a price increase of 10% will result in a decrease in the short run of around 6.3% and at the same time an increase in income in the household of around 10% will increase consumption of around 2.3%. These align with the result obtained by Barrett (1996, as cited by Barrett, 2004) where according to him an increase in the price of 10% will result in a decrease of around 5%. These show that the prices can be used to manage the demand, but they are not highly effective (Barrett, 2004). To have a large impact on consumption, the price increase has to be large, which becomes politically difficult and may have other adverse impacts (Barrett, 2004). This is because PP is often unfeasible to implement even if the theory suggests it might be useful. When the prices increase are feasible are less effective than expected due to the price elasticity being low within the range of feasible price increase (Datta et al., 2015). This point is supported by the fact that the low price of water means that the implementation of conservation measures brings too small financial savings to attract consumers (Barrett, 2004)

Supporters of the price increase strategy point out that the price should reflect the amount of water available and in times of scarcity, the price should reflect the amount of water available in the reservoirs (Amigues et al., 1997). The reason behind all these is that if the tariff is increased, households will shift part of their expenditures and change their consumption patterns (Rauf & Siddiqi, 2008).

There is some uncertainty about the effectiveness of the environmentally protective effect as prices increase do not assure the change in behaviors and the adoption of conservation measures (James, 1997, pp. 3-4, as cited by Barrett, 2004). There is a point in the price increase that will start pushing behavioral changes in the population, that is when the price paid begins to exceed any dental benefit received. A demand curve is used to display the willingness to pay and implement conservation measures (Barrett, 2004) as shown in Figure 4.



## WATER DEMAND REDUCTION EFFICIENCY: INDICATIVE COSTS

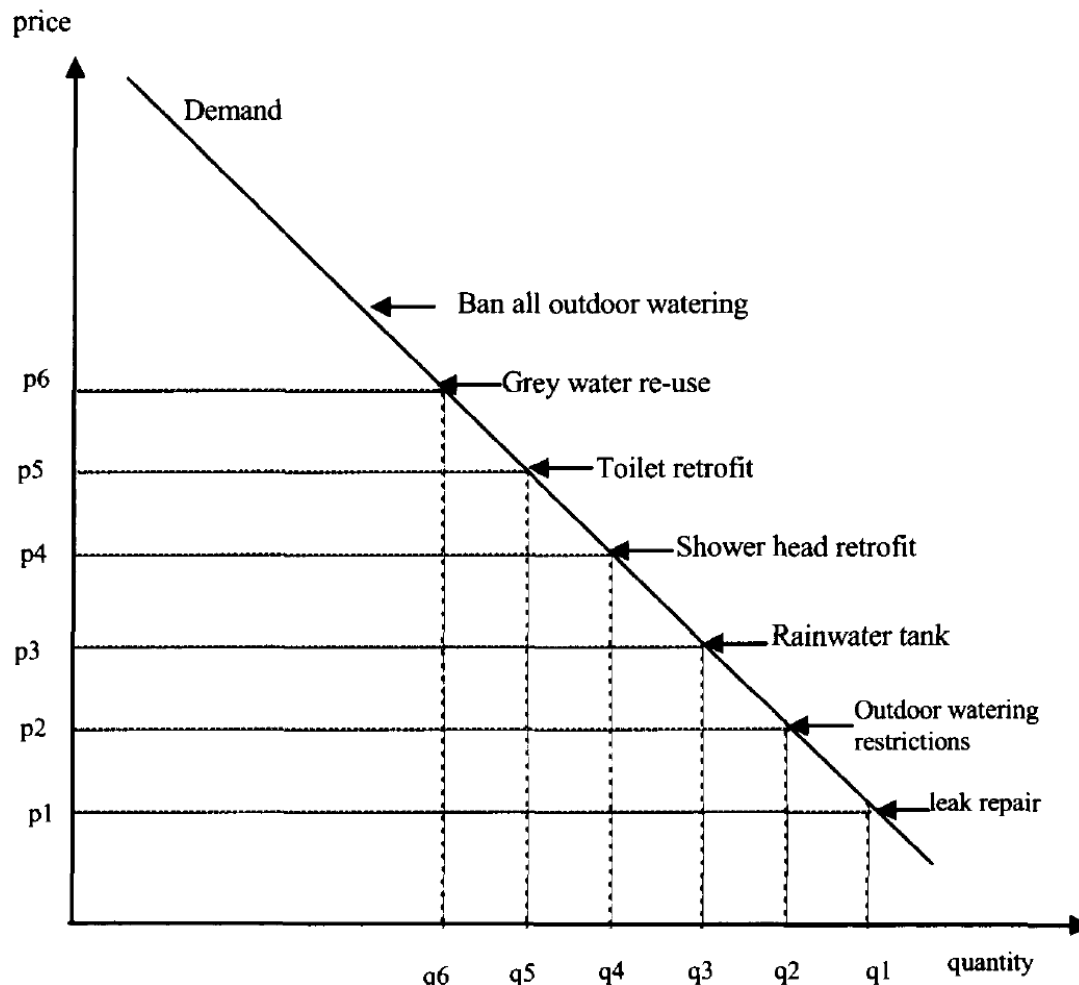


Figure 4 Water demand reduction efficiency (Barrett, 2004, pag 280)

As represented in Figure 4 as the price increase the amount consume reduces and that reduction is achieved via conservation measures from simple as leak repair to the more technological heavy as grey water reuse (Barrett, 2004). But there is some evidence that suggests that pricing is not enough to encourage consumers to fully adopt conservation measures that will benefit them financially (Barrett, 2004).

Most water conservation technology is selected indirectly by consumers, as they are already built into the house before they purchased it or rented it. The technologies installed in a house are not important enough to influence house purchase/rent. This is the reason retrofitting appliances in the house is at the top of the curve as the price increase is too large enough to justify the economic burden that implies the technology change (Barrett, 2004).

In addition, the implementation of water price rises are often ineffective in reducing consumption because households fail to notice such increase and fail to respond to them (Chetty et al., 2009), as the price rise are not imposed at the point of sale, it makes very likely that household will not effectively adjust to the price change (Datta et al., 2015)

According to the European Commission. Joint Research Centre. Institute for Environment and Sustainability (2015) households react to changes in water prices in the long term instead of the short term.

Cases studies show that water PPs are implemented as part of a wider policies package (Barrett, 2004) and that they reach around 30% of the population and some other measures achieve a bigger reduction (see ABARE, 1993, p. 93 as cited by Barrett, 2004), as Datta et al., (2015) shows that prices increases of more than 100% had limited impacts into the consumption levels and the reduction achieve was short-lived returning the consumption to normal levels after 1 year, due as it has been mention before the inelasticity of the water demand. de Sousa & Dias Fouto, (2019) mention that the reduction in water is mostly in households with a higher income as is possible they use the water for less essential activities.

According to de Sousa & Dias Fouto, (2019) is possible to implement policies that provided a bonus instead of increasing prices which had a larger impact on the behavior of the population.

The PPs have different impacts depending on demographic indicators, as in Europe PPs have a bigger impact in high-income countries like Denmark but not so much in the lower-income countries (European Environment Agency, 2017).

In the city of Leeuwarden, the intervention using PPs has been done in a voluntary scheme in which each user can make a decision base on their values, motivation, and situation, to use the subsidy scheme in place. The municipality to extend the reach of these policies has joined forces with many local businesses to ensure that more people know about them and can use them to implement more water-saving technologies at home (Ferwerd, 2021; Groen Leeft, 2021; Rondon Vandaag, 2022).

According to the website of Vitens, (2021a) they have intentions to increase prices to the big consumer due to the high volume of water demanded. They do not refer to any measure aimed at the household level.

## 2.3 Water Non-pricing Policies

The NPP can be classified into 3 categories: public education (indirect reduction) (Datta et al., 2015), technological improvements (an increase in efficiency), and water restrictions (direct reduction) (Kenney et al., 2008).

NPPs are effective as long as the prices of water remain within a reasonable range, households are unlikely to respond to a pricing stimulus (Garrone et al., 2020). The NPPs have many more options than the PPs, some of the different types are restrictions, awareness, peer comparisons, quotas, technological improvements, rationing, real-time consumption information, metering infrastructure, framing, commitment devices, defaults, and, implementation intentions, (Barrett, 2004; Botelho et al., 2021; Datta et al., 2015; European Environment Agency, 2017; Ferraro et al., 2011; Ferraro & Miranda, 2013; Ferraro & Price, 2011; Kenney et al., 2008; Liu et al., 2016;

Novak et al., 2018; Rahim et al., 2020) and their effectiveness is less studied than PPs (Barrett, 2004).

The NPPs can be grouped into 3 categories: public education (awareness), technological improvements, and water restrictions (Kenney et al., 2008)

NPPs of the regulatory type are usually more effective than PPs, but sometimes they are not the most appropriate (Barrett, 2004). There is now a growing interest in implementing NPP to manage the water demand, as the literature indicates that they modify social behavior with lasting results, also perceived as more socially acceptable than price increase (Reynaud, 2013). Most of the NPPs and their instruments are broad in their application, thus they do not discriminate between consumers based on the ability to pay, and are less prone to reduce water equity negatively than PPs (Datta et al., 2015). One important drawback of these policies is that they require considerable financial resources for their implementation, mostly in the case of the installation of a water-saving appliance in the household, which most of the time has to be subsidized by the policy makers (European Environment Agency, 2017).

According to James (1993, pp. 30-31), as cited by Barrett, (2004) the most successful instruments are those that specify quantity or quality constraints as of their operating characteristics. According to Datta et al., (2015) some utilities and municipalities have used relatively heavy-handed policies to reduce the water demand, including rationing or restrictions on what or when the water can be used. During emergencies usually implement restriction policies that in the short term provided a significant reduction, the implementation of these measures as they are very strict they have to be implemented within a limited time. (Barrett, 2004). These types of measures are very effective to reduce water demand but at the same time require a lot of monitoring to keep compliance(Datta et al., 2015).

Peer comparison is another instrument used to promote behavioral changes, strong social norms via peer comparison with the neighborhoods of the city have a great effect (Ferraro & Miranda, 2013; Rahim et al., 2020). These instruments include personalized feedback about their consumption and how to reduce it (Rahim et al., 2020). These policies greater promise to affect behavioral change in the short and long term (Ferraro et al., 2011). According to Liu et al., (2016) giving detailed feedback on water consumption habits is effective and can boost the adoption of conservation measures inside the household. These are used a lot in the energy sector and have shown significant reductions in monthly use (Ferraro et al., 2011). According to Datta et al., (2015) raising awareness about personal water use compared to the use of their peers is one of the measures that achieve long-term change in behavior regarding the use of water, the research of Ferraro et al., (2011) supports these as they found out that social comparison promotes both behavioral adjustment and durable conservation investments and have shown that the effects last more than 2 years after the first implementation, these is achieve pointing out social norms rather than making it about private efficient behaviors.

Technological improvements are based on the installation of the more efficient appliance, improvements to houses, and installation of saving devices (Botelho et al., 2021), but these

measures have a high financial impact, but the decision to adopt these measures is taken sporadically and are difficult to anticipate. Influencing the adoption of these types of instruments is difficult (Novak et al., 2018). Some systems alert about the use of water during showers or dishwashing in the form of alarm to keep a water budget but it have been proven that after time the annoyance generated by these systems dwell down and household return to their old behaviors (Botelho et al., 2021). The adoption of these instruments can be achieved when coupled with the PP of targeted subsidies providing relief from the financial burden that is the retrofitting of the old appliances inside the house (Gilbertson et al., 2011).

A recent form of regulatory water-use restriction is the imposition of specific water use technologies in building codes, for example, dual flush toilets (Barrett, 2004). Because these regulations are embodied in the water using technology they are very effective at reducing consumption (Barrett, 2004) One of the NPP that goes hand to hand with the PPs is the implementation of metering infrastructure, which enables water utilities to implement pricing to encourage water conservation and efficiency. Putting a price on the volume of water sends a clear message to consumers to use the resource more efficiently (European Environment Agency, 2017) The previous policy also allows for the implementation of real-time information about consumption, which allows households to set and reach goals of water use (Kenney et al., 2008)

A policy used usually in conjunction with others is to increase community awareness regarding the situation of the water resources via ads spots, news, or social media (Barrett, 2004). These measure most of the time is regarded as the cheapest one to implement but some scholars indicate that it is one of the less effective and the implementation of these type of policy do not provide a significant reduction in the water demand (Datta et al., 2015) in contrast Ferraro et al., (2011) shows that are effective to provide reductions on the short-run, if they are a couple with technical advice, the research shows that these type of instrument only influence behavioral adjustment, like watering the outdoor less or waiting to wash full loads of laundry, but no actual change on how the household use the water. According to Gilbertson et al., (2011) a method to increase the effectiveness of these instruments is to put the household in the position of imagining what would it be to have no water and then follow up with behavioral adjustment that will reduce the likelihood of that scenario occurring. In Leeuwarden Vitens is applying a weak social norm campaign, creating awareness in the population via newspapers, radio, and social media (Niewe Oogst, 2018; Wijk, 2020).

## 2.4 Effectiveness

Effectiveness is central to analyzing the water allocation for policymakers, but it is hard to measure because it is difficult to determine if PPs or NPPs are the most efficient in the real world (Barrett, 2004). Most of the time PPs are easier to evaluate their effectiveness, however, is more challenging to assess the effectiveness of NPPs or even the mix of PPs and NPPs (European Environment Agency, 2017).

Even with the inherited difficulty in asses the effectiveness of NPPs, many scholars have done case studies to evaluate how these measures are implemented and how effective they are in

different scenarios. According to the European Environment Agency, (2017), the reduction of leaks can reduce the amount of water extracted by around 50% and household consumption by 47%, from 150 liters per person per day (lppd) to 80 lppd, these numbers depend on the condition of the supply network and the household piping system.

The European Environment Agency, (2017) also indicates that the installation of water-saving appliances could save up to 40% per year at the household level, and according to their research sustained awareness campaigns are considered effective, but they do not detail the percentage to achieve for these measures, in these aspect Datta et al., (2015) and Ferraro et al., (2011) indicate that the awareness campaign shows no change or change that is statistically no significant when this instrument is implemented alone.

As mentioned before the effective policies to achieve a large water reduction in the short term and for a short period is the restrictions on water supply in a moment of acute water scarcity or emergencies (Barrett, 2004; Datta et al., 2015; European Environment Agency, 2017)

The main tool of the PPs, that is price increases have different effects depending on the water price elasticity function, which varies a lot even inside the same country, for which percentage of effectiveness is not provided (European Environment Agency, 2017). Abu Qdais, (2001) provided some insight, even if it is outside Europe, providing the case of Abu Dabhi that switch from a flat rate to a metering rate achieving reductions of around 29% in 73% of the population, the relative price increase by a factor 290%. This research is a supporter of the PPs as well as the massive installation of metering devices and the use of volumetric charges instead of flat rates. But Barrett, (2004) points out that at the moment most residential water prices are ineffective because they are too low, also it is unknown if a full cost recovery policy is been implemented. Barrett, (2004) points out that the prices have to be raised to increase their effectiveness of them in managing the water demand.

Social comparison or peer comparison is the most effective and the one to have a lasting effect on the behavior of the households, achieving reductions from 3.7% to the 5.6% (Datta et al., 2015), and these instruments can be reinforced with technical advice, water budget, technology adoption subsidies and other range of water demand management policies to increase their effectiveness (Ferraro & Miranda, 2013). According to Ferraro & Miranda, (2013) when awareness campaigns/social norms are coupled with the peer comparison instrument the reduction achieve is 5%, in contrast just the awareness campaign/social norms provide a reduction of about 2.5%; just providing information in an awareness campaign does not have a significant effect of the consumption of the households (Ferraro & Miranda, 2013; Ferraro & Price, 2011), these numbers are a supporter in previous research by Ferraro et al., (2011) and Ferraro & Price, (2011) where the effectiveness of the awareness campaign/social norms achieve a reduction of 2.7% but when coupled with the peer comparison the reductions achieve was 4.8%. Another important point of these instruments is the lasting effect they have on the households, as the awareness campaigns lose their effect over time and households return to their previous behaviors, when peer comparison is implemented the effects of reduction can be seen even after 2 years of the intervention (Ferraro et al., 2011). Datta et al., (2015) provided further insight on

the effectiveness of the peer comparison instrument with a percentage close to those found by Ferraro & Miranda, (2013); Ferraro & Price, (2011) with reductions of around 3.7% and 5.6%.

Another instrument measure has been the water budget which provided reductions between 3.4% and 5.5% (Datta et al., 2015). Datta et al., (2015) mention that the effect they have on the population varies depending on their demographic characteristics such as income and water consumption levels. As water budget is more effective in low consumption households and the peer comparison is more effective in the high consumption household (Datta et al., 2015)

In general, if the policy and instruments are chosen have to be subjected to cost-benefit analysis and if they have benefits that exceed their cost, policy maker and water utilities tend to stick with them (Barrett, 2004), this is one of the reasons why the awareness campaigns despite having a very low impact in consumption they are very cheap and easy to implement (Datta et al., 2015).

## 2.5 Social acceptances

Equity is one of the most important implications regarding the use of PPs, mainly price increases; this is because low-income households pay a larger percentage of their income on water than high-income households (Barrett, 2004). Forced them to cut expenses on other goods and services and paid the higher price without being able to adjust their water consumption (Barrett, 2004). But as Datta et al., (2015) mention the prices most of the time are so low that does not have a substantial impact on the households, these are supported by Barrett, (2004) as the water consumption of low-income households is a small part of the total household's consumption.

Some instruments use in the PPs to account for the inequity caused by price increases, is the use of a transfer payment, that could compensate low-income households (Barrett, 2004). These issues can be offset too by the use of the IBT instruments, in which the first price bracket is set to a price affordable for all income households with a maximum amount of water enough to cover necessities (Dahan & Nisan, 2007), the issues with these approaches is that couple with real-time water consumption data have shown to increase the consumption of certain households as they budget to stay in a certain bracket, providing them with room to consumption above their average (Dahan & Nisan, 2007).

The NPPs will vary depending on the policy and instrument implemented. The ban on watering gardens or washing cars in the street will mostly affect high-income households, but retrofitting or maintenance work in the pipe system will affect mostly low-income households (Barrett, 2004). Is recognized that in general rule PPs will reduce the equitable access to water services and NPPs will increase it, but according to Barrett, (2004), the impacts can be negligible.

Policymakers most of the time will not make a decision based on the equity factor to select the appropriate water demand management policy (Barrett, 2004). This does not mean that the equity aspect of the policies can be disregarded, as the impact of inequity will be larger for a low-income household, resulting in disconnections from the water network, than for a high-income household (Barrett, 2004).

Another important factor to study social acceptance is the ownership of the households. According to Ferraro & Miranda, (2013) owners may have a smaller incentive to reduce water consumption for watering outdoors than tenants, as the landscape of their property could suffer from certain water conservation policies and may impact the home value in the market.

## 2.6 Cognitive Interaction Theory

The Contextual Interaction Theory explains that the policy implementation and evaluation is a multi-actor interaction process that is ultimately driven by the actors involved. In this framework, each influences the others by their motivations, cognitions, and resources (Bressers & Kuks, 2004). Many research involving policies assessment have used this model and the subsequent governance assessment tool due to the theoretical background of this theory and the ease method to apply it and assess the state of governance in a big arrange of topics. (Casiano Flores et al., 2018; de Boer et al., 2016; Lordkipanidze et al., 2020; Mirnezami et al., 2020; Moretto, 2015)

The main assumptions of the theory described by H. Bressers & Kuks, (2004) are as follows: The policy process is considered a multi-actor interactions process. The actors can be individuals or organizations; “many factors may have an influence but only because and if as far as they change relevant characteristics of the involved actors”(Bressers et al., 2016); “these characteristics are: their motivation, their cognition, and their resources”(Bressers et al., 2016); “these three characteristics are influencing each other”(Bressers et al., 2016); the characteristics of the actors shape the process but at the same time, the process can influence them. “There is a dynamic interaction between the key actor characteristics that drive social interaction processes and in turn are reshaped by the process”(Bressers et al., 2016); the characteristic of the actors are influenced by the specific case context, like the geographical place, governance regime, political system, socio-cultural, economical, technological and previous decisions that can set the stage for some actors and exclude some others. (Bressers et al., 2016)

In the model, the governance system is formed by multiple scales and levels, actors, and networks (de Boer et al., 2016) as shown in Figure 5. The actors have diverse problem perspectives and ambitions, can employ multiple and diverse strategies and instruments, and have diverse and multiple resources and responsibilities (de Boer et al., 2016).

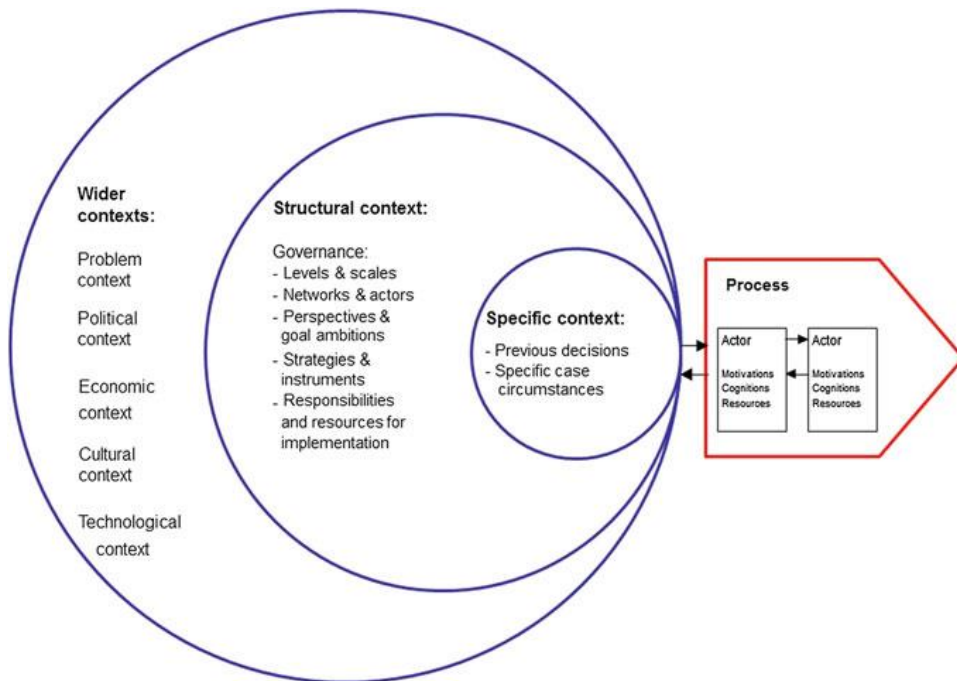


Figure 5 Interaction process influenced simultaneously by various layers of context (H. Bressers, 2009; H. Bressers et al., 2016, pag 48)

For the case in Leeuwarden, the specific context can be described as the relationship that the people have with the drinking water utility and the municipality. These relationships and their outcomes can be understood in terms of decisions about the number and type of amenities they have at home like washing machines and dishwashers, if they use a water-saving system built in the toilets and bathroom etc., as well as it can be understood in decisions to use these amenities and drinking water. The framework assumes that there are many factors of influence, for instance, whether they have a sustainability background, their level of education, if they keep themselves informed about environmental matters in the city, etc. The framework also assumes that both decisions about amenities and their use and use of drinking water are influenced by previous interactions. Some previous decisions done by the users in 2020 are for instance relevant. At the beginning of the summer, Vitens made a call to their customers to reduce the consumption of water by stopping filling pools, washing cars, and watering the garden due to the sharp increase in water demand that threatens the water reservoirs, and the response received by the households was seen next day when the consumption return to normal levels. (Wijk, 2020). The structural context is the organization of how water is been managed and governed, so far the ones that have taken the most interest in the problem are the water utility company, Vitens, and the municipality of Leeuwarden. A visual representation of these relationships can be seen in Figure 6.



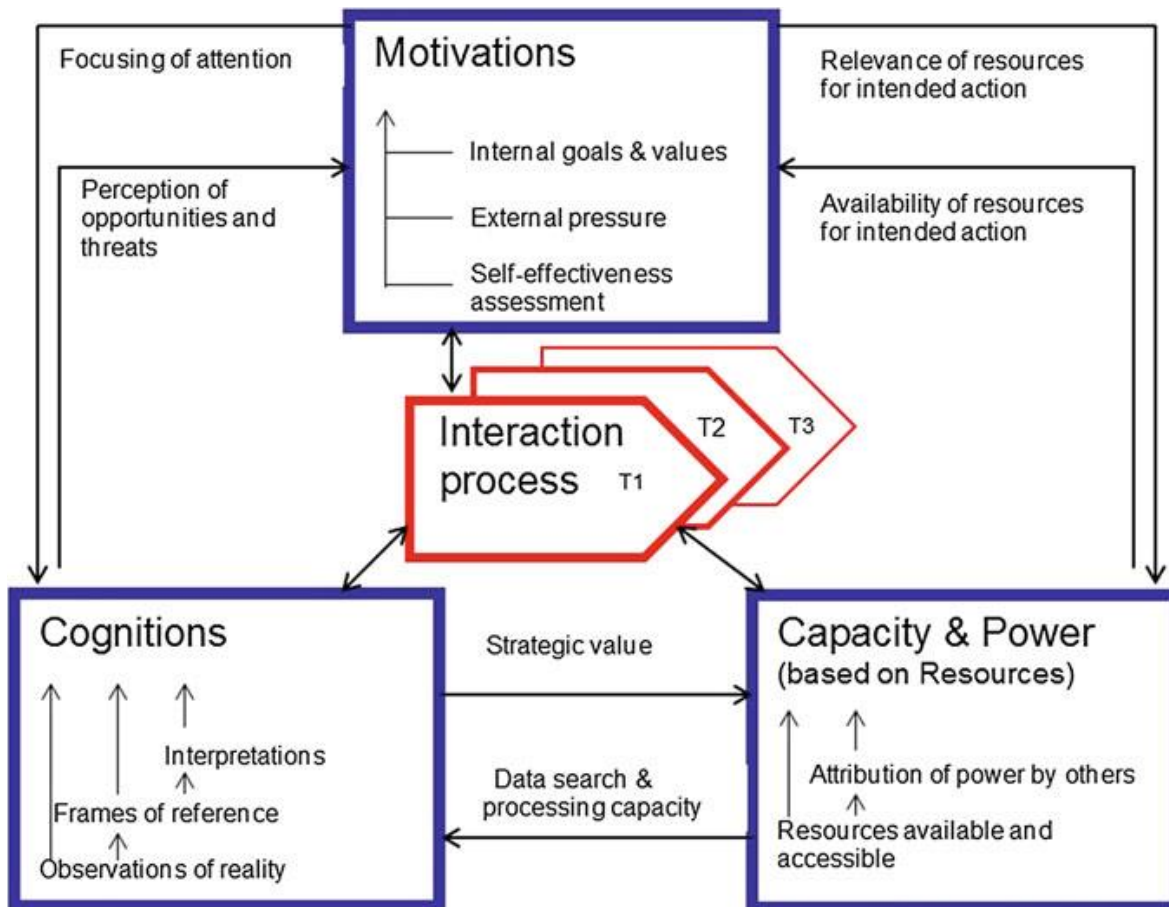


Figure 6 Dynamic interaction between the key actor characteristics that drive social interaction (H. Bressers et al., 2016 pag 49)

As implementation of a policy is a process of social interaction, the three characters (resources, cognitions, and motivations) are very useful to explain the dynamics of this process (Bressers, 2009).

Table 2 Description of 3 of the key elements of CIT (H. Bressers & Kuks, 2004, pag 79)

Scientific Perspectives	Individual	Social
Resources (power)	a. Choosing the greatest benefit	b. Those with the most power can choose
Cognitions (information)	c. It is not the facts that are important but how what is observed is interpreted	d. Interpretations of reality are the product of social construction
Values (Motivations)	e. People should want what is good	f. The limits to what is good are set by rules

Motivation is in a few words, the degree to which the application of the instrument is perceived as contributing to the goals and interests of the actors involved (Bressers, 2009).

Cognition is the amount of information available regarding the instrument, and how much information is available to the implementers and the target group. How clear is this information,

does the target groups know about the benefits or the drawbacks of the instruments? (Bressers, 2009)

Power refers to the relationship of power between the implementer and the target group. For example, is a major difference between the formal power held by authorities, and in the case of subsidies, the instrument can only be applied at the request of the target group. These also include the ability to appeal a decision made by an authority using the legal or administrative system (informal sources of power) (Bressers, 2009).

To carry out the assessment, the Governance Assessment Tool (GAT) will be used. The GAT has been created in a European context and is based on the Contextual Interaction Theory, which gives it a solid theoretical background, it sees governance as a context for decision-making and implementation (Casiano Flores et al., 2018). This tool has been used to assess many different topics of governance related to water (Casiano Flores et al., 2018). The GAT is a tool that takes into account many contextual factors and dynamics of the particular setting, in a systematic process to allow sorting through complexity. (Casiano Flores et al., 2018), these make the GAT a good option to assess the policies under the macro framework of the Contextual Interaction Theory (Casiano Flores et al., 2018).

### 3 Methodology

First, literature research was done regarding different policy approaches on how to manage the demand for water at the household level, these policies will be separated into 2 categories: economic policies (PP), these included changes in prices, taxes, fines, or subsidies; the second category was non-economic policies (NPP) that included awareness campaigns, education, restrictions on the amount of water used. Then with a comprehensive list of measures that could be applied a survey of likelihood was applied at random to the population of the city of Leeuwarden, in the survey was asked not just how likely is the measure to influence the behavior of the respondent but also how much do they agree with the possible implementation of these measures.

#### 3.1 Research unit

The research unit concerns households in the city of Leeuwarden, this city was selected due to logistical facilities to get the information needed. A difference will be made between a household that rents and have an inclusive contract (water is included in monthly payments for rent and services) and a household that rents and has an exclusive contract or own household (these households receive a bill that is exclusively related to water consumption). There also be differences in the income range of the respondents, as well as concerning how the households are composed: single person, couple, family with kids, or mixed households typical of students' houses. Another factor that was taken into account is the education level that has been reached. Another important factor will be if they own a laundry machine, dryer, or dishwasher. One other factor that will be important to make a difference between the respondents and their households will be the lack or presence of a garden and the range of the size of it.

## 3.2 Data Sources and Collection Methods

The research used different data sources, this included a random sample survey focused on the inhabitants of the city of Leeuwarden and a semi-systematic desk research will to find cases of application of demand control measures. Grey literature is used to obtain data regarding the use of the resources in the city and the measures implemented in the region.

With all previous research as a base, a survey to analyze the effectiveness and acceptance of the PPs and NPPs implemented in Leeuwarden was developed and distributed. The analysis of the data is reported in section 4.

### 3.2.1 Desk Research

To answer the first and second questions desk research was carried out. Systematic desk research was done using primarily scientific literature and as a second source of grey literature, such as UN reports, Vitens and Vewin.

There were 2 main searches for literature done using the following terms, "price water" and consumption, and pricing and "water consumption". The other literature were found from the references of the articles appearing in these search. The articles were then selected based on the title and abstract if they included terms refereeing to the water demand management policies, then a second filter was used to discard articles that were not available completely for download.

This research will provide options on how to improve the policies in place in the city of Leeuwarden, by both the municipality and the water company.

### 3.2.2 Survey

A survey answered the third research question by giving an insight into the social acceptability of the policies and instruments. The sample group was the population of Leeuwarden with an intended sample size of 68 respondents, these number was reached using the formula

$$Sample\ Size = \frac{(Z\ score)^2 * StdDev * (1 - StdDev)}{(margin\ error)^2}$$
, the values used were a Z score for a confidence level of

90%, equal to 1.645; a standard deviation of 0.5, and a margin error of 10% percent. The error margin and the confidence level were used due to the media and time available to spread the survey, knowing that the sample gathered will not be the most representative as online media was prioritized and field surveys were not deployed. These can be also seen in the resulting surveys as there is an underrepresentation of the age brackets over 50 years old and under 21 years old. It is understood by the researcher that these do not provide a definitive answer to the research and still needed more in-depth research to understand the complex social network that steers the decision-making process to reduce water demand at the household level and it is still needed some more research in this field to find the tailor-made solution for each case as there is no panacea to reach a reduction in the water demand at the household level in all cities. The values for the confidence level and the error margin were selected in the previous values because

the social analysis of the policies implemented to manage the water demand at the household level does not have a thick literature background as most of the research done in the field has been a focus on the reduction of water demanded but not much in the analysis on how these policies have and impact on the population and how they steer the behavior of the population reviewing the context that would provide the biggest effect.

The total amount of respondents was 31 full survey, which is less than half of the intended sample size, which provides some data regarding the phenomena being researched but is not a representative sample, because of these the conclusions reached in this study are by no mean definitive and need to be review with a bigger sample.

The survey was applied at random via the distribution network of the University of Twente and social media. The survey was managed on the platform Qualtrix XM. These guarantee the anonymity of the respondents. The survey was distributed via social media mostly in public groups with topics related to the city of Leeuwarden. The survey was up for a total of 2 weeks, from the 31 of May 2022 to the 14 of June 2022. The answers were filtered by the location of where the respondents lived. All the answers incoming from other cities outside Leeuwarden will be dismissed as are not part of the scope of this research. Then using pivot tables trends were found in the demographic group, like age groups, and income brackets.

A Likert scale was used to measure how likely it is that a household is affected by specific measures and various combinations of them. According to Jenn, (2006) questions have to comply with characteristics; they have to be valid, reliable, clear, interesting, and succinct.

For the questionnaire to be valid the questions have to ask what it intends to ask, in a way that the respondent understands the objective of the question.

To be reliable the questionnaire has to yield the same answers if the same question is posed to the same respondent in a short span of time.

The questionnaire has to be interesting for the respondent, these will improve the completion rate.

A succinct questionnaire has to aim only to answer the research objective of the research, there should not be questions outside the scope of the research.

### 3.3 Data Analysis

<b>Research question</b>	<b>Data Analysis Method</b>
First RQ	Desk research
Second RQ	Desk research
Third RQ	Social Acceptability Framework
Fourth RQ	Cognitive Interaction Theory Framework
Fifth RQ	Governance Assessment Tool

### 3.3.1 Analytical Framework

To answer question 3 it is proposed a social acceptability framework. The social acceptance or support/opposition of the measures will be assessed using the next factors, using the models developed by Witte, (2021) and Guo et al.,( 2022).

*Perceived Equity:* Does the implementation of the policy/instrument have the same impact on different social groups?

*Perceived usefulness:* How useful is the policy/instrument to reduce water consumption at the household level?

*Income Level:* How much percentage of their salary goes into water utility payments?

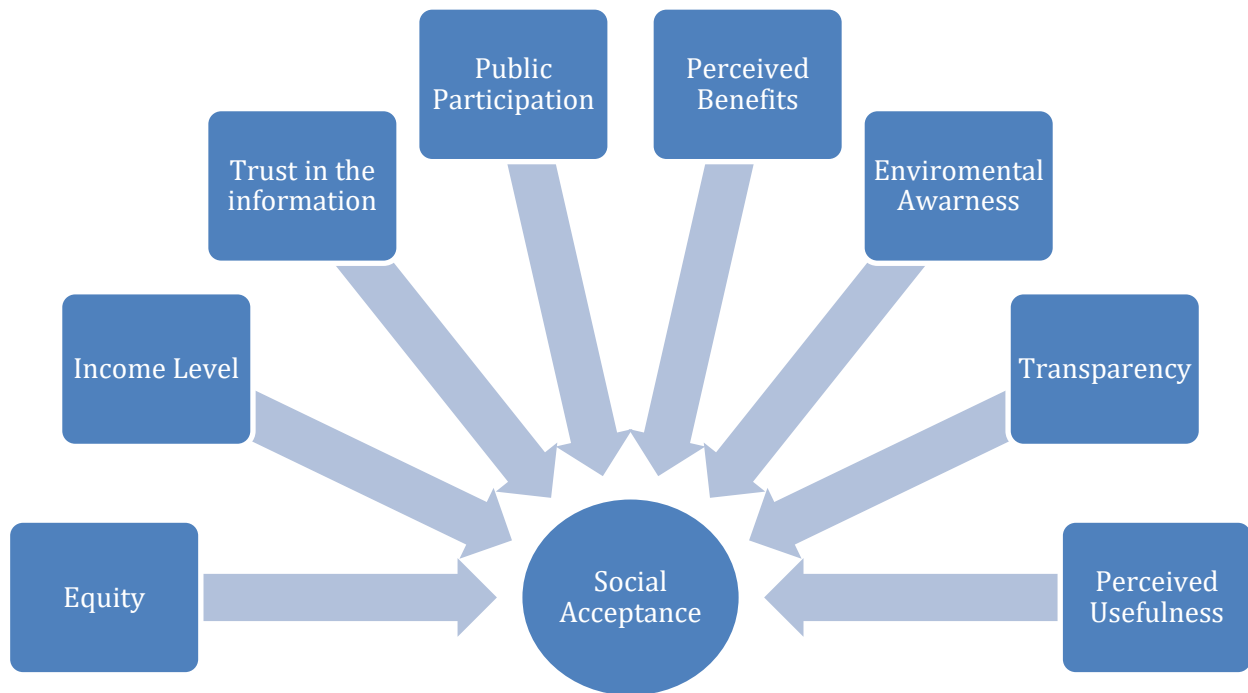
*Trust:* How important is trust in the water management actors for acceptance? Is there a lack of trust? What are the reasons for the lack of trust?

*Communication:* What's the need for communication of the policies and instruments to the target group? Which communication technics should be used to improve the efficiency of the policies and instruments?

*Benefits/drawbacks received:* What benefits are associated with the policy/instrument? What drawbacks are associated with the policy/instrument?

*Environmental Awareness:* How much is the environmental awareness of the population? Have an environmental-related education degree?

*Transparency in the implementation:* Is the implementation process of the policies/instrument transparent enough?



*Figure 7 Proposed social acceptance model*

These elements will be assessed using the previous survey, asking the opinion of the respondents regarding the policies implemented in the city. Using these opinions social acceptance was evaluated in qualitative terms, the results of this analysis can be found in section 4

To answer question 4 the Cognitive Interaction Theory was used. This framework allows for the analysis of the interaction between the household and the water manager institutions. To provide a perspective on how and why the policies and their instruments are acting upon each other and how these interactions can be improved. The CIT is explained more in detail in section 2.6.

To answer research question 5 the information collected regarding the policies in place in the city of Leeuwarden was analyzed using the tool provided by Bressers et al., (2016) using the framework of the Cognitive Interaction Theory framework, known as the Governance Assessment Tool.

This tool was chosen as governance assessment lacks a consensus due to the existence of so many different indexes and indicators (Moretto, 2015), this is most likely because there is no single type of governance system that can be applied to all problems (Casiano Flores et al., 2018). In this research, the effectiveness of measures and social acceptance of policies and instruments are addressed.

The GAT uses 5 different lenses to assess the policies, these are Levels and scales, actors and networks, problem and perception and goal ambitions, strategies and instruments, resources and responsibilities (Bressers et al., 2016; Casiano Flores et al., 2018). The most focus will be on the governance dimension of strategies and instruments. To provide a context about how the policies are being implemented the questions in Figure 8 will be answered.

Governance dimension	Main descriptive questions
Levels and scales	Which administrative levels are involved and how? Which hydrological scales are considered and in what way? To what extent do they depend on each other or are able to act productively on their own? Have any of these changed over time or are likely to change in the foreseeable future?
Actors and networks	Which actors are involved in the process? To what extent do they have network relationships also outside of the case under study? What are their roles? Which actors are only involved as affected by or beneficiaries of the measures taken? What are the conflicts between these stakeholders? What forms of dialogue between them? Are there actors with a mediating role? Have any of these changed over time or are likely to change in the foreseeable future?
Problem perspectives and goal ambitions	Which various angles does the debate of public and stakeholders take towards the problem at hand? What levels of possible disturbance are current policies designed to cope with? What levels of disturbance of normal water use are deemed acceptable by different stakeholders? What goals are stipulated in the relevant policy white papers and political statements? Have any of these changed over time or are likely to change in the foreseeable future?
Strategies and instruments	Which policy instruments and measures are used to modify the problem situation? To what extent do they reflect a certain strategy of influence (regulative, incentive, communicative, technical etc.)? Have any of these changed over time or are likely to change in the foreseeable future?
Responsibilities and resources	Which organisations have responsibility for what tasks under the relevant policies and customs? What legal authorities and other resources are given to them for this purpose or do they possess inherently? What transparencies are demanded and monitored regarding their use? Is there sufficient knowledge on the water system available? Have any of these changed over time or are likely to change in the foreseeable future?

Figure 8 Main Descriptive question of GAT (H. Bressers et al., 2016,pag 53 )

After a general view has been obtained, from the previous questions, the policies in place will be put to the test with the operationalization of the lenses proposed by Casiano Flores & Cromptvoets, (2020).

Governance Dimension	Extent	Coherence	Flexibility	Intensity
Levels and Scales	High—All the relevant government levels are involved. Moderate—Most the relevant government levels are involved. Low—Few relevant government levels are involved.	High—All the relevant government levels work together and trust each other. Moderate—Most of the relevant government levels work together and trust each other. Low—Few relevant government levels work together and trust each other.	High—It is possible to move up and down levels, depending on the issue to be led, in a pragmatic manner. Moderate—It is possible to move up and down levels, depending on the issue to be led. However, this requires institutional agreements that can be time consuming. Low—It is not possible to move up and down levels even. The system is hierarchical.	High—All levels are promoting innovation. Moderate—Most of the levels are promoting innovation. Low—A minority of levels are promoting innovation.
Actors and Networks	High—There is cross-sectoral collaboration among all the different networks of actors. Moderate—There is cross-sectoral collaboration among few networks of actors. Low—Only a specific network of actors collaborates.	High—Collaboration is institutionalized, stable and with trust among the different networks of actors. Moderate—Collaboration is institutionalized. It is stable and there is trust among few networks of actors. Low—The collaboration is not institutionalized and there is not trust among the different networks of actors.	High—It is possible to include new actors, shift leadership and to create social capital. Moderate—It is possible to include new actors. However, it is not possible to shift leadership or to create social capital. Low—It is not possible to include new actors, shift leadership, and to create social capital.	High—Coalition of different networks of actors promoting innovation. Moderate—Limited coalition of actors promoting innovation. Low—No coalition of actors promoting innovation.
Problem Perspectives and Goal Ambitions	High—The perspectives of all relevant actors are considered. Moderate—Few perspectives of relevant actors are considered. Low— Only the perspective of the main actor is considered.	High—The perspectives of all relevant actors support each other. Moderate—Few perspectives of relevant actors support each other. Low—The perspectives of relevant actors contradict each other.	High—It is possible to reassess the project during the process. Moderate—Only some aspects can be reassessed. Low—It is not possible to reassess the project during its implementation.	High—The current perspectives favor the project goal. Moderate—Minor changes are needed to include more perspectives that favor the project goal. Low—Major changes are needed to include more perspectives that favor the project goal.
Strategies and Instruments	High—Innovative strategies, including pilots, are considered and implemented by all the relevant actors. Moderate—Innovative strategies, including pilots, are considered and implemented by few relevant actors. Low—Innovative strategies, including pilots, are neither considered nor implemented by relevant actors.	High—The strategies and instruments do not present overlaps or conflicts. Moderate—Some strategies and instruments present overlaps or conflicts. Low—The strategies and instruments present overlaps and conflicts.	High—It is possible to combine different strategies and instruments for pragmatic reasons. Moderate—There are some limitations to combine different strategies and instruments. Low—It is not possible, or the actors are discouraged to combine different strategies and instruments.	High—The strategies and instruments are appropriate to reach the objective. Moderate—The strategies and instruments require minor changes to reach the objective. Low—The strategies and instruments require major changes to reach the objective.
Responsibilities and Resources	High—The relevant actors have clearly assigned responsibilities and the required resources. Moderate—Responsibilities are clearly assigned but there are not the required resources. Low—The relevant actors do not have clearly assigned responsibilities nor the required resources.	High—The relevant actors can combine their resources. Moderate—Only few relevant actors can combine their resources. Low—The relevant actors cannot combine their resources.	High—It is possible to pool different resources and to share responsibility with effective accountability mechanisms. Moderate—It is possible to pool resources but not responsibility. Low—It is not possible to pool resources nor responsibility.	High—The actors consider there are the appropriate resources to implement the project. Moderate—The actors consider the resources are tight to implement the project. Low—The actors consider the resources are insufficient to implement the project.

Figure 9 Operationalization of the GAT by Casiano Flores & Cromptoets, (2020, pag 6-7)

A value will be assigned to the rating in the operationalization table, creating an index like the one seen in Table 3.

Answer	Value
Low	1
Moderate	2
High	3

Table 3 Value of operationalization of GAT

Then the values for each lens will be added up and the final assessment will be done using the scale shown in Table 4 to determine the effectiveness of the policies.



Range of total	Qualitative Scale
11-12	Very Effective
9-10	Somewhat Effective
6-8	Somewhat Ineffective
4-5	Very Ineffective

Table 4 Effectiveness Scale

Finally, the policies and their instruments will be analyzed answering the question proposed by the GAT, shown in Figure 10, these will provide opportunities to improve the policies in place.

Governance dimension	Quality of the governance regime			
	Extent	Coherence	Flexibility	Intensity
Levels and scales	How many levels are involved and dealing with an issue? Are there any important gaps or missing levels?	Do these levels work together and do they trust each other between levels? To what degree is the mutual dependence among levels recognised?	Is it possible to move up and down levels (upscaling and downscaling) given the issue at stake?	Is there a strong impact from a certain level towards behavioural change or management reform?
Actors and networks	Are all relevant stakeholders involved? Are there any stakeholders not involved or even excluded?	What is the strength of interactions between stakeholders? In what ways are these interactions institutionalised in stable structures? Do the stakeholders have experience in working together? Do they trust and respect each other?	Is it possible that new actors are included or even that the lead shifts from one actor to another when there are pragmatic reasons for this? Do the actors share in 'social capital' allowing them to support each other's tasks?	Is there a strong pressure from an actor or actor coalition towards behavioural change or management reform?
Problem perspectives and goal ambitions	To what extent are the various problem perspectives taken into account?	To what extent do the various perspectives and goals support each other, or are they in competition or conflict?	Are there opportunities to re-assess goals? Can multiple goals be optimized in package deals?	How different are the goal ambitions from the status quo or business as usual?
Strategies and instruments	What types of instruments are included in the policy strategy? Are there any excluded types? Are monitoring and enforcement instruments included?	To what extent is the incentive system based on synergy? Are trade-offs in cost benefits and distributional effects considered? Are there any overlaps or conflicts of incentives created by the included policy instruments?	Are there opportunities to combine or make use of different types of instruments? Is there a choice?	What is the implied behavioural deviation from current practice and how strongly do the instruments require and enforce this?
Responsibilities and resources	Are all responsibilities clearly assigned and facilitated with resources?	To what extent do the assigned responsibilities create competence struggles or cooperation within or across institutions? Are they considered legitimate by the main stakeholders?	To what extent is it possible to pool the assigned responsibilities and resources as long as accountability and transparency are not compromised?	Is the amount of allocated resources sufficient to implement the measures needed for the intended change?

Figure 10 Governance Assessment Tool (Bressers et al., 2016 pag 57)

### 3.3.2 Validation of Data Analysis

Many sources of information were used to assure the validity of the data. The data gathered from the literature review was triangulated through different reports and articles, this is to avoid presenting only one perspective and reduce the bias of the researcher.

To assure the validity of the data obtained during the process of the research. The survey first ran a test period of 4 days, in which it was tested with a small sample group to assure it complies with the principles presented by Jenn, (2006). Which lead to different iterations of the questions to reach the best possible outcome and yield information that would be used in the research.

During the analysis of the survey data the trends found were checked with the result presented in other research studies to review if those trends were present and how they appears.

### 3.4 Ethical Considerations

To cover the ethical concerns that the study could have, the proposal of the study was submitted to the ethical committee of the BMS faculty in the domain of humanities and social sciences, in which all potential concerns were addressed as the anonymity of the participants, agglomeration of information obtained from the municipality and Vitens, and the storage of all the information collected.

Participation was voluntary and based on written informed consent. The consent was the first question given in the survey, if the respondent didn't consent the survey will skip to the end. As well the respondents had the option to abandon the survey at any point, and the information will not be used in the research, assuming that the abandonment of the survey was due to the intention of retracting the consent.

All the data collected in the survey and interviews were anonymized to avoid identification at a personal level. The distribution of the survey was done via anonymized link to avoid linking personal data as emails to the results.

The data was stored in external units and the University of Twente online storage services. To guarantee the availability of the information for future research and to avoid undesirable leaks that could affect the privacy of the participants in any way.

## 4 Results

Regarding the first research question of what policies and instruments are in place to reduce water consumption at the household level, four were found. From the municipality side, they have in place a subsidy scheme to implement water-saving technologies in old and new houses, which will be a mix of PP and NPP in the same policy document. Vitens has right now an awareness

campaign to try to push people to make behavioral changes to consume less water, a full cost recovery fee for the water, and (analog) metering implementation in all the houses possible. The municipality and Vitens run pilots in different parts of the city to try new policies that could help to reduce the water demand in the city.

For the second research question, which analyzes which other policies could be implemented in the city of Leeuwarden, 3 policies were identified. The peer comparison of water consumption within the neighbors is one, the implementation of an IBT to control excessive water consumption and a general water price increase.

Most people think that the price of water should not be increased but the respondents that know about the Vitens campaign think that the price should be increased. Most likely their awareness of water consumption and water resources situation is higher. Regarding implementing a peer consumption comparison with their neighbors most groups were neutral about the idea. But people that know about the Vitens campaign are more willing to accept the implementation of that policy, as well as the third bracket of income (€ 3,451 - € 5,175). The acceptability of this policy reduces in the age groups as the respondents grew older.

Another option presented to the respondents was the possibility of implementing an Increase Block Tarif (IBT). In general, the response is very neutral. Stand out that the people that have the water utility included in their rent contract are the ones more willing to the implementation of an IBT.

Some of the points that can be improved are improving the communication to the general public about how the policies are being implemented. Mostly how prices are set and how the subsidy is being given. The awareness campaign needs to reach a younger audience, as most of the people that know about the campaign are in the older age group. The subsidy scheme implemented by the municipality is more effective in the item that is the cheapest and the one that requires less effort from the population (rain barrel). To increase the adoption of the saving measure is recommended an increase in the price of the water is as right now there is no real incentive besides environmental awareness to consume less water.

A survey was used to determine the social acceptability of the instruments in place in Leeuwarden by the municipality and the water utility company, to answer the third research In total there were 50 reactions to the survey, from which only 31 were used, due to some respondents not living in the area of interest or did not fully complete the survey.

It was possible to analyze a broad spectrum of sociodemographic variables; age, economic status, education, monthly income, housing situation, and household composition. These variables were related to 2 main groups of dependent variables, the first group is knowledge variables, which assess if the respondents know their water consumption and the policies in place in Leeuwarden, and the second group was the answers given in the liker scale, that correspond to their opinion on different topics.

The analysis was done first using the social demographic variables, age group, economic status, income level, education level, house composition, and house situation, then the knowledge variable was used, knowing their water bill, knowing about the water campaign from Vitens, knowledge regarding their consumption, knowledge about their water provider, and knowledge regarding the subsidies.

At the moment of evaluating the social acceptance of the policies in place in Leeuwarden, we found that there is a lack of social acceptability from the framework developed in this document. There is a perceived lack of transparency in the application of the measures. Also, there is a perceived lack of benefits for the majority of the respondents as well as a lack of perceived equality. One thing that was noticed is that the population does not have an active role in the decision-making process of the policies that can be implemented and how they are being implemented, looking for methods to include the population could help increase the social acceptability of any policy put in place by either the municipality or Vitens. As well there is an important lack of knowledge regarding the water service, ranging from the knowledge of the cost paid for the water to even who is the water provider. This result was general for all the social groups analyzed. This is discussed in depth in the next chapter. The first thing that is identifiable from the survey is that there is a general lack of knowledge in the population of Leeuwarden regarding their water consumption and the importance of reducing water consumption. In general, only 23% of the respondents knew how much they paid for their water service. The groups that had a bigger knowledge about their bill were the older age group (more than 60 years old), the third bracket of income (between 3,451 & 5,175), and the respondents living by themselves, and only one of the respondents belongs to 2 of the 3 groups. This led to believe that there is a need for an information campaign directed to all the users to increase the knowledge about their water consumption, who provided the water, and from where the water is coming; with the final objective to appeal to the environmental and economic awareness that can lead to a reduction on the water demanded.

One odd result is that the people that rent is more aware of their water bill than house owners. As well more respondents said to know how much water they consume but they do not know how much they paid.

The percentage of people aware of the 2 main instruments aimed at the general public to reduce the water demand at the household level is 13% for the Vitens campaign and 16% for the subsidies offer by the municipality. Been mostly the older groups having more knowledge of both of them. Owners of the house have more knowledge about these instruments with a 33% for the Vitens campaign and 50% for the subsidies offered by the municipality. These possibly have to do with the possibility of taking chances in the house to save water, freedom that most tenants do not have. And even if the population knows how to reduce water consumption is not one of their priorities at this moment or they lack interest, which was a common answer for most of the respondents that knew about the saving measure they can implement but haven't.

There is a consensus that saving water is important, but for most of the respondents is not their responsibility as they do not consume more water than necessary, and they have a neutral

position on the possibility of reducing water. To the respondents that the Vitens campaign reaches they do act to reduce their water consumption as they have higher environmental awareness and this is the motivation behind all the respondents that have implemented saving measures in their houses.

The people in the third bracket of income (€ 3,451 - €5,175) think that the subsidies from the municipality are effective to reduce the consumption of water, more likely as they have more disposable income to implement the measures and ask for the subsidy. This is relevant as the most common reason for not implementing the measures is not that saving water is not one of the priorities at home and the second one is lack of money to implement them and the higher the income the opinion about the subsidies gets better. From a neutral position in the lower bracket to a 4.5 and 5 position of agreement. Age appears to be an important factor in the opinion about the subsidies as the adult group (30 – 39 years old) has the best opinion about the subsidy.

The awareness campaign from Vitens appears not to have an effect in giving people the tools to reduce their water consumption.

Most of the respondents feel that they do not receive any benefit from the subsidies offered by the municipality. The groups that perceived more benefits are the third bracket of income (€ 3,451 - € 5,175) and the young adult ( 30 – 39 years old).

The subsidy scheme implemented by the municipality has a negative perception regarding the equality of the measures. For most groups, the implementation of the measures is not equally accessible to all people.

In the transparency variable, the consensus in all the groups is that there is a lack of transparency on how the subsidies are been implemented the same as how the water prices are being set by the water company.

The fourth research question is in regards to the effectiveness of the policies in place to achieve behavioral change, using the Cognitive Interaction Theory framework to assess these changes. It was observed that the policies implemented had a low impact on the behavior of many of the respondents. The policies were aimed at the motivation aspect of the user and did not increase the knowledge that users have or need to have to be steered into less water-consuming behaviors, these were mostly seen in the policies implemented by Vitens, the policies implemented by the municipality was aimed in the power category but did not take into account the availability of the resources that the user have to implement the water saving technologies as well as the level of motivation in the population to take such actions, as the retrofitting of a household to accommodate new water-saving technologies is not only expensive; in the case of water recycling, but also disruptive to the household routine during the time the systems are being installed. Because of the lack of a holistic approach in which the policies are implemented tackling the lack of knowledge that is held by the population will hard to increase the motivation to take action, the capacity and power held by the municipality and Vitens give them few alternatives to use certain policies that are highly effective at reducing water but costly at a sociopolitical level

as water quotas or rationing. Also, policies such as certain bans, even when effective at the beginning of their implementation, are hard to keep enforcing in the long term.

The fifth research question refers to how to improve the implementation of the policies and instruments that are in place in the city, to assess improvement points the Governance Assessment Tool is being used, to briefly assess each one of the different governance domains, taking a major interest in the domain of instruments and strategies. We found from the first domain that refers to levels and scales there are only lower governance levels involved in the household water governance with the focus to reduce water demand. Being in this level the municipality and the water company (Vitens), due to their position on the governance scale are not able to implement certain policies that require a high level of enforcement.

In the second domain, we found two actors creating policies. The municipality with many networks with companies working towards the development of new technologies but not specifically to reach the population which is intended to create a behavioral change. The second actor creating policies is Vitens, and the study did not find evidence that Vitens is working with a network approach to reach its goal to reduce water demand. There is no organized cooperation between the two main actors in Leeuwarden. In this scenario, Leeuwarden and Vitens implement and put their policies forward and do not look for how to increase their synergy. But they do cooperate in some pilot projects, and because of these is possible that the cooperation and dialogue between these two actors will improve.

The third domain analyzes problem perspectives and goal ambitions. At the moment there is no bidirectional dialogue between the governance actors, the public participation is rated very low, as the municipality and Vitens select the policy and implemented it. The policies cant take much disturbance as the implementation parameters are very specific. At the moment the population will endure little disturbance in the water consumption patterns, as there is very little motivation to reduce the water demand.

Taking the fourth domain, strategies, and instrument, with a more in-depth assessment we found that the extent of the policies will score moderate, as the municipality and Vitens do implement pilots to try new strategies. The municipality implemented a pilot to try an app to reduce water consumption using gamification principles in the sector that Vitens was implementing a pilot to assess the possible implementation of a smart meter. In the coherence domain, the policies score high as the policies in place do not present conflicts or overlap. The third domain deals with the flexibility of the policies, at the moment it will score high as very possible to combine new and different strategies and instruments to increase the effectiveness of the policies in place. In the intensity domain, the policies need to consider major changes to reach the objective set by the municipality and Vitens. If we assign a value of one to low, two to moderate, and three to high, we assess an average value of effectiveness of 2.25, which will fall into moderate effectiveness. The operationalization provided by Casiano Flores & Cromptvoets, (2020) is very reductive to evaluate the few policies that are in place at the moment.

Using the original definition of each domain provided by Bressers et al., (2016). We found that the municipality has a lack of enforcement as the adoption of the water-saving technologies is voluntary, the municipality does monitor that the water-saving technology is installed to provide the subsidy, but after that first review, there is no mechanism in place to check that the technology is kept functional. The adoption of the metering in houses is still voluntary but will become mandatory to comply with the WFD of the European Union. The full recovery fee for the water is mandatory and has monitoring systems to assure compliance from the clients, the enforcement is also done by Vitens, with penalties in case of default. Regarding the awareness campaign, there is no enforcement or monitoring, as all are voluntary measures. There is synergy in the implementation of the massive metering and the full cost recovery price and the other two policies in place, the awareness campaign from Vitens creates synergy with the subsidy scheme of the municipality, as the awareness campaign points out some of the technologies that the municipality offer subsidies. For the third domain, the policies in place leave a lot of opportunities to add new policies to complement the ones in place and to cover other areas that are not covered by the policies in place. The fourth domain refers to the intensity of the policies we know that Vitens and the municipality have made public the change that they want to reach, that is a 5% reduction in water consumption at the household level but so far the instrument puts very few or none pressure into the households to reach these goals as most of the measure is voluntary and the ones that are enforced have little impact on the consumption level.

The fifth domain regards responsibilities and resources. We found that the policies of the municipality puts a lot of responsibility on the house owners, and building companies; as they are the ones to decide to implement water-saving technologies, and after they are implemented the house owners and building companies were responsible to fill the forms to gain access to the subsidies. The municipality is responsible for the delivery of the subsidy and to verify that the technologies have been implemented. The municipality has a legal authority to provide subsidies via the publication of the law that put in place the subsidy scheme. The information regarding how to access the subsidies is available on the public webpage of the municipality, and how many subsidies have been given the information is available if it is requested formally from the municipality. Regarding the policy implemented by Vitens, the one responsible is Vitens itself as is an awareness campaign to steer behavioral change.

Based on the answers to the research questions it can be seen that the result is in line with the literature regarding the impact that the policies applied in Leeuwarden have little impact due to the lack of enforcement and social impact. As well even though there is a metering policy the impact that these have is small as the price of the water is so low that there is no real incentive to reduce consumption or implemented saving technologies. Is needed to mix in the policies some policies that pressure people to reduce demand for a reason beyond environmental awareness. There is a lot of room to implement a new mix of policies that could help reach the goal of a reduction of 5% set by Vitens and the municipality. These would include strong social norms like peer comparison in the water bill. These have been discussed in the previous section that provided the biggest reduction in consumption. There is still no need for extreme policies like rationing so far, but if nothing is done is very likely due to climate change that these will become a necessity. There is the possibility to implement IBT due to the actual price of water being very

cheap and accessible to most of the population, and the extra profit of the IBT could be used to finance a more aggressive implementation of some NPPs like boosting the awareness campaign that so far is reaching very few people

To answer the main research question we need to go back to the framework of CIT and divide the answers from the survey into the three main lenses provided by CIT. The answers that fit the cognitive lens are the question that has to do with the knowledge the population has about their water consumption and the policies and instruments provided by the municipality and Vitens. The questions related to the motivation lens are those that ask directly about the motivation to implement water-saving measures. Finally, the questions related to the capacity and power lens are sociodemographic as income and housing situation. Putting the answer through these lenses we see that the only motivation is coming from internal values, and environmental awareness, there is a lack of external pressure policies, and regarding the self-assessment of how much water the respondents use, most of them said they do not use too much water, these are likely of two reasons, the first one is the lack of knowledge about their water bill and the second reason is that there is no a benchmark to which the respondent can compare their use and know how do they compare to this benchmark.

The knowledge factor shows that there is an important lack of knowledge in various topics. The more important ones to mention are the consumption data, the state of water resources in the Netherlands, the impact of climate change on the water resources, and the capacity of Vitens to keep providing water in the future. Vitens has made public announcements regarding the situation of the water resources used by them, and most of the time the call is that the water resources are under stress and that more conscious consumption is needed from the population most of the population ignores the call and do not change their behavior and in the cases where the population changes the behavior that change does not last and they revert to their normal consumption habits. There is also a lack of knowledge regarding how to save water in the house if the people have taken any action to reduce their consumption the go-to action is to take shorter showers. For the power and resources section, being water a human right matter and politically complicated to manage a lot of policies are if not hard to implement, they are hard to be accepted by the population or even to make policy by the governing body. Then there is the issue to enforce certain policies that restrict or prohibit activities like carwashing, filling of pools, watering the gardens, and other uses that are deemed as not essential by the literature, there is a lack of capacity to enforce these types of measures as they could be seen as socially oppressive. If we see the resources from the consumer point of view, there is a lack of economic resources to implement more complicated and expensive technologies, as for most people the two biggest reasons for not implementing water-saving technologies are the lack of money or not being one the priorities, these even if the respondent was aware that saving water is important.

## 5 Conclusions and discussion

At the moment the municipality has in place only the policy to provide a subsidy to those households that implement water-saving technologies, it doesn't matter if the house is a new build or it is to retrofit an old house, as the installation of water-saving technologies is not mandatory



for new buildings. Vitens have in place 2 main policies; metering in all houses to control the amount of water used in each house and an awareness campaign that tries to make households reduce their water consumption by appealing to their environmental values.

Following the result from the analysis and the situation of the city regarding the policies in place using the CIT framework, is advised that the best method to reach the goals set by the municipality and Vitens is to use policies that affect the cognition and motivation factors, as those two factors seem to be more acceptable for the population. One of the best measures that could have a great impact with a low investment from Vitens is the implementation of the comparison of consumption in the neighborhood, but it will need to work around the privacy legislation, which will make it easier as most of the data will be aggregated and will not be possible to link it to a specific household.

More follow-up is needed in the implementation of the policies, and there must be an increase in the intensity of the policies for them to be more effective. Furthermore, there is a need to provide more information regarding the set of water prices and the implementation of the subsidies as the general population shows that they think there is a lack of transparency in those two areas. The introduction of higher water prices could make the subsidies scheme more effective (Barrett, 2004), the best way to maximize the total impact on residential water consumption is the combination of PPs and NPPs (Barrett, 2004) with more diverse instruments that widen the reach of them with a synergetic approach that will yield far greater reductions than if they applied individually.

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## Appendices

### 5.1 Survey Design

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#### Consent

You are being invited to participate in a research study titled Assessment of price policies and non-price policies manage the water demand at the household level in Leeuwarden, Friesland, The Netherlands. This study is being done by Ernesto Yarinse González Guillén from the Faculty of Behavioral, Management and Social Sciences at the University of Twente.

The purpose of this research study is to assess awareness and social acceptability regarding the measures put in place by the municipality of Leeuwarden and the water utility company Vitens to reduce household water consumption. It will take you approximately 10 minutes to complete. The data will be used to provide feedback on how to improve outreach to reduce household water consumption and improve the sustainability of water resources.

We believe there are no known risks associated with this research study; however, as with any online-related activity, the risk of a breach is always possible. To the best of our ability, your answers in this study will remain confidential. To minimize any risks, the data will be stored in an external hard drive for 10 years after which your answers will be deleted. We will not collect any personal information that could be linked directly to you and all the information will be anonymized. Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any question.

Study contact details for further information: Ernesto González  
e.y.gonzalezguillen@student.utwente.nl

Do you agree to participate in the survey?

- Yes (1)
- No (2)

*Skip To: End of Survey If Consent = No*

---

Q1 Do you live in the urban area of Leeuwarden, Friesland?

- Yes (1)
  - No (2)
- 

Q2 How old are you?

- 18-20 (1)
  - 21-29 (2)
  - 30-39 (3)
  - 40-59 (4)
  - 60+ (5)
-

Q3 What is your economic status?

- Student (1)
  - Employed (2)
  - Retire (3)
  - Unemployed (4)
- 

Q5 What is your gross income monthly?

- Less than €1,725 (1)
  - €1,726-€3,450 (2)
  - €3,451-€5,175 (3)
  - €5,176-€6,900 (4)
  - €6,901-€8,625 (5)
  - €8,626+ (6)
- 

Q6 What is your house situation?

- Tenant (1)
  - Owner (2)
  - Other (3) \_\_\_\_\_
-

Q4 What is your higher educational level attained?

- High School (VMBO/HAVO/VWO) (1)
  - MBO (2)
  - HBO (3)
  - WO (4)
  - Master (5)
  - PhD (6)
  - Other (7) \_\_\_\_\_
- 

Q7 What is your household composition?

- Family (1)
  - Housemates (2)
  - Myself only (3)
- 

Q8 How many people live with you in the same household?

\_\_\_\_\_

---

Q9 Indicate which utilities, if any, are included in your rental payment

- Water (1)
  - Electricity (3)
  - Gas (2)
  - Internet (4)
  - None of the above (5)
- 

*Display This Question:*

*If Q9 != Non of the above*

Q10 Do you know how much you pay for your water bill?

- Yes (1)
  - No (2)
- 

Q11 Do you know how much water you use?

- Yes (1)
  - No (2)
- 

Q12 What type of water heater do you have?

- Gas (1)
  - Electric (2)
  - I do not know (3)
-

Q13

It is estimated that on average € 17.03 per month is added to the price of water just for the use of hot water in the shower, per person showering once a day.

Do you know how much gas/electricity you use used in the water heater?

Yes (1)

No (2)

---

Q14 Do you do anything to save water at home?

Yes (1)

No (2)

---

Q15 Have you taken measures to reduce your hot water consumption?

Yes (1)

No (2)

---

*Display This Question:*

*If Q14 = Yes*

*Or Q15 = Yes*

Q16 Mark the measures that you have. (select all that apply)

- I have a water-saving shower head (1)
  - I have a water recycling system (2)
  - I take shorter showers (3)
  - I shower with cold water (4)
  - I have a water-efficient toilet (2 flushing buttons) (5)
  - I do not wash my car in the street (if you have a car) (6)
  - Others (7) \_\_\_\_\_
- 

Q17 Do you know with which company you have a contract to supply water to your house?

- Yes (1)
  - No (2)
- 

Q18

Vitens is the company in charge of supplying water in the provinces of Friesland, Overijssel, Gelderland, Flevoland, and Utrecht.

As part of a water-saving campaign, Vitens provided tips via their website and social media on how to save water in the household as well as partial information on the state of the reservoirs.



Were you aware of Vitens' water-saving campaign?

Yes (1)

No (2)

---

*Display This Question:*

*If Q18 = Yes*

Q19 Have you applied any of the measured advice in the campaign?

Yes (1)

No (2)

*Display This Question:*

*If Q19 = Yes*

Q20 Which measure have you applied? (select all that apply)

- Water-saving taps, shower heads, and toilets (1)
- Place a rain barrel (2)
- Place an infiltration crate (3)
- Place a rainwater tank in your garden (4)
- Place a pond (5)
- Disconnect the downspout from the sewer (6)
- Build a wadi (7)
- Washing machines and dishwashers with an eco mode (8)
- Recycle water in the shower (9)

Q22 Did you know that the municipality offers subsidies to help reduce household water usage?  
Select the subsidy offers you were aware of (select all that apply)

- Uncoupling downspout pipe subsidy (max € 500 per house) (1)
- Discount for rain barrel (max € 25 per barrel, max 2 barrels per house) (2)
- Rainwater use installation subsidy (max 50% of total cost, up to € 2500) (3)
- Water recycling system subsidy (max 50% of total cost, up to € 2000) (4)
- Water-efficient toilets subsidy (max 50% of the price, up to € 200, max 2 toilets per house) (5)
- Other (6) \_\_\_\_\_
- I did not know about this (7)

---

Q23 Have you implemented any of the measures mentioned in the previous question in your house?

- Yes (1)
- No (2)

---

*Display This Question:*

*If Q23 = Yes*

Q24 If you have implemented any of the above measures, why? (select all that apply)

- Money saving (1)
- Environmental Awareness (2)
- Other (3) \_\_\_\_\_

Display This Question:

If Q23 = No

Q25 If you have not implemented any of the above measures, why not? (select all that apply)

Lack of money (1)

Lack of interest (2)

There is no need to save water (3)

Other (4) \_\_\_\_\_

---

Q26 If you could propose a different measure to be applied by the municipality to reduce household water consumption, what would you propose?

\_\_\_\_\_

---

Q27 Please select the option that best represents your opinion about the following statements.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Saving water is important (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I consume too much water. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can reduce my water consumption. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Friesland suffers from water shortages. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I act to reduce the amount of water used in my house because I'm concerned about the environment. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I act to reduce the amount of hot water in my house because I want to save on gas/electricity. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vitens' water-saving campaign on social media helps reduce household water consumption. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have followed the advice given by Vitens. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The subsidies implemented by the municipality are an effective way to reduce water consumption. (9)

I think that the municipality is doing the right thing by offering all the subsidies. (10)

The awareness campaign helps me realize how to use less water. (11)

I benefit from the measures applied by the municipality to help me save water. (12)

The measures from the municipality are equally accessible to everyone. (13)

The application of the measures is done transparently by the municipality. (14)

The water company is transparent about how the water prices are set. (15)

The price of drinking water should be increased. (16)

People who use more water should pay more than people who use less water. (17)

I would agree to have a comparison of my water consumption with the water consumption of my neighbors. (18)

End of Block: Block 2

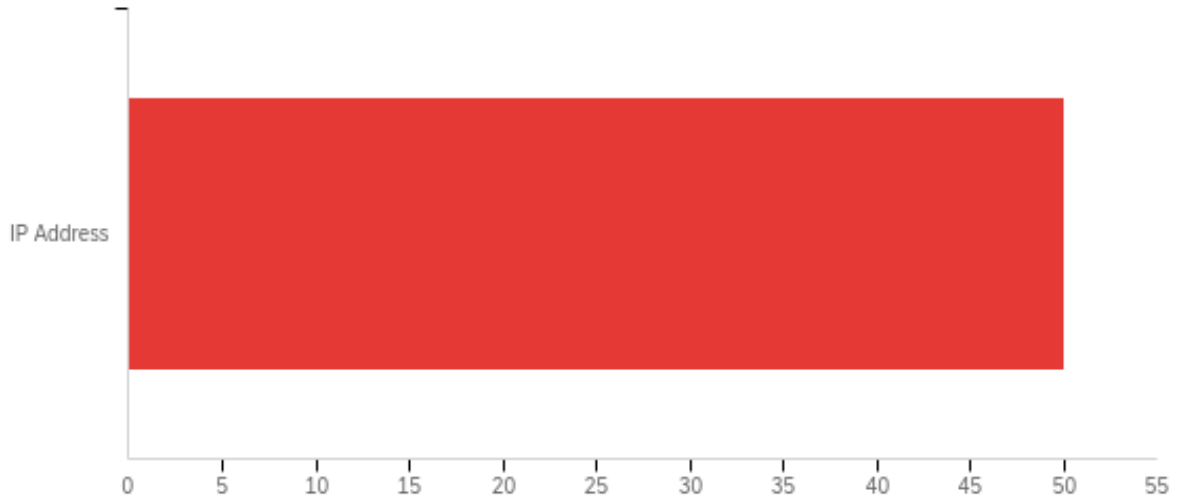
---

## 5.2 Raw data from the survey

### Default

### Report

**Consent - You are being invited to participate in a research study titled Assessment of price policies and non-price policies manage the water demand at the household level in Leeuwarden, Friesland, The Netherlands. This study is being done by Ernesto Yarinse González Guillén from the Faculty of Behavioral, Management and Social Sciences at the University of Twente. The purpose of this research study is to assess awareness and social acceptability regarding the measures put in place by the municipality of Leeuwarden and the water utility company Vitens to reduce household water consumption. It will take you approximately 10 minutes to complete. The data will be used to provide feedback on how to improve outreach to reduce household water consumption and improve the sustainability of water resources. We believe there are no known risks associated with this research study; however, as with any online-related activity, the risk of a breach is always possible. To the best of our ability, your answers in this study will remain confidential. To minimize any risks, the data will be stored in an external hard drive for 10 years after which your answers will be deleted. We will not collect any personal information that could be linked directly to you and all the information will be anonymized. Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any question. Study contact details for further information: Ernesto González e.y.gonzalezguillen@student.utwente.nl Do you agree to participate in the survey?**



#	Question	IP Address	
1	Yes	100.00%	50
	Total	Total	50



### Q1 - Do you live in the urban area of Leeuwarden, Friesland?

#	Question	IP Address		Total
1	Yes	100.00%	32	32
2	No	100.00%	6	6

### Q2 - How old are you?

#	Question	IP Address		Total
1	21-29	100.00%	17	17
2	30-39	100.00%	14	14
3	40-59	100.00%	3	3
4	60+	100.00%	4	4

### Q3 - What is your economic status?

#	Question	IP Address		Total
1	Student	100.00%	14	14
2	Employed	100.00%	22	22
3	Retire	100.00%	1	1
4	Unemployed	100.00%	1	1

### Q5 - What is your gross income monthly?

#	Question	IP Address		Total
1	Less than €1,725	100.00%	17	17
2	€1,726-€3,450	100.00%	13	13
3	€3,451-€5,175	100.00%	6	6
4	€5,176-€6,900	100.00%	1	1

### Q6 - What is your house situation?

#	Question	IP Address		Total
1	Tenant	100.00%	29	29
2	Owner	100.00%	9	9

### Q4 - What is your higher educational level?

#	Question	IP Address		Total
1	High School (VMBO/HAVO/VWO)	100.00%	2	2
2	MBO	100.00%	4	4
3	HBO	100.00%	10	10
4	WO	100.00%	5	5
5	Master	100.00%	15	15
6	PhD	100.00%	2	2

### Q7 - How is your household composition?

#	Question	IP Address		Total
1	Family	100.00%	18	18
2	Housemates	100.00%	9	9
3	Myself only	100.00%	11	11

### Q8 - How many people live with you in the same household?

IP Address

How many people live with you in the same household?

1

1

0

2

1

0

5

2

1

2

0

0

2

1

5

3

1

2

4

0  
2  
4  
1  
2  
0  
2  
3  
2  
3  
4  
5  
5  
1  
5  
3  
4

**Q9 - Indicate which utilities, if any, are included in your rental payment**

*Data source misconfigured for this visualization*

#	Question	IP Address		Total
1	Water	100.00%	18	18
2	Gas	100.00%	17	17
3	Electricity	100.00%	12	12
4	Internet	100.00%	6	6
5	None of the above	100.00%	10	10

### Q10 - Do you know how much you pay for your water bill?

#	Question	IP Address		Total
1	Yes	100.00%	10	10
2	No	100.00%	14	14

### Q11 - Do you know how much water you use?

#	Question	IP Address		Total
1	Yes	100.00%	9	9
2	No	100.00%	27	27

### Q12 - What type of water heater do you have?

#	Question	IP Address		Total
1	Gas	100.00%	25	25
2	Electric	100.00%	6	6
3	I do not know	100.00%	5	5

### Q13 - Do you know how much gas/electricity is used in the water heater?

#	Question	IP Address		Total
1	Yes	100.00%	3	3
2	No	100.00%	33	33

### Q14 - Do you do anything to save water at home?

#	Question	IP Address		Total
1	Yes	100.00%	21	21
2	No	100.00%	15	15

### Q15 - Have you taken measures to reduce your hot water consumption?

#	Question	IP Address		Total
1	Yes	100.00%	15	15
2	No	100.00%	21	21

### Q16 - Mark the measures that you have. (select all that apply)

#	Question	IP Address		Total
1	I have a water-saving shower head	100.00%	6	6
2	I take shorter showers	100.00%	16	16
3	I shower with cold water	100.00%	5	5
4	I have a water-efficient toilet (2 flushing buttons)	100.00%	12	12
5	I do not wash my car in the street (if you have a car)	100.00%	4	4
6	Others	100.00%	3	3

### Q16\_7\_TEXT - Others - IP Address

Others - Text

More use of rainwater

Spoel de wc niet altijd door.

Ik douche niet meer, maar was me met een spons en koud water. Ik was de helft van de tijd met koud water af, en de andere helft met warm water. Ik laat de kraan niet onnodig lopen.

**Q17 - Do you know with which company you have a contract to supply water to your house?**

#	Question	IP Address		Total
1	Yes	100.00%	22	22
2	No	100.00%	14	14

**Q18 - Were you aware of Vitens' water-saving campaign?**

#	Question	IP Address		Total
1	Yes	100.00%	5	5
2	No	100.00%	31	31

**Q19 - Have you applied any of the measured advice in the campaign?**

#	Question	IP Address		Total
1	Yes	100.00%	2	2
2	No	100.00%	3	3

**Q20 - Which measure have you applied? (select all that apply)**

#	Question	IP Address		Total
1	Recycle water in the shower	100.00%	1	1

**Q22 - Did you know that the municipality offers subsidies to help reduce household water usage? Select...**

#	Question	IP Address		Total
1	Uncoupling downspout pipe subsidy (max € 500 per house)	100.00%	1	1
2	Discount for rain barrels (max € 25 per barrel, max 2 barrels per house)	100.00%	5	5
3	Rainwater use installation subsidy (max 50% of total cost, up to € 2500)	100.00%	1	1
4	Water recycling system subsidy (max 50% of total cost, up to € 2000)	100.00%	1	1
5	Water-efficient toilets subsidy (max 50% of the price, up to € 200, max 2 toilets per house)	100.00%	1	1
6	I did not know about this	100.00%	28	28

**Q23 - Have you implemented any of the measures mentioned in the previous question in your house?**

#	Question	IP Address		Total
1	Yes	100.00%	6	6
2	No	100.00%	27	27

**Q24 - What motivated you to implement them? (select all that apply)**

#	Question	IP Address		Total
1	Environmental Awareness	100.00%	3	3
2	Other	100.00%	1	1

**Q24\_3\_TEXT - Other - IP Address**

Other - Text

that was the only option we had when buying a new toilet



**Q25 - If you have not implemented any of the above measures, why not? (select all that apply)**

#	Question	IP Address		Total
1	Lack of money	100.00%	5	5
2	Lack of interest	100.00%	3	3
3	There is no need to save water	100.00%	2	2
4	Other	100.00%	15	15

**Q25\_4\_TEXT - Other - IP Address**

Other - Text

Ik wist het niet

I didn't know I could

Ik huur dus ik mag niet zomaar dit soort dingen veranderen

I'm renting the place, not my own house

I'm a tenant

No aware of that

I simply did not know of them.

Staat lager op de prioriteiten lijst

I live in a rental apartment, so I have no say in implementing these things

For the advice: I already did all of them except that I have no small toilet flush option. For the subsidy measures: I did not know about them/I am a tenant and do not really know about investing in my house/I suppose the owner should make plans.

Andere prioriteiten

## Q26 - If you could propose a different measure to be applied by the municipality to reduce household wa...

IP Address

If you could propose a different measure to be applied by the municipality to reduce household wa...

---

Watermeter

---

No idea, I'm not focussed on this whatsoever

---

Geen idee

---

I don't know

---

Limit the amount of water available

---

water saving account

---

Nil

---

No idea

---

maybe something for (cloth) washing machines to subsidise?

---

Make the water almost free for a (low) certain amount of consumption.

---

Require washing machines, dishwashers, etc. to be more water efficient

---

Toilet spoelen met regenwater

---

Waterbesparende douchekop. Douchetimers,

---

To teach them that showering is not the most important for the health of the skin and life. It is washing that makes us clean.

**Q27 - Please select the option that best represents your opinion about the following statements.**

IP Address

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Saving water is important	3.00	5.00	4.57	0.67	0.45	30
2	I consume too much water.	1.00	5.00	2.30	1.22	1.48	30
3	I can reduce my water consumption.	2.00	5.00	3.77	0.88	0.78	30
4	Friesland suffers from water shortages.	1.00	5.00	3.07	0.77	0.60	30
5	I act to reduce the amount of water used in my house because I'm concerned about the environment.	1.00	5.00	3.55	1.19	1.42	29
6	I act to reduce the amount of hot water in my house because I want to save on gas/electricity.	1.00	5.00	3.60	0.84	0.71	30
7	Vitens' water-saving campaign on social media helps reduce household water consumption.	1.00	4.00	2.77	0.84	0.71	30
8	I have followed the advice given by Vitens.	1.00	3.00	2.23	0.80	0.65	30
9	The subsidies implemented by the municipality are an effective way to reduce water consumption.	1.00	5.00	3.23	0.96	0.91	30
10	I think that the municipality is doing the right thing by offering all the subsidies.	3.00	5.00	3.97	0.67	0.45	29
11	The awareness campaign helps me realize how to use less water.	1.00	5.00	3.07	1.15	1.33	30
12	I benefit from the measures applied by the municipality to help me save water.	1.00	5.00	2.57	1.17	1.38	30
13	The measures from the municipality are equally accessible to everyone.	1.00	5.00	2.82	1.04	1.08	28

14	The application of the measures is done transparently by the municipality.	1.00	5.00	2.87	0.92	0.85	30
15	The water company is transparent about how the water prices are set.	1.00	4.00	2.93	0.91	0.82	29
16	The price of drinking water should be increased.	1.00	5.00	2.17	1.13	1.27	30
17	People who use more water should pay more than people who use less water.	1.00	5.00	3.97	1.08	1.17	30
18	I would agree to have a comparison of my water consumption with the water consumption of my neighbors.	1.00	5.00	3.73	1.03	1.06	30

### Saving water is important

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	3	3
4	Somewhat agree	100.00%	7	7
5	Strongly agree	100.00%	20	20
4	Strongly disagree	0.00%	0	0
5	Somewhat disagree	0.00%	0	0

### I consume too much water.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	7	7
4	Somewhat agree	100.00%	5	5
5	Strongly agree	100.00%	1	1
4	Strongly disagree	100.00%	11	11
5	Somewhat disagree	100.00%	6	6

I can reduce my water consumption.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	4	4
4	Somewhat agree	100.00%	17	17
5	Strongly agree	100.00%	5	5
4	Strongly disagree	0.00%	0	0
5	Somewhat disagree	100.00%	4	4

Friesland suffers from water shortages.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	21	21
4	Somewhat agree	100.00%	3	3
5	Strongly agree	100.00%	2	2
4	Strongly disagree	100.00%	1	1
5	Somewhat disagree	100.00%	3	3

I act to reduce the amount of water used in my house because I'm concerned about the environment.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	3	3
4	Somewhat agree	100.00%	11	11
5	Strongly agree	100.00%	7	7
4	Strongly disagree	100.00%	1	1
5	Somewhat disagree	100.00%	7	7

I act to reduce the amount of hot water in my house because I want to save on gas/electricity.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	10	10
4	Somewhat agree	100.00%	15	15
5	Strongly agree	100.00%	3	3
4	Strongly disagree	100.00%	1	1
5	Somewhat disagree	100.00%	1	1

Vitens' water-saving campaign on social media helps reduce household water consumption.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	19	19
4	Somewhat agree	100.00%	4	4
5	Strongly agree	0.00%	0	0
4	Strongly disagree	100.00%	4	4
5	Somewhat disagree	100.00%	3	3

I have followed the advice given by Vitens.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	14	14
4	Somewhat agree	0.00%	0	0
5	Strongly agree	0.00%	0	0
4	Strongly disagree	100.00%	7	7
5	Somewhat disagree	100.00%	9	9

The subsidies implemented by the municipality are an effective way to reduce water consumption.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	10	10
4	Somewhat agree	100.00%	11	11
5	Strongly agree	100.00%	2	2
4	Strongly disagree	100.00%	1	1
5	Somewhat disagree	100.00%	6	6

I think that the municipality is doing the right thing by offering all the subsidies.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	7	7
4	Somewhat agree	100.00%	16	16
5	Strongly agree	100.00%	6	6
4	Strongly disagree	0.00%	0	0
5	Somewhat disagree	0.00%	0	0

The awareness campaign helps me realize how to use less water.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	11	11
4	Somewhat agree	100.00%	8	8
5	Strongly agree	100.00%	3	3
4	Strongly disagree	100.00%	4	4
5	Somewhat disagree	100.00%	4	4

I benefit from the measures applied by the municipality to help me save water.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	10	10
4	Somewhat agree	100.00%	4	4
5	Strongly agree	100.00%	2	2
4	Strongly disagree	100.00%	7	7
5	Somewhat disagree	100.00%	7	7

The measures from the municipality are equally accessible to everyone.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	12	12
4	Somewhat agree	100.00%	6	6
5	Strongly agree	100.00%	1	1
4	Strongly disagree	100.00%	4	4
5	Somewhat disagree	100.00%	5	5

The application of the measures is done transparently by the municipality.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	19	19
4	Somewhat agree	100.00%	2	2
5	Strongly agree	100.00%	2	2
4	Strongly disagree	100.00%	3	3
5	Somewhat disagree	100.00%	4	4



The water company is transparent about how the water prices are set.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	14	14
4	Somewhat agree	100.00%	8	8
5	Strongly agree	0.00%	0	0
4	Strongly disagree	100.00%	3	3
5	Somewhat disagree	100.00%	4	4

The price of drinking water should be increased.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	4	4
4	Somewhat agree	100.00%	2	2
5	Strongly agree	100.00%	2	2
4	Strongly disagree	100.00%	9	9
5	Somewhat disagree	100.00%	13	13

People who use more water should pay more than people who use less water.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	3	3
4	Somewhat agree	100.00%	14	14
5	Strongly agree	100.00%	10	10
4	Strongly disagree	100.00%	2	2
5	Somewhat disagree	100.00%	1	1

I would agree to have a comparison of my water consumption with the water consumption of my neighbors.

#	Question	IP Address		Total
3	Neither agree nor disagree	100.00%	6	6
4	Somewhat agree	100.00%	13	13
5	Strongly agree	100.00%	7	7
4	Strongly disagree	100.00%	1	1
5	Somewhat disagree	100.00%	3	3