

# Perspectives beyond the meter: a Q-study for modern segmentation of drinking water customers

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## Abstract

Given the growing interest among drinking water companies in the customer ‘beyond the meter’, generic accounts of the ‘average user’ no longer suffice. Yet, segmentation on the basis of specific characteristics or behaviour seems to offer a limited explanatory value. Hence, there is an increasing need for more detailed empirical knowledge of the potential for, and significance of, customer segmentation on the basis of subjective views and preferences. To this end, this paper not only explores different customer perspectives on drinking water, but also quantifies their prevalence and distribution, at a deep analytical level, in the Netherlands. The paper draws on empirical data collected from both a Q-study, encompassing a focus group and more than 30 interviews, and two large-scale surveys with a 3-year interval. We conclude that four customer perspectives on drinking water can be distinguished: (1) ‘aware & committed’; (2) ‘down to earth & confident’; (3) ‘egalitarian & solidary’; and (4) ‘quality & health concerned’. The modern customer segmentation approach in this paper offers deeper insights into the satisfaction, interests, concerns, and sociodemographic characteristics of customers related to these perspectives, which can aid companies in their quest to become more customer-oriented and responsive to different customer needs.

*Keywords:* Customer perspectives; Drinking water supply; Q-methodology; Segmentation; The Netherlands

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## 1. Introduction

Until quite recently, the term ‘drinking water customer’, let alone ‘drinking water customer engagement or excellence’, was largely if not entirely absent from the vocabulary of most public drinking water

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doi: 10.2166/wp.2019.078

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professionals. Indeed, drinking water has long been the domain of plant operators, engineers, and laboratory analysts, dedicated to optimizing the quality of drinking water, with the aim of delivering to the public safe and high-quality water at an affordable price. Today, however, many utility managers across Europe, including drinking water professionals, are seeking a stronger connection with what utility managers' language traditionally would call 'the demand side of the water chain', the 'number of connections', or the 'world beyond the meter', with the meter being the physically marked divide where the pipes from the 'public' network reach the homes of individual users (Hegger et al., 2011; Southerton, 2011; Brouwer et al., 2018).

In some countries, the objective of a stronger customer connection is mandated top-down by regulatory authorities. In England and Wales, for instance, the regulatory framework requires water utilities to develop business plans that reflect customer preferences for maintaining and improving service levels (Lanz & Provins, 2016). In other countries, including the Netherlands, this process has been predominantly bottom-up driven. In the past decade, under pressure from increasingly critical and demanding customers, Dutch water company utility managers increasingly feel confronted with the challenge to shift from being just a water supplier to becoming a customer-oriented service provider (Hegger et al., 2011). In the Netherlands, this growing interest in 'the world beyond the meter' was reinforced by the 2014 Organisation for Economic Co-operation and Development (OECD) study on the Dutch state of water governance. While the OECD study hailed the Netherlands as 'an international example' of water resource management, it also expressed concern about a 'striking awareness gap' among Dutch citizens with regard to key water management functions (OECD, 2014). Previous studies had warned of similar lack of citizen concern in several other countries (OECD, 2011). The 2014 OECD study concluded that Dutch citizens take water services for granted, which tends to decrease public involvement and risks undermining the willingness to pay for water services (OECD, 2014). Today, the ambition to more strongly and directly connect with customers is reflected in many online strategy statements and annual reports of the Dutch drinking water companies, which are often characterized as publicly owned but privately managed utilities (Beuken et al., 2014; OECD, 2014). For instance, Waternet, the water cycle company for Amsterdam, has gone public with its ambition of becoming the country's best public service provider by 2020 (Waternet, 2018), whereas Vitens, the largest drinking water company in the Netherlands, has declared customer excellence as one of its key strategic goals (Vitens, 2017).

Given the current regional monopoly structure of water utilities in the Netherlands, households cannot choose between different water providers. Therefore, preferences for different aspects of water services cannot be observed directly, making it not always easy to understand what customers consider important (Lanz & Provins, 2016). In fact, we would argue that what the 2014 OECD study identified as an awareness gap among Dutch citizens, to a large extent, could be considered a mutual, reciprocal awareness gap, since water utilities also generally have very little knowledge about the preferences and concerns of their customers, other than safe and high-quality water at an affordable price. To bridge this gap, among other things, various drinking water companies conduct customer satisfaction surveys or have created drinking water panels in which a small group of selected customers can regularly express their opinion (de Goede et al., 2016). Other companies have involved drinking water customers by means of 'citizen science', i.e., the participation of the general public in the generation of scientific knowledge, with positive effects on confidence and awareness (Brouwer & Hessels, 2019). Also in the current Dutch drinking water benchmark – initially an instrument to avoid direct government interference and later to stimulate improvements and efficiency gains in the sector (De Witte & Saal, 2010) – customers are consulted about their experience of the water quality and their customer service

experience (Vewin, 2013). As a result, more and more utilities recognize that customers are not merely indifferent consumers with the single concern of receiving safe water at the lowest cost, but that they interact in different roles and relationships with their providers (Hegger et al., 2011). Accordingly, drinking water companies increasingly recognize that the ‘average user’ does not exist, in practice (Boyle et al., 2011). Indeed, although traditional accounts on the preferences or wishes of ‘the average drinking water customer’ or ‘the majority of customers’ may still be dominant, more recently studies have demonstrated that there are significant variations between different customers and that water customer service expectations and preferences differ by user type (Fife-Schaw et al., 2007; Dzedzic & Karney, 2016). Accordingly, Boyle et al. (2011) argue that individual customers are all different and that distinguishing between different groups of customers with distinct usage patterns is preferable to treating the customer-base as a single, homogeneous mass.

Over the years, many studies have attempted to explain public reactions to, for instance, water reuse schemes. As observed by Smith et al. (2018), much of these studies have focused on exploring correlations between demographic characteristics and the public’s attitudes towards water reuse schemes. Some of these studies, for instance, suggest that women and younger age groups (Fielding et al., 2015) or specific religious or ethnic groups (Dolnicar et al., 2011; Garcia-Cuerva et al., 2016) generally are more risk-averse and more negative towards the idea of using water from reuse schemes, whereas people with higher incomes or education levels (Hills et al., 2002; Garcia-Cuerva et al., 2016) show a greater acceptance towards using reused water. Other studies, however, did not establish clear associations between demographic characteristics and the public response to water reuse (Friedler & Lahav, 2006; Smith et al., 2015). Whether or not these studies establish correlations between demographic characteristics and the public’s attitudes, what they all have in common is that they use a so-called classical segmentation of drinking water customers, which involves dividing a general group into subsets based on specific characteristics or behaviour, such as geographical segmentation, demographic segmentation (age, phase of life, gender, religion, etc.), socio-economic segmentation (education, income, etc.), and/or behavioural segmentation (willingness to buy, etc.).

Based on authors such as Po et al. (2005), who argue that individual psychological characteristics and attitudes rather than demographic characteristics can explain differences in the level of confidence customers have in drinking water; and Hegger et al. (2011), who demonstrated that different people look at water in different ways, have different behavioural practices, and think and act from different perspectives, we would argue that a modern segmentation based on the diversity of lifestyles, personal views, values, norms, goals, motivations, and other ‘soft’ differences in perspectives or subjective views on drinking water, would be even more useful than a classical segmentation based on such ‘hard’ socio-demographic differences. However, empirical research on the value and applied potential of modern segmentation in the field of drinking water is scarce. This study aims to advance knowledge in this field. The objective of this study is threefold: (1) to elicit the perspectives of drinking water customers; (2) to examine and quantify the prevalence and distribution of these different perspectives in the Netherlands; and (3) to deepen the perspectives by relating them to data on sociodemographic factors, customer satisfaction, concerns, and interests. The remainder of this paper proceeds as follows. An outline of the overall research design is presented in Section 2. This is followed by a step-by-step description of the Q-methodology in Section 3. Section 4 presents an outline of the drinking water perspectives that resulted from our Q-analysis, whereas Section 5 discusses the prevalence, distribution, and closer examination of these perspectives within the Netherlands. Section 6 presents the overall discussion and conclusion.

## 2. Research design

The case study focus of this study is the Netherlands, where 10 drinking water companies with separated geographical supply areas – all semi-public bodies operating under private law – provide drinking water that meets the highest quality standards with regard to safety, quality, and security of supply (Hegger *et al.*, 2011; OECD, 2014). The present study sought to gain a deeper understanding of the perspectives of Dutch drinking water customers by using two methodologies. Firstly, in 2015, the Q-methodology was used to elicit drinking water customer perspectives. Secondly, a quantitative survey was conducted to determine and compare the prevalence and distribution of the different perspectives in 2015 and 2018.

The Q-methodology, which is intended to identify subjectivities, provides a foundation for the systematic study of people's viewpoints, beliefs, attitudes, and feelings (Brown, 1980; McKeown & Thomas, 1988). Important features of the method are that it draws on the strengths of both quantitative and qualitative methodologies and does not require shared perspectives to be hypothesized in advance (Brown, 1993). Even though the Q-methodology is commonly viewed as a relatively novel method, it has been applied since the 1950s in various studies, including in the water domain (Raadgever *et al.*, 2008; Minkman *et al.*, 2017). Q-methodology consists of five stages: (i) developing the concourse and selection of statements (the 'Q-sample'); (ii) purposive selection of respondents (the 'P-set'); (iii) Q-interview; (iv) Q-analysis; and (v) Q-interpretation. Section 3 elaborates on stages (i)–(iv). Stage v, the interpretation of the Q-analysis, is presented in Section 4.

The ultimate goal of the Q-methodology is to elicit the existence and not to assess the prevalence of different perspectives. For a true insight into the drinking water customers, however, the existence of different perspectives alone is unsatisfactory. Knowledge about the different perspectives becomes considerably more valuable when combined with insights into which and how many customers hold different perspectives. To this end, we have conducted two subsequent quantitative surveys, in 2015 and 2018, respectively. The first survey ( $N = 1000$ ) was primarily aimed at investigating the existence of the different drinking water perspectives in the service area of the largest drinking water utility in the Netherlands, Vitens, which annually delivers 350 million m<sup>3</sup> water to 5.6 million customers. The second survey ( $N = 3183$ ) covered the Netherlands nationwide and was aimed at gaining a deeper understanding of the prevalence of the different customer perspectives, similarities, differences, and underlying attitudes between the perspectives, as well as assessing the robustness of the perspectives. In both surveys, respondents were, among other things, asked which of the four drinking water profile descriptions that resulted from our Q-analysis best matched their own perception and way of thinking. The full questionnaire contained 45 questions, including a series of five-point Likert items, close-ended questions with limited response choices, and several open questions. In addition, although beyond the scope of the current paper, the questionnaire contained a number of willingness-to-pay questions designed to estimate customers' relative willingness to pay for specific improvements related to drinking water provision. The distribution of customers within the four perspectives was examined using the chi-squared ( $\chi^2$ ) test. This test determines whether there is a significant difference between the expected frequencies and the observed frequencies or whether the distribution of customers within the four perspectives diverts from a distribution determined by chance. By making use of the  $\chi^2$  test, it was statistically analysed whether the customers within the profiles have significantly ( $p < 0.05$ ) different properties compared to properties of the other respondents. The statistical summary is shown in Appendix A in Supplementary Materials.

### 3. Q-methodology: step-by-step

#### 3.1. *Developing the concourse and selection of statements*

The first stage of Q-methodology is the collection and selection of statements that well reflect the ‘concourse’ or the so-called flow of communicability surrounding the topic under the study (Brown, 1993). In this study, the concourse relates to the broader topic of drinking water supply on which citizens have explicit opinions. All statements, which at all times should reflect ‘ordinary conversation, commentary, and discourse of everyday life’ (Brown, 1993), were taken from a literature study and a focus group on drinking water with 22 randomly selected customers. During the first part of the focus group, the participants were divided into small groups and asked to draw, and afterwards to explain, mind-maps in relation to the concept of drinking water in order to assess their initial associations, desires, and fears related to the topic. In the second and plenary part, the focus group participants were asked to reflect on four future scenarios related to drinking water. This resulted in a long list of over 60 statements, covering themes such as quality, price, sustainability, and transparency. In the course of pre-testing with drinking water professionals and experts in the field of water governance, and after removing overlapping and redundant statements, a final set of 47 statements were selected (the ‘Q-set’), fully listed in Appendix B. To maximize the understandability of the statements among the participants of the Q-interviews, all statements were kept close to their original wording.

#### 3.2. *Purposive selection of participants*

Q-methodology makes use of purposive sampling, whereby the selection process is guided by a diversity of perspectives instead of representativeness in survey research. In line with its objective to uncover different patterns of thought rather than their numerical distribution among the larger population, Q-studies typically use smaller sample sizes compared to conventional surveys. This drinking water Q-study included 32 respondents, all purposively selected based on the expectation that they would provide different points of view about drinking water compared to the other respondents. To this end, respondents were selected based on, among other things, diversity in age, education, religion, family size, residential condition, cultural background, philosophy, and income. Furthermore, certain specific types of water users were involved, including households with additional water purification devices, water recycling installations, or swimming pools. Via a combination of the researchers’ own social networks and snowballing, 33 respondents were selected in our ‘P-set’, of whom 32 agreed to participate.

#### 3.3. *Q-interview*

In a period of 2 months, 32 face-to-face Q-interviews were conducted. During these interviews, respondents were asked to rank all 47 statements on a bell-shaped distribution, with a scale that represents significance or salience to the respondent (Brown, 1980). In Q-studies, respondents evaluate statements in relation to the other statements (rather than individually, as in Likert scale-based surveys), with a forced distribution, meaning that the number of statements per column is predefined. In our study, this was a normally distributed nine-point Q-sort scale, indicating a spectrum ranging from most disagree (−4) to most agree (+4). In order to understand how each statement was being interpreted and why, respondents were encouraged to think out loud during the full sorting procedure: both during

their first reading and sorting of statements into the stacks ‘agree’, ‘disagree’, and ‘neutral/don’t know’ as well as during the subsequent stage in which they were asked to rank all statements on the nine-point Q-sort scale. After finishing their sort, and by means of a few open questions, respondents were invited to reflect on their positioning logic as a whole, with a special emphasis on the statements placed at the outer columns, as these are the most salient to their perspectives. All interviews were conducted at the respondents’ home, office, or in a neutral environment, and lasted between 45 and 90 min. With the consent of respondents, all interviews were recorded and the final Q-sorts photographed. As described in Section 4, the qualitative interview data from this Q-interviews were used to ‘translate’ and ‘interpret’ the statistical factors into qualitatively rich perspectives.

### 3.4. Q-analysis

The fourth phase entails a factor analysis of all individual scoring patterns, known as the Q-sorts. To this end, all 32 Q-sorts were entered into the computer software PQMethod 2.35. This software uses factor analysis – in this study centroid analysis – to explain the variance among all Q-sorts. Respondents with a ‘shared perspective’ or ‘factor’ (who sorted the statements in relatively similar ways) are basically clustered by this method. Next, the PQMethod was used to maximize the total variance between the factors using Varimax rotation (McKeown & Thomas, 1988). Only factors with an eigenvalue of  $>1$  were rotated. In addition, we verified whether the factor loadings were statistically significant (higher than 0.38), that the total explained variance was higher than 0.45, and that the product of the two highest factor loadings was equal to or more than two times the standard error. Most Q-studies result in fewer than seven factors and often not more than two or three (Peter et al., 2008). This study on customer perspectives resulted in four factors. For each of them, PQMethod calculated composite sorts. These composite sorts can be understood as typical Q-sorts, representing the individual sorts of the respondents in this group, which form the basis for the interpretation of the factors. In this interpretation step, the researcher goes back and forth between the quantitative and qualitative data from the interviews. Starting points for interpretation are the so-called defining statements comprising (i) the statements with highest and lowest scores (those with a rank value +4, +3, -3, or -4) and (ii) the statements that distinguish one factor from another (those with a statistically significantly different rank value on that factor as compared to the other factors). As elaborated on in the next section, the result of this interpretation is a set of four drinking water perspectives with a qualitatively rich narrative.

## 4. Four drinking water perspectives

In this section, the four drinking water perspectives that resulted from our Q-analysis are described. For each perspective, a short narrative is presented along with some relevant interview quotes that were used for qualitative interpretation of the factors as perspectives.

### 4.1. Perspective 1: aware & committed

This fairly idealistic perspective focusses on the power of the collective in which each individual is responsible for their own actions. Sustainable behaviour with respect to nature and humans is highly



valued, such as water-saving efforts on both household and collective level. From this perspective, it is a great waste of resources to irrigate gardens and/or flush toilets with clean drinking water; the use of reused water would instead be welcomed. In this perspective, increased awareness and understanding of water management and environmental challenges will inspire ever more people to make the ‘right’ decisions and to reduce their ecological footprint. Furthermore, this perspective places great confidence in ‘green’ technology. Water utilities are considered responsible for the production of water in a sustainable and environmentally friendly way: ‘Especially in this time when we are dealing with climate change, I expect from my drinking water company that they care about the environment and act accordingly’. The provision of open and real-time data on the consumption and quality of drinking water is believed to result in more conscious and environmentally friendly behaviour, especially when these data are accompanied with tailored advice on, for instance, water-saving practices.

#### *4.2. Perspective 2: down to earth & confident*

Customers with the down to earth & confident perspective like taking things easy and hence consider the responsibility of drinking water companies important. ‘I do not worry, and don’t want to worry. Actually, I don’t want to put any energy into thinking about water. They [the drinking water company professionals] have studied for that, so they have to know, not me’. At the same time, this perspective emphasizes the importance that water companies stick to their core task of ensuring adequate, healthy water of good quality in the most efficient way possible. All sorts of extra services, from products for a sustainable household to vitalized water, are accordingly labelled as unnecessary or nonsensical. This perspective does not foresee any future problems regarding the supply of water, mainly due to a strong belief in technological progress. From a convenience perspective, the availability of water without mandatory water use restrictions is regarded as important, as is the availability of drinking water in the public space. Initiatives such as the reuse of rainwater are regarded as unattractive, especially when accompanied by ‘personal hassle’.

#### *4.3. Perspective 3: egalitarian & solidary*

This perspective focuses on equality and care for the other. According to this perspective, drinking water is a basic human right to which every person should have access. Therefore, the water sector should be managed by public entities. Indeed, this perspective regards privatization of the sector as a doom scenario, as it is perceived to lead to less quality at higher costs, as a result of which the accessibility of water for the financially weak might be jeopardized. From an equality perspective, supplying more service or quality (differentiation) at a premium payment is taboo for this group; it should be avoided at all costs that more affluent households gain access to qualitatively better drinking water. ‘To me it is very important that water is accessible and affordable to all, and that everyone has the same quality’. The social commitment and solidarity of this perspective does not stop at national borders. Indeed, this perspective emphasizes that Dutch drinking water companies have a social duty to help in countries where clean and reliable drinking water is not self-evident. This perspective also shows solidarity with future generations. Accordingly, in this view, it is important not to waste water and to organize the water supply in a sustainable way.

#### 4.4. Perspective 4: quality & health concerned

Personal health and the quality of drinking water are the dominant values in this the fourth perspective. Healthy is perceived as ‘as natural as possible’ and without added substances. As one interviewee expressed: ‘As I am convinced it is better for my health, I prefer to drink water and eat food that is as natural as possible’. This perspective fears recycled water and water extracted at locations where industry, agriculture, or urban planning predominates. In this perspective, there is concern about whether the quality of water can also be guaranteed in the future; drugs and medicine residues in water are considered a potential risk for individual health. Water companies should therefore continue to invest in the further improvement of water quality. ‘It is not okay if our drinking water contains chemical contaminants. They have to be removed completely (...) adverse health effects may only appear after 20 years’.

### 5. Closer examination of the perspectives

#### 5.1. Prevalence of the perspectives

As mentioned above, identifying different perspectives helps to understand better the needs and preferences of a wide range of customers, instead of assuming the existence of the ‘average’ customer. However, for a true insight into the preferences, fears, and desires of drinking water customers, next to a better comprehension of the perspectives themselves, we take the view that it is also important to gain knowledge about how many, and which, customers hold the various perspectives. In fact, data on the different perspectives can be used to create customer profiles and segmentation based on subjective views on drinking water. In order to determine which percentage of customers fall within each group, each profile was translated into a set of four or five propositions and presented in a matrix question format in both the 2015 and 2018 survey. In answering these questions, respondents were asked which set of propositions, numbered A to D, best represented their individual perceptions. Our empirical analysis indicates that Dutch drinking water customers feel most connected to the perspectives ‘egalitarian & solidary’ (31%), ‘aware & committed’ (29%), and ‘down to earth & confident’ (27%). The smallest section (13%) of drinking water customers most identifies with the ‘quality & health concerned’ perspective ( $p < 0.05$ ,  $\chi^2$  test).

Bearing in mind that drinking water for a long time was considered a low-interest product (Hegger *et al.*, 2011), this result could be viewed as surprising. Indeed, from this traditional view, it would seem logical to hypothesize that most customers would support the ‘down to earth & confident’ perspective; the perspective that best fits the idea that water customers are primarily passive recipients of water who just pay the bills and otherwise feel little to no connection to water. Our results, instead, indicate that many customers do feel connected with drinking water and relate it to typical high interest topics such as health (the quality & health concerned perspective), sustainability (aware & committed perspective), and solidarity (egalitarian & solidary perspective) (Frijns *et al.*, 2013). This finding resonates with the argument by Hegger *et al.* (2011) and Heino & Takala (2015a) that there is a need to shift from the current paradigm, wherein goods and production processes are at the focus, to a new paradigm where water as a service to, for instance, a healthy environment or public health, is at the core of the value creation.



5.2. Differences between drinking water companies

This study not only looked at the prevalence of the different perspectives within the Netherlands overall, but also assessed the distribution of perspectives in the geographical areas that are serviced by the different drinking water companies. As depicted in Figure 1, our empirical data show that the variation between their customer perspectives is very small. This result indicates that the subjective views on drinking water in the various supply areas in the Netherlands are relatively similar. Not because they are all the same, but because they are very similar in their diversity. Merely, three drinking water companies (Brabant Water, Dunea, and Vitens) have significantly fewer or more customers in just one specific perspective ( $\chi^2, p < 0.05$ ). One drinking water company (Evides) has significantly more or fewer customers within two perspectives ( $\chi^2, p < 0.05$ ).

Further research is needed to gain more detailed insights into the reasons for these small differences, even if the resemblance of the customers served by the different drinking water companies surely is the most important conclusion. Speculatively, the finding of relatively more customers with a ‘quality & health concerned’ perspective in the supply area of Evides is related to the GenX discussion in this area during the time of study (Brandsma et al., 2019), which may have contributed to making the relationship between health and water more dominant in this area; whereas, for instance, the finding of relatively more customers with the ‘aware & committed’ perspective in the supply area of Dunea and Waternet may relate to the position of the cities of The Hague and Amsterdam, and hence the dominance of the metropolitan resident in this area. As explained in the next section, inhabitants of cities with more than 300,000 people more often hold an ‘aware & committed’ perspective ( $\chi^2, p < 0.05$ ).

One last but very important observation about the data in Figure 1 is the division of perspectives in the distribution area of water company Vitens. These figures are not noteworthy *per se* but become all

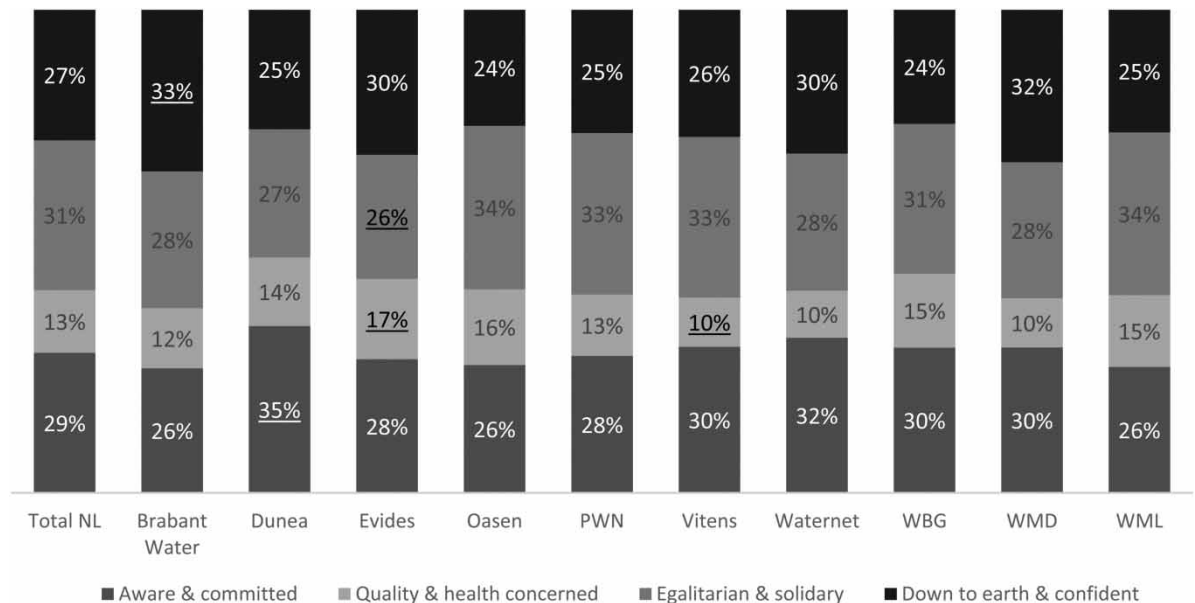


Fig. 1. Customer’s perspectives per drinking water company. Percentages underlined are significantly different from the average division.

the more so upon a comparison between the 2018 and 2015 survey data. As explained above, the 2015 survey only covered the service area of Vitens. In percentage terms, we find that the 2018 distribution of perspectives in the Vitens supply area hardly deviates from the distribution in 2015: ‘egalitarian & solidary’ (34% >33%); ‘aware & committed’ (31% >30%); ‘down to earth & confident’ (27% >26%); and ‘quality & health concerned’ (8% >10%). Statistically, the perspectives in this area are even significantly evenly distributed ( $\chi^2$ ,  $p = 0.15$ ). Given that the period between the two surveys is only 3 years, it would be too soon to conclude that customers’ perspectives are stable over time. However, this result does indicate that our method is reliable for analysing the prevalence of the different drinking water customer perspectives.

### 5.3. Sociodemographic factors

Aiming to acquire a deeper understanding of the profile of customers with different perspectives, we correlated the four perspectives with data on gender, age, education, income, and geographical location. The analysis revealed that significantly more men (30%) than woman (25%) have a ‘down to earth & confident’ perspective ( $\chi^2$ ,  $p < 0.05$ ). This distribution resonates with the idea that men, generally, look at risks more soberly (de França Doria, 2010). A large number of hypotheses have been suggested in the literature to provide explanations for this so-called white male effect, varying from the idea that women and minorities have less social and formal decision-making power than white men, the idea that women have a greater caring role, to differences in world views, to the idea that minorities have a greater likelihood of being exposed to possible risks (de França Doria, 2010). For the other perspectives in our study, there is no significant difference in the distribution among men and women.

In addition, there is a significant correlation between perspective and age: customers with the ‘quality & health concerned’ perspective are significantly younger (average 44) than customers with the ‘aware & committed’ perspective (average 49), the ‘egalitarian & solidary’ perspective (average 50), and the ‘down to earth & confident’ perspective (average 50) ( $t$ -test,  $p < 0.05$ ). Customers holding the ‘quality & health concerned’ perspective, whereby the connection between water and health is paramount, also significantly more often have children living at home ( $\chi^2$ ,  $p < 0.05$ ). This aligns to previous research showing a positive relation between the presence of (young) children and higher risk perceptions (Rundblad et al., 2013). Drinking water customers with the ‘aware & committed’ perspective generally have a higher education and earn an above average salary, whereas customers with the ‘egalitarian & solidary’ perspective generally have a lower education and earn significantly less often above average ( $\chi^2$ ,  $p < 0.05$ ). Finally, our data show that inhabitants of cities with more than 300,000 people more often hold an ‘aware & committed’ perspective ( $\chi^2$ ,  $p < 0.05$ ). Above demographic variables in relation to the ‘aware & committed’ perspective resonates with Liere & Dunlap (1980) who observed that environmental concern is, among other things, positively associated with education, income, and occupational prestige, i.e. social class. This association can be explained by reference to Maslow (1970) hierarchy of needs theory, suggesting that a luxury, such as environmental quality, can be indulged only after more basic needs such as adequate food, shelter, and economic security are met.

### 5.4. Satisfaction

As depicted in Table 1, our empirical data show that most drinking water customers are very satisfied with the quality of their drinking water: on a scale from 1 to 10, the average customer appreciation score

Table 1. Appreciation scores on a scale from 1 to 10, in conjunction with the concerns (concerned and somewhat concerned scores combined) and needs (fully agree and agree scores combined) per perspective.

		Average	Aware & committed	Down to earth & confident	Egalitarian & solidary	Quality & health concerned
Scores	Quality	8.3	8.4*	8.5*	8.3*	7.4*
	Price/quality ratio	7.7	7.9*	7.7	7.8*	6.9*
Concerns	Quality	30%	28%*	15%*	30%	63%*
	Availability	29%	32%*	16%*	30%	45%*
	Affordability	40%	35%*	33%*	44%*	58%*
	Disturbances	11%	9%	8%*	10%	24%*
Interests	Water saving	46%	56%*	33%*	46%	53%
	Self-measuring	31%	32%	20%*	30%	53%*
	Involvement	20%	22%	11%*	21%	36%*

Scores and percentages with an asterisk (\*) are significantly higher or lower compared to the other scores ( $t$ -test or  $\chi^2$ ,  $p < 0.05$ ).

for quality is 8.3/10. Even if the average price/quality ratio score is significantly lower (7.7/10), it is still a good score ( $t$ -test:  $p < 0.05$ ). Customers with the perspectives ‘aware & committed’, ‘egalitarian & solidary’, and ‘down to earth & confident’ give significantly higher scores than customers with the ‘quality & health concerned’ perspective. This result is in line with what could be expected. Indeed, customers with the perspectives ‘aware & committed’ and ‘down to earth & confident’ are characterized by optimism and down-to-earthness, respectively, whereas customers with the ‘quality & health concerned’ perspective are characterized by their concerns about health and the quality of water.

### 5.5. Concerns

Although the appreciation scores for the quality of water and the price/quality ratio show a high degree of satisfaction, our data nevertheless suggest that, at the same time, customers are concerned about various aspects related to their drinking water. Three out of 10 customers expressed concern about the quality of their drinking water: respectively, 6% and 24% of the customers were found to be very or somewhat concerned about this issue. Customers also expressed some concern about the future availability of sufficient drinking water: 4% of all customers we found to be very concerned about water quantity, another 25% expressed some concerns about this issue. Furthermore, and despite the general presumption that the price of drinking water is low, four out of 10 customers expressed concern about the future affordability of water. At present, this study found that 12% of all customers sometimes have difficulty paying the water bill. For one out of 100 customers this is often difficult. Finally, there is a small group of customers found to be moderately (10%) or concerned (1%) about increases in supply disturbances. Customers with the ‘quality & health concerned’ are, as could be expected, significantly more often concerned about quality, quantity, price, and disturbance issues than all other customers ( $\chi^2$ ,  $p < 0.05$ ). For instance, as depicted in Table 1, we find that 63% of these customers are concerned about water quality; clearly, a very different picture compared to the average customer. In contrast, customers with the ‘down to earth & confident’ perspective expressed the least concern regarding all issues ( $\chi^2$ ,  $p < 0.05$ ). Also, customers with the ‘aware & committed’ perspective are relatively less concerned about the future availability of water, quality, and price developments. Customers with the ‘egalitarian & solidary’ perspective are only characterized by their fear that drinking water may become unaffordable in the future. The fact that this group of

customers is more concerned about this issue indicates solidarity for economically less advantaged households and is therefore completely in line with expectations.

### 5.6. Interests

The results of this study show that the traditional dominant image of drinking water customers as uninterested and passive recipients of water is no longer valid if it ever was. Although this does not apply for all customers, if only because this study shows the diversity of customers, our results suggest that there are many customers for whom drinking water, notwithstanding its relative low costs, is more than a low-interest product that only gets noticed when it is missing, as has long been assumed within the drinking water sector (Hegger et al., 2011). As depicted in Table 1, almost half (46%) of the respondents indicate that they would like to save more water at home; among ‘aware & committed’ customers, this percentage is even 56%. This observation not only confirms the environmental concern of ‘aware & committed’ customers but also resonates with the work of Heino & Takala (2015b), who maintain that for many customers saving water is an important value, even when there is no shortage. Apart from the fact that many customers want to save water, a third (31%) of the customers indicate that they would like to have a direct, personal role in measuring the quality of their own drinking water. Among customers with the ‘quality & health concerned’ perspective, the number of customers that showed interest in self-measuring the quality of their own drinking water is with 56% significantly higher, whereas, within the group of customers with the down to earth & confident perspective, this interest in self-measuring is significantly lower (20%). As depicted in Table 2, when relating customers’ interest in self-measuring the quality of their individual drinking water to the appreciation scores for quality and confidence scores for drinking water companies, we find a strong correlation. The lower the perceived quality of drinking water, the higher the interest in self-measuring this quality. The same pattern can be seen in relation to confidence. The lower the confidence in drinking water companies, the greater the interest in self-measuring the quality. Arguably, this could be interpreted as notable, because traditionally pro-active profiles have been associated with active and committed customers (‘aware & committed’ perspective), often in the form of citizen science (Brouwer & Hessels, 2019), yet in this study it was correlated with concerned customers (‘quality & health concerned’ perspective).

In addition to interest in water-saving and self-measuring quality, we find that approximately one in five customers (20%) would like to be more involved with their drinking water company. Again, we find

Table 2. Interest to measure the quality of own drinking water in relation to an appreciation score for quality and a confidence score for drinking water companies.

Interest is self-measuring the quality of water	Average appreciation score for quality*	Average confidence score for drinking water companies*
Fully agree	7.5	6.5
Agree	8.0	6.9
Neither agree nor disagree	8.2	7.0
Disagree	8.5	7.4
Strongly disagree	9.0	7.7
Don't know	8.6	7.3
Average	8.3	7.1

Both scales run from 1 to 10 (\*significant difference).

that customers with the ‘quality & health concerned’ perspective significantly more often and customers with a down to earth & confident perspective less often indicate that they would like to get involved in policy-making processes of their drinking water company. Clearly, hypothetical questions such as these may suffer from a social desirability bias. Nevertheless, they provide insights into the relative differences between the various customers.

## 6. Discussion and conclusion

Given the growing interest among drinking water companies in the customer ‘beyond the meter’, generic accounts of the ‘average user’ no longer suffice. This paper confirms the idea that at present, should this ever have been the case, drinking water customers can no longer be captured under one single name or generic profile and offers deeper insights into the potential for, and significance of, customer segmentation on the basis of subjective views and preferences. By making use of the Q-methodology, this study distinguished four different customer perspectives on drinking water: (1) the ‘aware & committed’ perspective, characterized by pro-environmental values and collective sustainability ideals; (2) the ‘down to earth & confident’ perspective, characterized great confidence in the responsibility of drinking water companies, along with the desire not to be bothered about drinking water; (3) the ‘egalitarian & solidary’ perspective; characterized by great sense of solidarity with less-favoured households, developing countries, and future generations; and finally, (4) the ‘quality & health concerned’ perspective. Customers within this perspective are primarily focused on personal preferences and needs, especially regarding their own health.

In the Netherlands, drinking water customers feel most connected to the perspectives ‘egalitarian & solidary’ (31%), ‘aware & committed’ (29%), and ‘down to earth & confident’ (27%). The smallest section (13%) of customers most identifies with the ‘quality & health concerned’ perspective. This diversity is reflected in the prevalence of the different perspectives within the service areas of the different drinking water companies, with very little variance among the service areas. Not because the subjective views on drinking water are all the same, but because customers within the different service areas are very similar in their diversity. Strikingly, and upon comparison between the 2018 and 2015 survey data, this study shows that the division of perspectives in the distribution area of water company Vitens are stable over time, indicating that our method is reliable for analysing the prevalence of the different drinking water customer perspectives. Although this study is focused on the Netherlands, its methods can easily be replicated in other contexts.

The modern customer segmentation approach in this paper offers deeper insights into the satisfaction, interests, concerns, and sociodemographic characteristics of customers related to these perspectives, which can aid companies in their efforts to become more customer-oriented, and when translated into empathy maps and design tools and techniques such as customer journeys, more responsive to different customer needs.

## Acknowledgments

The authors would like to thank all interviewees and survey respondents for sharing their views and Jos Frijns for reviewing the first draft of this manuscript and suggesting several improvements. In addition, we would like to thank Roelof Sijpersma, Jeroen Schmaal, and Rian Kloosterman for their

advice during the study. This paper was based on research financed by the joint research programme that KWR carries out for the Dutch drinking water companies and De Watergroep, Flanders.

## Supplementary material

The Supplementary Material for this paper is available online at <http://dx.doi.org/10.2166/wp.2019.078>.

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Received 25 April 2019; accepted in revised form 11 November 2019. Available online 28 November 2019