

## Relationship (or its lack) between population and a water and sanitation service: a study of users' perception in Vitória (ES) Brazil

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### ABSTRACT

The objective of this paper is to identify and analyse the perception of groups of dwellers of Vitória, Espírito Santo, Brazil, regarding their relationship with the water and sanitation service and aspects of water handling. Participants living in four distinct urban districts of the capital city were interviewed in their own houses and the Discourse of the Collective Subject approach was employed to order the data so obtained. The testimonies revealed the health risk to which individuals were exposed by virtue of: (i) inadequate knowledge concerning the water supply offered, (ii) lack of stimulus to exert their citizens' rights and obligations in relation to the water provided for their consumption and (iii) poor channels of communication between the community, the water and sanitation service and the local public health authority. The study concluded that there is a need to rethink the forms of information provided to the population that are presently adopted by these institutions.

**Key words** | discourse of the collective subject, health risk, potable water, qualitative analysis, users' perception, water and sanitation service

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### INTRODUCTION

Numerous studies have been conducted worldwide concerning the public perception of the quality of water provided for human consumption. Such interest is exemplified by work carried out in Australia (Syme & Williams 1993), Canada (Levallois *et al.* 1998, 1999; Jardine *et al.* 1999; Turgeon *et al.* 2004; Jones *et al.* 2005, 2006, 2007), France (Euzen 2003; Piriou *et al.* 2004), India (Joshi *et al.* 2002; Andey & Kelkar 2009), Mexico (Ennis-McMillan 2001), Portugal and the United Kingdom (Falahee & MacRae 1995; Bates 2000; Strang 2004; Doria *et al.* 2005; Doria 2006;

Doria *et al.* 2009; Doria 2010), the United States (McGuire 1995; Means *et al.* 2002; Duda *et al.* 2003; Johnson 2003; US Environmental Protection Agency 2003; Mackey *et al.* 2004; Blette 2008) and Turkey (Celik & Muhammetoglu 2008).

In Brazil, the quality of water for human consumption is legislated through Resolution number 518/2004 (Ministério da Saúde, Brasil 2004), which also emphasizes the responsibilities of the water utilities as well as government environmental and health authorities. The water utility has the task of ensuring and monitoring the quality

of potable water. The health institutions are in charge of surveillance of public water systems, whilst the environmental authorities are responsible for monitoring the sources of water for various uses including human consumption.

The rights of the general public to receive information concerning the quality of potable water, as outlined in Resolution number 518/2004, is assured by Decree number 5440/2005 (Governo do Brasil 2005), which defines how such information must be transmitted to the users by the water supply services and governmental health authorities.

The general public also has responsibilities concerning the water consumed and, within this context, an important issue is how users understand the need that supplied water has to be appropriately treated before consumption. Additionally, the public must appreciate that water quality can only be guaranteed by supply services and authorities up to the point of entry to the residence. Users are, of course, responsible for maintaining water quality inside dwellings through the correct installation of pipes, storage tanks and in-house treatment equipment. In summary, the quality of water consumed can only be secured with the effective participation of the population.

The objective of this research was to identify and analyse perceptions of tap water by groups of residents of Vitória, Espírito Santo, Brazil, and regarding their relationship with the water and sanitation service and aspects of water handling. This city occupies an area of 93.38 km<sup>2</sup> and is one of three Brazilian capitals located on islands. According to the 2002 census, the population of Vitória was 283,000, of whom 99.5% are supplied with treated water, and 89.80% are connected to the sewerage system (Prefeitura Municipal de Vitória 2009). The state provider of water and sanitation service is the Companhia Espírito Santense de Saneamento - Cesan.

In Vitória, information concerning the water supply system, and the actions to be taken in order to avoid wasting water, is broadcast by television, radio and internet and is also disseminated by the state water and sanitation service company. Furthermore, the Office of the Secretary of Health for the State of Espírito Santo (SESA) produces printed material, in the form of pamphlets and folders, which stresses the importance of consuming water of acceptable quality.

The present study is one of the very few of this kind preformed in a developing country. Doria (2010) points out that 'most research in this area has been conducted in developed countries with stringent water quality standards and reliable supplies'. Moreover, it investigates the issue of intermittent supply and the relevance given to pathogenic microorganisms, rarely explored in the literature.

## METHODS

Details of the project were approved by the Ethical Committee of the Federal University of Minas Gerais. Written consent was obtained from all participating individuals prior to the commencement of the research programme.

### Study design and participating groups

The present study was conducted using the Discourse of the Collective Subject (DCS) method. This qualitative technique, developed by Lefèvre & Lefèvre (2003), attempts to preserve the ideas and expressions of the subjects studied at all stages of the investigation, starting from interview preparation and leading through to the processing and presentation of the results. Such a method was employed in order to allow the public to talk directly about the subject under investigation, and consisted of a discourse-synthesis written in the first person singular, which combined key expressions (KE) containing similar central ideas (CI) or anchorages (A).

The construction of the DCS began with the initial testimonies, as presented in the recorded interviews, and continued with the decomposition of these discourses using the methodological features KE, CI and A identified in each individual discourse and in the whole participating group. The analysis concluded with a summary in which the collective discourse of all the subjects was reconstituted.

Application of the DSC method demanded strict planning of the various phases involved including: (i) preparation and pre-testing of the questionnaire for the interview; (ii) definition of the area/group to be investigated; (iii) selection of participating individuals; (iv) preparation of the interviewer; (v) preparation of the interview settings;

(vi) organization of the required equipment (camera and tape recorder); (vii) establishment of an atmosphere appropriate for the interview; (viii) collection of raw data through interviews; (ix) tabulation and analysis of the data; and (x) construction and interpretation of DCS, with the assistance of the professional version of Qualiquantsoft software.

The choice of areas to be investigated was based on findings presented in a previous report by Queiroz (2006). The selection of the participating groups was performed with the help of community leaders and of community health agents working for the Family Health Programme (Programa Saúde da Família - PSF). Forty-eight residences in four urban administrative districts of Vitória, namely Mangue Seco (MSe), Ilha das Caieiras (ICa), Santa Teresa (ST) and Jardim Camburi (JC), were selected for possible study. The residents of 40 of these dwellings, 10 in each urban area, agreed to participate in the research programme.

### Data collection and analysis

Data were obtained from interviews, based on a semi-structured questionnaire, that were conducted individually in the residences of the participants and witnessed either by a community health agent (professional integrating of PSF) (ST and ICa districts) or by a community leader (MSe and JC districts). The collection of data was carried out in two phases: 10 interviews were conducted during October and November 2004 (the first part of the research), whilst the remaining 30 interviews occurred in August and September 2006. Collection of data and analysis took place concomitantly.

## RESULTS

The DCS method employed in the study produced a vast amount of material. The selected discourses quoted below were transcribed *ipsis litteris*, and the translated as faithfully as possible.

### Participants

The characteristics of the individuals studied, grouped according to their residential area, are presented in Table 1.

Most of them were of the female sex (38/40) and the average time of residence in the regions was more than 20 years. All of the dwellings were served by Cesan. In the ICa group, two of the houses were connected to the Cesan water supply clandestinely (known as a 'gato' connection locally) and no payment was made for the water consumed. In the ST group, the main piping system, together with the monthly water bill, was shared amongst family members or neighbours in six houses. The water bill represented 2.7% of the family income in the ICa group, 2.3% in the ST group and 1.4% in the JC group. The socio-economic level of the latter group was higher than those of the first and second groups.

### Importance of a water supply

Access to water services was considered very important by 38 out of the 40 individuals questioned on the basis that it made life more comfortable.

You have to carry water from one place to another ... Can you imagine if there was no plumbing in the house? What a difference! (MSe).

Although Brazilian policy focuses on the economic value of water, some individuals (10/40) were more likely in their representations to express its divine gift.

You have to thank God! If I don't have water, I have nothing – I have my hands tied .... I cannot imagine myself without water ... I pray when I open the tap ... I think it is beautiful! (JC).

Participants revealed in their discourses an awareness regarding the unequal access to water and, since they considered water to be a divine gift, they recognized that it was everybody's right to have such access.

Ah, I think everybody has to have it, don't they? ... It's a right, isn't it? Nobody owns the water, it's from nature, it's from God. (MSe).

Everybody has the right, don't they? ... And there are many people that haven't got it. (JC).

**Table 1** | Characteristics of the four participating groups studied

Characteristics of the individuals (n = 40)		Regions studied*			
		MSe (n = 10)	ICa (n = 10)	ST (n = 10)	JC (n = 10)
Age (years)	Minimum	25	32	24	27
	Maximum	63	74	69	80
	Average	39	46	38	56
Family monthly income (R\$) <sup>‡</sup>	Minimum	†	250.00	300.00	3000.00
	Maximum		3000.00	900.00	9000.00
	Average		815.00	575.00	4900.00
Monthly water bill (R\$) <sup>‡</sup>	Minimum	7.00	8.00	3.00	25.00
	Maximum	55.00	40.00	34.00	178.00
	Average	27.07	21.69	13.40	69.57
Schooling level	None	0	1	1	0
	1° grade completed or not	7	9	5	4
	2° grade completed or not	3	0	4	1
	University	0	0	0	5
Number of people per dwelling (average)		4	6	4	4
Water meter present	Yes	5	6	6	10
	No	5	4	4	0
Type of drinking water consumed	Tap	4	3	1	0
	Filtered	4	5	6	6
	Bottled water (supplementary)	0	1	0	0
	Bottled water (exclusively)	2	1	3	4
	Boiled	0	1	0	0
Use of filter in the dwelling	Yes	4	5	7	10
	No	6	5	3	0
Presence of water tank in the dwelling	Yes	9	10	9	10
	No	1	0	1	0

\*MSe – Mangue Seco, ICa – Ilha das Caieiras, ST – Santa Teresa and JC – Jardim Camburi.

†Data not obtained.

‡Exchange rate at the time of interview (09/2005): 1 US\$ = R\$ 2.36 and 1 £ = R\$ 4.33.

Most individuals in all of the groups expressed an understanding regarding the need for water for the purposes of personal and domestic hygiene. However, whilst individuals from all four groups stated that water was essential for personal hygiene, only individuals from the MSe and ICa regions spoke clearly about the practice of hand washing.

You have to look after your personal hygiene. You have to have a shower ... brush your teeth, wash your hands ... You have to clean the house ... Wash clothes, clean

the floor and the bathroom, flush the toilet, these things are essential, aren't they ... For me to cook ... Wash the vegetables ... Do the dishes. (MSe).

To drink, to have a shower, to wash your hands, to do the dishes ... To cook the meals, no? ... To wash clothes, flush the toilet ... To wash the path. (ICa).

To drink ... For my personal hygiene, to have a shower, to wash clothes, to cook food ... To wash dishes, clean

the house, clean the bathroom ... To clean things in general. (ST).

To drink, to have a shower, to brush my teeth, to flush the toilet, to wash the bathroom, to wash clothes, to cook, to do the dishes ... To clean, for all housework, no? ... For hygiene. (JC).

### Water supplies to the dwellings

A water connection to the house was significant in the lives of all of the individuals questioned. Water supply was considered to be a major asset of the community as well as a crucial element in the life of an individual.

Oh, God! What do I say ... I think it represents a lot, doesn't it? (MSe).

Water is a very precious thing, isn't it? The wealth of the community is water, without water we are nothing! (ICa).

Ah, it's wonderful stuff, isn't it? Yes, it makes our life much easier, doesn't it? (ST).

The connection of a water supply to the house also represented a social value in the lives of some of the participants (10/40). This idea was expressed by several individuals when they compared their situation with that of their neighbours: if one resident had something, the other should also have it. It was possible to observe the aspiration for fairness of rights amongst such individuals. One person described how a neighbour living nearby still suffered from the hardship of carrying water in a container on her head. Such problems formed part of the past of the inhabitants of the region, but for this particular neighbour it was part of her present. Additionally, this individual depended on the goodwill of her neighbours.

Ah, it is important to have your house connected to the water. I don't want to be dependent. If my neighbour had it and I hadn't, would I have to depend on my neighbour? ... I want my own water connection! (laughs) (MSe).

I've carried a lot of water in my time. On my head ... I've had to queue ... Here, there is a neighbour, poor woman, I think she is 50 years old, she has no water tank in her house. Sometimes, when the water is off, she has to go up there to collect water ... Even today! She lives down there, in a wooden house. (ST).

One of the subjects interviewed maintained that he used his neighbour's water pipe and did not pay for the service.

I had water, you understand. But only when I lived in the other house ... But in this one I haven't got it. (ICa).

Some residents had made their own water connection (2/40), whilst some houses shared the same water supply and resultant bill.

My brother did the connection for us, but he only did one connection because we are a family. (ICa).

It wasn't difficult, young lady, we did it ourselves, didn't we? We bought all the materials and we did it. (ST).

### Sources of the water distributed through the public system

Opinions regarding the source of the water supplied by the water and sanitation service were diverse. Some individuals demonstrated a complete lack of knowledge concerning the origin of the water and the means by which the water was delivered to their houses. Around half of those questioned (21/40) thought that the water came from rivers, although the answer was presented with some uncertainty. They were unable to identify correctly the route taken by the water pipes from the source to the point of delivery, and they had no knowledge whatsoever of the process of water treatment. Furthermore, those individuals who knew something about the subject expressed a lack of trust in the information that they possessed, preferring to use qualifying phrases such as *I have heard ...*, *According to them ...*, *They say that ...*

Oh, I heard that the water comes from the rivers, doesn't it? I think it comes from the rivers Marinho and Jucu ... According to them, it is treated ... They say that it passes

through treatment phases until it gets to the peoples' houses ... Through purification. (MSe).

From the river Santa Maria as well, isn't it? (ICa).

River Santa Maria is one of the rivers, isn't it? There are other rivers, in the direction of Vila Velha. (JC).

Look, it comes from the river Doce, doesn't it? (ST).

It was interesting to note the lack of spatial orientation of the individual who mentioned the river Doce as a source of water, considering that this river is some 300 km from Vitória.

The regions of MSe, ICa and ST, on the island of Vitória, are served by the Vale da Esperança system, which captures water from the river Jucu. The JC region is, however, located on the mainland, and is served by the Carapina system from the river Santa Maria.

Many of the individuals (13/40) stated that they did not know the origin of water and offered various guesses including the river Amazon (it's far from there, about thousands of km) and the sea.

I do not know the answer ... I think it is by hydration, isn't it? (MSe).

Now you've got me, I don't know! ... River Amazon, isn't it? (ICa)

From beyond the hills, I have to tell you, I don't know ... From the sea, no? No, not from the sea but from rivers, doesn't it? ... It must come from forests! (laughs) (JC).

The lack of specific knowledge regarding the origin of water was a feature of all of the groups.

### Quality of the water supplied

Two important aspects concerning the quality of water were perceived by study subjects. First, the quality of water was normally good, and second, the normal characteristics of the water altered after a period of shortage. Most people (30/40) thought that the water supplied by the public

service was excellent and associated this quality with the treatment received prior to distribution.

Look, I think the water is very good because it is treated ... You even don't pay the value that should be paid for it! (MSe).

Cesan water, I think it's fine, isn't it? ... In this aspect too, very nice! Wonderful! (ICa).

However, there were those (19/40) who, whilst recognizing that the water was normally clean, sometimes perceived alterations in its properties. A few individuals expressed their concern regarding such aspects of water quality and their implications. These perceptions were associated with taste, colour, presence of suspended material or previous health problems. Moreover, some representations were permeated by mistrust concerning the bacteriological status of the water even though it presented a normal taste, odour and colour according to their expectations.

Ah, most of the times it is normal, isn't it? You know, it has nothing in it, nothing visible, no? But sometimes it looks dirty, but I don't know, do I? If you study it, if you test it, something like that, you will probably find some bacteria in it, won't you? ... Well, sometimes it has a strong taste, hasn't it? ... But I think that it is something that they put in to kill the microbes, isn't it? ... It comes muddy sometimes during the rainy season. (MSe).

A lot of dirt comes with it! ... Sometimes I think that not even after filtering we are free of ... You know. (ST).

Yes, when it rains, the water gets dirty ... Sometimes it is yellowish, other times it is whiter, with a strong smell of chlorine ... I think it has to be treated a bit better ... Because it has problems ... It is treated water and we pay for it, don't we? (JC).

It was noticeable that individuals possessed some knowledge regarding pathogenic microorganisms, although they could not see them with the naked eye. The possibility

of acquiring diseases from drinking water was a matter of concern for the whole population. However, people were also aware of the strong taste of the water and associated this with the presence of chlorine used as a disinfectant. Participants expressed concern at the inconvenience caused by the intermittent supply of water, and commented on the risk to which the population was exposed during such periods. They noted particularly the influence of rain on the quality of the water supplied and expressed distrust of turbid water even after filtration.

Although they were conscious of problems concerning the water supply, they did not take any initiative of their own to solve or minimize them but merely waited for the water to flow from the taps again and for the product to return to its familiar characteristics. Only in the JC region did individuals express the idea of water as a service, since they mentioned that it was necessary to pay for the right to receive water of an appropriate quality.

### Quality of drinking water

The perceptions regarding the suitability of mains water for drinking purposes varied amongst the individuals interviewed in the present study. Roughly half (21/40) thought that the water was clean enough for all applications but that it needed to be filtered before drinking. According to the people interviewed (21/40), drinking water had to be cleaner and the ceramic filters employed in most homes changed the aspect of the water. Moreover, filtration was considered indispensable because the water supplied by Cesan could be contaminated with microorganisms and could thus cause health problems.

It comes clean, to do the washing, you know? To cook ... But to drink, it is not really for drinking, is it? ... It has to be a little bit cleaner, you know? The water from the streets is a little yellowish, and the water from the filter is white, you know? Even if it passes through that process of Cesan, we have to filter, don't we? Because of our health. I think drinking water has to be filtered. Why would you drink water directly from the tap? What about the bacteria? ... You can't see them, can you? We can see that it is clean, but only through the microscope can you see if there is really something there! (MSe).

Moreover, some individuals (11/40) stated that they purchased bottled water, although living under severe financial constraint and earning only enough money to survive. They justified this preference by saying that bottled water presented a different taste, but admitted that perhaps this was a false impression. In their opinion, bottled water should be used in the preparation of food as well but that would be too costly.

I prefer to buy mineral water to drink. You cannot buy mineral water to do other things, to cook food, which would be the correct thing to do, wouldn't it? So, you buy mineral water for drinking, don't you? If you buy mineral water, it is different from Cesan water, which comes from the street. It's just that it seems better. I like mineral water. It's probably psychological sometimes, isn't it? (MSe).

The water we buy is much better! Special, they say, don't they? I don't know! It has a different taste. (ICa).

I use tap water only for domestic chores, you understand? (ST).

If Cesan's water was cleaner ... Less polluted, we could use the water from Cesan too! (JC).

In the present study, one of the individuals mentioned boiling as an alternative method for improving the quality of drinking water.

Normally, I boil the water and keep it in the fridge. (ICa).

On the other hand, two participants in the present study attempted to filter the water through a cloth before drinking it.

I put a cloth on the tap of the kitchen sink, but I am afraid, I have to buy a filter urgently, but I am using the water like that any way. (MSe).

These statements show that misinformation can contribute to an increase in exposure to health risks. People know about the risk of contracting diseases and try

to avoid the problem by, unfortunately, taking the wrong precautions. A cloth tied to a kitchen tap was actually observed during one of the interview visits.

### Maintenance of domestic filters

A number of individuals (18/40) believed that a household ceramic water filter would retain any dirt particles present in the water. Many of the statements showed the concern that parents had with respect to the health of their children and indicated that they were well aware of a child's vulnerability with respect to water of bad quality.

Because of the children. They cannot drink water that hasn't been filtered, can they? Perhaps, in this water, there are many ... Some dehydrations, you know? If there is no filter, it is not eliminated, is it? The dirt, there are all types of microbes, bacteria, all sorts of things. (MSe).

It is ... Because the water is not totally clean, it is not supplied for us to drink directly, is it? To avoid some type of problem, no? ... Worms, some small bugs, everything. Because the water comes to our tank and after that it gets full of ... Because if I drink dirty water, I get ill! (ST).

It is because this water, they say it comes hydrated, but we are not so sure. Because everybody says that the water is good, I don't trust the water, no I don't! (laughs) I think the water gets better by filtering, it gets rid of the impurities, if it has any ... The water gets better ... More suitable for drinking, isn't it? (JC).

Approximately 50% of the individuals recognized the importance of maintaining the domestic filter in good condition, although not all of them knew the correct maintenance procedures. Everyone had a different opinion.

I maintain it. I wash it with a sponge, soap and rinse, only that! Or I wash the filter with sugar, I was told to do that, you know? ... I rub it with sugar, removing all the dirt, then I rinse it with warm water and place it back in the filter unit. I think I wash the filter every

two weeks, maybe every two months, perhaps every week. (ICa).

Because it gets black ... It gets full of mud. I wash first with soap powder then with sugar, I rub sugar with a sponge? (ST).

### Maintenance of the domestic water tank

The cleanliness of the domestic water tank represented a very important matter for most of the individuals questioned (32/40). They revealed that they were conscious of the significance of the procedure in order to maintain the quality of the water supplied by the public system. Unfortunately, none of the water tanks had been cleaned properly thus risking the health of all members of the family.

Every three or six months, we take the top off, wash the tank, dry it very well, remove all the residue, then I connect the water again ... Because the water comes with lots of dirt from the street. (MSe).

Sometimes we clean it .... Well, we drain the tank, clean it completely and wash very well inside, with a sponge, rub it all, the sides as well, then I dry the tank with a clean cloth. We put a little chlorine into the water to kill the microbes, then we close the tank and fill it again. (ICa).

We remove all the water, then if there is dirt in the bottom, we clean with a cloth, put a little bit of water and use a cloth again until it is clean, after that we fill the tank again ... I use vinegar, I wash all the tank and rinse it. (ST).

Individuals expressed different opinions regarding the need for a water tank, but most of them (26/40) agreed that it was necessary mainly because of cuts in the water supply.

Ah, because we are afraid that we might run out of water, so ... What should I do? With the tank we are more in control, if the water is off, we have a reserve supply, don't we? (MSe).

### Irregularity of the water supply

Water shortages were perceived in different ways: in the MSe, ICa and ST regions, participants (19/30) stated that the problem was only occasional and that the water service announced the occurrence of such an event in advance, whilst in the JC region, people expressed a rather different opinion.

Look, it's rare that the water is cut here ... The number of times, it is not frequent ... Generally, when the water is going to be cut off, they tell us, you understand? ... Sometimes my neighbour knows ... Have you heard? It is on the television ... And the radio too ... The water will be off! Save water! One tells the other ... When we have a lack of water, it is crazy! (MSe).

Some individuals (16/40) stated that cuts in the water supply did not happen often.

No, it is not often, in Jardim Camburi it is not often, really! They tell us, you understand? Cesan takes the trouble of telling us via the radio and television, we then store water ... Sometimes, in the summer, there is a lack of water. Ah, I have to ring 155 and speak to Cesan, it is the number of Cesan. No, I never did it, because it never happened. (laughs) (JC).

All of the individuals in the JC region stated that water shortages in their area were rare, but the majority of those interviewed also mentioned that they enjoyed the advantages of a domestic water tank. The representations of the JC group thus differed from those of the inhabitants of the other areas, indicating an inequality in the water service among the regions studied. Whilst six people in the ST group claimed that water cuts in the region were rare, these individuals also mentioned that, since they had a water tank, they could continue to use their own stored water for three days or so and would not notice if the mains water supply was cut for a short period. Indeed, in the ST region the mains water was actually suspended to two houses during the interviews.

Four individuals living in the ST region complained that water shortages were frequent.

Yes, there are cuts, mainly during weekends, but I think it is because it is high here, you understand? The maximum, at least during the time I've lived here, I saw lack of water was one day, one day and half, you understand? It is rare to have water directly from the street during the day, ... Ah, young lady, sometimes ... I wait for it to come back, I wait for it to arrive. No, I have never rung Cesan to complain about this thing of lack of water. (ST).

Only a few individuals (3/40) communicated with Cesan about cuts in the water supply or complained about the service provided by the company.

Do something about it? Ah, we ring Cesan. They respond very well, sometimes it takes time, but now and again it's quick, isn't it? They don't solve anything though, the shortage of water continues for a month. (ICa).

We ring Cesan and they say that the time limit is 48 hours, that it will return to normal, but it doesn't happen in 48 hours. (ST).

The majority of individuals (21/40) claimed that they knew the reasons for the water shortages and they were eager to demonstrate their knowledge in this area. Although many participants were dissatisfied with the irregularity of the water supply, they believed that it was necessary in order to improve the quality of the water.

Miss, when the water is cut, they are doing something! ... Look, in general, when they tell us, it is ... A burst pipe somewhere, or they are cleaning, these sorts of things. They wash the tank, don't they? ... Because we are not going to be able to drink that water continuously, something has to be mended. Because lack of water is always for a reason. (MSe).

Because the water is sent to one place and the other gets nothing ... The lack of water happens because most people don't pay, do they? Or it is because of excessive waste. (ICa).

### Internal and external leakages from pipe work

Leakage from the internal pipe work in the house was a matter that caused concern amongst all of the individuals. They acknowledged that such problems had to be solved quickly in order to avoid waste and extra expenditure; water supply is metered in Vitória. They also worried about the future consequences of such leakages.

Ah, I try to fix the problem as soon as possible, to avoid wasting water! I get desperate when the tap drips, because drip, drip, drip ... Do you know? When you realize, you have already spent a lot ... Because otherwise I will spend big money, it costs me, hurts my pocket. Also, this water will be needed by others in the future. As they say – let's save water, everybody, in the future there will be no water, do you understand? (MSe).

However, when there was a leakage in the mains pipe in the street, opinions about what action to take diverged. Most people (29/40) rang the Cesan help centre, thus demonstrating that they were aware that leaks in the water system represented an extra cost to them. These users expressed a sentiment of solidarity with others, which appeared to be influenced by programmes shown on the television. Such users, whilst worrying about other people, appeared to detach themselves from the problems caused by lack of water even though it is chronic in at least three of the regions studied. This is, perhaps, because difficulties concerning the lack of water are not shown on the television.

Ah, if the leak is in the street we have to call Cesan. I ring Cesan ... Because we are paying for it as well, the money comes from us, and water is going to be short for other things ... It is a shame to pass by a place and see the water running away freely, and then you think ... My God, there are many places that don't have much water, these people need water, places that we see on the television, so many people, in the Northeast ... with no water, do you understand ... We encourage one another and call Cesan to mend it ... They come. (MSe).

Two participants declared that they rang Cesan only when the leakage caused them inconvenience.

Ah, if it is bothering me, I ring Cesan, if not, I leave it as it is. If there is no water in my house, you know? Because of that leak. Ah, if it is a nuisance when I have to pass by ... That mud. Otherwise, I don't care, no I don't. (laughs). (MSe).

A few participants (8/40) claimed that they never rang Cesan even in the case of leakage.

### Assistance provided by the water and sanitation service

The help provided by the water and sanitation service was considered to be good by some of the participants (3/40), whilst others (17/40) thought that Cesan took far too long to come to their assistance.

In general, they take a long time to come ... We ring, they say they will come within 24 hours, but because they take too long, we get some people in and fix the problem ourselves, as a community ... Ah, more or less two days, oh, the water leaks for quite some time! Wasting water for quite some time. When they come, the person from Cesan ... We have already solved the problem ... We mend the pipe somehow ... Then they come and get angry, you know? They swear at us because ... The work we did was wrong ... But they take too long, don't they? We can't leave the water leaking ... When it happens. (ICa).

The service takes too long, so I keep ringing ... Annoying them, sometimes they stop receiving calls, I think ... Because it gives the engaged signal. (JC).

### Payment of the water bill

Within the four regions studied, water bills accounted for between 1.3 and 2.7% of the monthly family income. The payment of the water bill is a greater representation in the poorest groups (ICa, MSe and ST).

In the present study, approximately half (19/40) of the individuals stated that the water bill represented a significant fraction of their monthly resources, but that the expense was worthwhile.

I think it is a bit heavy. For example, this is not the only bill, there are other bills, you understand? ... It is worth it, because it is necessary. I need it, because we cannot live without water, can we? (MSe).

Other participants (18/40) reported that the water bill was not even considered in their finances and that the service was worthwhile. The view of these individuals was that a supply of quality water was more valuable than money.

I don't think it is costly. I don't think the bill is heavy, because it is small. Only when we are unemployed and fishing is bad. It is my pleasure to pay. (laughs). It is worth paying, clearly it is important! (ICa).

Three individuals (3/40) in the JC region stated that the water bill represented a significant portion of their income, but they could not decide whether the service represented good value. In the JC area, a public sanitation system is provided and the sewage cost is collected together with the water bill, representing an extra cost equivalent to 80% of the water bill. Although the participants considered sewage services as important as water and health services, they complained about this extra expenditure.

Sometimes they charge a fee, which I think is wrong, for the sewage. I think we have to contribute ... Naturally, they have to get the money from somewhere in order to do their jobs, but 100%! I think that is absurd! I think that the government has the condition to collect the money from the taxes that we pay. So, I think they should reconsider this, don't you know? I believe that the service is not worthwhile, but because other people, those who have no conditions, can still have water, it is good value. (JC).

### Administration of the water and sanitation service

More than half of the participants (22/40) in the present study had no knowledge concerning the administration of Cesan. Most individuals stated that they had never considered such matters, although they thought that management of the water supply was a great responsibility.

I have never stopped to think about this. I don't know what to say, but it must be a very responsible person ... Because it is a very big company. Maybe it is the mayor or the government, no? We don't have this information, if they don't tell us, we don't know, do we? (MSe).

A number of participants (11/40) believed that the government was responsible for Cesan, but they did not know which governmental sector was in charge of this aspect.

For me ... It is part of the government, isn't it? Is it the Secretary of Health? ... Or is it our mayor? Sometimes I think it is the government, no? (ICa).

### DISCUSSION

It is possible to observe, through the recorded testimonies, that each participant had his/her own perception with respect to the water that he/she consumed. [Euzen \(2003\)](#) states that such perceptions depend on the personal history and on the development of the individual concerned. This author observes that habits change according to circumstances and that each person builds his/her own expectations with respect to the water distribution system. [Doria \*et al.\* \(2009\)](#) suggest that perceptions of water quality and risk result from a complex interaction of diverse factors like the public satisfaction with organoleptics properties (especially flavour), risk perception, contextual cues, perceptions of chemicals (lead, chlorine and hardness), external information, past health problems and trust in water supplier.

The access to water services was considered very important in this research and was considered to be a major asset of the community as well as a crucial element in the life of an individual. This was also pointed out by [Monteleone \(2008\)](#), who shows a vision of water not limited to the idea of a human need to maintain life, but also as an essence for life renovation and well-being.

Most testimonies reflected the participants' understanding of the importance of consuming good quality water, mainly with respect to the inherent health risk. However, the discourses revealed a lack of knowledge regarding the correct procedures required in order to preserve the quality of water supplied to their domiciles. Although the

participants received good quality water, they tended to treat the product in a manner that could jeopardize their health, for example, with incorrect procedures of domestic water tank and ceramic filter maintenance, boiling water (Nichter (1985) discusses 'how are the public health messages interpreted by people in developing countries'), using alternative sources of drinking water like bottled water. However, the individuals really did believe that they were doing something good and protecting their families. Syme & Williams (1993) found that responses to the acceptability of water quality and water quality risks judgement scales relate to perceived credibility of societal institutions and feelings of control over water quality and environmental problems.

It should be noted that some people believe that bottled water has superior quality, creating fantasies concerning its taste, and dream about attaining a higher social-economic status simply by consuming this type of water. A number of studies have indicated that users prefer bottled water even though the presence of contamination has been demonstrated in some brands (Syme & Williams 1993; Ferrier 2001; Doria *et al.* 2005; Celik & Muhammetoglu 2008; Doria *et al.* 2009; Doria 2010). Doria (2006) discusses some of the reasons (dissatisfaction with tap water organoleptic and health/risk and other concerns), why people decide for an option that is often more expensive and less comfortable than tap water. The author points out the increasing consumption of bottled water over the last decade, even in countries where tap water quality is considered excellent. Doria (2010) also discusses the hypothesis 'that drinking water is increasingly regarded as a product that should be enjoyed, rather than a basic necessity'.

Intermittent water supply was perceived in different ways in this study. One interesting angle of intermittence was explored in a study in India comparing areas with intermittent and continuous water supplies that found no differences in service satisfaction, as long as the water provided was sufficient to meet basic demand (Joshi *et al.* 2002). With another perspective, Andey & Kelkar (2009) indicate that domestic water consumption depends on adequacy of water supply under intermittent operation.

Montenegro *et al.* (2009) report that understanding complaints regarding tap water is a useful tool for improving water quality management. In their study the results

show that variability of complaints is associated with distributed water quality and also the socio-economic make-up of the population.

Information concerning the rights and obligations of users is essential for the exercise of citizenship. In Brazil, the rights of users are enshrined in the law, although there are many circumstances in which it is impossible to fully implement that law. Valadares (2000) asserted that 'in order to survive, an individual does not always behave as a citizen'. Soalheiros (1998) also remarked that 'there is the law, and there are also those things that are impossible to achieve through the law'. Thus, users should be encouraged to exercise their citizenship whenever possible. There are many ways in which to disseminate the knowledge required and reform of the educational system is one of them (Morin 1999). It is certainly necessary to review the methods used to transfer information to the population but, according to Valadares (2000) 'we know that educational campaigns are not enough to achieve the goal and that further reflection is indispensable'. Research on the development of new techniques for improving the quality of potable water should be accompanied by the development of strategies that would allow access of this information to the population, thus ensuring progress towards a better quality of life. Valadares (2000) stated that 'we live in a world where people are more and more unnoticed'.

The perceptions of the participants were influenced considerably by television. In this context, it is noteworthy that a television was on in 23 of the 40 houses visited throughout the morning interviews, although this was not the case in the (somewhat better-off) JC region. Whilst individuals declared that news regarding the water supply was provided by the television, such a method of knowledge transfer has failed to alert users about the existence of legislation, or of their rights and obligations. Such evidence indicates a gap between the information communicated by the media and the daily reality, i.e. the messenger does not articulate the message appropriately.

Public and sanitation authorities should be more interested in conveying information about their services to users in order to build confidence and to guarantee that the quality of water received is preserved within the domestic environment. Lack of information may result in distrust and misconceptions, whilst the transfer of knowledge can lead

to a greater participation by the community in the management of water services and to the establishment of more acceptable practices. Well-informed users would then be able to choose the healthiest and most cost-effective of the alternatives of drinking water, tap water or bottled water, for example, that may be available. Means *et al.* (2002) remarked that 'there is an apparent gap between what the public says it wants and what water utilities often think that the public wants'.

Celik & Muhammetoglu (2008) obtained results that 'provided important ideas for improving the acceptance by the public of tap water as a drinking source at low cost', including 'organizing public awareness campaigns, informing the public about the results of potable water quality monitoring, using drain valves after maintenance, and renewing old parts of the distribution network'. Blette (2008) discusses 'the need for timely communication, the challenge of providing information when there is uncertainty in the science and the importance of preparing to respond to critical incidents' and shows in her study that 'other members of the community may have better access to consumers or are more trusted, it is important for water utilities to establish relationships with the media and the local public health community'. Syme & Williams (1993) 'support those who advocate localized information and involvement campaigns on water quality issues'.

Thus, public administrative authorities at the municipal and national levels should promote a dialogue between communities and the water/sanitation services in order to build user confidence and consciousness, and to give them the chance of participating in the decisions concerning aspects that directly affect their lives.

## CONCLUSIONS

Analysis of the representations obtained in the present study gave rise to the following conclusions:

1. Users expressed different perceptions and behaviours towards the quality and origin of water, and these may impose a risk to their health and unnecessary expenditure in the form of purchase of bottled water.
2. There was a general distrust of the quality of water supplied by virtue of the taste and the presence of suspended

solid material in the product. Individuals, therefore, opted for alternative forms of drinking water such as filtered, boiled or bottled water. Even sieving water through a cloth attached to the tap was considered better than using water as supplied from the mains. These precautions indicate that the public institutions and the water supply services need to guarantee the quality of water and to invest in more efficient methods of information transfer in order to gain the confidence of the user.

3. There was a disparity in the regularity of water distribution and in the tariffs applied to calculate the cost of water in the different regions studied. A similar disparity was noted in relation to sewerage services. Whilst users were aware of such differences, they did not complain to the utility companies. The utility company Cesan did not provide a clear explanation of the criteria employed in establishing its water and sewage tariffs.
4. There was a general lack of knowledge concerning the procedures for maintaining water filters and domestic water tanks. Users were aware of the importance of maintaining the cleanliness of such units but did not know the correct methods to employ, hence risking the health of their families.
5. Users showed a lack of involvement in the management of water and sewage services, possibly owing to a lack of information regarding the origin of water and the fate of sewage.
6. There was a lack of communication between users and the water and sanitation company, resulting in disinformation concerning the occurrence of external leakages and clandestine water connections. Probably most of these situations remain unidentified by the company.

The testimonies presented here revealed a lack of knowledge by customers regarding their rights and obligations relating to water consumption. In addition, the ineffectiveness of the communication strategies adopted by the water and sanitation service and the local health authorities was obvious. The representations of the users indicated the necessity of rethinking the manner in which information is delivered to the population, since the present approach does not make the exercise of citizenship an easy matter. Furthermore, there is a need for the implementation of strategies that not only stimulate advertising and consumption but also self-esteem, which is essential to a good quality of life.

Considering that the perceptions of users concerning the water they utilize is a dynamic subject, the results presented here are not complete. Certainly, other elements could be identified in the testimonies, and these could be analysed in order to add to the existing knowledge.

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## ANNEX 1 – QUESTIONNAIRE

### Theme 1: the importance of water in the people's life

What is the importance of water to your life? And for your community? What do you think about having water at home? Should everyone in the world have access to water at home? If not: What do you think? Whose is the responsibility?

### Theme 2: origin and characteristics of the drinking water used at home

Where does this water come from? What is the path that the water takes to come to your house? What do you think of this water? Why? When you open the tap, what is the water like? Is there a difference between drinking water and water for washing clothes? If yes, what? What is the water used for drinking? What should the water be like that can be considered of good quality for a person to consume?

### Theme 3: importance of water for human consumption

For you what is the importance of consuming good quality water?

### Theme 4: forms of water use at home

What use do you have of water in your home? What amounts of water do you use? Do you use a filter? If yes: Why? Does it need cleaning? How? How much and for how long? If not: Why? Do you have a water tank? If so: Why? Do you clean it? How? How much and for how long? If not: Why? What happens when you have a water leak in your house? Why? And when it occurs in the street? Why? Do you call Cesan? How do you do it? How good is the service?

### Theme 5: relationship with the water and sanitation service

What do you think about the connection property of water? How did you get it? Is the payment of the water bill representative of the monthly income of your home? Do you lack water in your home? If yes: How much and for how long? Why? What steps do you take in the absence of water? Have you ever suspected the quality of water in your home? If yes: When that happens do you take any action? If you talk to Cesan: How is the attendance of Cesan? Do you insist? Who is responsible for Cesan?