THE PERCEPTION OF USERS ABOUT THE IMPACTS OF WATER RATIONING ON THEIR HOUSEHOLD ROUTINES[1]

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Introduction

The access to potable water and sanitation is an essential human right to the full enjoyment of life; it is also directly linked to the rights to life, health, food and housing. This human right was recognized by the United Nations (UN) in July 28th 2010. From this date on, States and international signatory organizations should provide financial resources, capacity building and technology transfer, mainly to developing countries, in order to strengthen the efforts of providing potable water and safe sanitation to all people (UNITED NATIONS, 2010).

The different social strata in Brazil experience urban water supply in different ways. At the same time, the water resource management sectors do not seem to be able of producing equitable supply and water access conditions. They reinforce the current development model, which keeps the less privileged strata invisible (ZHOURI, 2008). The different population strata are exposed to unequal water access conditions often masked by sanitation service performance indicators presented through statistical means linked to the municipal scale or to large intra-urban sectors.

The forms of provision and access to water in Campina Grande City were monitored in the current study, and the water supply conditions in an intentional sample of

1. Acknowledgements: The authors acknowledge funding from the Brazilian agencies CNPq, CAPES and FINEP, as well as R&D Projects LIGA/FINEP, BRAMAR/FINEP, INCT Climate Change and the Brazilian Research Network on Global Climate Change (Rede Clima). We are also grateful to Artur Moisés Gonçalves Lourenço and Bárbara Tsuyuguchi for their support in producing the maps.

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households were assessed. The sample was stratified according to household income and to the hydraulic condition in order to show the users' perception about the impacts of water rationing on their household routines.

Next section will present a brief account of the history of Campina Grande. It will also point out a process, in which the history of the development and modernization of the landscape production system and its infrastructure is highly intertwined with the structuring of a water supply system able to compensate the water scarcity characteristic of the Brazilian semiarid region. Therefore, Campina Grande is considered to be a "waterscape", according to Swyngedouw's (1999) definition. The term waterscape has been used by several scholars (BUDDS; HINOJOSA, 2012; HEYNEN; KAIKA; SWYNGEDOUW, 2006; SWYNGEDOUW, 1999; ZIMMER, 2011; ZUG; GRAEFE, 2014).

According to Swyngedouw (1999), water resources produce power relations within physical and social spaces – socio-natural relations of domination and subordination, of access and exclusion, of emancipation and repression – in which several symbolic and cultural meanings linked to water and to its uses circulate. These physical and social spaces are co-produced by daily practices and negotiations that result from material and immaterial interactions between humans and water. Swyngedouw (1999) argues that development and modernization processes continuously induce changes in the waterscape, which is turned into "a liminal landscape" (SWYNGEDOUW, 2004, p.29), into an arena of competition for power.

His concept allows defining waterscape in different contexts and scales such as in small areas, cities, regions, watersheds and even countries. It emphasizes historical trajectory and scenarios of the waterscape, as well as the power relations and different water-resource appropriation modes that emerge from it. It is worth highlighting that waterscape is not merely an alternative to spatial scale, but a socio-spatial configuration that consists of social and ecological processes, which allow analyzing the "water-society" relations in a given context. The analysis transposes the limitation of spatial scales and administrative structures, whose flows of water, power and capital lead to the production of unequal socio-ecological arrangements in space and time (BUDDS; HINOJOSA, 2012).

As it was suggested by Perreault, Wraight and Perreault (2012), Campina Grande waterscape considers the water source for the city, besides the city's urban space and its historical trajectory of water shortages and differentiated water supplies (either in quantity or in quality).

With regard to water supply, Swyngedouw (2004, p.29) states:

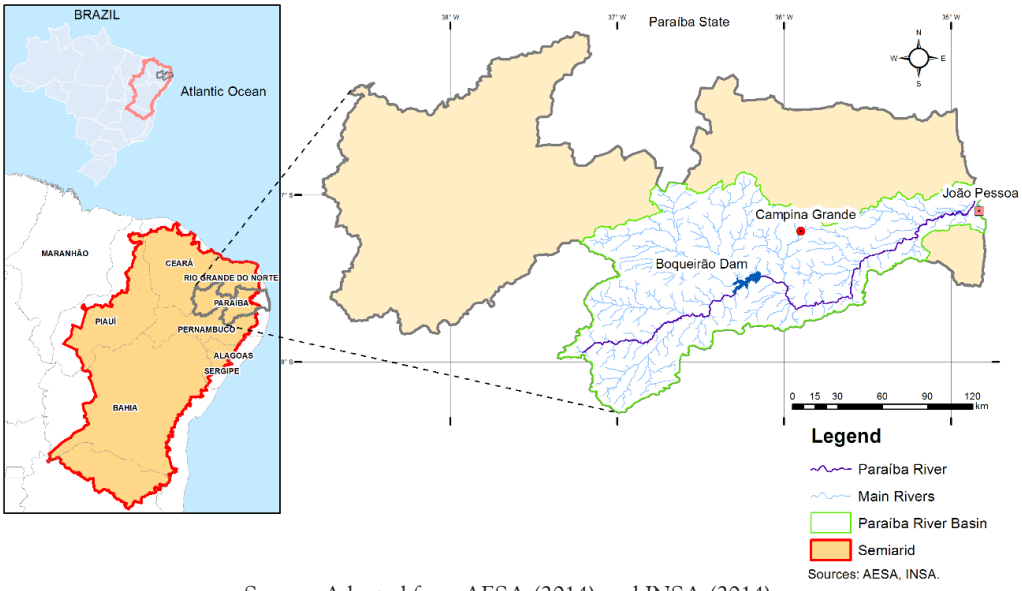
> "The capturing, sanitizing, and biochemical metabolizing of water to produce 'urban' drinking water simultaneously homogenizes, standardizes and transforms it into a commodity, as well as into the real-abstract homogenized qualities of money power in its manifold symbolic, cultural, social and economic meanings."

The different meanings attributed to water by the interviewed users, the narrative snippets about their water-use-related household routines, as well as the elements that indicate water injustice are presented in the third section of the current study.

Campina Grande – the construction of its waterscape

Campina Grande comprises the second largest population in Paraiba State after the State capital: João Pessoa. It is a prominent economic and educational hub in the Brazilian Northeastern region. It is located in the Brazilian semiarid region, at the coordinates 7°13'11" S and 35°52'31" W, as shown in Figure 1, with altitudes ranging from 337 to 665 m above sea level and urban area of 96 km². According to the last national census held in 2010, its population comprises 385,213 inhabitants (IBGE, 2012), and the number of people living in urban areas represents 95% of this population.

Figure 1 – Campina Grande location in the Brazilian semiarid region



Source: Adapted from AESA (2014) and INSA (2014)

The Campina Grande waterscape results from the association between the centrality promoted by its location and the need to expand the drinking water supply means to an ever-increasing population in a water-scarce region.

The current water supply system in Campina Grande and in other 26 towns depends on the Epitácio Pessoa Reservoir, which is also known as Açude Boqueirão (Boqueirão Dam). The reservoir is located approximately 40 km distant from Campina Grande City and inserted in the Paraíba River Basin, as shown in Figure 1. The dam's drainage basin is located in the driest Brazilian region, i.e., the Brazilian semiarid region, which shows high natural climatic and hydrological variability and rainy season between February and May. The evaporation rates are very high and the weather forecasting system has good performance of up to six months in advance (GALVÃO *et al.*, 2001). According to historical accounts, such a location leads to intermittent water supply, which may get

worse during water scarcity periods (RÊGO; ALBUQUERQUE; RIBEIRO, 2000; RÊGO, GALVÃO & ALBUQUERQUE, 2012; RÊGO *et al.*, 2001).

Campina Grande used to be the meeting point of several drovers – participants of troops of cowboys who travelled the region negotiating several types of goods – at the bed of a clay pit, which is now known as *Açude Velho* (Old Dam) before it emerged as a village. It became a city on October 20th 1864 (ALMEIDA, 1978); however, the restricted water availability limited its expansion, which led to the construction of the following dams: in 1828, Açude Velho (Old Dam), which remains active until the present day and is the most visited tourist attraction in town; in 1830, Açude Novo (New Dam), which dried up in 1877; and in 1917, Açude do Bodocongó (Bodocongó Dam), which has saline water. In 1927, the water supply was implemented in Puxinanã, with untreated water and limited supply. In 1939, the water supply from Vaca Brava dam, located in Areia Town, came into operation and it supplied the growing population for a decade. Açude Boqueirão was completed in 1957, and it has been operating since then with current gross capacity of 411 hm^3 in order to meet the water supply needs of the aforementioned city (AESA, 2015; MENESES, 2011).

Açude Boqueirão would be able to ensure water supply to Campina Grande and to several other cities of the Borborema Plateau for several years. This water source is also used for economic activities, mainly in crop irrigation and fishing, as well as for leisure activities.

Açude Boqueirão faced the most critical situation of its history from 1997 to 2000, when its lowest water level and worst water quality were observed (RÊGO; ALBUQUERQUE; RIBEIRO, 2000). At that time, its multiple users, including the urban population of Campina Grande, were subjected to water rationing, which lasted from 1998 to 2000.

Campina Grande was divided in two main areas during this period. Each area was alternately supplied every 24 hours in the first rationing phase, in 1998; as for the second phase, which began in September 1999, the 24-hour interval was increased to 48 hours. Besides the rationing, other actions were necessary, namely: the judicial suspension of crop irrigation and the interruption of the downstream river-perenization discharge flow.

In November 1999, the dam was working with only 15% of its capacity and the salt concentration in the water made it unsafe for human consumption. Some urban areas had to endure four days without water supply. The first summer rains started falling in January 2000, and the rationing was suspended in April of that year. The water level in the dam returned to normal in January 2004, when a series of wet years began and remained until 2011 (GALVÃO *et al.*, 2001; RÊGO; GALVÃO; ALBUQUERQUE, 2012; RÊGO *et al.*, 2001).

It was expected that actions should be taken in order to efficiently manage Açude Boqueirão during the period of rainy years, from 2004 to 2011. However, the water demands for urban supply and crop irrigation increased with no control and no authorization (RÊGO *et al.*, 2015). A new drought cycle began in 2012, and it ended up in the current rationing, which began in December 2014 (RÊGO *et al.*, 2015).

The water management in Açude Boqueirão is quite peculiar. Since the dam is inserted in the Paraíba River Basin, it is subject to the State water resource manage-

ment, as it is stated by the Brazilian Constitution – which assigns to State governments the mission of managing and administering the water harvesting and supply through joint efforts of the federal government providing public funds and interstate works. The Brazilian Constitution also understands the waters resulting from the Union's works as Union asset. Since Açude Boqueirão was built by the National Department of Works against Droughts (DNOCS - Departamento Nacional de Obras contra as Secas), as well as other dams in the Brazilian semiarid region (RÊGO *et al.*, 2015), it is managed by the National Water Agency (ANA - Agência Nacional de Águas). This singularity leads to the first conflict, namely: the water management of Açude Boqueirão at federal and state levels.

The ANA granted the Water and Sewage Company of Paraíba State (CAGEPA - Companhia de Água e Esgotos da Paraíba) in 2005 the legal authorization for urban water supply. The authorization expired in 2008 and was renewed in July 2012, right after the new drought period had already began. In addition, the authorized water withdrawal value was *above* the value of Açude Boqueirão regularization flow estimated by the State Water Resource Plan (PERH - Plano Estadual de Recursos Hídricos). Therefore, there was a mismatch between the readiness to perform the necessary actions and the agreement of limits between the federal and state spheres. Thus, it is worth highlighting the role played by the State legislative power, mainly by the State Public Prosecutor's Office, which opened a Civil Public Survey in 2012 and created an arena to find solutions. This claim triggered other actions, since the state and federal executive authorities did not directly act in this matter (RÊGO *et al.*, 2015).

The information about the status of the water crises that currently affect the Brazilian Southeastern and Northeastern regions came to the media long after the actual impacts were felt by the population and after the election campaign for President, Governors and Executive authorities, from October to November 2014. The current water crisis in the Brazilian Northeastern region began in 2012. It was recorded and released by ANA in March 2015, in a Special Booklet on the subject, which accompanied the 2014 Water Resource Situation Report. This report includes the water crisis in the Brazilian Southeastern region, which began in 2013 (ANA, 2015).

It is worth emphasizing that the media disclosure of the *water crisis* in the Northeastern region (popularly known and named as *drought*) happened after the media visualization of the *water crisis* in the Southeastern region, which involved the richest Federation States, namely: São Paulo, Rio de Janeiro and Minas Gerais. The Southeastern *water crisis* produced a national mobilization to search for solutions, revise the systems in use and minimize the impacts.

The collected data showed the recurrent concern by the population about the vitality of Açude Boqueirão. The respondents' accounts showed their living memory about the water shortage, the need to get water in distant places and the lower quality of it, in comparison to the quality of the water currently provided by CAGEPA.

In early December 2014, the month that had followed the elections, CAGEPA started the water rationing in Campina Grande and in the other urban centers supplied by Açude Boqueirão. The water supply was suspended for 36 hours per week, from 5 p.m.

on Saturdays to 5 a.m. on Mondays. In June 2015, the rationing increased to 60 hours per week, from 5 p.m. on Saturdays to 5 a.m. on Tuesdays.

Next section will show the Campina Grande water users' perception about this rationing, its impact on their water-use-related household routines, and the indicators of a water injustice situation in the city.

Perceptions about the rationing impacts on the water-use-related household routines in Campina Grande

Assumptions

Data extracted from surveys about the previous rationing period (which happened from 1998 to 2000) indicate that the population strata in Campina Grande were differently affected by water scarcity. The highest-income population strata were able to store water in residential reservoirs and to consume mineral and/or desalinated water, whereas the lowest-income population strata stored water in pots and pans (RÊGO *et al.*, 2001).

Taking the aforementioned research variables and previous studies as basis (GRANDE *et al.*, 2014), the current study about the water supply conditions in households and the perception of users about the impacts of water rationing on their water-use-related routines adopted two variables, namely: household income and risk of water shortage due to hydraulic criteria.

When it comes to income rates, the assumption adopted in the previous study, as well as in the present one, states that the lower the household income is, the lower the capacity to store water in tanks and individual reservoirs, and the lower the capacity to obtain water supply from other sources (water truck, desalinated water, etc.).

The hydraulic criterion refers to the location of the households in relation to the reservoirs of the water supply system. The assumption is that the higher the topographic elevation of the households in relation to the reservoirs is and the greater the distance between the household and the reservoir, the greater the risk of water shortage.

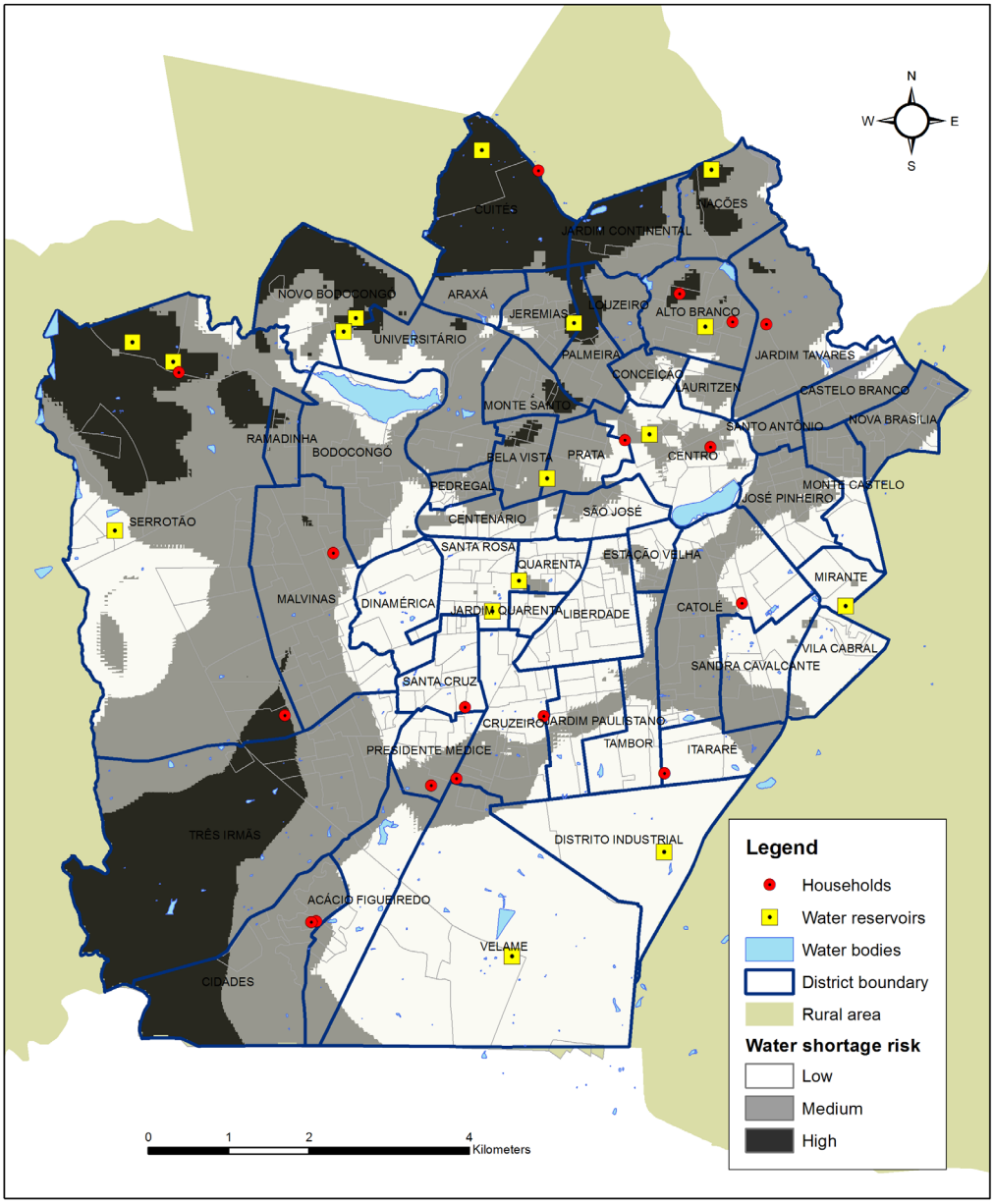
Methodology

The research underlying the current study was conducted by data collection on monthly visits that were carried out from October 2014 to April 2015. A non-random sample of households was stratified by the aforementioned variables. Semi-structured interviews about the water supply conditions in the dwellers' homes and their perceptions about the rationing impact on their water-use-related household routines were conducted during the visits.

According to previous studies (MENESES, 2011; CORDÃO; RUFINO; ARAÚJO, 2013; GRANDE *et al.*, 2014), the users were selected based on the identification of areas in the city subjected to different levels of water shortage risk, due to the hydraulic criterion, as shown in **Figure 2**. The user's position in the water supply system determines how long he/she stays without water in case the supply is interrupted. The risk of water shortage based

on the hydraulic criterion was considered an indicator of possible differentiated conditions in the system. However, it may not exactly represent the different risk levels due to the urban growth dynamics. Besides the existence of subsystems, which may supply a certain area from a more distant reservoir, new network bypasses may be quickly added to the system.

Figure 2 – Water-shortage risk map according to the hydraulic criterion in Campina Grande



Source: Adapted from Cordão, Rufino and Araújo (2013) and from IBGE (2012)

The household income data were treated according to four intervals: up to 1 minimum wage, from 1 to 5 minimum wages, from 5 to 10 minimum wages, and above 10 minimum wages, referring to the minimum wage value of R$ 724.00 (seven hundred and twenty-four reais) at the time the interviews were performed, i.e., in 2014. These intervals were adopted by taking into consideration that the household income of up to 1 minimum wage represents a severe poverty status (poor or extremely poor). The interval for household income between 1-5 minimum wages took into consideration the low-and middle-income groups. The income value adopted in housing programs subsidized by the federal government was assumed as interval limit. The household incomes above 5 minimum wages were divided in two intervals. The class with income above 10 minimum wages was isolated, because it was considered to be the wealthier population in this interval. Volunteer users from different household income levels, who are household residents in these areas, were selected, as shown in Table 1, and their names remained anonymous.

Table 1 – Households according to household income and to water shortage risk

	Water shortage risk according to the hydraulic criterion			
Household income (minimum wage)	High	Medium	Low	Total
up to 1 m.w.		1	1	2
from 1 to 5 m.w.	2	6	2	10
from 5 to 10 m.w.	2		1	3
above 10 m.w.		1	1	2
Total	4	8	5	17

Source: Prepared by the authors

The field research was carried out at the households, and it enabled the personal interaction between the respondents and the researcher as well as the observation of water storage conditions and water use practices in their home contexts (CRESWELL, 2014).

Two types of forms were used. Form 1 was applied in October 2014 in order to collect demographic information about the respondent and the housing. Form 2 was applied from November 2014 to April 2015 in order to collect data about general water shortage occurrences (including rationing), and about the impacts on water-use-related routines and adaptations. The Form 2 was monthly collected and semi-structured interviews were held. These interviews were focused on the meanings users attributed to their water supply experiences and they were used to collect opinions and to observe the users' behaviors and actions in their home environment, since they may reflect different perspectives and visions (CRESWELL, 2014) within the income strata.

Data from Form 2 cover 180 consecutive days, from November/2014 to April/2015. They correspond to one month of regular and normal water supply (November/2014) followed by five months of water supply with rationing (from December/2014 to April/2015).

Social disposition of users and perceptions about the rationing impacts on the water-use-related household routines

This section presents the data collected in the initial interviews and in the monthly visits, as well as the illustrative cases regarding the users' perceptions about the rationing impact on their water-use-related household routines.

Before the water rationing (November 2014)

The water storage units observed in the households were: 250-, 500- and 1000-liter capacity water tanks, suspended or resting on the floor, connected to the general water supply network and to the household internal hydraulic network or 'not connected' (supplied from taps or hoses and emptied with buckets); 200-liter capacity concrete barrels; cisterns with capacities of 2000, 2500, 10000, 12000 and 16000 liters; 5-, 10- and 20-liter capacity buckets; 100-, 120- and 300-liter capacity barrels; 60-liter capacity clay jars; 2-liter capacity plastic bottles.

Water tanks connected or not to the general water supply network and to the household internal water network were considered as regular water storage units; users who 'had absolutely no' water tank were considered not to have regular water storage unit.

The relationship between the existence of water storage units in the households and the household occupation condition – owned, rented or given – showed that most users who reside in their own homes and in rented homes have regular water storage unit at the rate of 73% and 75%, respectively. This rate is 50% among those living in given households, which suggests that higher income users, i.e., those with financial ability to purchase or rent a house, have greater water storage capacity.

Table 2 presents the data about the mean water storage capacity (based on the water tanks) and the amount of people living in the households in relation to the household income variable. The aim was to analyze the relevance of the amount of people living in the household and a probable significant relation between water consumption and water storage capacity. Besides the fact that the high-income strata have more than twice the capacity of the low- and medium-income strata, they have also adapted to the impacts of water rationing in different ways. According to the narrative of a high-income user, "if the existing water tank cannot meet the needs of the house, we buy another water tank"; it shows little sensitivity to the water scarcity issue and to a more rational use of the resource.

Table 2 – Household income, water storage capacity and number of people in the household

Household income (minimum wage)	Mean water storage capacity (based on the water tanks)	Number of people in the household
up to 1 m.w.	0 l /household	2 to 8
from 1 to 5 m.w.	295 l / household	2 to 8
from 5 to 10 m.w.	833 l/ household	2 to 5
above 10 m.w.	750 l / household	2 to 4

Source: Prepared by the authors

The aforementioned data demonstrate how the water storage capacity, based on regular water storage units, is proportional to the household income, which is decisive in the different rationing impact levels, which may affect the individuals within a population. When the water storage capacity is associated with narratives focused on what happened before and after the rationing, it indicates that the wealthiest people tend to be less affected, and it represents a water injustice situation.

In addition, data in Table 2 show an inverse association between social class and amount of people living in the surveyed households. It may indicate an association between greater amount of people, higher probable water consumption and less storage capacity, which may also be interpreted as potentially indicative of a water injustice situation. It is worth comparing the mean water consumption per household in order to qualify the indicative potential of collected data.

After the water rationing implementation (from December 2014 to April 2015)

In addition to the water-saving and consumption reduction measures, all users reported measures to increase water storage capacity, both those who had regular storage units and those who did not have them, as it can be seen in the illustrative narrative below.

> Here at home, we had just one 250-liter water tank. After the rationing implementation, I bought another 1000-liter one to ensure we would not go through the difficulties experienced in the previous rationing. We also started storing and reusing laundry water in the external cleaning and toilet discharges. The elder teach the younger ones how to save water. (Male user, administrative assistant, 58 years old, complete high school, living in the district of Cruzeiro, in an area of *low* shortage risk, *middle*-income interval).

The interviewee also reported that he developed *new habits* regarding water use, all in the sense of making an economic use of the resource. It is worth emphasizing the

role played by his experience with the previous rationing and his ability to increase his storage capacity, which was indicated by the acquisition of an additional water tank with increased capacity.

The next narrative presents common points with the previous one:

> Here at home, we had one 500-liter water tank we used when there was water shortage. When the rationing was announced, I bought a children's pool to store rainwater and water from CAGEPA. I use a chemical tablet to treat the children's pool water. We also started controlling the shower duration for all of us. In addition, we adjusted the toilet discharge box level to half of the original level ... We also started reusing the water from the second cloth washing, which is less dirty, practically clean, in the following washings. We surely developed new habits to save water. (Female user, housewife, 31 years old, complete elementary school, living in the district of Jardim Tavares, in an area of *medium* water shortage risk, *middle*-income interval).

It is possible to observe in the presented case that the household already had a certain storage capacity, which was expanded through the acquisition of a new storage unit. The new habits, developed after the rationing implementation, were also mentioned, as it happened in the first report.

The next narrative of a high-income user points to some peculiarities:

> We already had two 1000-liter water tanks. What we did after the official rationing announcement was the maintenance of the 16000-liter cistern, which was not in use, and we purchased a pump to transfer the water from the cistern to the water tanks ... We did not change our water-use habits after the rationing started. (Female user, retired library, 70 years old, college education, living in the district of Alto Branco, in an area of *high* water shortage risk, *high*-income interval).

The excerpts of the interview with the aforementioned user indicate a different perception and narrative about the impacts of rationing on wealthier users in comparison to the perceptions of the middle and lower income users. Her speech points to a situation of low susceptibility to the effects of rationing due to social-class-related aspects. The households of the upper classes tend to have higher water storage capacity, which causes its users to keep their water-use-related routines largely unchanged.

The next interview was conducted with another user, whose income is up to 1 minimum wage. It is possible to see another peculiar situation, as shown in the illustrative excerpts from the speech of this user:

> We have no water tank or cistern. When there is water shortage, we use a 100-liter bucket to save water. We always used this bucket, and after the rationing started, we use it more. And we also purchased a smaller bucket ... Nothing changed because of the rationing, we are

> still saving water, as we always did. I reuse the laundry water and bath water to clean the floor inside and out [of the house] and to flush the toilet. (Female user, housekeeper, 55 years old, complete elementary school, living in the district of Catolé, in an area of *low* water shortage risk, *low*-income interval).

Although this user said that *nothing changed because of the rationing*, at the same time, she also claimed to have purchased a smaller bucket and to use the buckets more often. Her narrative apparently repeats that of the previous user (high income); she uses the expression *we are still*, when referring to water-saving habits. The similarity with the data from the interview performed with the high-income user lies on their common perception that the impacts on the water-use-related routine are imperceptible. However, a closer analysis points to a crucial difference: the discrepancy between their perception about the rationing impacts and the practices mentioned by the low-income user. This discrepancy may be interpreted as the naturalization of impacts by a certain type of user who, with or without rationing, keeps his/her water-saving routines. Due to the lack of regular water storage unit (water tank), to the recurrent water shortage events in the city, and to the water-saving pressures related to the water resource pricing, this user seems to incorporate a water consumption style, which meets the water-saving campaigns performed by the water supply company in the city to elicit the population in this extreme situation, namely: the rationing.

A common data found among users with incomes *up to 5 minimum wages*, living in the district of Cidades in areas of *medium* water shortage risk, was the fact that they did not have regular water storage units. When they were asked what they used to do in the event of water shortage, they answered, for instance:

> I do not do much; I wait for the water to return. (Female user, general services - retired, 78 years old, education up to the 3rd grade of the elementary school, living in the district of Cidades, in an area of *medium* water shortage risk, *middle*-income interval).

> I wait for the water to return and, in case of emergency, I use mineral water (Male user, mason-on leave, 64 years old, education up to the 4th grade of the elementary school, living in the district of Cidades, in an area of *medium* water shortage risk, *low*-income interval).

The data collected from these users showed monthly *per capita* water consumption from 1.1 to 2.0 m^3 in households with 6-8 people, before and after the rationing implementation, and no change in water consumption after it started.

In order to illustrate the herein performed analyses, Table 3 shows the households, according to household income and the average monthly per capita water consumption in the studied period, i.e., from November 2014 to April 2015.

Table 3 – Households according to household income and to monthly *per capita* water consumption

	Monthly *per capita* water consumption (mean Nov/14-Apr/15)		
Household income (minimum wage)	**1.1 – 2.0 m³/ month**	**2.1 – 4.0 m³/ month**	**4.1 – 6.0 m³/month**
up to 1 m.w.	1	1	
from 1 to 5 m.w.	4	6	
from 5 to 10 m.w.		2	1
above 10 m.w.			2
Total	5	9	3

Source: Prepared by the authors

Initially, the narratives of the users whose household income interval is up to 1 minimum wage showed that they did not experience any impact from water rationing. However, during the follow-up conducted throughout the months, this group of users reported some impacts, which had not been mentioned in the first interview, namely: the 'bowl' bath, the water storage in plastic bottles, the reuse of waste water to flush the toilets and the economy in the use of clothing to reduce the number of washings (three loads of clothes washed in the washing machine per month).

It was possible to observe among them the improvised water storage in pans, pots, clay jars, buckets and concrete casks, which were not always provided with lids or held in appropriate locations and, consequently, were not able to ensure the maintenance of the quality of the supplied water. Again, it was possible to see the permanent nature of the resources scarcity impacts on the water-use-related routines of these users. According to the common sense, these impacts are associated with periods of rationing, fact that explains the initial statements of *no impact*.

The income variable is associated with "*per capita* water consumption" variable both focusing on the different perceptions about the rationing impacts on the water-use--related household routines.

The householders with monthly *per capita* water consumption *from 2.1 to 4.0 m³* and household income from 1 up to 10 minimum wages were those who reported more impacts on their water-use-related routines, namely: laundry suspension, dry cleaning, flushing the toilet using buckets, reuse of laundry water, reuse of bath water, reuse of dishwashing water, improvisation and acquisition of water storage units, increased water storage capacity, rain water harvesting.

The household users with monthly *per capita* water consumption *above 4 m³*, all of them with household income above 5 minimum wages, reported less impacts, namely: reduced bath duration, laundry suspension, reuse of laundry water.

Finally, the householders with monthly *per capita* water consumption *from 1.1 to 2.0 m³* and household income from 1 up to 5 minimum wages, reported *no impact*, as it

was previously described, but these speeches were modified to *some impacts* during the direct observation in the field.

The direct observation in the field allowed seeing that, even in non-rationing periods, there are impacts caused by water shortage, which are overruled or underperceived by users who incorporate measures in their water-use-related routines, which are required from users from other areas and other income intervals only in rationing situations. It would result from the income constraints they are subjected to, since they limit the acquisition of water and regular storage units and force users to live under a resource-underconsumption condition.

The water-underconsumption naturalization mechanism observed in the responses of low- and middle-income users may also be understood through their historical acquaintanceship with water scarcity, which is typical of the region.

Checking the assumptions

The assumption related to income and water storage capacity *is confirmed*: the higher the income is, the higher is the water storage capacity, which results in less impacts on the water-use-related household routines.

However the assumption related to income and water storage capacity *is not confirmed* for users with household income *from 1 up to 5 minimum wages*, some of them have cisterns in their households.

It is worth highlighting that the cistern is an ancient form of water reserve (PASSADOR; PASSADOR, 2010). Cisterns were commonly used in Campina Grande since the city was founded. However, their use was interrupted when Açude Boqueirão became the source of urban water regularly supplied by CAGEPA, in addition to the sale of bottled water.

These users, with household incomes *from 1 up to 5 minimum wages*, reported that they increased their physical efforts carrying water for domestic consumption and hygiene to face the current water rationing, as shown in the illustrative excerpts from the narrative of two of these users:

> The two 500-liter water tanks we have stay on the ground. I have to bend down to fill the buckets and carry them into the house several times during the rationing days ... So, my back and legs hurt due to much effort and poor posture. (Female user, school cook, 42 years old, complete high school, living in the district of Cruzeiro, in an area of *medium* water shortage risk, *middle*-income interval).

> When I get home, I have to carry buckets full of water from the cistern into the house several times in order to get things done in the rationing days. My legs no longer stand it... (Female user, general services, 44 years old, education up to the 4th grade of the elementary school, living in the district of Cuités, in an area of *high* water shortage risk, *middle*-income interval).

In such cases, the assumption related to income and water storage capacity *is confirmed* for income household up to 1 minimum wage: they have neither water tanks nor cisterns and the water for the water-use-related routines is stored in plastic bottles, buckets and similar containers, in small areas.

Regarding the hydraulic criterion, data collected from the interviews with the householders located in the districts of Alto Branco, Cuités and Serrotão, which are areas of high water shortage risk, showed that those were who recorded the largest number of water shortage hours in a 180-day period, which started in November 1st 2014. This observation allowed confirming the assumption related to the hydraulic criterion, and suggested that CAGEPA disregards the need to manage the determining weight of *the location of the housings in relation to the water supply network reservoirs*, causing asymmetries in the urban water supply.

Final considerations

The data analysis of the interviews and of the water supply monitoring performed in the households suggests the need to establish objective parameters regarding the impacts on the water-use-related routine in order to complement the description of the scenarios, which was based on the different perceptions of the users and of the researcher.

The most important conclusion of this study until the present moment is that the poorest population strata - either due to the recurrent supply problems in the areas they live in, or due to the embarrassing factors related to household income, or due to historical and cultural aspects, which have a strong influence on the behavior of the Brazilian semiarid population, shaped by living with water scarcity, tend to naturalize the restrictive rationing impacts since their water consumption and use routines are characterized by restriction, and they live in a permanent state of resource economy. This finding explains the reported perception that "nothing changed" because of the rationing, which was repeatedly found on the middle- and low-income users' speech.

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Submitted on: 15/06/2015
Accepted on: 19/12/2015
http://dx.doi.org/10.1590/1809-4422ASOC150155R1V1912016

THE PERCEPTION OF USERS ABOUT THE IMPACTS OF WATER RATIONING ON THEIR HOUSEHOLD ROUTINES

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***Abstract*:** In water scarcity situations, water rationing is a management measure taken in order to ensure equitable access to water. The current study presents some factors that contribute to a situation of water injustice in Campina Grande, a city located in the Brazilian semiarid region, which has been facing a new drought cycle since 2012. The water supply conditions in the households and the users' perceptions about the impacts on their water use routines were monitored for 6 months. Two variables were considered: household income and water shortage risk. Among the main conclusions, the following stand out: (1) the higher the household income is, the higher the water storage capacity and the lower the impacts on the household routines; (2) the poorest sections of the population tend to naturalize the restrictive impacts of the water rationing since they have experienced and lived in a permanent state of water saving.

Key-words: Water rationing; Campina Grande; Water-use-related household routine; Naturalization of the impacts of water rationing; Water injustice.

***Resumo*:** Em situação de escassez hídrica, uma medida de gestão é o racionamento de água, visando garantir o acesso equitativo ao recurso. Neste estudo, são apontados alguns fatores que contribuem para uma situação de injustiça hídrica em Campina Grande, cidade do Semiárido Brasileiro, que atravessa um novo ciclo de seca desde 2012. Foram monitoradas as condições de abastecimento de água em domicílios e as percepções que seus moradores têm dos impactos do racionamento de água nas suas rotinas domiciliares, durante 6 meses. Duas variáveis foram consideradas: renda domiciliar e risco de desabastecimento de água. Dentre as principais conclusões estão as de que: (1) quanto maior a renda domiciliar, maior a capacidade de armazenamento de água e menor o impacto nas rotinas domiciliares; (2) as camadas mais pobres da população tendem a naturalizar os impactos restritivos do racionamento, por experienciarem e viverem em estado permanente de economia de água.

Palavras-chave: Racionamento de água; Campina Grande; Rotina domiciliar de uso da água; Naturalização dos impactos do racionamento de água; Injustiça hídrica

Resumen: En una situación de escasez de agua, una medida de gestión es el racionamiento de agua para asegurar el acceso equitativo al agua. En este trabajo se señalan algunos factores que contribuyen a una situación de injusticia hídrica en Campina Grande, ciudad del semiárido brasileño, pasando por un nuevo ciclo de sequía desde 2012. Se controlaron las condiciones de abastecimiento de agua en los hogares y sus percepciones de los impactos en sus rutinas de uso de agua durante 6 meses. Se consideraron dos variables: ingreso familiar y riesgo de escasez de agua. Las principales conclusiones son que (1) mayor será el ingreso del hogar, mayor es la capacidad de almacenamiento de agua y menos es el impacto en las rutinas domésticas; (2) los sectores más pobres de la población tienden a naturalizar los impactos restrictivos de racionamiento por vivir en un permanente estado de ahorro del agua.

Palabras claves: Racionamiento de agua, Campina Grande; Uso rutinario de agua en los hogares; Naturalización de los impactos de la escasez de agua; Injusticia hídrica.