

PERCEPTION AND ACCEPTABILITY OF RAW WATER CHARGES AT NORTHERN PARAÍBA RIVER BASIN IN BRAZIL

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Abstract: The Brazilian Water Resources Policy considers water as an economic good and so its management must be decentralized and participatory. The State of Paraíba, Northeastern Brazil, has already approved water charges to be applied within its territory. This process, following the Brazilian water policy's guidelines, had the participation of the State's basin committees. Paraíba's water charges, therefore, can be considered legitimated by water users, civil society and government. This paper presents the results of a research made at the Region of the Lower Course of Paraíba River, through questionnaires application, aiming to verify people's knowledge about the instrument of charging, as well as the acceptability of the already approved values. According to the results, this economic instrument is little known by the population. Since the success of water charging depends on its acceptance by society it is necessary to adopt strategies which increase its rate of acceptability.

Palavras-chave: Acceptability, Water charges, River Basin Committee.

INTRODUCTION

Some discussions have occurred in relation to the efficiency of water resources management and to the situation of degradation and scarcity of water resources, which have a finite character. There is the perception of the need for guaranteeing – to the actual and future generations – the necessary water availability associated to a decentralized and participatory water resources management, as expressed, by the Law 9433/97 (Brazilian Water Resources Policy).

An effective water resources management must be supported by public participation, based on the civil society representation at adequate fora, like river basin committees (RBCs) (LIMA, 2003). According to Jacobi and Barbi (2007), water users must be organized and actively participate at RBCs, in order to defend their interests in relation to water charges values and, as well, to the application of the collected funds, since these fora are the places where methodologies and values are discussed.

The study of committee members' perception, as well as that of all the basin water users, about the main aspects of water charges can point out guidelines for possible adaptations and optimize their adoption by other river basin entities (MAGALHÃES JÚNIOR & NUNES JUNIOR, 2009). Magalhães *et al.* (2003) claim that a water charge model, in order to be approved by society, must address the following conditions: (i) public and political acceptability; (ii) conceptual simplicity and transparency; (iii) implementation and operation easiness; (iv) compatibility with the other water management instruments.

This paper evaluates the water charges acceptability and defines strategies which could help its acceptance by society, based on a opinion survey and on the interviewers' profile, focusing on the Hydrographic Region of the North Paraíba River Lower Course, located at the Brazilian Northeast Region.

Raw Water Charges in Brazil

The Brazilian Water Resources Policy has established management instruments that aim to guarantee the water uses control and the management of low water availability situations, in order to allow the effective access to water. Among these instruments, raw water charges have the objective of ensuring water sustainability through adequate operations which provide the efficient allocation of water resources, mainly in high water scarcity regions (BARROS *et al.*, 2006).

The understanding of raw water charges demands its analysis and discussion by society, so as to meet the principles of participatory management. According to Magalhães Júnior and Nunes Júnior (2009), it is essential that the payer-users and RBCs' members have access to the information about decisions on water charges and the destination of the collected funds. Santos (2002) emphasizes that the water charges instrument acceptance and implementation must be gradually upgraded, so as to allow the long-term planning and avoid the production costs to largely increase.

The Brazilian experience in raw water charges is still recent, and has been initiated in 2003, at the South Paraíba River Basin, which covers municipalities of the States of São Paulo, Minas Gerais and Rio de Janeiro. So far, at the Union domain rivers (those which covers territory of more than one State), the raw water charges instrument is implemented at the watershed of the rivers Piracicaba-Capivari-Jundiá (since 2006) – which sets over the States of São Paulo and Minas Gerais – and São Francisco (since 2010) – involving lands of the States of Minas Gerais, Bahia, Pernambuco, Alagoas, and Sergipe –; at the Doce river basin (States of Minas Gerais and Espírito Santo), the instrument of water charges is still at the initial phase of implementation, with the approval of the mechanisms and values to be adopted. In relation to the State domain rivers (those completely inserted in one State territory), water charges are formally implemented at the States of Ceará, Rio de Janeiro, Bahia, and São Paulo.

The River Basin Committees (RBCs)

The river basin committees constitute the basis of the management system, since it is there that: the debates about the issues related to the basin's water resources are promoted; the action of the involved entities is articulated; and water conflicts are solved in first instance (DOMINGUES; SANTOS, 2002).

The RBCs stand out as an important tool in the process of public participation, and allow the several segments of the society, related to the basin's water resources, to be represented. The Brazilian water resources legislation foresees that the civil society has a central responsibility in guiding water resources policy and management. According to Camargos and Cardoso (2004), one of the greatest challenges faced by the process of consolidation of the water resources model is to achieve, by means of the RBCs and other collegiate bodies, participatory water management.

André (2006) highlights that participatory management refers to the involvement of individuals and groups, which are positively or negatively affected by a proposed intervention. Dinar *et al.* (2005) consider that, when the decision-making process is not participatory and the local conditions are not adequate, the process becomes weak and, the water management, ineffective; in the other side, the substantial increase experienced by the participation of stakeholders in the decision-making process, with the adequate and transparent access to information, augment the probability of success in managing water resources.

The benefits of public participation, among other aspects, is linked to a greater acceptance of decisions made, by the involved individuals, to a democracy strengthening, and, consequently, to a more economically and environmentally sustainable management (MOSTERT, 2003).

Social perception and acceptance

A public policy based on joint participation of society and State to be implemented, requires major efforts than those necessary to its legal creation. In relation to raw water charges, the process of its implementation in the Brazilian river basins is still viewed with caution, probably due to the involved complexity and to the society's information gap.

As highlighted by Viol (2005), a comprehensive and systematic understanding of the nature of a tax, as well as its purposes, allows that something understood as compulsory can be accepted and, inclusive, voluntarily paid. So, in order to have an efficient water charges implementation, it is necessary the strengthening of the articulation among the various social segments involved, and an effort – from the water resources manager – in the dissemination of information to society, ensuring a participatory and integrated decision-making process.

The importance of this issue – social perception and acceptance in relation to raw water charges – is translated by the great diversity of studies found at the specialized literature. For instance:

- Larson (2009) analyzes the society's attitudes, based on the application of a questionnaire, looking for defining positive and/or negative attitudes in relation to water resources protection, considering the metropolitan region of Portland, Oregon;
- Magalhães Júnior and Nunes Júnior (2009) analyze raw water charges social acceptance, at the portion of the South Paraíba River Basin inserted in the State of Minas Gerais, aiming to lift reflections on prospects for its conduction in Brazil;
- Campos Júnior *et al.* (2007) evaluate the knowledge and acceptability of the inhabitants of Campina Grande (State of Paraíba) in relation to raw water charges;
- Forgiarini (2006) evaluates water charges acceptability at the Santa Maria River Basin (State of Rio Grande do Sul);
- Barros *et al.* (2006) present a methodology for identifying the typical profile of water users, in order to simulate the collecting potential at the South Paraíba and Piracicaba-Capivari-Jundiá rivers basins.

Study Case

The North Paraíba River Basin

The North Paraíba river basin is located in the Paraíba State's semi-arid region and presents an area of 20,127.17 km². The basin presents great diversity of climate and physical characteristics, and is divided in four sub-regions: the hydrographic regions of Upper, Middle and Lower Course of North Paraíba river, and the Taperoá river sub-basin (Figure 1). For this study, the questionnaires were applied at the North Paraíba's Lower Course region – where is located the State Capital (João Pessoa city) – which already presents problems related to quail-quantitative availability problems.

The Lower Course of North Paraíba river is situated at the coastal region of the State of Paraíba, in an area of 3,940.45 km². The annual precipitation rate varies from 1,000 to 1,600 mm, presenting decreasing values from the coastal region to the interior. Variations on the temperature distribution are 20°C to 24°C (minimum values) and 28°C to 32°C (maximum values, which are reached in the months of November and December).

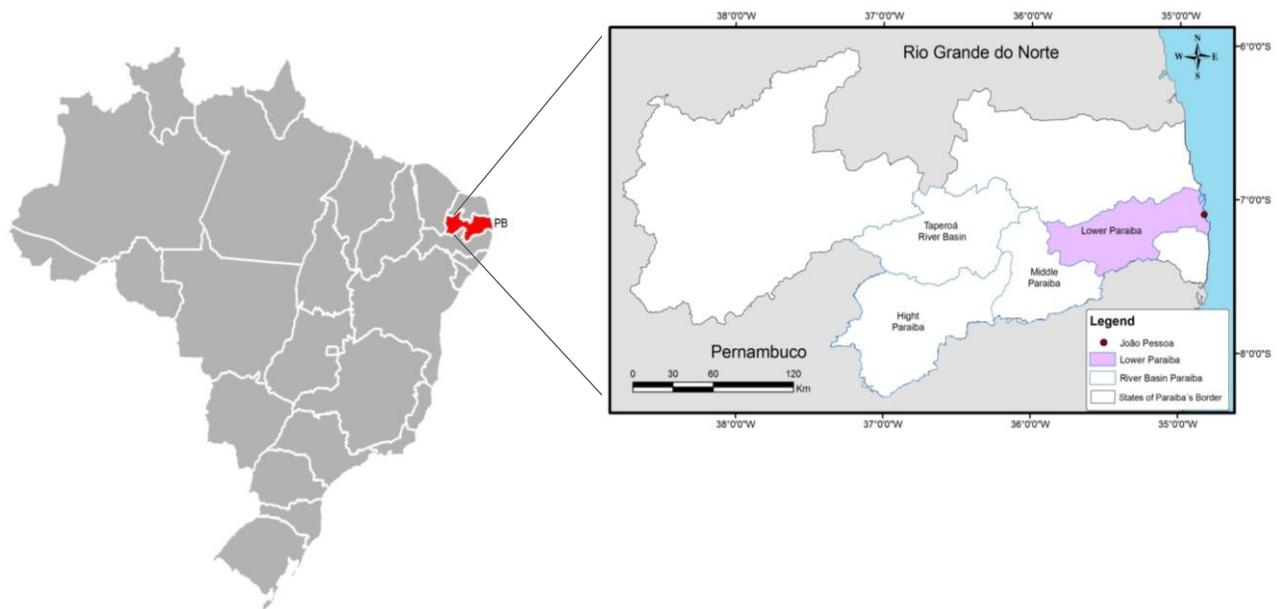


Figure 1 North Paraíba River Basin, highlighting the Lower Course Region.

João Pessoa city stands out by its tropical climate, hot and humid, with temperature varying from 22°C to 30°C. It has an area of, approximately, 211 km² and a population of 716,042 inhabitants (IBGE, 2010). The city represents the major State's economy (industry, commerce and services), besides the greatest HDI (which corresponds to 0.783). Its urbanization tax is close to 100%.

Although João Pessoa city is situated at the Lower Course of North Paraíba river basin region, it imports water from the neighbor system of reservoirs named Gramame-Mamuaba and from the Marés reservoir. The water availability deficit appears as one of the reasons for the increasing use of groundwater, especially by the medium and high income inhabitants (which live in vertical and horizontal residential condos). In this sense, the raw water charges application can help in rationalizing water use, and, consequently, in getting a better water management at the region.

The North Paraíba River Basin Committee (RBC-PB)

At the beginning of the year 2000, the process for formation of the RBC-PB was initiated, and it was consolidated in 2007 with the committee members' election. The social segments that compose the RBC-PB are (according the National policy guidelines): Water Users, Civil Society, and Public Power, which represent, respectively, 39,29%, 32,14%, and 28,57% of the totality of members (60). The RBC-PB Board of Directors is composed by a representative of Civil Society (President), a representative of Water Users (Vice-President), and a representative of the federal Public Power (Secretary).

In January 2008, the RBC-PB has approved the RBC-PB's Deliberation 01/08, which defines the way for implementing raw water charges, and determines the values to be adopted in the committee's area of acting.

Raw water charges in the State of Paraíba

In the State of Paraíba, the instrument of raw water charges is defined by the Law 6308/96, which establishes the State Water Resources Policy (SWRP). As attributions of the basin committees, within their respective areas of acting, the Law determines, among others: (i) to propose the raw water charges mechanisms, always with the aim of blaming water users for the uses consequences, and expanding the universe of water users conscious of water resources importance; (ii) to suggest raw water charges values, based on economic-financial viability studies.

In July 2009, the State Water Resources Council (SWRC), based on the deliberations of all installed State basin river committees – among which it is the RBC-PB – has approved the SWRC Resolution 07/09, which deals with raw water charges mechanisms and values to be adopted in each basin river committee, by a period of three years, along which should be made more detailed studies for optimizing the instrument. Table 1 presents the approved values for the provisory raw water charges system to be adopted at the RBC-PB's area of acting.

So far (2011, May) raw water charges have not been implemented in the State of Paraíba, since the SWRP Resolution 07/09 needs to be regulated by a decree from the State Executive Power, fact that has not happened yet.

Table 1 Water charges values to be implemented at the North Paraíba River Basin.

USES		VALUES* (US\$ / 1000 m ³)
Irrigation and other agrobusiness uses	First year of implementation	1.838
	Second year of implemetation	2.450
	Third year of implementation	3.063
Domestic Water Supply, Service Water Supply and effluent disposal		7.352
Industrial Water Supply		9.191

* Considering the dólar value in May 23, 2011: US\$ 1 = R\$ 1.632.

FINDINGS AND DISCUSSION

Acceptability evaluation

The evaluation of raw water charges acceptability, within the study area, was based on the application of questionnaires to a population sample at João Pessoa city, which was made from February to August 2010.

The population sample was defined by considering the number of inhabitants with age superior to 16 years, and using the method of Length Sample Determination for Finite Population (Equation 1).

$$n = \frac{\left(\frac{Z_{\alpha/2}}{2}\right)^2 \times p \times q \times N}{e_0^2 (N-1) + \left(\frac{Z_{\alpha/2}}{2}\right)^2 \times p \times q} \quad \text{Equation 1}$$

Equation 1 Terms and the utilized/calculated values (between parenthesis) are indicated below.

n – corresponds to the lenght of the sample (358 interviewers);

$Z_{\alpha/2}$ – refers to confidence degree, with 95% (1.96);

e_0 – sample error, i.e., the difference between a sample result and the true population result (5%);

p – sample proportion, corresponding to the individuals who belong to the analyzed category (0.63);

q – population proportion of individuals who don't belong to the analyzed category ($q = 1 - p \Rightarrow q = 0.37$);

N – number of inhabitants with age superior to 16 years (452,245 inhabitants).

Although the calculated length of the sample is 358, actually 30 more interviews were made, thus totalizing 388 interviewers, randomly chosen.

The interviewers received a folder containing information about the theme and an overview of water resources management in Brazil and in the State of Paraíba, in order to acquire better conditions to answer the questions asked, an action which also contributes to the spread of knowledge among the population.

The analysis of the answers allowed the evaluation of population knowledge and perception about water resources situation, the identification in detail of water uses, as well as the determination of raw water charges acceptability level. The topics presented in Figure 2 detail the obtained results.

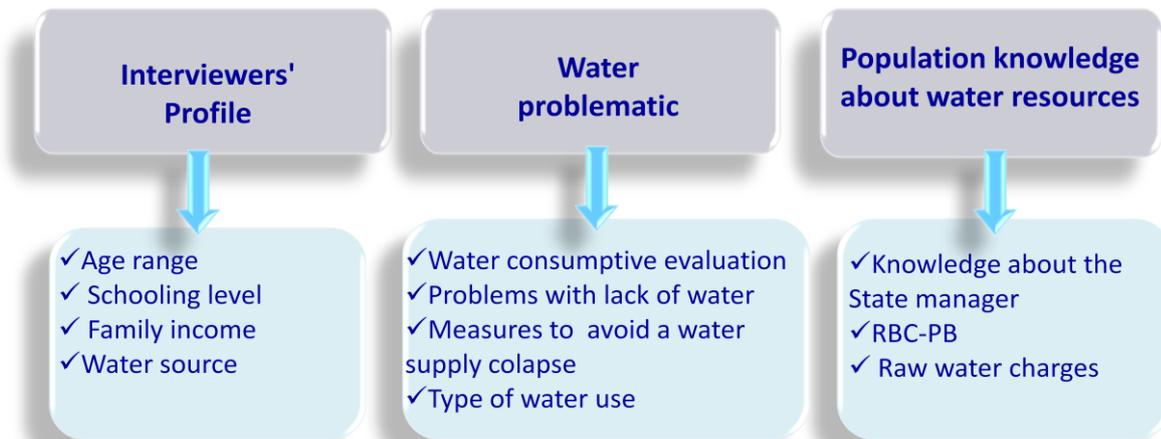


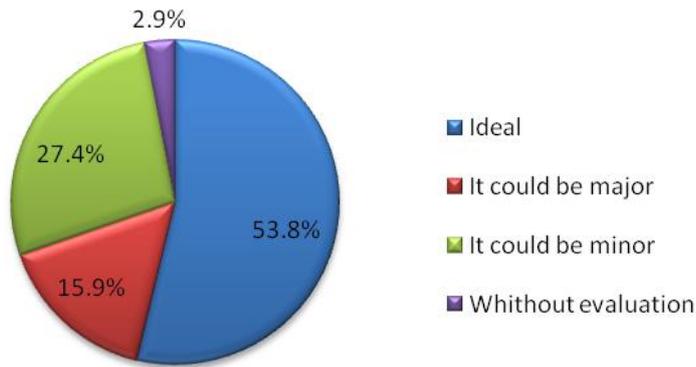
Figure 2 Topics covered in the questionnaire

Interviewers' profile

The sample components present the following profile: majority of males (63.1%); age ranging from 20 to 30 years (42.0%); complete high school as schooling level (31.9%); and family income varying from one to five minimum salaries – considering the minimum salary of US\$ 312.50 (US\$1.00 = R\$1.632, exchanging tax valid in May 23, 2011); water source utilized: groundwater (11.6%), water supply company (85.6%), and groundwater and water supply company, simultaneously (2.8%).

Water problematic

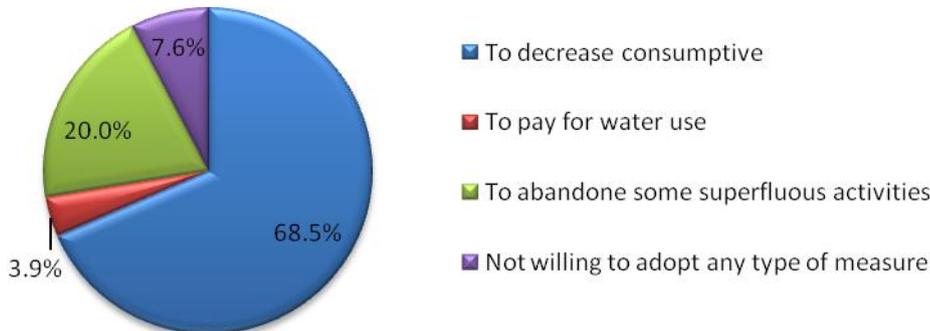
Human water supply is, according to the interviewers, the main groundwater use (81.0%). The majority of the interviewers consider that their water consumption is “ideal”, while a significant percentage of them (15.9%) considers it could be increased. In relation to the perception about problems with lack of water, one can verify that 39.9% of the interviewers believe that the problems are already occurring, while 36.9% believe they only will occur in the future. When asked about measures which could be adopted to reduce water demand, 68.5% of the interviewers are not willing to modify their habits of consumption; among the other answer options, (to pay for water use is the one which presents the minor percentage of choice (Figure 3 (a), (b), (c)).



(a) Interviewers' perception about their own water consumption.



(b) Interviewers' perception about water problems.



(c) Interviewers' willingness for decreasing their water consumption.

Figure 3 Interviewers' opinion about water problematic.

Population knowledge about water resources management

The sample components demonstrated very little knowledge about water resources management, as well as about the Brazilian National Water Resources Policy. Only 9.80% of the interviewers know the State of Paraíba water manager entity (AESAs – Executive Agency for Water Management of the State of Paraíba) and mere 5.2% of them know the existence and/or the acting of the RCB-PB.

In the specific case of raw water charges, the term was unknown by the majority of the interviewers (78.9%). After reading the explanatory folder, 34.9% of the interviewers said to believe that raw water charges are one more type of tax created by the Government, and only 12.3% believe that they are an instrument with educational effect, while 34.4% remained unable to opine on the subject, as shown in Figure 4.

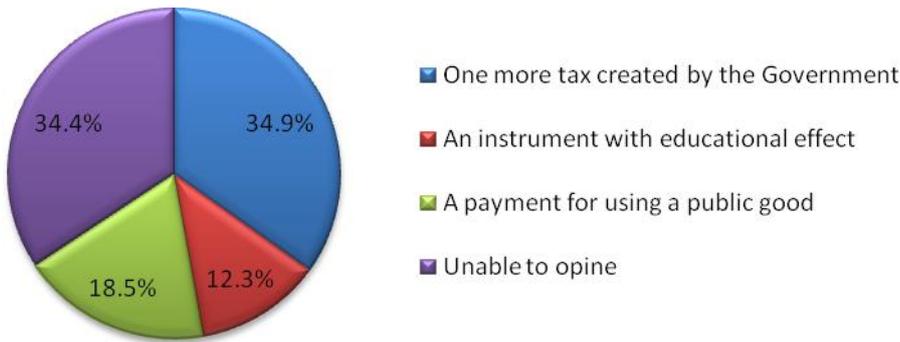


Figure 4 Opinion of the interviewers about the term “raw water charges”.

The interviewers were asked about the raw water charges values approved by the RBC-PB. The obtained answers indicate some incompatibilities, since the term “raw water charges” is still little discussed: the lack of information induces the majority of the respondents (33.9%) to perceive the values as “adequate” (Figure 5); at the same time, when they were asked about their willingness to decrease their water consumption after raw water charges are implemented (Figure 6), again the majority of the interviewers (30.9%) would not decrease their water consumption, which indicates their lack of understanding about raw water charges objectives.

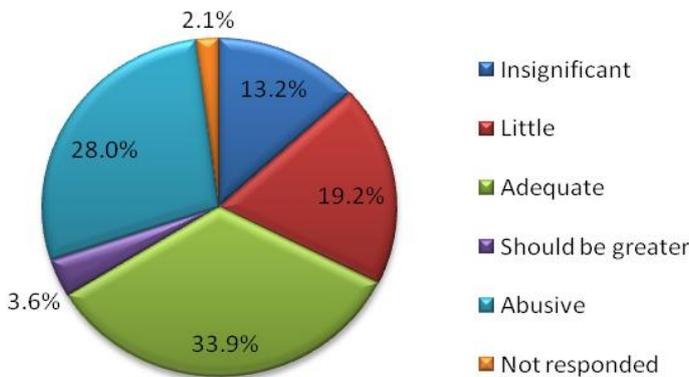


Figure 5 Interviewers' perception about water charges approved values.

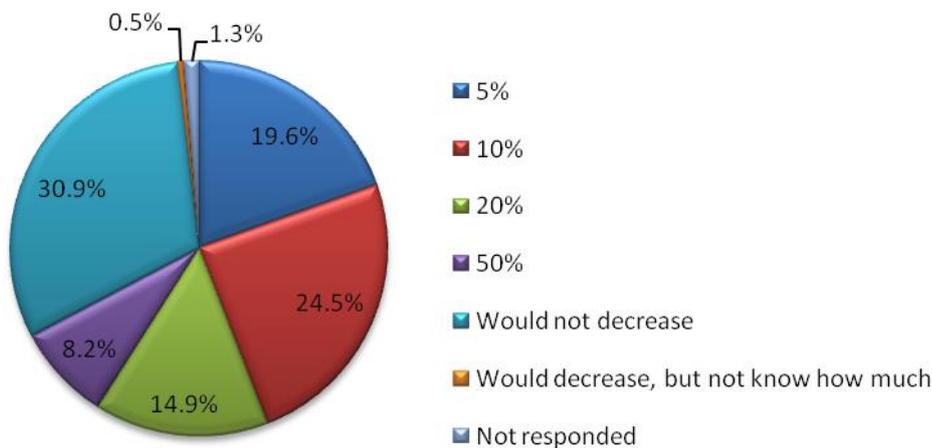


Figure 6 Interviewers' willingness to decrease water consumption after raw water charges implementation.

CONCLUSIONS

This paper presents the results of a survey, realized among the population of João Pessoa city, the State of Paraíba's Capital and focusing on the knowledge about water resources management and raw water charges, in order to allow the evaluation of this management instrument acceptability.

The answers obtained from the application of questionnaires to a sample of 388 inhabitants permit the following analysis conclusions:

- *Water problematic*: the fact of the majority of the respondents consider their water consumption as "ideal", or that it "could be major", indicates their ignorance about the situation of low water availability that already exists in the North Paraíba river basin, where they live, as well as about the water conflicts already occurring in the Gramame river basin, from where the water is imported to supply the majority of João Pessoa city's population. Such ignorance, therefore, can be considered one of the motives for their reactionary positioning in relation to modifying their water consumption standards;

- *Population's knowledge about water resources management*: the answers make clear that there is little or none knowledge about the State of Paraíba's water manager entity (AESAs) and the North Paraíba River Basin Committee (RBC-PB); as a consequence, this ignorance about the water resources framework and the tools for managing these resources extends to raw water charges, and so induces most of the respondents to make a mistake and consider this management instrument as a "new tax to pay".

The ignorance in relation to water resources availability and management indicates the need for a greater dissemination of information on AESAs and RBC-PB's activities among the population; besides, it serves as a warning regarding to the priority to be given to the insertion of "water resources management" into every levels of schooling's curricula, leading to the awareness of the water problematic and to the understanding of the need for water resources management making, in order to guarantee these resources rational and sustainable use.

The obtained results therefore, as they indicate the lack of the population's knowledge about water resources, make impossible an effective evaluation of raw water charges acceptability, since it is necessary to know and to understand the water resources management policy in order to be able for consciously accept it or refuse it. Despite this, it is possible to verify that, in a primary reaction (after they have been informed and have read the explanatory folder provided by this research) the interviewees, in majority, found the approved raw water charges values adequate, in the sense these values would not imply a considerable impact on their water bills and, so, would not induce them to decrease their water consumption (as indicated by Figure 3 (a)).

Thus, another conclusion refers to the perception of raw water charge values as "low", which makes them unable to reach the objective of inducing water rational use; however, even low, these values can start the educational process that is one of the raw water charges objectives. This is an indication of the wisdom of the collegiate body (RBC-PB) in defining a temporary raw water charges system, with the 3-years period dedicated to further studies for prices to be charged, which must be able to attend both the financial goals (reverting part of the collected funds in actions for water resources protection/preservation) and those of rationalizing water use, as contained in raw water charges definition.

As a final conclusion, the continuous action of the bodies responsible for the formulation of policies (river basin committees, State Water Resources Council) and for the implementation of the management instruments (State Water Resources Manager, AESAs), publicizing their actions along with the population's formal education about water management, can make reality the rational and sustainable use of the State of Paraíba's water resources. In this sense, the discussion on participatory and decentralized water resources management represents an important tool for its effective implementation, allowing democratic decision-making and the multiple water uses monitoring in the river basins of the State of Paraíba.

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