



## Water supply diagnosis in the municipality of Cajazeiras, Paraíba State, Brazil

### *Diagnóstico do abastecimento de água no município de Cajazeiras – PB, Brasil*

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**Abstract:** The water supply is a key factor for the development of the population in a region. The mapping areas that are not supplied with drinking water is an important mechanism, once the vulnerable locations are identified, which leads to establish policies and programs to mitigate the problem. Thus, this paper aims at examining areas that present vulnerability in access to water in the municipality of Cajazeiras, Paraíba State, Brazil. In order to carry this research out, data from the Brazilian Institute of Geography and Statistics were analyzed. The results indicate a disproportion in access to water between rural and urban areas, with the first being very vulnerable to contamination factors. It is necessary environmental education programs for sustainable water use, the development of technologies to ensure good quality water and the well being of the people, by the high risk of water-related diseases caused by the contamination that may occur in capture, transport and storage of water.

**Key words:** Semi-arid; alternative sources; water quality; rural zones.

**Resumo:** O abastecimento de água é um fator determinante para o desenvolvimento da população em uma região. O mapeamento de zonas que não são abastecidas com água potável é um mecanismo importante, uma vez que são identificadas as localidades que apresentam vulnerabilidade, sendo assim possível estabelecer políticas e programas que amenizem a problemática. Dessa forma, o presente trabalho tem por objetivo analisar as zonas que apresentam vulnerabilidade no acesso à água no município de Cajazeiras - PB, por meio de dados obtidos junto ao Instituto Brasileiro de Geografia e Estatística. Os resultados indicam uma desproporcionalidade no acesso à água entre as zonas rurais e urbanas, sendo a primeira muito vulnerável a fatores de contaminação. Dessa forma, faz-se necessário programas de educação ambiental para o uso sustentável da água, como também o desenvolvimento de tecnologias que garantam a segurança hídrica e o bem-estar das populações que residem nessas áreas, tendo em vista o alto risco de ocorrência de surtos de doenças de veiculação hídrica devido a contaminação que pode ocorrer na captação, transporte e armazenamento.

**Palavras-chaves:** Semiárido; fontes alternativas; qualidade da água; zonas rurais.

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## INTRODUCTION

Drinking water is essential to the development of all biota and the whole society. It is responsible for many benefits such as: control and disease prevention, practice of hygienic habits, comfort and well-being, increased life expectancy and economic productivity (RAZZOLINI and GÜNTHER, 2008). However, many areas in the semiarid of Paraíba State, Brazil, are vulnerable in terms of access to reliable sources (SILVA FILHO et al., 2015).

Water supply by means of a treatment and distribution water system is far from reality for many rural areas. Its deficiency promotes the search and use of alternative water sources, often unreliable, which present potential risks of damage to the health of those who use them (SILVA FILHO, FARIAS and ARAÚJO, 2015).

The access to water in an acceptable range of values established by Ordinance n°. 2914/2011 (BRASIL, 2011) of the Ministry of Health as parameters for safe drinking water is of great importance, once the population has water, in terms of quality, guaranteed. Then, the water supply diagnostics are needed to verify the population served by this service.

According to Araújo et al. (2015), the use of geoprocessing tools, such as spatial data in cartographic databases, is an important mechanism for identifying vulnerable and underserved areas. Thus, the identification of

different types of access to water in vulnerable regions is a basic question to diagnose the life quality of the social actors involved. This identification will assist the development of measures, actions and programs that change the service situation (BARCELLOS et al., 1998; SILVA FILHO et al., 2015).

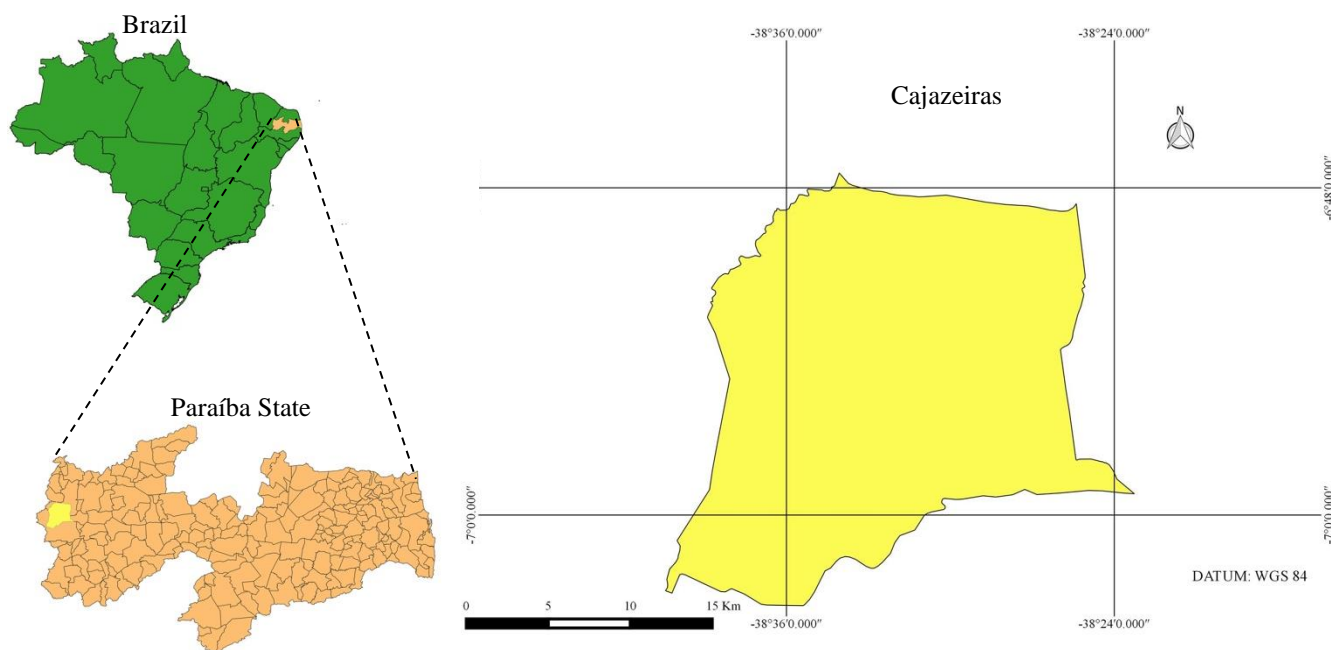
By the problems described, this paper aims at examining rural and urban areas that present vulnerability in access to water, through the data spatialization from the Brazilian Institute of Geography and Statistics, in a municipality located in the semiarid region of Paraíba State, Brazil.

## MATERIAL AND METHODS

### Description of the study area

According to the Brazilian Institute of Geography and Statistics 2010 Census, the municipality of Cajazeiras has about 58,446 inhabitants, which corresponds to approximately 1.55% of the Paraíba State population. In climatological terms, it is inserted in the Drought Polygon, which provides a warm and dry semiarid conditions, according to Köppen classification (CPRM, 2005). Cajazeiras is located in the western part of Paraíba State, as shown in Figure 1.

**Figure 1.** Geographical location of the municipality of Cajazeiras, Paraíba State, Brazil.



### Adopted procedures

The methodology used in this study was based on the following steps:

- a) Secondary data analysis from the Brazilian Institute of Geography and Statistics 2010 Census about the the access to water in the municipality of Cajazeiras;
- b) Determination of the coverage index through dividing the number of residences supplied with drinking water by the total number of residences;
- c) Mapping of vulnerability zones that have access to drinking water through geoprocessing techniques;
- d) Identification and comparison of the forms of access to water in rural and urban zones in the study area.

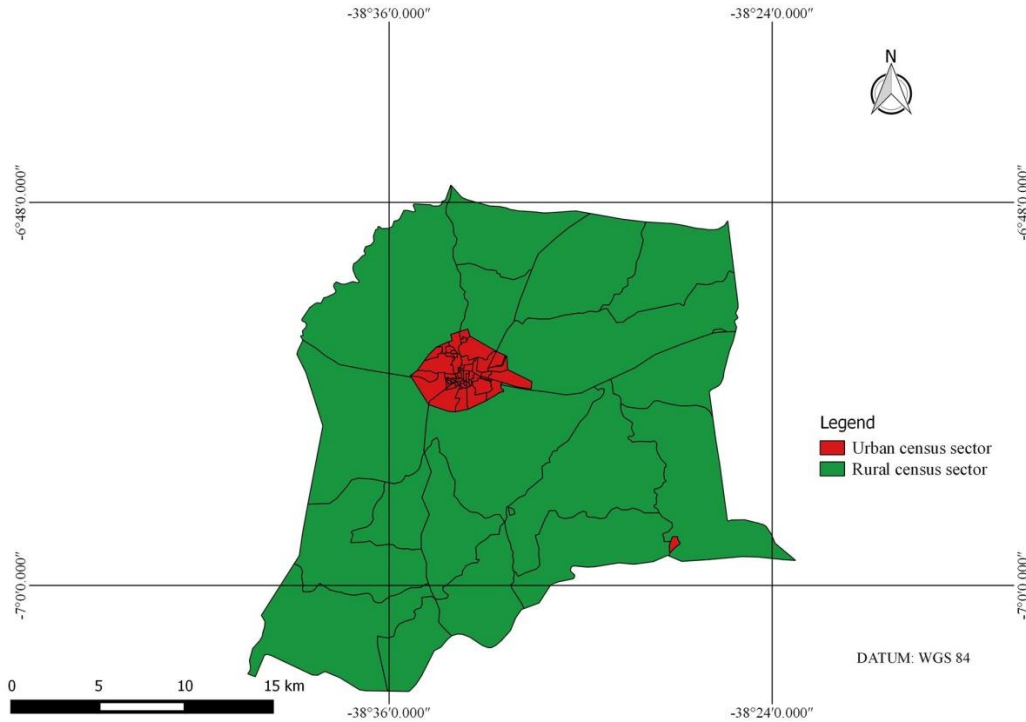
## RESULTS AND DISCUSSION

It was recorded by the Brazilian Institute of Geography and Statistics 2010 Census a total of 17,279 residences in the municipality of Cajazeiras, Paraíba State, Brazil, which are

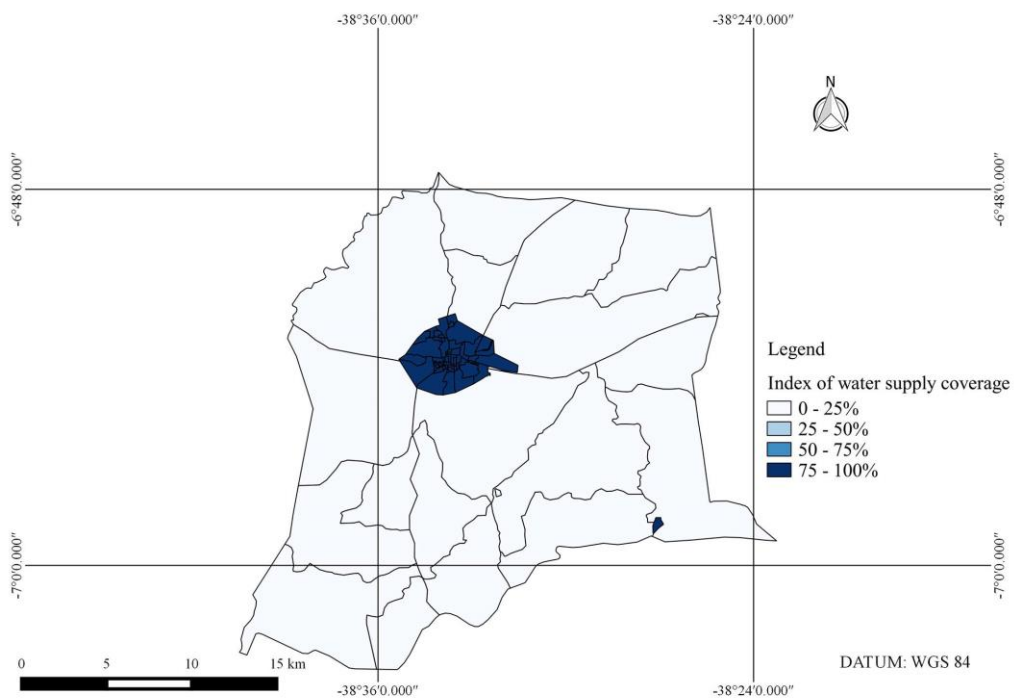
distributed in 72 census sectors. These sectors are divided into rural and urban, according to Figure 2.

Also according to the Institute, the access to drinking water, through a treatment and distribution water system, in the municipality of Cajazeiras has the following coverage, as shown in Figure 3.

**Figure 2.** Division of the census sectors into rural and urban, according to the Brazilian Institute of Geography and Statistics, in the study area.



**Figure 3.** Coverage of drinking water supply in the study area, according to the Brazilian Institute of Geography and Statistics.



Through a disaggregated analysis of the data obtained at the level of census sectors, it is possible to clearly see the water access through the water supply system in the municipality.

It is important to mention that there is a census sector considered urban, but it is away from the others. The Institution should verify this information in its database.

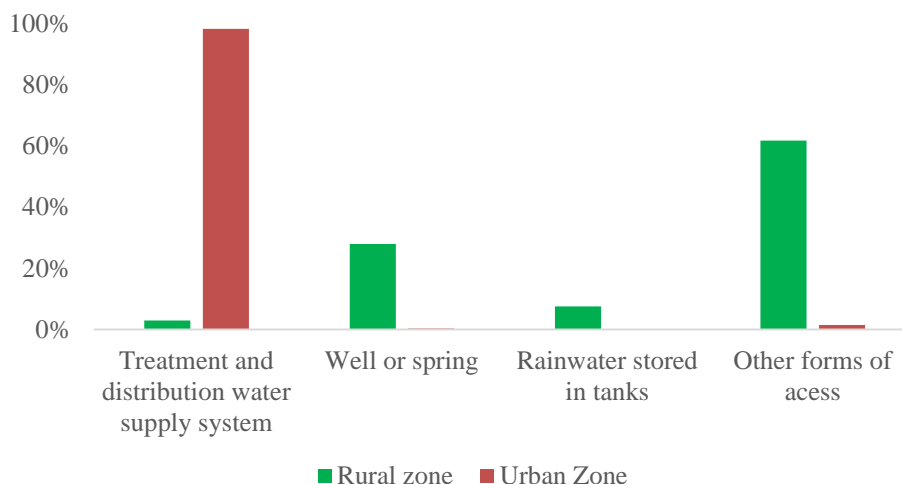
Analyzing the spatial distribution of data concerning the number of residences served by drinking water supply, it can be noticed that the shades in dark blue are the smallest census sectors, which are related to urban zones. As for the sectors in lighter blue shades, it can be inferred that they are larger sectors and less dense, characteristic of rural areas.

Silva Filho et al. (2015); Sales, Candido and Leite (2013) conducted studies in some municipalities, in the semiarid of Paraíba State, and found out similar results to those obtained in this work, where rural zones have lower

population density, absence or low coverage by the water supply system and exhibit larger census sectors, at detriment of urban zones, which have these proportions opposed (SILVA FILHO, FARIAS and ARAÚJO, 2015).

Population groups living in areas with lighter blue shades, as shown in Figure 3, are possibly more vulnerable to diseases. They have access to water from other sources, as can be seen in Figure 4.

**Figure 4.** Forms of access to water in the municipality of Cajazeiras, Paraíba State, Brazil, according to the Brazilian Institute of Geography and Statistics 2010 Census.



Through analysis of the Figure 4, 98.22% of the residences located in urban zones have water access through a treatment and distribution water supply system. It was found that due the low attendance by this system in rural zones, 61.67% of the rural residences have access to water through alternative sources, such as water truck, rivers and weir. They also have access to this resource through a well or spring (27.94%) and rainwater stored in tanks (7.49%).

The absence or inefficiency of an adequate system of water supply and lack of sanitation infrastructure, puts at risk the health and well-being, both individual and collective, resulting in increased incidence of infectious diseases, which primarily affect children and elderly (RAZZOLINI and GÜNTHER, 2008).

According to Silva Filho, Farias and Araújo (2015), it is important to observe that the consumption of water from sources like rivers, lakes, purchase water trucks, dam, well, spring, cistern are considered unsafe due to not knowing its physical, chemical and biological characteristics. Another relevant factor is that relates to improper handling of these sources, for example, the use of pails and containers soiled or even improper packaging and in lack of equipment maintenance. Thus, the vulnerability to situations that cause disease becomes broad due to these contaminations (SILVA FILHO, MORAIS and SILVA, 2013).

**CONCLUSION**

The spatialized diagnosis of the access to water through a tratment and distribution water supply system and its coverage by census sectors in the municipality of Cajazeiras, Paraíba State, Brazil, proved to be an important factor to be

discussed with the social actors, once the locations that possibly are more vulnerable were identified.

It is seen that the drinking water supply in the study area is entirety in urban sectors. And the diffuse rural population does not have covering or has it inefficiently.

Thus, it becomes necessary investments in these locations, health education campaigns and the adoption of preventive measures in order to reduce the risk of diseases provoked by the use of unreliable sources.

**REFERENCES**

ARAÚJO, S. C.; SALES, L. G. L.; SILVA FILHO, J. A. ; MARTINS, W. A.; MELO, F. J. S. Diagnóstico da realidade do saneamento básico na zona rural do município de Pombal-PB: Uma análise em nível de setor censitário do IBGE. In: Congresso Nacional de Meio Ambiente de Poços de Caldas, 12., 2015, Poços de Caldas. Anais do XII Congresso Nacional de Meio Ambiente de Poços de Caldas. Poços de Caldas: IFSULDEMINAS, 2015. p. 1-8.

BARCELLOS, C.; SANTOS, S. M. Colocando Dados no Mapa: A Escolha da Unidade Espacial de Agregação e Integração de Bases de Dados em Saúde e Ambiente Através do Geoprocessamento. Informe Epidemiológico do SUS, Brasília, v. 6, n.1, p. 21-29, 1998.

BRASIL. Ministério da Saúde. Secretaria de Vigilância em Saúde. Portaria n.º. 2.914 do Ministério da Saúde. Estabelece os procedimentos e responsabilidades relativos ao controle e vigilância da qualidade da água para consumo humano e seu

padrão de potabilidade. Diário Oficial [da] União, Brasília, DF, 12 dez. de 2011.

CPRM - Serviço Geológico do Brasil. Projeto cadastro de fontes de abastecimento por água subterrânea: Diagnóstico do município de Cajazeiras, estado da Paraíba. Organizado [por] João de Castro Mascarenhas, Breno Augusto Beltrão, Luiz Carlos de Souza Junior, Franklin de Moraes, Vanildo Almeida Mendes, Jorge Luiz Fortunato de Miranda. Recife: CPRM/PRODEEM, 2005.

RAZZOLINI, M. T. P.; GUNTHER, W. M. R. Impactos na saúde das deficiências de acesso a água. Revista Saúde e Sociedade. São Paulo, v.17, n.1, p.21-32, 2008.

SALES, L. G. L.; CANDIDO, G. A.; LEITE, K. M. M. Diagnóstico da realidade do abastecimento humano na sub-bacia do rio do Peixe-PB: uma análise em nível de setor censitário do IBGE. In: Simpósio Brasileiro de Recursos Hídricos, 20., 2013, Bento Gonçalves. Anais do XX Simpósio Brasileiro de Recursos Hídricos. Porto Alegre: ABRH, 2013. v. 1, p. 1 - 8.

SILVA FILHO, A. P. C.; MORAIS, R. D.; SILVA, J. B. Doenças de veiculação hídrica: Dados epidemiológicos, condições de abastecimento e armazenamento da água em Massaranduba - PB. Geoambiente On-line, v. 20, n. 20, p. 83-96, 2013.

SILVA FILHO, J. A.; FARIAS, C. A. S.; ARAÚJO, S. C. Análise de grupos populacionais rurais vulneráveis as doenças de veiculação hídrica: um estudo de caso no semiárido paraibano. In: Workshop Internacional de Água no Semiárido Paraibano, 2., 2015, Campina Grande. Anais do II Workshop Internacional de Água no Semiárido Paraibano. Campina Grande: REALIZE, 2015. p. 1-6.

SILVA FILHO, J. A.; SALES, L. G. L.; ARAÚJO, S. C.; MARTINS, W. A. Diagnóstico do abastecimento de água para a região do Médio Piranhas no semiárido paraibano: uma análise em nível de setor censitário do IBGE. In: Congresso Nacional de Meio Ambiente de Poços de Caldas, 12., 2015, Poços de Caldas. Anais do XII Congresso Nacional de Meio Ambiente de Poços de Caldas. Poços de Caldas: IFSULDEMINAS, 2015. p. 1-8.