II WORKSHOP INTERNACIONAL
SOBRE ÁGUA NO SEMIÁRIDO BRASILEIRO

PUBLIC POLICIES FOR CREATION OF WATER INFRASTRUCTURE IN THE STATE OF PARAÍBA - BRAZIL

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INTRODUCTION

The human right to access water is directly connected to the right to life and, as a limited natural resource, the assurance of meeting the demands becomes a very relevant object. Since the water consumption for multiple use have increased, the hydric infrastructure work is vital for the development of regions with irregular rainfall regime as in the Brazilian Northeast.

Although there are built dams records in the fifteenth century by the Dutch in the Northeast, the emergence of damming as public policy was initiated after the drought of 1877, known as a severe drought, which killed about 500,000 people and had stigmatized the region as problematic (Villa, 2001). It was from this calamity that has awakened to the need for infrastructure works that would allow the population to live with this phenomenon of high recurrence in the region. However, the political will of the federal government on several occasions, did not follow the urgency of implementing such works, alternating moments of high investment, usually after severe droughts, with times of scarce resources.

According to Mello (2011), the Nacional Department of Drought Combat (DNOCS) is the public body that most implanted dams in Brazil, totaling 214 large dams in semi-arid until 1982, with its golden times during the 50’ties and 60’ties. By the end of this policy from federal government, during the 1980s, the states of the federation had to become the high entrepreneur in construction of public dams, and the State of Paraiba was one of the most who have bet on this strategy of coexistence with the drought in the Northeast.

Thus, this study aims to speculate about public policy of creating water infrastructure in the State of Paraiba as a coexistence strategy in the semi-arid.

METHODOLOGY

In order to evaluate the effectiveness of public policies implemented in the State of Paraiba, the aim was to identify the main projects related to water resources that are executed or under implementation in the State of Paraíba, as well as to characterise the current situation of water infrastructure and its location regarding the watershed and semi-arid region. For this, secondary data was obtained from the Paraíba's Executive Water Management Agency (AESA).

STUDY AREA

The State of Paraíba has about 80% of its territory inserted in the Brazilian semi-arid region according to Portaria MI No. 89/2005, which is characterized by presenting annual precipitation less than 800mm, aridity index of up to 0.5 or drought risk higher than 60% (Brazil, 2005). This region has a predominance of shallow soil and crystalline substrate, a factor that difficult the storage of water to form aquifers, making the region very solicitous to build dams for water storage superficially. The water supply system is based on surface waters, corresponding to 76% of the state collection and low exploration on underground source (ANA, 2010).

RESULTS AND DISCUSSION

Since the 1980s, the Paraiba State Government has been adopting the policy of damming, beside the canals and pipelines constructions, in order to satisfy the society feature of overvaluing the traditional engineering view, in which the construction of water infrastructure stands in relation to the management processes of existing

resources. It happens because the management processes, such as obtaining water use license and taxing raw water, is considered as increasing in bureaucracy and source of income for the state.

In an attempt to meet water demands and provide economic development for the state, two relevant projects related to water resources authored by Paraíba State governments should be highlighted: The Canaã Project, *Projeto Canaã*, established during the period of 1983 to 1986, composed by a series of actions aiming to ensure self-sufficiency in food production in semi-arid Paraiba with the implantation of dams and small irrigation projects; The Water Plan, *Plano das Águas*, developed between 1999 and 2002, with emphasis on water accumulation in dams, distribution of these waters with multi-municipal water supply system and implementation of irrigation projects with main objective to attenuate water deficit in the areas of higher population density, as well as the rural areas of recognized agricultural potential.

Recently, governmental actions returned to the implementation of large hydric infrastructure with the construction of a channel, still under construction, named as *Canal Vertentes Litorâneas*. This work is considered strategic for the states's water security since it will allow better distribution of the waters of the São Francisco river transposition. The canal has a capacity of 10 m^3/s and will ensure water supply for economic development of the eastern region of the state, however, this work does not have an utilization plan developed yet.

CARACTHERIZATION OF PARAIBA'S RESERVIOURS

In mapping conducted by the Cearense Foundation of Meteorology and Water Resources - FUNCENE, in partnership with the National Water Agency – ANA, and the Ministry of National Integration - MI, and updated in October 2014, 434 polygons corresponding to artificial water surface were georeferenced with area close to or greater than 20ha in the State of Paraíba (Brazil, 2008).

The AESA carries out monitoring 124 public dams, of which only 14 are out of the semi-arid region. In addition, 104 reservoirs have capacity to store over than 10 million cubic meters, a volume that characterizes ability to ensure water security for human consumption, as well as economic development, reducing their vulnerability to overwhelming effects of the Brazilian northeastern evaporation and recurrent drought.

Due to the intrinsic characteristics of the semi-arid region, the need for construction of dams is higher in this region than in the rest of the state. This fact is confirmed by analyzing the Table 1 and Figure 1 below, when taking into account the basins and sub-basins that are complete or partially inserted in the semiarid region.

In addition to the greater amount of reservoirs, these works still tend to have higher storage capacity when they are in the semi-arid, ensuring guaranteed flows even during prolonged drought seasons. In Figure 1, is also possible to see the extensive existing water pipelines in the state, integrating basins and delivering the water where it is most needed.

Figure 1: Water infrastructure in the State of Paraíba

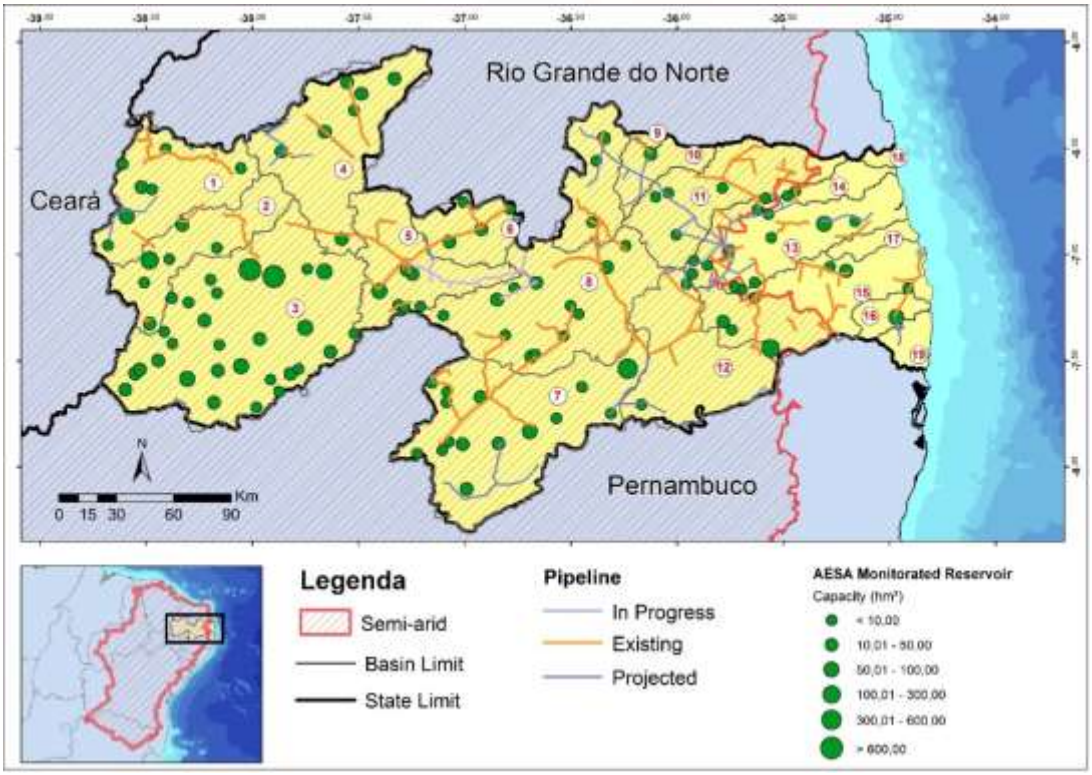

Table 1: Number of reservoirs and maximum storage capacity per basin, sub-basin or hydrographic region

Basin, Sub-basin or Hydrographic Region	Map Code	Inserted in Semi-arid?	Nunber of reservoirs	State population	Water storage capacity (hm^3)
Peixe	1	Entirely	8	6%	143,28
Região do alto curso do rio Piranhas	2	Entirely	6	1%	322,51
Piancó	3	Entirely	29	8%	1.657,96
Região do médio curso do rio Piranhas	4	Entirely	7	4%	170,89

Espinharas	5	Entirely	7	4%	111,26
Seridó	6	Entirely	7	2%	55,74
Região do alto curso do rio Paraíba	7	Entirely	15	2%	673,09
Taperoá	8	Entirely	12	4%	110,11
Trairi	9	Entirely	0	0%	0
Jacu	10	Entirely	1	1%	12,37
Curimataú	11	Partially	5	4%	34,24
Região do médio curso do rio Paraíba	12	Entirely	5	14%	284,42
Mamanguape	13	Entirely	15	13%	93,42
Camaratuba	14	No	2	1%	0,69
Região do baixo curso do rio Paraíba	15	Partially	4	33%	17,63
Gramame	16	No	1	1%	56,94
Miriri	17	No	0	0%	0
Guaju	18	No	0	0%	0
Abiaí	19	No	0	1%	0
TOTAL			124	100%	3.744,54

Source: AESA

From table 1 is possible to note that, although Piancó Sub-Basin has only 8% of Paraíba's population, it has the highest water storage capacity. On the other hand, the basins and sub-basins that are not totally inserted in semi-arid region have lower storage capacity *per capta*.

CONCLUSIONS

The water infrastructure works building strategy that allows storage and distribution in time and space has been widely used over the years in the state of Paraiba in order to ensure meeting the water demands of the population, especially in semi-arid part of the state due to their higher water stress. Featuring extensive system of pipelines and canals and almost four billion cubic meters of water storage capacity, the state's condition is satisfactory for periods of favorable rainfall. However, its population is still vulnerable to drought conditions as is being noted during the current drought scenario that extends since 2012, causing the disruption of human consumption, in addition to the suspension of agricultural activities and loss of livestock in various locations in the state.

This might lead us to conclude that the strategy adopted by the governments has not yet achieved the objectives of ensuring the meeting of demands of Paraiba's population. Thus, it is necessary to review this policy by, for instance, analyzing the potential of individual storage such as cisterns, combined with the implementation, in fact, of the instruments of the National Water Resources Policy, allowing these resources to have a sustainable use. By taking these actions, it is still possible that the state suffers the consequences of a severe drought due to water stress caused by the demand being greater than supply, however its vulnerability would decrease.

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