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ABSTRACT

In this paper are analyzed the water's uses under multiple actors' representation in a territorial approach of Doce River's middle course watershed, in the southwest part of Goiás, Brazil. With the territory and subsistence agriculture and ranching's "modernization" increases the capitalist farming and ranching, changing the pace of production and technologies employed in the production process, the space organization and also the water's uses and senses. The Doce River's basin and the southwest part of Goiás are representative for the analysis of water's uses and significant because of the plurality of actors and activities involved in the production process. The research problem that is expected to be answered is: how the territorialized actors in Doce River's basin represent the uses and meanings of water according to its place in the world? Following a plural methodological conduct, primary and secondary quantitative and specially qualitative data are used, which reveal the meanings given by these actors to the spatial reality in discussion. In this research area, predominated by agribusiness, both the export agriculture activity as well as the ranching one, make the water enter in international economy system, having, in consequence, a geopolitical sense.

Keywords: water's uses, social representation, multiple actors, watershed basin, southwest Goiás.

Introduction

The exorbitant action of the global economy upon the bioma Cerrado's territory has conducted geographers and not geographers to understand the nature's components in a sociopolitical perspective. The works directed to physical issues relating to land, vegetation and water; the ones that diagnose negative environmental impacts, as well as those which see the susceptibility and future scenery don't analyze, simultaneously and in an integrated way, these nature's components associated to the social dynamics that use them.

The water's uses is one of the subject matter that allow the geographical research to scale the policy between society and nature's components. Many works, such as Ribeiro (2008), evidence the water in the center of geopolitical disputes. This disclosure, besides politicizes the researches, requires that the methods which understand the water only as water resources, hydrographic, hydrologic cycle must be exceed.

The vital importance of the water is included in biodiversity studies and in its relations with deforestation, with the pesticides' uses, with exporting-goods production, with the kinds of agriculture and its interests, with the life's quality, with the urban life way, with political organizations, with types of territorial administrations, and others.

Considering the facts, it is necessary to emphasize that the water – used in irrigation; consumed in the industry; commercialized in virtual manner; used in household; to leisure; that causes war; which is polluted and used in power generation – must have its uses rethought.

It means, in short, that a new capitalist accumulation model also creates a new way of water's uses. Thus, it's unthinkable a space without the water's use, just as it is not possible a social subject without dealing organically and politically with the water.

This comprehension suggests to geographers and other professionals involved with the theme to work with different theoretical approaches and with different methodological procedures.

By taking a plural methodological procedure – as says Amorim Filho (2007), when argues that geography is born multiple – it's possible to develope in this paper the approach of water representations.

It starts from the idea that the subjects involved in the geographical phenomena, adding to use water, as the watershed of the Doce River's, create, according to its political and social place, a way of see and represent it.

This mode discloses, in the case of this article, the senses and the meanings given by these subjects to the spatial reality in discussion. It also reveals, in the implied sense of the official discourse, the tactics of the subjects.

This article now presented is part of master dissertation defended at the Institute of Environmental and Socio Studies of the Federal University of Goiás, Brazil, in September 2010. The research problem is: how territorialized actors in the Doce River's watershed represent the uses and meanings of water, according to their place in the world?

The work broaches a qualitative methodological aspect started from several procedures and tools. Researches and depth questionnaire with semistructured and structured questions were also developed. The interviews' result was diagrammed and represented in different ways, increasing the reflection that followed later.

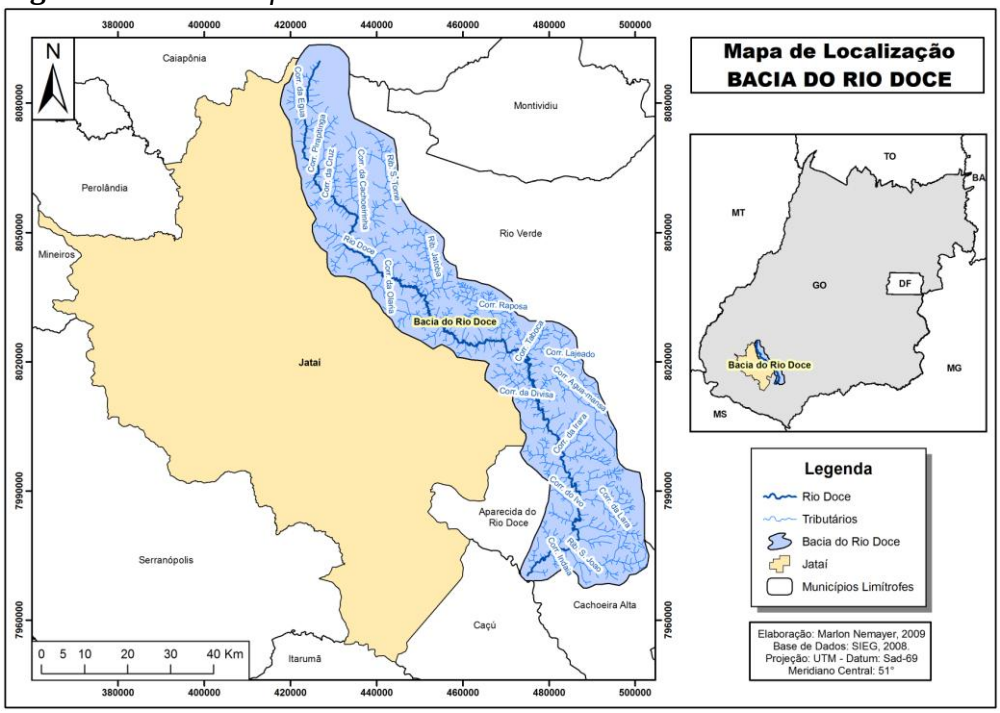
In definition of the questions and in the chosen of the subjects, sought to be connected with the theoretical assumptions and with the main direction of research: to gather social representations of different subjects that occupy and own the basin of the Doce River's territory, evidencing that the differences of social classes, identity and culture of these individuals develop different relationships with water, according to their position in the place's economy.

Because of this, the representations of these individuals signalize to a diverse awareness about the same phenomenon, revealing the political meaning of this representation and, in using this conscience, they construct relations with the infrastructure and with the space logistics, establish agreements with other subjects and "territorialise" also their intentions.

The Doce River's Basin in the Context of the Southwest Goiás Region

The Doce River's watershed, with 261,034.28 ha, is located, more specifically, in the municipality of Jataí, between 8,093,663 and 7,967,476 south latitude and 417657-503105 west longitude, in Southwest of Goiás, Brazil, as demonstrated at Figure 1.

Figure 1. *Location of Doce River Basin*



The Southwest Goiás occupation process has increased with the agricultural frontier's expansion in the Cerrado's areas, from the 1970s, especially with the production of corn and soybeans.

Specially the land in that region had their demand increased and, the most the flat areas or softly wavy and clayey soils were more required, the cattle breeding was moved to sandier soils areas.

Notice that the land's use, though the increase of exploration upon the natural resources, modified the use's forms, changing significantly its balance. The process of deforestation of Cerrado, for grazing or agriculture, implies the reducing availability of water to many country properties.

The silting up promoted by the indiscriminate deforestation of watercourses' banks, the drainages of "covais/murundus" and the commitment of groundwater recharges areas cause the streams' reduction and the disappearance of springs, when compromise the water supply, especially in rural areas.

According to Moragas (2005), in rural areas, especially in agriculture, the production process produces waste chemicals (pesticides and fertilizers) which associated with eroded sediments are transported by the air and water and pollute water bodies.

In fact, in cattle raising the demand for water is expressively lower; however, "the organic wastes can also endanger other water's uses, especially those arising from swine cattle" (Moragas, 2005, p. 19).

Specially cities as Rio Verde, Jataí, Caiapônia, Caçu, Cachoeira Alta, Aparecida do Doce River (shown in map 1), among others, have problems concerned to water's quality caused by its contamination originated in agriculture and in pastures.

> In the Southwest Goiás, the municipalities of Santa Helena de Goiás, Verde River and Jataí, inserted in a agriculture's pronounced region and incipient agroindustrial growth, exemplify the difficulties in managing natural resources, especially water resources (Moragas, 2005, p.19).

Consequently, with the large superficial runoff, occurs the groundwater's supplies responsible for most of the occurrences of water courses that contribute to the formation of Doce's river watershed.

If the rainfall indices establish, in general, the volume of water that supplies the basin, its regulation, during the year, is promoted by the geology and the area soils characteristics, that means that more permeable soils allow greater infiltration.

The infiltrated water is retained by an impermeable layer; in the Doce River's basin this layer, normally, is composed of basaltic rock and the water is released from these reservoirs, forming springs.

The springs, in its turn, while organize the drain, serve to the use of different subjects of the basin. Being one of the greatest riches of Cerrado, the courses and fountains suffered great negative impacts because of the biome's integration to the national and international economy, from 1970. Hence, the

current uses of this basin water are the result of a rediscovery of Cerrado. In this sense, Chaveiro (2010, p 67) points out:

> This statement requires to understand that, recently, around three to four previous decades, the Cerrado was seen as low economic efficiency biome, in which the biodiversity's discussion was almost completely denied. Especially from the 1970s on, driven by an effusive territorial modernization and agriculture process, the biome has been placed as a promising land and important territory for building wealth. Into this contradiction – a denied and soon exhausted biome – by the look of the economic profitability's territory criterion we have to interpret the Cerrado besides a reading based just as a nature that makes up a Biome, classified by the physiognomy and ecosystem concepts. Similarly, the interpretation of its biodiversity requires be exceeded the claim for their species' configuration or genetic quality of biological diversity of each vegetation type.

Besides the spatial notion must involve an understanding of multiple scales action, according to the principle of periodization, a territorial reading of the changes, despite the hegemonic actors, occurs differently in the places. Calaça (2010, p. 8) asserts that:

> In the period 1970-2005, it's found the replacement of Cerrado forested areas and of natural pastures by the planted ones and grains, cotton, sugarcane and the rural settlements expansion for family farming. The softly undulating surfaces were occupied by projects financed by PRODECER aimed for diversified agricultural production. With agribusiness expansion it also increased eucalyptus plantations, which complemented this process.

The author's analysis reveals that it is in course a strategic production mode to introduce the Cerrado areas in the laws of territory capitalist profitability.

In this logic, the components of nature are being reevaluated by economicist criterion. This criterion is based on in what is most important in the production mode: to found a space economy in accordance with the actors' power.

The Water's Territorial Approach: The Doce River's Watershed in the Context of "Modern" Agriculture

According to Santos (2003), the territorial reading requires to think the domination process by the agricultural areas, by the productive specialization and by the imbalance in the space's uses, privileging the hegemonic groups interests; by the capital's distribution in space; by the space appreciation and by

the optical of space value. All these components are based on the relationship between the subjects and the territory's use.

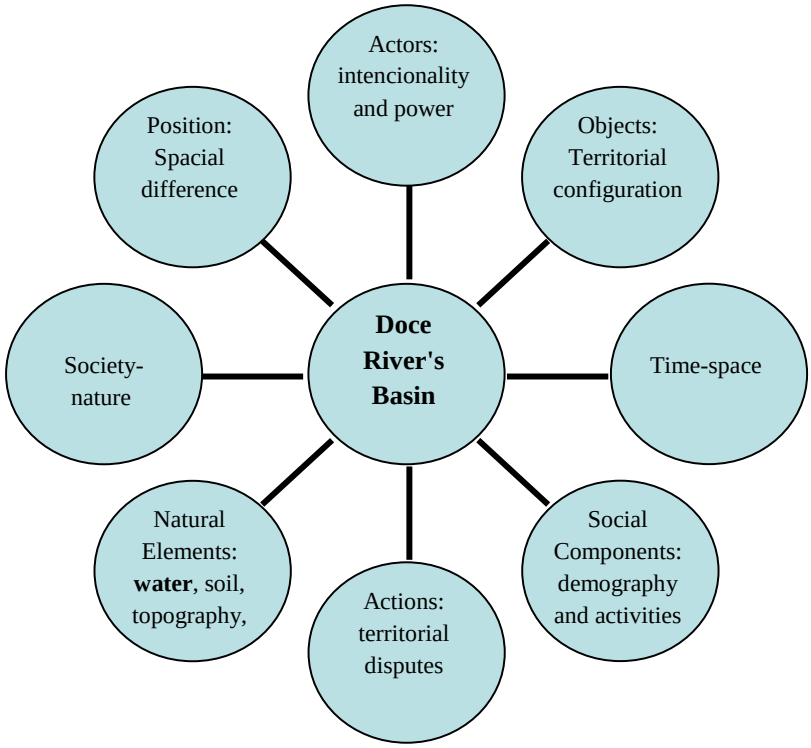
So, the subjects' multiplicity identity had as a criterion, in the present research, the differentiation according to the kind of the relationship with economic activity. Thus, it's possible to identify, as well, that the different uses and the different results are mediated by factors such as economic power, political sense, intellectual training and mode using land and water.

To formulate principles of qualitative mapping was observed that, more important than the quantitative criteria of the sample, is the level of diversification of these actors and their worldview.

The relationship interpretation between the subjects' diversity and their water's uses gives us a panoramic view of the basin and raises the level of pressure on water, as well as draws subtitles spatial economy through the main activities established in that territory.

The analysis was organized according to the organizational chart (Figure 2) – Doce River's Basin - range of actions to follow

Figure 2. *Doce River's Basin – Range of Actions*



Source: Oliveira, F., A., 2009.

According to Figure 2, it is possible to emphasize that the charge in Cerrado in the context of the economic game of international relations doesn't exclude only biodiversity, but creates a new type of basins' uses.

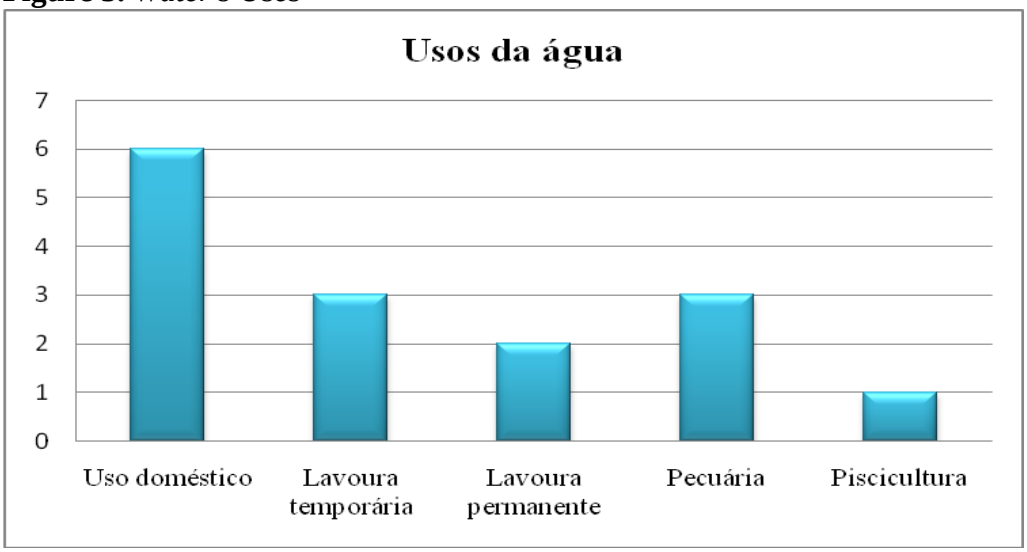
It should be added that the water becomes also a dispute spatial object, depending on the spatial context. Thus, it will be seen that this occurs in the Doce River's basin, starting from the representations of different subjects.

Doce River's Basin: The Political Meanings of Representations

After presenting a general scheme of analysis, delineated by a collective effort between members of the Institute of Socio-Environmental Studies at the Federal University of Goiás, were gathered the representations of various subjects belonged to the basin.

The first question: (do you) use the water in which activities? In the purpose of relating economy and water condition, it resulted in the data of Figure 3 - Water's uses.

Figure 3. *Water's Uses*



Source: OLIVEIRA, F. A. de. (2010).

The synthesis of representation, shown in graph1, demonstrates that the main social and economic activities are the 'domestic supply' which, according to studies, is not an impactful activity; soon after, the temporary agriculture and livestock appear.

According to the notes taken on the field-work, the soybeans and corn cultures, as an expression of seasonal agriculture, joined with the cattle raising, are the activities that most use the basin's water.

It is it is noticeable also that these two activities are present in the largest properties and have the market as purpose. Even if the synthesis of water-use relatively to the economy demonstrate the mode how agriculture and livestock market pressure basin, the testimony of the various subjects are diversified.

For an agronomist, the basin's water's use, in conformity to his perception, is:

> We use rainwater, so our activity does not impact. To prove this, our cattle drinks water from fountains that form water from the basin. We know that each head of cattle consumes 60 liters water/day and may fatten till 1 kg/day, according to the pasture nutrients (Agronomist, 2010).[1]

Linking the words of a "science's man", user of the basin too, it is evident that his speech, although contains scientific justification when pointing data, does not improve in the reasoning that it could perceive impacts.

In turn, for an owner who confines cattle, grows eucalyptus and practices pisciculture on the border of the municipalities of Jataí and Verde River, the vision is catastrophic. He says that:

> Water is essential for everything in farm. If we don't take care of the water, we are lost. I don't see future, because it's only destruction; deforestation disrupts the rains' system. In my boyish time, the rains had certain date, religiously; we could make plans for the rains time. Now it rains too much, it is very cold and the sun is unbearable. I draw out water using semiartesian well to supply house and quench cattle. I have 19 artificial lakes for fish breeding, totalizing 240,000 fishes; the water that supplies the lakes comes from a spring inside my property (FARMER, 2010).

Although this owner understands that water takes part in everything in farm and has a view that it is necessary for many activities and functions, such as climate balance, supplying, provision for livestock and fish farming, his vision is catastrophic and, simultaneously, he created 19 artificial lakes. It is clear, then, that his speech is contradictory to its use. Possibly, the water ideology and the strength of environmental discourse reached him.

A cooperative member, with a standard policy organization proceeded from a landless settlement history, has a different view. He says that:

> Water is life. I'm on the edge of the Doce River and supply the house from cistern. Without water our collective cooperative project doesn't work. It means that we must have a political action that defends water and, this way, we defend life. The water in our basin is everyone's responsibility. We are in favor of clean water. If it ends, we end (COOPERATIVE MEMBER, 2010).

A territorial interpretation of the basin requires to think the water in the set of activities, both economic as those related to life, as the interviewed said.

In rural areas, water is used in many activities: domestic supply and watering livestock, irrigation, environments and in the utensils cleaning. Thus, the water availability is a assumption for these economic and social activities and for the reproduction of life.

[1] Although field research data reffers to 2010, the reality remains the same nowadays.

A rural school principal, with wide experience in place, when asked, showed that the basin, when compared with 20 years ago, has changed considerably.

His perception is that occurred a decrease in the discharge, as well increased the activities that directly use the water. He said that:

> I'm always engaged with environmental issues at school because I realize that people are concerned about how to use, properly, the water resource. Therefore, we developed a project with garbage collect, with spring recovery and the community market garden. I know it's not too much, but it's our contribution. Today the school must worry about that; we must be attentive to environment, to what happens around us and to the planet (SCHOOL PRINCIPAL, 2010).

The position of the school principal, though expressed in a generic way, shows something that others interviewee have not shown: he understands that each person or institution need to take care of their environment and see, also, that the environmental issue has a 'multiescalarity' or interescalarity'. Even if the worry seems to unite the local to the global, its argument is vague.

A young teacher (29 years old), came from rural settlement, with more political force, shows a more critical view. She says:

> Water is very important and my mother's possession is dry. The fight now is for water, especially for water quality. The color of the water is strange; so we believe the water is contaminated. Some springs were damaged by cattle trampling. Here, we create only 3 cows because cows don't have good water to drink. We use rainwater and plant a small agricultura of soybeans or corn (TEACHER, 2010).

The teacher words reveal two variables: from the land possession of his mother, without water, she realizes the water depth dimension to keep the activities and shows the political sense of water. She sees that water resolution has a political dimension.

This aspect is coherent with the territorial approach, because this kind of analysis takes as premise the fact that the land ownership mode and its use include the nature components, in the power dimension plot (Mendonca, 2004; CALAÇA, 2010; CHAINS, 2010).

By a comprehensive reading of the basin, one researcher interviewee, different from the last interviewee, makes his interpretation of the basin when highlights elements involving water, such as human disturbance degree, changes in rainfall mode, land and irrigation uses, added to environmental problems. This researcher tells us that:

> To analyze a river basin it's important, first, to pay attention to the angle of analysis. I am a geographer and I have effective link with the research field of physical geography. Therefore, my analysis follows these field methods.

> Starting from this focus, I sum my field experiments, the laboratory work and data collection. I can tell you I don't have the perception of reducing water. Scientifically, there is no evidence of changing in rainfall discharge, because no rain-gauges were found. Numerous silting can be found, especially in the upper reaches of Doce River's basin. With the installation of COSAN, today Raizen (largest producer of ethanol in South America), there was a significant change of land use, the irrigation increased and the basin is in strong anthropic process. However, an analysis of the water quality was produced in September 2009 and, according to Resolution of Conama 060/2005, the water was considered potable. And it's not all: there is no riparian vegetation (RESEARCHER ON PHYSICAL GEOGRAPHY, 2010).

The way to situate the question, as have been seen in the narrative above, begins by worrying about the method. While the other speaker emphasized the political element, this one emphasizes the logical field. And it's the logical field that leads him not to make decisive considerations, neither antecipates results without measuring the phenomena in debate. But, even without measuring, using his perception resource, he ends recognizing that there are environmental problems in water's use.

The narrative of a geography student, association member, is emphatic:

> The water has differentiation in the territory in respect to quantity, quality, drainage organization. Its use depends on cultural and economic condictions and on the environmental vision of whom uses it. The most predatory activities are the commercial agriculture. I think it is necessary an environmental service and that the money paid by those producers, who pluck profit of water, shoud be directed to fund projects to others who do not have profits. (GEOGRAPHY STUDENT, 2010)

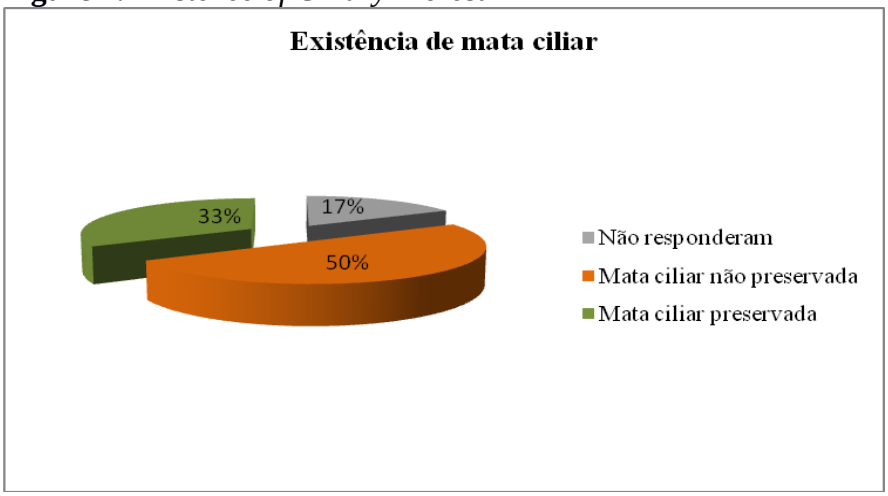
The words of this student demonstrate the systemic sense of water. His understanding, based on the totality’s principle, leads him, in a short time, to develop a proposal: those who use too much the water must pay for this use and that payment should be used in incrementing a less profitable activities. The sight of a rural seated has a more political emphasis:

> Water is a patrimony of life; every human being needs water; every hour, every day. What we see here, here in Cerrado, here in our region, is the indiscriminate use. Those who have money, capital, continue using. Thus, they earn more money, accumulate capital and distruct the river. After, the problem is of whom? Who has the courage to touch a sore spot? We have to put, do you see? It is necessary put people together, people who fight for water, because we have to fight for life. (RURAL SEATED, 2010).

Even if his vision is more political, his words do not specify how water is used, that is, the process is explained, but the shape does not. When asked

about the preservation of the ciliary forest, as an important means to avoid silting, erosion, water contamination, the representations were synthesized in Figure 4 - Existence of ciliary forest.

Figure 4. *Existence of Ciliary Florest*



Source: OLIVEIRA, F. A. de. (2010)

The assertion that the riparian forests are not preserved reveals that there is a distance between the interpretation of the phenomenon and its empirical confirmation. When asked to an agronomist about the riparian forest, his answer has related the scientific reading to its use, but without deepening:

> The riparian forest is the salvage of any stream. It's a cowardliness takes it off; it's like to take off a mother who protects her child, the water is unprotected. And it's against the law, but the country (government) has difficult to monitor; then people will take advantage of the soil with more moisture. Then come the problems and....who will take care? Then, we all pay for it (AGRONOMIST, 2010).

The problems list that pass by the lack of riparian vegetation includes its consequences: silting, water contamination, lack of vegetation, erosion.

It can be argued that deforestation is the problem that most contributes to eliminate riparian vegetation which, in its turn, impacts the basin water. This evidence is related in research world about the subject. Silva (2007, p. 71) explains the process:

> ...The livestock occurs throughout Goiás state area, where concentrates soybean, corn and cotton region, especially in the southwest portion of the state and throughout the west Goiás. This activity's history is that from XIX century until the early XX, the greatest concentration was in the southeastern portion of the state (Estevam, 1998, p. 244; Deus, 2003, p. 59). During the XX century, the activity moved to the southwest, where there were huge and cheap properties with native vegetation, and, as

> already noted by Barrier (1997, p.38), to the region of "Estrada do Boi" (*Ox Road*), where the vegetation was almost totally natural, especially from the mid-twentieth century. Grain production occurs also in the most deforested areas – the border between southeast and southwest of the state.

The historical explanation for deforestation linked to economic activities and to increasing regions of culture types shows that the relationship between deforestation and these activities impacts the water's use.

The integrated understanding between society and nature does not allow separate the environmental problems of social problems. This interrelation depends on a theoretical device that, in our view, is compatible with the territorial approach, which includes, in a unique field of vision, the economy, the actors, the natural components, the infrastructure and the intentions.

More Findings on the Water Issue

Concerning global water perspectives The United Nations World Water Development Report 2016 warns that:

> Reduced water availability will further intensify competition for water among users, including agriculture, maintenance of ecosystems, human settlements, industry and energy production. This will affect regional water, energy and food security, and potentially geopolitical security, prompting migration at various scales. The potential impacts on economic activity and the job market are real and possibly severe. Many developing economies are located in hotspots of water-related stress, particularly in Africa, Asia, Latin America and the Middle East. Climate change exacerbates the threats to water availability and is expected to increase the frequency, intensity and severity of extreme weather events. Climate change will inevitably lead to the loss of jobs in certain sectors. A proactive approach to adaptation via employment policies may offset some of these losses. At the same time, climate change is creating job opportunities of its own in terms of mitigation and adaptation activities (ONU, 2016, p. 3).

It is clear that one of the challenges for the multiple uses of water in Southwest Goiás, in Brazil and in the world is the increase of irrigation and urban expansion, on irrigation to FAO irrigation and drainage paper, says:

> Beyond water for crops, irrigation projects are seen within the larger context of basin water management in regards to both the qualitative and quantitative aspects of water. Moreover, also within a canal system, farmers and other inhabitants in the area may use 'irrigation water' for many other purposes. Furthermore, the demands on the operator include issues in the sphere of mitigation of possible negative side effects of

> irrigation, e.g. salinization, waterlogging and the spread of vector-borne diseases. All these issues place more or less stringent requirements on the chosen mode of operation. Managers need to consider, several services and/or externalities within a canal system including: domestic water supply to villages; groundwater recharge; streams and water bodies for fishing activities; water supply for livestock; environmental needs/impacts (groundwater recharge, waterlogging, salinity, and drainage and return flow from the CA to natural streams); recreational needs; health and sanitation.Energy production is sometimes another important use of water in multiple-use reservoirs. The routing and scheduling of water demands to generate energy is most often at the main inflow point to the project. However, in some cases, it may be within the system itself (FAO, 2013, pag. 24).

On the problems of urban water, which increase with the urban expansion, the researcher David Sedlak, author of the book Water 4.0: The Past, Present, and Future of the World's Most Vital Resource, points out some challenges and possibilities and cites as an example the drought in California, United States and the depletion of the main water reservoir in São Paulo, Brazil. It is seen:

We never really take on the prospect of turning on the tap and nothing comes of it. This is possible because, when things went wrong in the past, it was always possible to increase a reservoir or dig a few more underground wells. In a time when all water resources are used, it will no longer be possible to depend on that mode previously used.

There are people who think that we are going to solve the urban water problem by getting water from our rural neighbors. But this is an approach which is full of political, legal and social dangers. Even if we could get our hands on the water of our rural neighbors. We would just postpone the problem to others. In the form of higher food prices and there are good chances that it would be returned to us, and danger to the aquatic ecosystems that already depend on that water.

Sedlak, think there is a better way to solve our urban water crisis and I think it's opening up four local water sources that I compare to taps if we make smart investments in these new water sources, we can solve our urban water problem and lessen the possibility to come face to face with the effects of a catastrophic drought. If they said 20 years ago that a modern city could exist without the supply of imported water, they would probably be considered unrealistic and ill-informed dreamers. But in my experience, working with some water-thirsty cities in recent decades has shown me that we have the technologies and management skills. According to David Sedlak, the four local water sources we can turn to are: stormwater harvesting, water reuse, water conservation seawater desalination. Like Sedlak, water is considered the most vital resource in the world. Therefore it is necessary to make intelligent uses of each drop of water.

Final Considerations

The researches about Goiás Southwest date from the 1970s, in a context of separation between a traditional economy and a "modern" one, which, from there on, had the aim to insert Cerrado in the international economic game.

The region is identified as "modern", productive, rich, however with large deforestation rates. This paper demonstrated that the consolidation of current economy, in southwest Goiás, produced new ways of using the natural components. Among these, water is what till now aroused less attention from researchers.

Besides checking its importance in all the vital system and its correlation with other natural components, its economic importance comprises its political value, because the different subjects, qualified by different economic conditions, use it to reproduce their conditions.

In this context, the dispute for economic hegemony involves the dispute for water. It was examined, in this present work, how subjects treat the matter, are consciousness about it and are able to see their political destiny.

By following the direction of works realized in IESA, we tried to use the qualitative procedure of social representations founded on the theoretical framework that has been called "territorial approach".

The center of this theoretical perspective is understanding the territory, when unites the subjects and their intentions and, thus, treat them as political subjects with their relationship with all natural components. This relationship is historically determined and spatially contextualized.

Therefore, the Doce River's basin, for being in the center of a "modern" strong economy region, even with a economic activities diversified, is pressure object and dispute between those who use it to keep their life and those who use it to keep their wealth. This understanding makes us see that the territorial dispute involves the dispute for water, not always visible.

The high rainfall indexes in the region are object of interest of large enterprises, as well as real reason to raise land prices and, contradictorily, to cause deforestation, to reduce biodiversity and to create new ways of life.

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