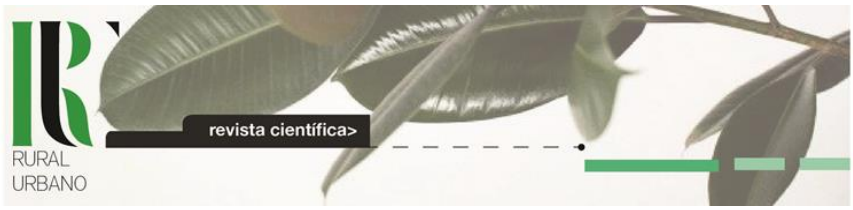

ENVIRONMENTAL CONFLICTS IN THE IRRIGATED SCHEME FROM PETROLÂNDIA MUNICIPALITY: SUBSIDY TO UNDERSTAND THE LAND MANAGEMENT AT THE MIDDLE-LOW SÃO FRANCISCO BASIN

CONFLITOS AMBIENTAIS NOS PERÍMETROS IRRIGADOS DE PETROLÂNDIA: SUBSÍDIO PARA COMPREENDER A GESTÃO DA TERRA NO BAIXO-MÉDIO SÃO FRANCISCO

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Abstract

The Itaparica region located between Pernambuco and Bahia had got part of his territory flooded due to the construction of the reservoir of the Luiz Gonzaga Hydroeletric, built in 1988. About 10,500 families were transferred to resettlement areas as result of the reservoir construction. More than 21,000 people lived in urban areas and more than 19,000 in rural areas. The resettlement were used construct new cities and areas with irrigated settlements and small villages (*agrovilas*). The resettlements of Apolônio Sales, Icó-Mandantes and Barreiras Bl2 are the oldest in the Petrolândia Municipality, only the first present different infrastructure. This research aims to discuss the challenges in land management of the irrigated schemes of Chesf in Petrolândia after the Itaparica reservoir construction. Field works, including interviews and workshops using the Constellation Analysis methodology was used as tool in the elaboration of this study. Currently the *agrovilas* are with an outdated water supply and treatment system most likely causing health issues for the resettled people. The *agrovila* area presents a disorderly urban increase, normally caused because of immigrants who came to the irrigated scheme to work in the farming or to invest in the agriculture. They also expand new irrigated schemes through inappropriate areas, leaving residential garbage in the native vegetation and using water uncontrolled, causing reduction in the water supply. The debate over the water and land access and the effective action of the public power together with the producers are urgent to solve the existing problems in the resettlements.

Key-words: Environmental Conflicts; Irrigated Settlements; Semi-arid

Resumo

A região de Itaparica, situada na porção pernambucana do Submédio São Francisco sofreu inundação de parte do seu território para servir como reservatório da barragem de Itaparica, em função da instalação da Usina Hidrelétrica (UHE) Luiz Gonzaga, inaugurada em 1988. A formação do reservatório repercutiu na transferência de aproximadamente 10.500 famílias para reassentamentos, mais de 21 mil pessoas moravam nas áreas urbanas e mais de 19 mil habitavam nas áreas rurais. A construção da barragem proporcionou a instalação de novas cidades e assentamentos irrigados constituídos por lotes e agrovilas. Os assentamentos de Apolônio Sales, Barreiras Bl2 e Icó-Mandantes são os mais antigos do município de Petrolândia. O primeiro é o único com diferente estrutura. A pesquisa objetiva apresentar os desafios na gestão dos perímetros irrigados da CHESF em Petrolândia após a construção da barragem de Itaparica. Para elaboração deste estudo foram realizados trabalhos de campo na área, incluindo entrevistas e oficinas utilizando a metodologia de Análise de Constelação. Atualmente as agrovilas encontram-se com um defasado sistema de abastecimento e tratamento de água provavelmente provocando problemas de saúde na população. Com o crescimento das famílias e a imigração houve um aumento desordenado dos núcleos urbanos, localizados nos assentamentos. Isto proporcionou um uso descontrolado da água, a expansão irregular nas áreas de vegetação nativa, o descarte descomprometido de lixo residencial, além da expansão de áreas agrícolas sobre as áreas de sequeiro, provocando a redução no tempo de distribuição da água no assentamento. O debate acerca o acesso à água e a terra e a ação conjunta dos órgãos públicos e dos produtores são urgentes para solucionar os problemas vigentes nos assentamentos.

Palavras-chaves: Conflitos Ambientais; Assentamentos Irrigados; Semiárido

1 Introduction

During the 1980 decade the Itaparica Dam was constructed in the region of Itaparica – Northeast Brazil in order to produce electricity through Luiz Gonzaga Hydropower station aiming to increase electricity distribution for the whole Northeast. This was a governmental measure to attract industries and to contribute with the irrigated farming. The Itaparica region is located at the semi-arid and at the middle-low São Francisco River Basin, between the state of Bahia and Pernambuco. Periodically this region faces a dramatic drought period, which increases the challenge of living in a semi-arid environment (ANDRADE, 1984).

The Companhia Hidroelétrica do São Francisco[1] (Chesf), a governmental institution, conducted the construction of the dam. During this process, two cities and eight municipalities were flooded including urban and rural areas, which represent about 83.400 ha in Bahia and Pernambuco (BRASIL, 2010).

Around 50.000 people lost their houses because of the flooding. In addition, a vast amount of those people lived at the margin of the São Francisco River as a small-scale producer

[1] In English we can translate literally as São Francisco Hydropower Company.

in the agriculture and in the livestock sector. They were transferred to new settlements with irrigation system, which was built to mitigate the impact of the forced moving. Moreover, two new cities were constructed in Pernambuco, Petrolândia and Itacuruba with draining system[2] in the whole area, schools, health center, water supply etc. (SCOTT, 2009).

Currently, after 30 years the settlements present several problems for land management. Furthermore, the infrastructure obsolescence and the population growth of the settlements is the major challenge faced by the government. For almost three decades, there have been no plans and interventions to deal with those problems. The region shows low rate of economic growth, such as GDP and low rate of HDI (DOMINGUES, 2009).

This research aims to present the first results of studies about land use in the municipality of Petrolandia. As a matter of fact, the study emphasize on the issue of the land and water access. The field works were done mainly on the settlements of Icó-Mandantes, Barreiras Bl2 and Apolônio Sales in the Petrolândia Municipality on the Pernambuco's side.

2 Methods

This research is part of the INNOVATE Project (Interplay among multiple uses of water reservoirs via innovative coupling of substance cycles in aquatic and terrestrial ecosystems). The project concerns a scientific cooperation between Brazilians and Germans universities and institutions aiming to draw an innovative coupling of substance cycles, evaluated on macro, medium and local scale and embedded in societal structures. For this article, it will be focused on the approach of the use and occupation of the land, especially the access to land and water (INNOVATE PROJECT, 2014).

The INNOVATE project develops an interdisciplinary method involving several researchers and Ph.D candidates from Brazil and Germany universities aiming the work together to visit the field work and sharing information. The area was chosen because of the environmental issues and the under average low economic growing tax. The research is committed to studying alternatives for sustainable management of the natural resource and to overcome poverty. The project is divided into seven subprojects with a specific theme, such as SP1. Aquatic Ecosystem Functions; SP2. Terrestrial Ecosystem Functions; SP3. Green Liver; SP4. Biodiversity; SP5. Modeling; SP6. Socio economy; SP7. Decision Support Approach (INNOVATE PROJECT, 2014).

[2] In the last city it has not draining system for the whole population.

The first steps for this article were based on literature concerning the history of the environmental conflict in Petrolândia, mainly about the water and land access. The empirical material was achieved through some recurrent observation *in loco* by interviewing the farmers, the agricultural-technical-support staff, managers from Chesf, and other institutions, such as Companhia de Desenvolvimento do Vale do São Francisco e Parnaiba (Codevasf), Plantec, the Labor Union of Petrolândia, the Town Hall of Petrolândia and its specific departments.

During the field works together with the group of the SP7, we applied the Constellation Analysis. This is a method with the specific view to answer such questions: how is the relation between the farmers and water and land? And do the farmers have enough access to water and land to produce theirs crops? It were organized three workshops, two were done in Petrolândia Municipality, one of them in the resettlement of Icó-Mandantes with farmers, the other one in the City Hall with local institutions, both were divided into five groups with two SP7 representative. The third workshop were done in Recife with institution of federal level, with the same model as in Petrolândia. Each group was responsible to debate different theme, such as water use, land use and São Francisco River Basin governance. After the workshops the group of SP7 discussed about the results and summarized it in some reports for INNOVATE Project.

This article presents the first results after the work fields, group discussion and conferences presentation. Moreover, the SP7 group has organized some meetings to learn the Constellation Analysis method and to debate the findings from the workshops and interviews. The SP7 represents the group who works with a *Decision Support Approach* (DSA), which is responsible for studying alternatives for supporting economic and environmental management decisions (INNOVATE PROJECT, 2014).

3 Discussion

This section aims to address the concept of political ecology and to comprehend how this approach contributes to understanding the roots of issues on the land use in the irrigated scheme of Petrolândia. The origins of political ecology is the interface between natural, social and political sciences. During the 1980s the concept was spread worldwide by the major influence of the American and British researchers (KRINGS, 2013).

According to Bryant and Bailey (2000) the term political ecology was given firstly in the 1970s, but during the 1980s and 1990 the area established deep roots for supporting the current

researches in the field of nature society relations, especially in environmental matters in the underdeveloped countries.

The political ecology arises in the context about the environmental debate as a new research field. The area filled the gap in the environmental research because it develops an analytical approach integrating environmental and political understanding (BRYANT; BAILEY, 2000).

The aim of this research field is to develop a critical approach to understand what the problems on the environmental change are. Whereas experts make efforts to think strictly on alternatives to overcome the problems of the inefficient management and excessive exploration of the natural resource (ROBBINS, 2004).

The political ecology comprises various theses in order to study environmental issues, this article emphasizes the context of the conflicts to access the natural resources. The main question in this topic is to understand who has the access to the resources and why they got those advantages over others who have the same right. Thus, it is studied gender, social and racial unequal. Usually the environmental conflicts are related to scarcity of products from governmental or private field (ROBBINS, 2004).

Environmental conflicts are those related to the access or control of the natural resource and the territory. The agents of those processes face different interests and values because of the great power asymmetry. Those conflicts present different conceptions about territory, nature and environment (SVAMPA, 2013).

The construction of megaprojects likely represents the cause of environmental conflicts. The territory is rebuilt and people have to pay taxes. The native or the local people still being excluded, and the society will be divided (SVAMPA, 2013).

According to Acselrald (2010) the environmental conflicts occur when the legitimacy of some kind of space domain is challenged due to the statement of existence of overlapping unwanted practices. The occurrences of such practices interact with the space over others, who are normally older.

In Brazil there are several examples to explain how the environmental conflicts are established. The government usually construct great project or infrastructure, as hydropower station, reservoir, roads, electricity stations and so on, where poor communities live such as indigenous, *quilombolas* (slave descendants) or low-income people.

According to Harvey (2005), the exploration of natural space which impacts directly in the production of small-scale producer or of the whole community is called as accumulation by dispossession. This concept concerns groups or class of people who are underprivileged and have lost their resources in order to empower the capitalist development. Brazil has invested for many years in that kind of economic process, more quickly because of the involvement in the globalization (ACSELRALD, 2010).

In the later years of the 20th Century the world viewed the rapid growing of megaproject, which aims to increase the control over the natural resources. For example, the extraction and export of raw material from Latin America. However without increasing the value of the product (SVAMPA, 2013).

For this research we have used the Constellation Analysis methods in order to visualize a scenario where the problems are. This approach can be used together with the studies in the political ecology field, because it is a tool for supporting and improving the findings about environmental conflicts.

The constellation analysis was created in the Technical University of Berlin in the 1980s and has the goal to give base for natural/social research in order to support studies about environmental assessment/management and to understand better the nature and society relations.

Constellation Analysis is a comprehensive approach, which aims to identify possible changes by the planning and governance structures. Inter-disciplinary processes are used in order to optimize the methods to achieve the findings. In addition, this concept involves the governance sectors, stakeholders, the most important influences and instruments, and environmental elements. The elements and their relationships are visualized in order to support interdisciplinary or transdisciplinary discussions processes. In this way, the study goes beyond a snapshot of the existing situation, and introduces dynamic relationships (i.e. coalitions and exclusions) enabling the development of scenarios for change (SCHÖN et al. 2007, BRUNS et al. 2011).

The research process of the Constellation Analysis pursues a central question of the land management constellation. This may include political, environmental, or strategic actions taken at different levels. It is used relevant elements such as actors, natural and technical elements, systems. They are found of the basic constellation, which will be defined through document analyses and key person interviews (SCHÖN et al. 2007, BRUNS et al. 2011).

All constellation elements are analyzed equally, as well as the perceptions of involved experts. The multiple perceptions of the constellation elements are a result of the core elements, which influence the performance of the constellation. The actors are single persons or groups of actors, institutions, i.e. Chesf, Codevasf, farmer; the natural elements are biotic and abiotic components of the environment; The technical elements are all relevant artefacts e.g. irrigation techniques; The systems are policies, strategies, goals, legislation, e.g. soil monitoring program, environmental licensing, irrigation projects.

In an iterative inter- and transdisciplinary visualization process the driving elements are mapped in the center of the constellation (visualization, text). Then, the respective functioning and characteristics of the constellation are explored, as well as the underpinning dynamics which seem to drive the constellation. Existing or necessary advocacy coalitions (SABATIER; JENKINS-SMITH, 1993) is identified and relevant policy levels for solutions addressed.

4 Petrolândias Issues Due to Itaparicas Reservoir Construction

The construction of the Itaparica reservoir resulted on the forced transference of thousands of families to resettlements. Over 21.000 people lived in urban areas and over 19.000 lived in rural places, including 200 families of the indigenous group Tuxá (BRASIL, 2010).

The investment allocated to compensate the impact of the transference was the biggest budget for resettled lives' reconstruction worldwide (SCOTT, 2009). In Pernambuco it was constructed several resettlements and two cities Petrolândia and Itacuruba. Both found at the *Região de Desenvolvimento Sertão de Itaparica* (Map. 1) (PERNAMBUCO, 2010).

Petrolândia Municipality comprises approximately an area of 1.056,590 km². The new city was planned, that means they have enough space for a hospital, schools, parks, sanitation and other basic services. Normally most of the cities in Brazil have been constructed without a city plan. Its population in 2010 was around 32.492 inhabitants, in which 69,92% lived in an urban areas. The urbanization rate is higher than the entire region, Petrolândia presents 73% and the region 57% (PERNAMBUCO, 2008).

Map 1. Petrolândia Municipality Localization

Source: CONDEPE-FIDEM Agency (2010) and IBGE (2010).
Elaborated by Guilherme Araújo

Three resettlements were constructed as irrigated scheme, in Petrolândia such as Apolônio Sales, Icó-Mandantes and Barreiras Bl2, where the resettled could still producing their crop. In each resettlement there are *agrovilas*[3], but only Apolônio Sales has no agrovila, the resettled from this area came from other older Irrigated Scheme - Projeto Barreiras, consequently they received other agreement (SILVA et al., 2007). Differently from the others, in Apolônio Sales the farmers cultivate in the same place where they live. Some producers were able to construct a small agroindustry in order to bottle their own coconut water and sell it in the local market.

The irrigated schemes were constructed around the Itaparica's reservoir, because of the irrigation system. Every resettlement comprise by lot and *agrovilas*. Furthermore, consist of a legal reserve[4] and *sequeiro*[5] areas. The *agrovilas* are urban places where 50 houses were built in the 1980s; currently there are over 150 ones because of the population growth. It has schools, a health center, roads, water and electric energy supply (GUNKEL; SOBRAL, 2007). The water supply is managed by Chesf and the population do not have to pay any tax for this support.

[3] Small village for the resettled people.
[4] Specific land guaranteed by the law for protecting the native vegetation
[5] This is an area where is forbiden the use of the irrigation. *Sequeiro* is related a dryland

At the beginning of the resettlements constructions every resettled member received a subsidy called *Verba de Manutenção Temporária*[6] (VMT), while the irrigation system was not installed. This subsidy was given to help with the farmer's livelihood for just six months. However, the irrigation system took over eight years to be ready and some of the lots are so far without the system, because some areas are not environmentally prepared for irrigation. They have soil with concentrated portion of nutrients, which in addition with large proportion of water can become salinized (GUNKEL; SOBRAL, 2007).

Codevasf conducts the agricultural support in the irrigated scheme, guaranteed by an agreement signed by Chesf and Codevasf. The agreement works just for a period and then it is necessary to be approved again if both sides agree on the terms (BRASIL, 2010).

5 Implication for land use on Irrigated Schemes

In the Municipality of Petrolândia, Chesf established three irrigated scheme, although there were various soils studies developed, some farmers were transferred for places not suitable for irrigation. This measure brought several problems for many producers, who for 28 years have been dependent on the VMT. They never had the opportunity to produce like the other farmers.

Since the beginning of the resettlements until 2015 Chesf faced challenges to compensate the forced transference suffered by the small-scale producer. Currently this responsibility was transferred to Codevasf, by the end of the *Termo de Cooperação*[7] signed in 2007 by both institutions. Chesf has spent approximately 89,46 million dollars to support the irrigated scheme. In 2013 was made a new investment of 41,09 million dollars. This amount is required to be used for VMT payment, for hiring technical assistance support, for the cost with water supply and to solve problems with land ownership.

The three irrigated schemes produce a vast number of fruits and other crops. The most important product is coconut, watermelon and banana. Those products are sold in the region and into the global market. Moreover, the land presents several management problems as well, such as waste of water and water supply deficiency, random waste disposal, barriers to sell the production, environmental impacts, loss of land and overcrowded *agrovilas*. Those problems are often in all resettlements and are the reason for the farmers' low income, some of them have to sell their land in order to overcome this situation.

[6] The translation into english is Temporary Maintenance Budget
[7] Cooperation agreement

According to Svampa (2013), agricultural areas from Latin America countries has been explored to supply markets placed in big cities, also in developed countries. It is used the raw material by low price, industrialized and sold it with high price. The exploration process results in environment degradation and dispossession for small-scale farmers.

5.1 Overpopulation in the agrovilas and water issues

In the irrigated scheme of Icó-Mandantes (figure 01) the coconut and the watermelon are the most produced crops. Its area is approximately 22.881ha with 16 *agrovilas*, which have enlarged due to population growth. Those urban areas have enlarged three time more, currently it is found there approximately 150 house, while it were built to accommodate only 50 house. This change resulted in various social problems, such as crime, alcoholism and reduction of the water supply. Currently the population is suffering with the lack of the infrastructure to support this growth.

In every *agrovila* it can be found new houses built outside of the official area. Usually the new habitant are relative from the resettled people, who came from another city because of the opportunity to work on the farming. There are case, a son or a daughter got married and built a *puxadinho*[8]. That means they have just constructed a new house beside or in the backward of their family house. The new construction uses the same amount of water and electric energy as the main house. It is common to find someone, who receives water illegally. They install equipment to obtain water without formal registration, even though this is not a drinking water. Those problems contribute to the water supply reduction in the entire *agrovila* and sometimes to some health problems. This issue has been increasing mainly because of the project of *Transposição do Rio São Franscisco*, currently there are many workers from other cities arriving in the *agrovilas* because of the job in this project.

Water is natural element in the Constellation Analyse, during workshop in Petrolândia and Recife this element were connected with the majority other element (natural, symbol, technical and actors) due to its importance to people survivor and economic growth. The problem about water access were a guiding theme in all groups. Both for land use and for river basin governance this issue is relevant in the region, because the use of land is justified if there

[8] A kind of house constructed in the garden of other house, usually in the family house. The term is more related a sort of expansion of the main house.

are enough water for crops cultivation and the governance works mainly in the way to offer a fair water distribution.

According to some interviewees, the demographic growth and the old infrastructure for water supply caused a critical water reduction for every resettled. Currently the *agrovilas* receive water for just 4 hours per a day, which is not enough to achieve 1000 liter for each house, as was established in the agreement.

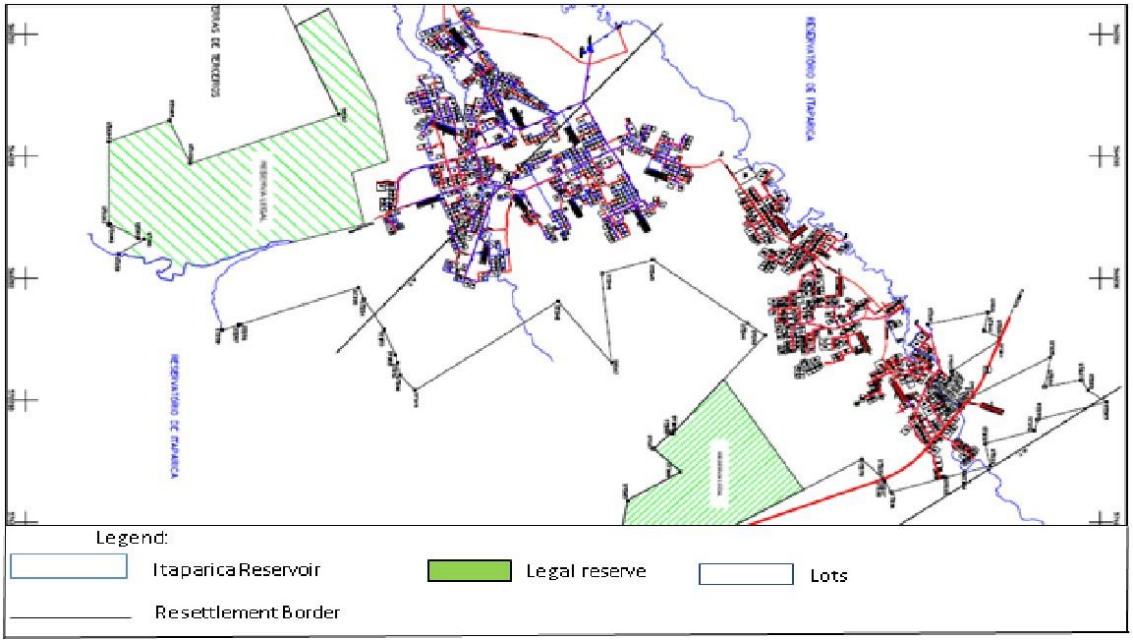
In Apolônio Sales there are an illegal urban area, which was built by the workers and family from the resettled. They have invaded an area without the permission of Chesf. They capture water and electric energy, which increase Chesf cost to maintain the resettlement. In the area there are small store and bars to supply the basic needs.

The population has faced also the lack of basic infrastructure concerning water treatment and storage. There is just someone responsible for the *agrovilas*-water-treatment-stations and has no training to develop this job. The resettled claim that sometimes it is applied an excessive amount of chlorine, which is harmful for residential purpose. There are *agrovilas* which are in worse condition, where there are no staff for water treating. The maintenance has not been done and the result is total dirt, rust, etc.

Concerning the water safety, an interviewee claimed, that there is an abandonment of the water-supply-treatment station. In this area dead animals was found in the residential water. Some people had disease such as intestine infection and others due to the lack of water treatment. However, no water quality exam have been done to assure where those problems really come from.

The farmers have been facing problems with other resettled, who have bought extra land in order to increase the production area. Each resettled member received 8ha for irrigated production in Apolônio Sales, in Icó-Mandantes and Barreiras Bl2 3ha or 6ha and another area for *sequeiro* crops for all resettled. The *sequeiro* area has different measure for each resettled, related the individual's agreement made before the transference. With the purchase of extra area, usually *sequeiro*, those farmers have to use more water to irrigate those new areas. An interviewee claimed, that there are many resettled expanding their production area through *sequeiro*, e.g there is one, who has expanded for about 60 ha to produce onion.

Figure 01. Irrigated Scheme Icó-Mandantes.



Source: CHESF library. July, 1996.

Currently not only resettled has production area in the resettlement. Many investors are buying land there, because of the cost free of water supply. In many cases those farmers also buy the *sequeiro* area from the resettled. The problem are for the producer, who has his land at the end of the irrigation system. They always suffer with the lack of water, because they cannot obtain enough for their crops, due to the water overuse of the farmers placed before.

Besides, it is found the water waste issue. Due to the water supply gratuity, many farmers uses a large proportion of water without control. They usually use the sprinkler irrigation system, which is not recommended because of the environmental impacts. The water overuse contribute to the soil salinization, and further their infertility.

In order to avoid the water overuse in Apolônio Sales, Chesf started a measure to simulate the controlling of use by evaluating each farmer's uses monthly by a water meter. Every month since 2013 the farmers have received bills with the total use in a month and how much they would pay, if it were not a simulation.

In addition, Chesf stats that in the future the water in Apolônio Sales is going to be paid. This measure had an important impact for several resettled farmers, who have suddenly stopped wasting water.

The resettlements of Petrolândia comprise a *locus* of reproduction of environmental conflicts, according Robbins theses of political ecology, the access to the natural resource can be addressed as the major problem for farmer economic growth and even their survivor. Those areas in semi-arid regions are spaces for spreading of the capital through national and international agents. The government supports the scarcity of the resources, when this public agent do not create measure to reduce the unequal distribution or to control this relation inside these public resettlements.

5.2 Waste disposal

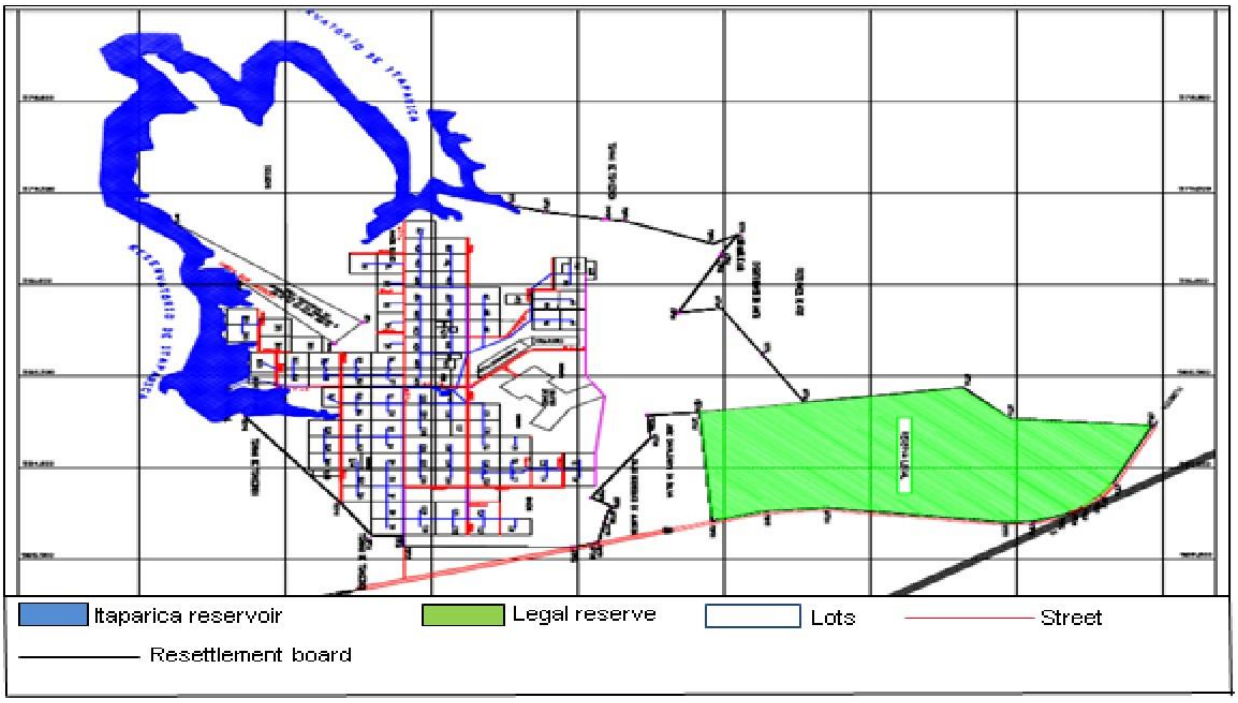
The uncontrolled waste disposal is a huge problem in every irrigated scheme. It was found several places with many kinds of waste, such as residential, agricultural and industrial, which were randomly disposed around the resettlement. Although there is in Petrolândia Municipality a landfill area, the resettlement's habitants are used to throwing the waste in the native vegetation or somewhere on the streets.

During a work field in Barreiras Bl2 the interviewee presented a specific place where people and also the local government dispose randomly a large proportion of waste in the legal reserve. It was found packages of pesticide and various residential garbage. He claims that by the rainy days, this place is quickly flooded and the water runs into the reservoir with the pollution. The problem increase because this part of the reservoir is where the water is taken to supply the city.

5.3 Value-Chain Issues

The irrigated scheme of Apolônio Sales has 3.506,23ha (figure 02) and is the most profitable of all the resettlements in Petrolândia. Although it is produced banana, watermelon, onion and other varieties of fruit to be sold on the local and national market, the main produce is coconut water for export to USA and Europe (Figure 03). Every day is collected around 33 thousand coconut to transport the coconut water to Ceará to the Paraipaba Agroindustry. The first process is done in the branch of Paraipada Agroindustry in Apolônio Sales. In Ceará the coconut water is industrialized with flavors, such as pineapple, orange and peach with mango and afterwards it is exported.

Figure 02. Irrigated Scheme Apolônio Sales.



Source: CHESF library. July, 1996.

In Apolônio Sales most of the farmers have signed an agreement with the Paraipaba Agroindustry, which assures that the product will be sold into the global market. After the Agroindustry bottles the coconut water, it is sold to Vitacoco Company, which sells the product into the United States and Europe with other flavors (figure 3). In Europe the coconut water from Apolônio Sales is mostly found in expensive supermarkets. Although, there are various Asian market, which sells coconut water especially from Thailand at cheap price, the coconut water from Petrolândia was not found in those stores. It was found only into the an exclusive by high end supermarkets, such as Galeria Kaufhof München (Figure 03) and Feinkost Käfer, being both supermarkets in Germany. Those supermarkets are recognized because of the high price and the products with refined flavors.

There are also some producers, who are independent of the Agroindustry, because they have their own small factory, where it is possible to bottle the coconut water. The producer sell the bottled coconut water on the local market, around Petrolândia.

Figure 03. Coconut water from Apolônio Sales in Munich - Germany.

Foto of Guilherme Araújo. November, 2014.

In Icó-Mandantes and Barreiras Bl2 the coconut water is also the main product, but it has a different destination. Usually it is sold on local or national market. The negotiation is always conducted through the intermediary and the farmers still dependent for their decision. An interviewee claimed that the intermediary network is very organized and they do not create opportunity for concurrence among themselves, in order to have in control the established price. Under control some producer, said that the intermediaries steal production while they are collecting the coconut water on the farm. The price is always established by the intermediary and can be changed every time, for example, in 2011 the price was R$ 0,60 per coconut and in the following year the price reduced to R$ 0,25.

The coconut water produced in Petrolândia is example, which depicts the Svampas thought about the results of environmental conflicts. The value of coconut from the resettlements and their price for the final consumer, usually located in Europa or USA, address the idea. Areas as Petrolândias resettlements comprise a territory which supply developed countries by low cost, while the real price of the products, which include, the extraction and the industrialization process is paid by local people from the producer places, through labor force, extraction low cost and the weakness of the law.

5.4 Infrastructure and Technical Assistance Issues

The VMT is one of the biggest challenge in the resettlement management. In Apolônio Sales the farmers do not receive this subsidy, because in the 1990s they got installed the irrigated system. However, in Icó-Mandantes and Barreiras Bl2 there are several families, which still being dependents of this governmental subside, because they live in a land, whose the soil is not able for irrigation.

A new issue for the producers is the lack of irrigation system maintenance. There are case, which the waste rest retains the water, which should reach the farmers. The resettled claimed that Hidrosondas, which works for Codevasf, has not been doing the periodic maintenance.

Several farmers complained about the lack of support in the farming production. Currently Plena Consultoria is responsible for farming support, but they work with a few number of technicians, which is not enough to achieve all resettlements. To compensate this problem, the resettled people have been receiving the support from private company, such as store where the pesticide is sold. They buy the product and receive a technical support from the staff who works also for the company. In 10 years those kind of company have grown from 4 stores to 13, only in Icó-Mandantes there are 3 and in the city of Petrolandia there are 10 stores.

The lack of technical services and access to infrastructure depicts one way to control the natural resource and assure the environmental conflicts, according the approach of political ecology. The agents who have more possibilities to buy equipment and to contract technical support, will develop more power between other agents, creating a power asymmetry and have more decision influence on the territory.

5.5 Conflicts to Access the Land in the Resettlements of Petrolândia

To achieve the results of these topics a constellation was elaborated during the workshop in Icó-Mandantes and in Petrolândia City Hall, various farmers were interviewed as is explained in the methods. Each resettled contributed for shaping the constellation by debate and opinions about the local governance etc. The finding of this section should be used in order to support the local government to deal with the land and environmental conflicts, such as the ones presented before and to understand how works the relationship between governmental sectors concerning the management of the resettlements.

The constellation analysis is a tool to address problems in the local environment and to understand how it begin. To study environmental conflicts it is crucial to structure how diverse elements play their role contributing with this issue. Conflicts emerges from an inefficient or a lack of relationship between the elements analyzed on the constellations. In Petrolândia most of the problems is related on the elements: actors and nature, usually the absence of the public agents promote a scenario of unequal use of natural goods e.g. the public land market and the illegal water pick up.

According to the constellation analysis the main problem for managing all resettlements in Petrolândia is a result of the lack of communication between the stakeholders, such as Chesf, Codevasf, Petrolândia Major, Hidrosondas, Labor Union, producers, NGO, institutions, social movement etc.

The biggest issue for the all farmers, mostly in Icó-Mandantes and Barreiras Bl2, is the institutions failure to follow the responsibilities, such as irrigation system maintenance and technical agricultural support, currently the Plena Consultoria is responsible for the irrigation system and the technical support.

The lack of market assistance is also a huge problem. The resettled are not organized in associations or cooperatives, which increase the difficulties to reach the market by themselves. The presence of Sebrae courses could be a solution in order to give instructions in the way for dealing with market. With this scenario, they remains dependent on the intermediary without perspective to overcome this relation to be independent or to have more opportunity to bargain price etc.

Other institutions, such as the governmental Agency for the Water and Climate (CPRH), Brazilian Institute for Environment (Ibama), Environmental Department of the Major of Petrolândia, NGO for environmental issues, Pernambuco Technology Institute (ITEP) etc. do not communicate with each other to finding solution against issues related the use of the natural resources. The lack of this relationship and the effective inspection contribute to the growth of environmental impacts and the unequal control.

The construction of the Hydroelectric Plan of Luiz Gonzaga currently represents a support to promote environmental conflicts in the resettlements of Petrolândia. The territory of the region were rebuilt as result of the megaproject of the hydroelectric. So new agents has been growing and controlling natural resource, specially water and land. This scenario address an

asymmetry on the income achievement and relation between actors, natural resources access. In this way local people has been excluded of the benefits of the Luiz Gonzaga Plant.

6 Conclusions

The construction of the Itaparica's Dam resulted in various impacts for local land management in the region of Itaparica. Before the forced transference the farmers developed a small production such as fruits, vegetables and livestock at the margins of the São Francisco river. After they were transferred to resettlements, the production methods was drastically changed to monoculture and they started to face many environmental problems, such as water and land access.

Those issues provoked land exclusion and contributed to increase the dependence of the resettled people on the government subsidy and on the intermediary in order to get the crops sold. The resettlements are as an Oasis in the semi-arid context, because of the cost-free water, the opportunity to have technical assistance support financed by Codevasf and many stores where a lot of pesticide can be found, including agricultural assistance. With this scenario the *agrovilas* became attractive for new people interested to work on the crops and also for news investors, who wants to develop new productions.

Those findings contributed to understand that the new changes in the resettlements resulted in several impacts, for instance water supply, land degradation, uncontrolled waste disposal, vegetation degradation etc., which during the drought period become higher and accelerate the environmental and social impacts in the irrigated scheme.

Currently the main problem in the resettlements is the lack of communication and work together by the most of governmental and private company responsible for resettlement management in Petrolândia. Chesf and Codevasf play the most important role associated with Majors departments and other regional and national institution such as IBAMA, CPRH etc. The disorganization between those institutions results in many environmental and social impacts, such as land salinization, lack of irrigation system maintenance, water pollution etc.

The articulation between institutions (governmental and private) and the farmers, represented as institutions, associations, Labor Union, NGOs etc. are very important for changing the present condition, which was presented in this article. It is necessary to implement environmental education to deal with uncontrolled waste disposal. In order to overcome the issues of the market, the producer have to receive technical assistance by institution, such as

Sebrae. Those measures should be important for dealing the current scenario found in the irrigated scheme of Petrolândia 30 years after the Dam's construction.

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