DIFFERENCES AND SIMILARITIES IN IMPACTS OF HYDROELETRIC DAMS BETWEEN NORTH AND SOUTH OF BRAZIL

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Since the second half of the twentieth century, the Brazilian government decided to steer the energy policy for the production of hydroelectricity, using as main argument the exceptional potential of the country in terms of water resources. With technical choices and important investments, Brazil has built hydroelectric plants/dams throughout its territory, favoring some specific areas (Southeast, Northeast and South), where the potential was higher. For decades, the country has experienced more or less intense phases of dams constructions, according to the national and international economic contexts. Nowadays, Brazil is at an intense construction stage. The construction of hydroelectric power plants (HPP) always entails a number of consequences, both positive and negative, besides covering a broad spectrum of society sectors: political, environmental, economic, planning, and social. In this article, we focus on the latter - the effects that the establishment of a hydroelectric plant causes on the people and their spaces, having as comparative point the experiences that occurred in the North and South of Brazil. What differences and similarities can be found in these regions? The social and spatial aspects involved in the dams impacts are considerable, which is why we will cover rural communities, looking at how they are destroyed, and sometimes, rebuilt.

This article is an idea, an attempt of comparison, an exercise to be able to examine more thoroughly the spaces and thus evaluate the effects of dams. The idea of comparison is to control if generalizations are valid (28) ie, to verify or infer ideas, theories, and events between the South and the North. Comparisons are used to detail the entities, to provide data for explanatory theory (17). As explained by Sartori (28), "the compared survey does not have mathematical rigor, but allow identifying "trends laws"". The examples we cite reinforce and complement each other. The case studies are the cornerstones of the construction of theories and our comparison attempt may help to think of the spatial and social effects of dams.

Our comparison is based on two different studies. The first, accomplished between 2006 and 2010 in southern Brazil in a doctoral research, was made up of three periods of field, six months each, around the river Uruguay. More than 150 questionnaires were completed, covering a little less than 580 people affected by two dams (Foz do Chapecó

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and Machadinho). Questionnaires, several interviews, literature reviews and field observations contributed to the analysis of the region. The second survey is more recent, it was done in 2014 and 2015 and takes place in the region of Altamira, where the Belo Monte dam is built. Nearly 800 questionnaires were applied in the urban area of Altamira; from this amount, almost 300 were to the populations and migrants directly affected, and 400 questionnaires in the rural area near Altamira, also influenced by the construction work. In addition to the socioeconomic and demographic questionnaires, several interviews were conducted, observations periods of the field and the areas directly affected by the dam.

From the research conducted in the South and after the first analyzes of the North research, we can establish a comparative exercise between the two contexts. The south of the country, which will support this research, is represented by the Uruguay River, located on the border between the states of Santa Catarina (SC) and Rio Grande do Sul (RS). The region is composed of a heterogeneous population, divided between original families, living for hundreds of years in the region (caboclos and indigenous), and families resulting from European colonization from the late nineteenth century. In the North, the Belo Monte dam, located in the city of Altamira (Pará) is the greatest civil construction of the country. Several families will be affected by the construction of Belo Monte, as the power plant will reach both the rural area of the Xingu river and its indigenous communities, riverine and fishermen, the populations of Transamazonian and gatherers, as well as the urban area of Altamira, regional center, where there are fewer than 100,000 people (13).

The distribution of the population along the river and its local characteristics will also be addressed, something fundamental to analyze the spatial impacts of dams, as well as the issue of compensation received by the families affected, and how from them, it may change - or not - their living conditions. We will analyze the issue of mobility, an important topic in the dam construction because it implies a forced migration. At the end, we will discuss the family living space itself, ie, the landscape in which they are and will be installed.

To talk about these various topics, the article is divided into two parts. At first, we will discuss the differences in socio-spatial impacts between the North and South of the country, mainly about the organizations of families, social struggles and the resettlement of people that are affected by the construction of the dam. In the second part, we will evaluate the similarities between the two studied areas, with emphasis on aspects related to migration, mobility and landscapes.

I - Differences from impacts in the South and North

Differences in spatial organizations

The population study of a space is made up from the analysis of the distribution and organization of families. In both verified areas, north and south of Brazil, the main distribution of the population is linear along a river. Thus, at any location, the first families impacted by the major construction are those who live on the banks of rivers. Both in the South and in the North, the riverine families are connected with the natural elements,

whether by natural resource (water, fish), whether the physical structure of the landscape (leisure, beauty). However, beyond the linear aspect, other spatial structuring elements of the families will also differentiate the two regions.

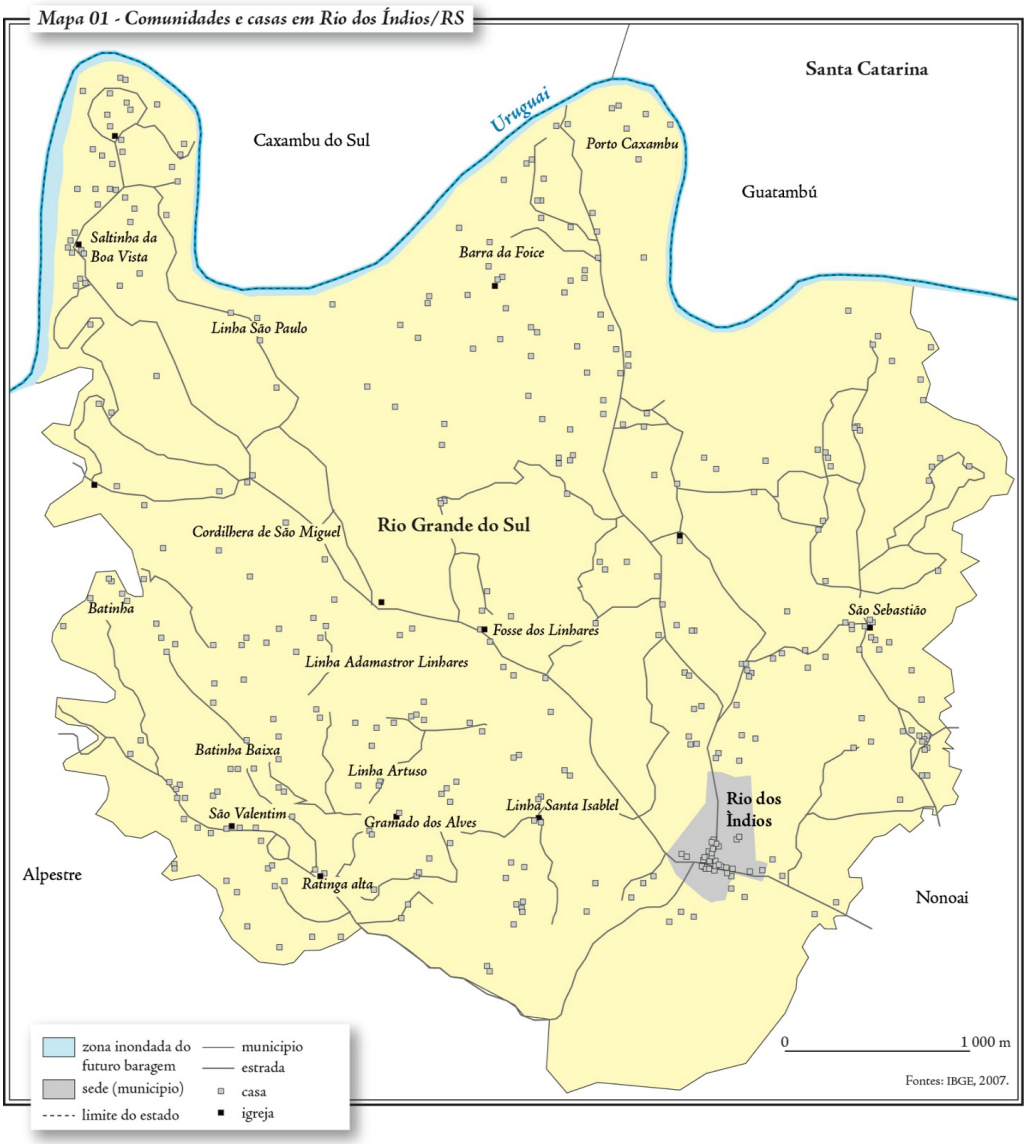
To understand the relationship of the families affected by the dam in the South with its territory, we will cover two essential characteristics: the temporality of the families and the social and territorial construction. On the Uruguay River, we find settlement marks made about 10,000 years ago, according to archaeological research that describe the populations so as "hunter-gatherer groups" (24). The river was the main source of livelihood of the indigenous groups that occupied the region, especially the Tupi-Guarani and Kaingang (25). In terms of new installations of large populations, this occured only in the early twentieth century (2). The extreme regions (west of SC and northwestern RS) were the last to be occupied by European colonization, which defined the population of the two states. The European newcomers on the banks of the Uruguay River were called "pathfinders", demonstrating how the region was isolated and uncrowded. The population was concentrated along the river, not only for timber exploitation from the banks, but also to be able to move toward Argentina. The occupation of the interior of the region happened later, thus constituting in regional urban centers (Erechim-RS and Chapecó-SC), which were born and developed throughout the twentieth century.

In the research conducted in 2007 with the populations affected by the hydroeletric power plant of Foz do Chapecó (16), we see an important phenomenon of the population rooting with their living space, ie, the residence space with the places which they are related. Sixty five affected families were interviewed in six municipalities in the surroundings of Foz do Chapecó HPP (in Rio Grande do Sul and Santa Catarina States). The installation of 30 of the families interviewed happened in the period between 1960 and 1979. Regarding the 65 householders, half were born in the same city of residence and the other half was born in neighboring municipalities, with a maximum distance of 100 kilometers. Regarding the migrations, there were 24 families who never left the city where they lived. The residence time of the families indicates the importance of the relationship between them and the places involvement, and the attachment between the individual and its place gets reinforced with the frequency and time.

In terms of socio-territorial construction, the European descent rural populations (mainly Germans and Italians) have organized themselves around the church in the form of community-collectivities, as described by Henri Mendras: "The peasant societies (...) are organized into collectivities, small and relatively autonomous, installed on a territory they exploit" (18). Thus, in the municipalities established along the river Uruguay, we find communities centered around a church, at the same time that they have dirt roads and the river as transport routes. In the Map 1, we visualize the population distribution in the municipality of Rio dos Indios (RS), highlighting two communities near the Uruguay river, Caxambu Port in north-central, and Saltinho da Boa Vista in the northwest. These are families structures near the river that end up creating the family connections and interrelationships in the neighborhood.

The population set of the region was configured after the course of hundreds of years and thorugh the formation of organized groups. The moment of installation of a

hydroelectric power plant causes situations of changes in families that have complex interrelationships and a long relationship with the place of life.



On the other hand, in the north, in the region of Altamira, Lower Xingu, the spatial distribution of the population is different, for having a history and spatial organization differentiated of the rest of the country. The original populations were in villages or were nomadic, but today, indigenous people represent a reduced portion compared to that found in the Amazon at the time of contact with Europeans. The mortality of up to 90% reduced the number of indigenous in the Amazon. They were the majority until the

eighteenth century and thereafter became minority. In current times, only 2.1% of the population in the Amazon is recognized as indigenous, according to the census of IBGE 2010, against only 0.4% in Brazil. The indigenous population grew over 11% between 2000 and 2010, mainly for identity reasons, as explained by the IBGE, "phenomenon is known as' ethnogenesis' or ' ethnicization" (13).

In the municipality of Altamira, the indigenous population increased 21.8% between 2000 and 2010 (13). To explain the growth, we utilize the same criteria of the IBGE's about the most recognized identity of indigenous today than in previous decades. We reinforce this with the fact that the company responsible for the hydroelectric of Belo Monte applied a special treatment to meet indigenous peoples, promoting the indigenous self-identification. Numerous riverine families in the region decided to "become" indigenous to have access to a specific treatment, no longer being in a "invisible" affected riverine category (following the interview with the prosecutor of the Federal Public Ministry, Thais Santi in Altamira, May 2015).

Another explanatory factor is the growing migration of rural populations to the city. It is noticed that in the IBGE data, the rural indigenous population declined between 2000 and 2010. In 2010, the indigenous population represented slightly less than 4% of the population of Altamira municipality (13). The region of Altamira is characterized by the external immigration since the late nineteenth century, related to several cycles of development (rubber boom and Transamazon Highway). In the period 1970-1990, the people of North and South moved to the region with the prospect of colonizing the lots offered by INCRA (20).The populations of Transamazon are divided in two ways along the highway: some families decided to live in their own lots, while others constituted rural villages, where families and activities were concentrated. Thus, in the construction zone of Belo Monte, there are several centers of population concentration (agrovila at the Km 60 or the Santo Antonio Center, near the side road 50), in addition to small farmers scattered in lots.

A distinct significant population present in the Altamira region are fishermen and small coastal farmers who live on the banks of the Xingu River. They are spread in an isolated manner along the banks, building a strong connection (economic, social cultural and commercial) with the city of Altamira, where they move frequently. Field observations confirm that the rural-urban connection is strong, and people are used to live in the two spaces. The only nearby rural communities on the Xingu River, are located on islands, as the island Ilha da Fazenda, in the Volta Grande, about forty kilometers from the city. According to the Environmental Impact Assessment EIA-2009, there are approximately 350 riverine established on the island, which will be directly affected by the Belo Monte dam (8). We find, in this case, a spatial organization comparable to that described in the Uruguay River, but also in the Transamazonian agrovilas. The South and North populations are diverse and multiple, but all linked by rural connections through economic activities and ways of life.

Another socioterritorial impact element refers to the urban impact suffered by the affected urban households, which is little addressed by the literature and technical analysis. The city of Altamira, in the case of Belo Monte, and the city of Itá -SC with the

Itá power plant, are two examples of urban locations that have received direct impacts. In the case of Itá, it was a city of 1,000 inhabitants (8,000 in 1996) (13) that had to be rebuilt next to the old one, but at a higher altitude, while the old town was hit by the waters of Itá plant. The new city, planned for 2,500 inhabitants according to the 1995 Eletrosul information, had more than 4,000 people in 2010 (13). The case of Itá is extreme, because the changes to the city costed a lot of money, and led to a hard work for the responsible company Eletrosul. According to Raquel de Mattos Viana:

> The case of Itá city is emblematic because despite all spent initial investment with the relocation of the city, what is seen, today, after the construction of the plant, is a serious economic problem, with high unemployment. Thus, the experience of the city of Itá, the urban question appears primarily as a mere urbanistic problem(30).

Altamira is a different case because it is not in question the relocation or total reconstruction of the city. In terms of population, the city of Altamira has 76,700 inhabitants in 2010 (13). We must point out that, to Altamira, the analyzes are based on projections and hypotheses, as the city has not been impacted by the rise of reservoir water yet (scheduled for November 2015). However, even with reduced information, we know several elements that help to establish an accurate frame of the future of the city. The first structural change will be at the wharves on the Xingu river. The Norte Energia, in its Basic Environmental Project, says that "should be deployed all necessary recreation infrastructure, including toilets, kiosks with grills, sports courts and docks for recreational boats" (23). Until today, missing a few months for the rising waters, only four small buildings are in construction. Another element that experiences a profound change is the main urban stream, Altamira, which currently cuts the city in half. The urban part of Xingu river will be larger both in height and in width, with a new area of permanent protection of 100 meters (23).

By adding a comparative space, we can include the impact on the urban population of the Madeira River dams. The hydroelectric plant Santo Antônio is located seven kilometers from the center of Porto Velho, home to more than 250,000 people (13). The total number of people affected in the urban area is 1100 (7), but in the review process of the impacts, made by the same authors, the urban impacts are not highlighted.

The expectations in the transformation of Altamira region are big with the construction of Belo Monte, and comparing to Porto Velho, we can imagine that the impacts will be much broader. With the profound changes in the spatial distribution of the population, caused by the Belo Monte dam, we can expect major changes also for the people and society of Altamira.

Differences in the social struggles

In order to attenuate the impacts generated by the construction of hydroelectric plants, local people try to get organized in defense against other actors with different interests. There is a social movement of national character, which defends the people

affected by dams, called Movement of Dam-Affected People – MDAP (Movimento dos Atingidos por Barragens). It can help to differentiate the social organization of the people affected between the South and the North.

The MDAP was born in the mid-1980s, in the South, around the Uruguay river. A large project to build more than twenty hydroelectric plants started the people's movement, organized by "pastors of protestant churches, trade union leaders and some local intellectuals" (29), whose first time was to inform the inhabitants of the region, then mobilize them against the construction of the plants. In order to prepare the families for the arrival of hydroelectric power plants, the Regional Commission of Dam-Affected People (formerly MDAP), implemented some training. Another key aspect was the information provided to the families in the region, creating a counterpoint to the information or non-information presented by Eletrosul or the federal government. The families were prepared for the arrival of the plants, thus responding to the main objective of the social movement, which according to L. Sigaud, was "to inform the peasants in order to mobilize them against the construction project of the dams" (29). The same author compares the social situation of the South to the Northeast, explaining that Southern families were much more prepared, while northeastern populations demonstrated "unbelief" front to the events (29). Although this author deals with events that took place in the years 1980-1990, this description can be compared with what is experienced by the population of Altamira.

We observe several social movements monitoring and fighting the impacts of Belo Monte, mainly because the "benefit arising from these dams are considerably less attractive than those listed in the picture often painted by project proponents" (9). Regarding the magnitude of the construction and its impact, we could foreseen more protests and contestations, but this can perhaps be explained as "the resistance movements are configured by dissonant perspectives and comprising unequally different forces of social action" (11). For years we observed the disorganization and disunity of social movements in the struggle against the Belo Monte dam. Today, the social group that is protesting with more visibility is formed by indigenous. Fighting the impact made to 12 indigenous lands (according to Norte Energia), they protested several times and in some of them, had their claims heard. Numerous ethnic groups (Parakanã, Curuanã, Xipaya, Asuriní, etc.) held protests at the construction site of the Belo Monte or in the Norte Energia offices. According to the prosecutor of the Federal Public Ministry, Thais Santi, the fight and protests brought conquests for the indigenous. Being a particular population group, there is an emphasis in the way the indigenous were treated by the company and the government.

Other social movements are numerous, but with small claim power. The social movement most recognized in the region, which always fought against the construction of the plant, is the Xingu Vivo para Sempre (Xingu Living Forever), which brings together numerous local movements and according to them, "aggregates organizations representing riverines, fishermen, workers, rural workers, indigenous, inhabitants of Altamira, people affected by dams, women's movements and religious and ecumenical organizations" (Xingu Vivo Para Sempre). The MDAP is represented in Altamira, but has a reduced strength in comparison to the space occupied in the South, mainly by political and structural reasons. During an interview with local leadership, held in February 2014, the situation

in Altamira was described as "complicated," and said that "the MDAP can not fight" against the company. Other social movements are present, but with smaller: fishermen, women, local residents, lookouts, etc. Today, these actors seem to be trying to organize themselves to the Altamira Defense Forum, created in March 2015.

The last actor who acts to defend the local population is the Judiciary, through the Federal Public Ministry. The prosecutor Thais Santi, during an interview with El País newspaper, claimed respect of the law by the federal government, stating "The Government can choose to construct Belo Monte, but can not choose to disregard the law in the hydropower implementation process" (6). Interviewed in February 2014, she explained the choice of some themes (rural and urban settlements) to defend those affected, because the issue was too broad. After gathering information about the situation, the prosecutor began the defense of the family on the daily life, claiming some more specific elements (access to the river, for example).

One of the results of different social struggles is the offer of equally distinct indemnities. In Brazil, there is a failure in the measures and in the compensation process for the families affected by dams impacts. Since the 1980s, due to the MDAP's struggles in the South, some options were offered to the families that were directly affected: money compensation, an urban or rural individual resettlement (also called self-resettlement or letter of credit) and a collective rural resettlement. These proposals exist around twenty years and are result of an agreement between Eletrosul and Regional Commission of Dam-Affected People in 1987. Therefore, this agreement is local and without legal value, but has established a trading base in the south. The agreement have never turned into law and, today, there is no legal provision establishing the indemnity options for the affected families.

Based on research carried out in the South, it is observed that the individual resettlement and indemnity options are the most chosen (16), and, as explained H. Rocha, it is "a clear preference of those affected for the indemnity options in cash and letter of credit "(26). They are also the clear preference of the construction companies, the inverse of the collective rural resettlement, seen as more complex to implement, requiring negotiations with groups of families and more resources than a set of individual claims.

Confirming this statement, in the region of Altamira, we found the same elements, except that there is a almost total denial by the collective rural resettlement, not yet existing in the region, even being proposed in the negotiations with the affected families. Until recently, several protests of families requesting the regularization of indemnities options occurred with the formal support of IBAMA (12). It was also pointed out by Andrea M. Barreto, Public Defender, the noncompliance with the social obligations that Norte Energia company assumed, particularly with the families of the center Santo Antônio, in the great majority favorable to this indemnity (interview with the Public Defender of Para A. Barreto, February 2014). Today, most families abandoned the idea of being resettled all together in one rural area, after the delay of a concrete response from the company. We also observed the policy of Norte Energia failing to meet their commitments in the Environmental Impact Assessment and Environmental Basic Plan (according to the studies from Instituto Socioambiental and the Getulio Vargas Foundation), which hinders the

relocation of families and damages a profound way the quality of life of those affected in the region. Social struggles are different between the South and North of the country, but they participate in a set which "the conflict established by the implementation of hydropower projects exemplifies the struggle for environmental justice, revealing us the dispute over the social reappropriation of nature "(32).

Results, the redistribution of families

The consequence of the impacts of power stations, of social struggles and indemnities can be observed in relation to spatial and territorial changes, because as a result of the fact that someone is affected by the construction of a dam, a migration takes place (change of main residence) and therefore, the beginning of a new life in outer space. In terms of living space, the options are summarized, a bit caricatured, between the urban or the rural. We must warn here that this aspect is not easy to investigate, because the information is rare about the area of migration arrival. However, we observed a profound difference between the South and the North, especially regarding to areas of migration arrival of affected families.

In order to compare, lets first situate the new lives of those affected according to what was observed in southern Brazil. Table 01 presents the official indemnities received by affected families in five large dams in the Uruguay basin, showing that most of the indemnities were made in the form of money directly to families (65% of families affected in the region). Being also the favorite choice of the company that built the dam, we can ask whether it is the result of choice of the affected family or is the result of a corporate policy, thus constituting, in a sort of obligation for families. We stay without a clear answer, but it is evident that both for the company and for the family, the money option is the one that gives more freedom.

The second most preferred option for the families is the letter of credit, which offers a minimum of enterprise monitoring and infrastructure in time to move to the new property. The third most preferred option is collective and rural, followed by an average of 9% of the affected families. This modality offers the best life-changing conditions for the affected families, because, in addition to receiving a property (land and house), they are resettled in communities with finished infrastructure (roads, electricity, telephone, community warehouse, school, etc.), social assistance and technical (agricultural) assistance for five years. In the end, however, we may ask ourselves what is the level of freedom and knowledge that the affected people have to choose the best option.

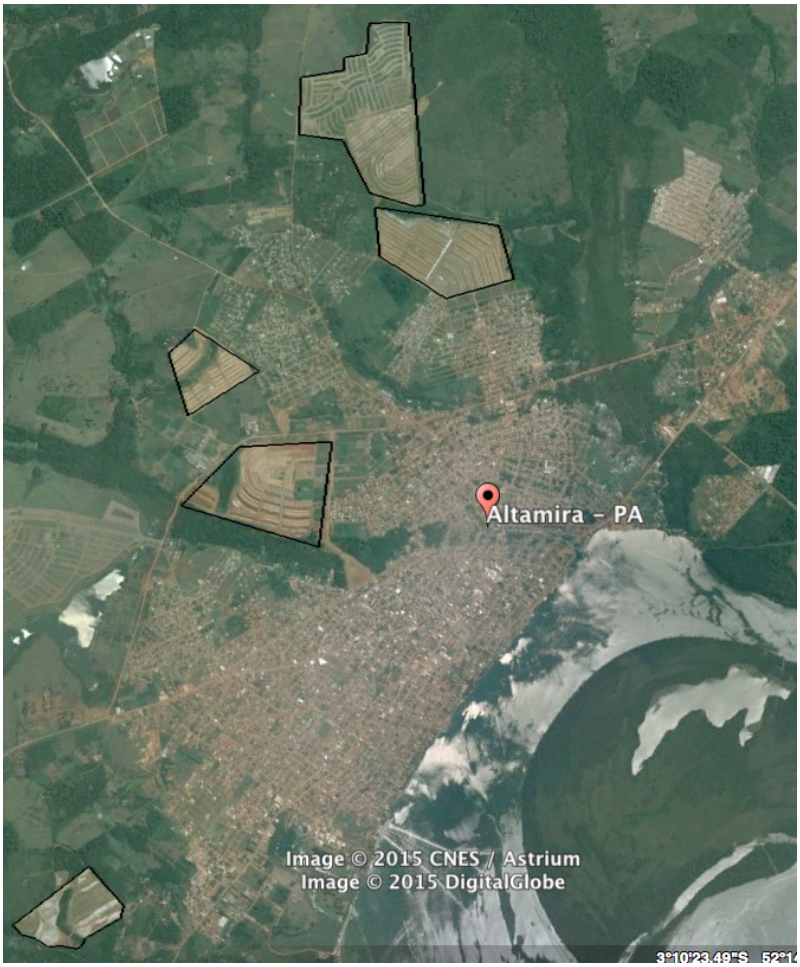
Table 01: Indemnities in HPPs in southern Brazil (27), by Guillaume Leturcq.

	Ita	%	Machadinho	%	Barra Grande	%	Campos Novos	%	Foz do Chapecó	%	Total	%
Indemnização em dinheiro	3260	78,4	873	38,4	959	63,1	449	59,2	1200	73,0	6741	65,1
Carta de credito	458	11,0	796	35,0	249	16,4	167	22,0	314	19,1	1984	19,2
Reassentamento rural coletivo	370	8,9	200	8,8	193	12,7	81	10,7	44	2,7	888	8,6
Reassentamento em area remanescente	72	1,7	31	1,4	5	0,3	62	8,2	25	1,5	195	1,9
Outros			375	16,5	114	7,5			61	3,7	550	5,3
TOTAL	4160	100	2275	100	1520	100	759	100	1644	100	10358	100

In Altamira, the situation of those affected can not be compared with those affected in the South, because the processes of indemnity and displacement of the families are still occuring. However, some trends are already noticed. There is an overrepresentation of indemnities in urban areas. Norte Energia is building five Urban Collective Resettlements (UCR) in the city of Altamira. The UCRs are not in the same state of construction. As an example, the UCR Jatobá was the first to be built and to receive affected families (January 2014). It is currently occupied by hundreds of families, although not finished. In comparison, the UCR Laranjeiras, in the south of the city, is still closed and under construction. The new urban neighborhoods of UCRs in Altamira represent 316.5 hectares around the city (see Map 02). In October 2014, 3 of 5 UCRs were occupied with affected families. The first families that moved into urban neighborhoods were the ones that wanted to quickly leave the old house. The cases of families with fear abandoning the old residence and be replaced will happen later in the process.

To support the idea that rural families were installed in urban settlements, the prosecutor Thais Santi explained the situation about the cases of fishermen and riverines. It is common for them to have two residences, one in the city and another on the river. At the moment of receiving a compensation, the Norte Energia has forced people to choose which residence would be indemnified, and several of them decided by a house in the UCR. She also confirmed that some indigenous families have been temporarily installed on the UCRs. In early 2015, North Energy has promised to build a new resettlement of 500 lots, named Pedral, to meet the demand of indigenous and fishing families. It will be located in the southern edge of the city, being close to the Xingu River. We can not declare that the families were forced to move to the city, but the lack of options shows, in reality, how those affected were with reduced choice: compensation in money, a house in Altamira, to wait for the collective rural resettlement or, finally, to wait for the resettlement construction to be done near the Xingu River.

Map 02: City of Altamira and the new neighborhoods, by Guillaume Leturcq / Google Earth.



The socio-territorial differences are important when we consider the social impacts generated by the dams in the North and South. The differences arise due to the structure of the population distribution and its history. In this way the families have different reactions about the construction of the hydroelectric plant. While in the south a struggle of almost thirty years was prepared, in the North, the struggle organization is in its early stages. The consequences are direct in the lifestyle changes and in the living space of the affected families, which in the case of the North, they must adapt to new space reality (urban zone, new neighbors, mobility, etc.).

However, despite the deep differences between North and South of the country with regard to dams, we will now illustrate some similarities between the two regions.

II - Similarities in relation to impacts on the South and North

Migrations

The construction of hydroelectric plants modifies the geography of places. We saw earlier that, according to the region, North or South of Brazil, there are differences in the interaction between man and its space. We will analyze now how there are similar relationships in the two areas, especially with regard to migrations, mobility and transformation of landscapes.

The construction of a hydroelectric plant is not the first step in the implementation of the dam, because even before the start of construction, there is a long phase of studies and projects in which information is disseminated. As explained in the case of Itapiranga plant on the Uruguay River, a dam can be an "invisible territorial mark" (15), in the sense that changes the way of acting of the population in the region where it will be built. Thus, in the case of Itapiranga, we noticed a change in the local economy linked to the dam construction project. This project is from the 80's and, until now, the plant has not been built yet, but it continues to be spoken about and a recurring spectrum in the region.

From the moment a project starts to become reality, with the initial traces of construction (eg opening the responsible company's office), there are the first population movements. Migrations to the dam construction site originate mainly from the vicinity of the region, with the arrival of people seeking jobs and opportunities. According to what we notice in the South, there are spaces occupied temporarily and irregularly by families aiming to gain an indemnity. We observed the same movement in Altamira, even before the start of the construction. This was the case, for example, of precarious wooden houses construction on the Xingu River waterfront in Altamira, held by families who were living there in the hope of receiving some compensation money.

Another movement that took place in the South as in the North, is an anticipatory migration, ie families that will be affected in the future that decide to move before the beginning of the construction. We observe this phenomenon in Itapiranga, where riverside families went living within the municipality before even knowing whether the dam would be built or not (15). In the case of Belo Monte, the riverine families that live between the city and the river banks decided to live more often in Altamira. However, it is not only the affected families or the ones looking for opportunities that migrate around the hydroelectric plants. During the construction phase, many people head to the region in order to work or look for work.

In southern Brazil, a space that receives dams over 60 years with a certain frequency (even longer if we add the South to the Southeast), the people working in construction sites are called "barrageiros" (dam builders), a term also found currently in Belo Monte. The "barrageiros" from the South were into large constructions, like Itaipu or Itá, and until now, they work in various other constructions. These workers move from job to job, getting specialized in the construction of hydroelectric sites. We noted that the "barrageiros" are from the Southeast and Northeast of the country, and remain for months working on the construction site to then stay for a period at home, or they go to work in

another dam. A consequence of this fact is little utilization of local labor. We can explain this by the knowledge of local workers, more oriented towards agricultural work than for civil construction.

In Belo Monte, the city of Altamira hosted several populations, mainly masculine, who went there in order to work on the construction site. The construction of a dam requires manpower, qualified or not. This temporary economic activity is very attractive in rural areas with few well paid crop options. The attraction of the construction of a hydroelectric plant is evident and, for example, the Belo Monte hired up to 35,000 people at the end of 2013. These migrations can be analyzed as before and during the construction of the plants.

The people affected by the dams can be defined as migrants, although some broader conceptualizations consider people affected by other reasons even without migration. Nevertheless, we realize that for a vast majority of families, the phenomenon is accompanied by a flow, a change of the main residence. Whether in the South or in the North, migration is mandatory and compulsory. The affected families must go through a complex process of changing residences At first, they need to know whether or not they will be directly affected, as this fact will depend on the limits of the construction site and the reservoir. After being informed that they need to move out, and then accept the idea, there comes the phase of reflection on the destination, which will be strongly linked to the compensation to be received by the affected family. The decision-making, more or less oriented, will decide on the future residence. From this moment, the family will start the stages of moving out, which can be a process relatively long and painful, as it will depend on the difficulties of negotiation and receipt of indemnity. Thus, in the case of Belo Monte, we talked to families who are still awaiting the compensation to be deposited into their bank account so they can move out. This is period of indecision and transition is suffered to the affected families. The dam Machadinho, in the South, the affected families had to argue in the judiciary to receive compensation.

Migrations are one mandatory phenomenon that follow the all hydroelectric plants constructions. They can be classified in various ways, depending on the complexity, stages, period, types of populations, numbers and reasons. They are an element to study in a specific way, in order to understand the population movements and the impacts of dams on society.

Mobilities

In addition to population migrations, there is another population flow directly linked to territorial changes occurred as a result of the construction of a hydroelectric plant. Mobility is an element that increases to the affected families and to the people of the region. So, either before or after the dam construction, transformations in mobility are aspects that we see both in the North and in the South.

Studies conducted with populations affected by dams in southern Brazil have shown an increase in the acquisition of individual modalities of transportation by families who wanted to benefit from mobilities (16). The data shows that cars and motorcycles

were the most purchased by the affected people at the time of moving to the new home. We note that the location of the rural settlement in a municipality will also eventually affect the new mobilities of the families. Thus, in a town like Barracão in Rio Grande do Sul State, where there are two resettlements of Machadinho dam, the families live in a structure that has school, community center, roads, among others resoures, and where the municipal services are important (mobile dentist and school transport, for example). In these resettlements, we realized that the families did not need much mobility features, as they walked to the most frequented places in their routine. By the opposite angle, in Curitibanos, we have visited a resettlement that is far away from the city and with low infrastructure, a fact that made the families being more dependent on means of transportation.

Overall, in the South, we conclude that the implementation of a hydroelectric plant serves as an engine for mobility increase, as families seek to establish a connection to the old life (16). The old life means both the place as social relations. So, after we had interviews with the affected people living in Campos Novos (Santa Catarina State), about 100 kilometers from the Machadinho dam, we found that their mobility needs are to visit former neighbors, see their families and stay in touch with the previous living area.

After moving, there is a dispersion of the social relations of those affected people, and mobility is a response to try to reduce that. To confirm this explanation, we verified the frequencies with which those people were visiting other family members. Therefore, for the victims of the Machadinho dam respondents, the frequency of family visit before moving out was much more important. From 71 interviews, 36 visited family from 1 to 5 times per month and 26 between 6 and 10 times per month (9 unanswered). After moving, the frequency of visits has decreased, 53 families visited other members from 1 to 5 times per month and 6 families from 6 to 10 times per month (12 unanswered) (16). Geographical distance and life changing explain the decrease in visitation, but mobility is an attempt to solve the problem detected.

The mobility after the construction work can also be perceived. In Altamira, we observed an intense movement of population in the city. The aspect of the Belo Monte region and the fishermen's way of life is reason for explanations. It is in Altamira that happens the concentration of activities and decisions, and it is the transportation center of the region. As head office of North Energy and other companies involved in building the dam, Altamira also became the basis of all activities related to the dam. However, the construction site is located 50 kilometers from the city. Thus, this distance is an element that enhances the mobility in the region, especially for the staff and construction workers. We note an intense bus flow between the two centers, as employees of Belo Monte must be connected with the city of Altamira. Still, the centers can not receive all the employees and others are temporary, forcing them to go to Altamira, which is also a area for services and entertainment, among others.

The second is the appearance of the area hit by the Xingu river. The vast majority of affected families live on the edge of the Xingu River. Living from fishing and small agriculture, they are linked to Altamira for sales and services, but with the construction of the plant, the connection became even higher for them, mainly to look for information, talk

to the companies, attending meetings, among other activities. All informative elements are concentrated in the same area, and during this indecision period, families seek for details about their future conditions, which makes them to go more often to Altamira. An observation made in Altamira, and also that reinforces the idea of a higher mobility, is the large amount of motorcycles in the streets. The population began to increasingly move around in a growing city in terms of surface.

Without information yet to explain how will will be the reality of the affected people after migration, we can set up hypotheses on the issue of families mobility. For this, we need to look for clues, both for urban mobility and for the rural-urban mobility. We already know that a significant portion of the affected families will be resettled in the city of Altamira in five UCRs located on its periphery (see Map 02). The city is growing in terms of population and surface. Altamira is a medium city in Brazil and, according to a study by the Applied Economic Research Institute in 2008, medium-sized cities grow more than the rest of Brazil in terms of GDP and population (21). We can imagine that, with the past urban developments in Altamira, the adaptation of the transport offer will become essential to the increase of urban mobility.

The existence of collective public transport in Altamira is recent, but "invisible" to the population in daily life, because there are no concrete information about bus stops and schedules. According to the National Association of Public Transport (Associação Nacional de Transportes Públicos), the larger the city, greater use will be made of public transport and non-motorized transport (1), and more than 90% of public transport used in Brazil are buses. Considering this fact, we can imagine that it will quickly be indispensable in the region. This important subject appears insistently in the city of Altamira, especially after the horizontal growth of the city. The connections between the suburbs and downtown are required, allowing us to expect that it will be a matter to be highly debated in the upcoming years by the local urban planning.

In terms of rural-urban mobility, here we can also predict an increase. There are global and general reasons that can explain this fact. The transformation of production activities and rural economies have a diversification tendency. Rural households include more and more the urban spaces in their lives (22). The authors conclude that for the older populations of the region, there were "long-distance migration from rural areas, [...], the displacement of the new generations are more in a circular type", for which there is a feasible mobility offered by "mobilities systems [that] articulate residential dispersions, intergenerational cooperation and complementarity of roles within families". Generally, in the world (especially in Europe and America), it is seen the trend of an increasing mobility between rural and urban areas. Such evidence is confirmed also in the Amazon, where the urban areas are growing, being more attractive for rural populations.

In addition to these global factors, local factors favor the rural-urban mobility. The opening of the paved part of Transamazonian in January 2014, between Medicilândia, Brazil Novo and Altamira, is fundamental. The opening has changed many things for families who live along the road crossed by the Transamazonian, because in addition to being able to circulate more safely and quickly, they now have access to urban spaces that previously was harder to reach, for example, Altamira, which is a regional center.

We can relate this element with the possible installation of affected families in lots of Transamazonian side roads and the likely correspondence with the affected people from the South with regard to the mobility necessity.

Dams disturb a lot the territory where they are built, and we demonstrated in this study that they may constitute an incentive to increase local mobility. However, without the adjustment of public policies, they can become a major problem, both in terms of infrastructure and for the local population distribution.

Landscape and geographical environment

The last element that we presented in the article is something that always happens with the implementation of hydroelectric plants: the profound transformation of the landscape. The geographical landscape notion allows the geographer to access the world of social representations of nature (4). And regardless of the exogenous values in the appreciation of landscapes, the genesis of them is an interactive process between people and their environment (3). Thus, to understand the evolution of the landscape with the construction of hydroelectric plants, it is not enough to analyze the physical structure, but to understand the role of society in the geographical environment. A construction work of a hydroelectric plant size entails, in a mandatory way, a landscape disturbance in their physical and abstrac forms.

In physical form, either in the South or in the North, the construction of a dam is implanted in a rural area where there is an anthropic field, but with physical elements of the countryside: farming, trees, dirt roads, isolated houses, reduced population and, in our case a key element, a river. The physical transformation is evident in both the construction site and in the reservoir that will be created with the dam. The two elements disturb the entire local spatial logic, and families living in the region shall get used to the changes. For example, the reservoir Machadinho, 70 , on the Uruguay River, ended up creating islands and profoundly transforming the physical landscape. Another important element was the creation of a bridge between the two states (Rio Grande do Sul and Santa Catarina) on top of the dam, which facilitated connections (population, economic, different transports, etc.).

They are not only negative elements that will change the landscape, but profound disturbances always happen. At Belo Monte dam, part of the Xingu called Volta Grande will be almost dry after the dam construction, as it will have a river water diversion. It is a section of about 100 kilometers that will change deeply and, according to the Norte Energia (23), it will receive just a "residual flow". Another element that we can foresee as disturbing is the reservoir of 400 which will appear on the Xingu River.

In addition to the physical transformation in Volta Grande, it is important to try to imagine part of Xingu river almost dry and how will be the relationship of local populations with the geographical space. In 2007, according to IBGE (13, 23), 800 people lived in the Volta Grande, scattered among the villages Ressaca, Ilha da Fazenda and Garimpo de Galo. Without even having accurate information about the populations of the place, we know that some were gone and others have stayed or intend to stay after the construction

completion. How will the life of families who survive mainly from fishing or mining? How will they react before the river loss and the familiar landscape?

The geographical analysis of a landscape includes a part on the representations, ie on "the idea of the landscape as a social construction, or cultural, cognitive wide, more than that one about the landscape with ground level" (5). The same author, according to "landscape theory" acknowledges its existence as well as a mental construction. So we can associate other elements such as memories, feelings, emotions, information, secrets, dreams, projects, etc. From this, each one has their own perception of the landscape and its interaction with. The author R. Verdum can contribute to conclude indicating that "there is the need for the Landscape Unit to be socially recognized for its forms, functions, structures and dynamics, and to be included as an important part of the historical and cultural dimension of the place and the surrounding area" (30).

The change made by a hydroelectric plant also define the imaginary and the representation of the place. In the case of Belo Monte, the people of the region have a very specific view of the dam which can be positive or negative. It is based, for some people, on visual information and for others on a lot of local information.

Moreover, it would be interesting to understand the mental construction of the Belo Monte landscape for Brazilians who have never been in the Amazon and Altamira, but this represents another research, on which could be involved the mental construction of the Amazon, of the Xingu river, of hydroelectric plants, northern populations, among others. We should also point out that an element liable for a more detailed analysis would be the environmental impact, something not studied in this research, but which greatly feeds the representation of dams in space.

Final considerations

The local and regional repercussions of hydroelectric plants are an issue that we can analyze in the entire Brazil. The lack of interaction and dissemination of information was reason to try to understand and analyze what are the differences and similarities of the impacts between the North and the South of Brazil. Disturbances may have intensities varying with random durations, but they always modify the geographic areas on which happen.

The analysis of South and North contexts helped to try to enhance the comparison (28) between the two spaces and to look the varying degrees of similarities, more or less intense in the case of socio-spatial effects.

A hydroelectric power plant is located in a complex geographical space, composed of local population, various economic activities and landscapes. The consequences of the plants are directly visible in all elements that are part of the geographical spaces and society.

In the article, when comparing the North and South of Brazil, we see different realities and histories. We can also highlight similarities and differences in socio-territorial impacts, evidencing how the change of social environment influenced the life of social groups and individuals.

To understand the impacts in a comparative perspective, we should examine not only the geographical and territorial characteristics, but also the distribution and the

history of the population. In the South, the population proved to be prepared for the arrival of the dams and organized to face the modifications. While in the North, social movements are in the bonding and organization stage, and affected families seem to be more isolated. In the phase of indemnities and resettling, the Southern families achieved more positive results after years of struggles and negotiations. In turn, in the north, we see a greater individualization and separation of families, resulting from the economic logic of the responsible company.

While we realize several differences in impacts, it was also possible to observe deep similarities in the responses to the impacts for the Southern and northern families. In terms of population flows, we conclude that the implementation of a construction project compulsorily modify the logic of circulation in the region, increasing the flows. In this most intense movement, it appears new circuits that belongs to both permanent migrations as to mobilities, such as, for example, the relation countryside-city. Finally, the landscape, the basic life element of riverine families, is also impacted by the construction of a dam, marking the affected people forever after they were forced to move.

We conclude that the differences and similarities of socio-spatial impacts are also a result of information disclosure failures and experiences, reason that let us ask: why the negative effects of dams on local populations keep repeating? To continue the research in this direction, it would be good to diversify the examples to go further on the comparisons, as well as spatial analysis should go through scales schemes, in order to analyze not only local consequences, but regional, national and international.

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DIFFERENCES AND SIMILARITIES IN IMPACTS OF HYDROELETRIC DAMS BETWEEN NORTH AND SOUTH OF BRAZIL

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***Abstract*:** The environmental impacts of hydroelectric dams in Brazil are investigated in local and regional scales, for the last years. In this paper, we analyze the impact than the establishment of a hydroelectric dam has for the people and their spaces, with the comparative experiences occurred for the North and South of Brazil. We will focus on aspects related to the organization of families, social fight, the compensation and resettlement of people affected by the dam's construction, as well we take a look to the similarities between the two areas, with emphasis on aspects related to migration, mobility and landscapes. For this, we rely on research carried out on the river Uruguay (South), based on interviews, questionnaires and studies of primary and secondary sources, from 2007 to 2014 and also in a survey that is currently being held in Belo Monte area (North), which also uses primary and secondary sources, with fieldwork periods.

***Keywords*:** Socio-territorial influences; Hydroelectric dams North and South of Brazil.

***Resumo*:** Os impactos socioambientais das usinas hidrelétricas no Brasil têm sido investigados, em escalas locais e regionais, nos últimos anos. Nesse artigo, analisamos os impactos que o estabelecimento de uma usina hidrelétrica causa sobre as populações e seus espaços, tendo como marco comparativo as experiências ocorridas no Norte e no Sul do Brasil. Focalizaremos os aspectos relacionados à organização das famílias, às lutas sociais, às indenizações e à reinstalação das pessoas atingidas pela construção de uma barragem, assim como, avaliaremos as semelhanças entre as duas áreas, com destaque aos aspectos relacionados às migrações, mobilidade e paisagens. Para tanto, nos apoiamos em pesquisas desenvolvidas no rio Uruguai (Sul), baseada em entrevistas, questionários e estudos de fontes primárias e secundárias, desde 2007 até 2014, e também em uma pesquisa que está sendo realizada, atualmente, na região de Belo Monte (Norte), que também utiliza fontes primárias e secundárias, com períodos de pesquisa de campo.

***Palavras-chaves*:** Impactos socioterritoriais; Usinas hidrelétricas, Norte e Sul do Brasil.

***Resumen*:** Los impactos ambientales de las centrales hidroeléctricas en Brasil han sido investigados en escalas locales y regionales, en los últimos años. En este paper, analizamos

el impacto que el establecimiento de una central hidroeléctrica causa nas personas y sus espacios, con las experiencias comparativas se produjo en el Norte y el Sur de Brasil. Nos centraremos en los aspectos relacionados con la organización de las familias, las luchas sociales, la compensación y el reasentamiento de las personas afectadas por la construcción de una represa, así como evaluar las similitudes entre las dos áreas, con énfasis en los aspectos relacionados con la migración, la movilidad y paisajes. Para ello, nos basamos en la investigación llevada a cabo en el río Uruguay (Sur), sobre la base de entrevistas, cuestionarios y estudios de fuentes primarias y secundarias, de 2007 a 2014 y también en una encuesta que se está celebrando en la región de Belo Monte (Norte), que también utiliza fuentes primarias y secundarias, con períodos de trabajo de campo.

***Palabras clave*:** Impactos socio-territoriales; Centrales hidroeléctricas Norte y Sur de Brasil.