7th Macon meeting – Rivers and Lands

Symposium 13-14 September 2012

"Territorial changes for the inhabitants of rivers used for hydroelectric power generation in Brazil"

Guillaume Leturcq

Introduction

The construction of large hydroelectric dams is a process which has been expanding for over thirty years in Brazil, beginning mainly in the 1950s. It is internationally recognised that these structures have both positive and negative effects. In Brazil, interest in the impacts of dams goes back to the late 1980s, but in recent years they have been particularly in the spotlight due to the construction of a number of headline projects. Today, it is easier to get information about the effects of large dams on their environment, but there is still not enough research on their effects on local populations and their land. However, this presentation, the result of several years of research, will give an overview of the impact of these large works on the surrounding land areas. We will therefore approach dam construction using a three-stage process to analyse four land areas. The stages relate to the actual building of the dam, because there is a before and after stage, just as there is a construction stage. We will present four land areas, because as well as the three linked to the stages of construction, there is an additional one which arises when the victims of the dams migrate and start a new life several kilometres away from their former dwellings. This presentation will approach the different land areas under study in chronological order.

Pre-dam territory

The locations of hydroelectric dams in Brazil are highly varied, as such constructions can be found in all five regions of the country - in Amazonia, in the North-East, in the South-East and South-West, as well as in the South, the region where our research was undertaken. In these five regions, there are considerable differences in landscape, with dense rainforest in Amazonia, semi-arid zones in the North-East and rolling terrain in the South of Brazil. This great variety of environments means that the consequences of dams for ecosystems and for society vary according to where they are built. However, one factor which remains the same is that they are always built in rural, often socially disadvantaged areas.

A hydroelectric dam causes lasting disturbance to the rural landscape. The choice of a dam construction site is always made with a view to avoiding urban areas as much as possible, mainly due to the number of compensation claims and the high level of impact. Dams are therefore often located in rural areas remote from regional and national centres. In the 1950s, Brazil underwent large-scale urbanisation, and in 2010 almost 85% of its population lives in urban areas (IBGE -- *Instituto Brasileiro de Geografia e Estatística*, 2010). And yet Brazil remains a distinctly rural country, with almost thirty million inhabitants in rural areas and a flourishing agricultural economy. 'Agriculture and livestock therefore still play an important role in the Brazilian economy: generators of currency which are vital for the country's balance of trade.' (THÉRY, 2009).

Rural populations are organised into small groups which are usually known as 'communities' – 'Farmers' societies... are organised into relatively small and independent collectives, and live on land which they farm themselves.' (MENDRAS, 1995). They are organised around a small centre, usually made up of one or two churches (Catholic and Evangelical), a village school and a community centre. This arrangement is particularly common in the South of Brazil, where most of the population is descended from European migrants - Italians, Germans and East Europeans settlers who established themselves in the South of Brazil, shaping the rural landscape and building small communities.

Descendants of the European settlers have lived in the South of Brazil for over 150 years. The rural spaces where the dams are built are home to deep-rooted communities, who have adapted to the natural environment. In Amazonia, Indian communities who have lived there for centuries are displaced by dam construction. In the North-East, the current inhabitants have also lived there for centuries, whether of African or European origin. In addition, the rural population in Brazil has an aging demographic, as the youngest often leave for the nearest urban centres.

The rural populations affected by dams are often the families of small-scale farmers, who cultivate less than fifty acres of land (which they may or may not own). Most of them practise subsistence agriculture, mainly in Amazonia and in the North-East. In the other three regions, there are some farmers with land holdings considered to be medium-sized. The fact remains that the majority of the families affected are those of small-scale farmers. In the Western part of Southern Brazil, the sites chosen for dam construction are often distinguished by having a majority of small-scale farmers, as well as a few farmers with direct links to the local agro-industrial centres, mainly breeding chickens or pigs.

The populations who are the victims of dam construction are often in a precarious financial position. They possess limited resources and their survival is dependent on their environment. They have often established strong links with the river or waterway (where the dam is to be constructed). This link allows them to vary their economic activity. This is also an important factor for their living space, because the river is part of their daily lives, as a landscape, living area and economic space.

In conclusion to this initial analysis of the pre-dam territory, we can develop a broad framework of the type of land areas affected by construction. Dams are built in rural spaces, usually far away from urban centres. They are established in regions of small-scale agriculture where there is a great variety of landscapes. The victims of dams are often in a precarious economic situation and therefore ill-prepared for relocation. As far as relocation is concerned, we can also add that families are often displaced causing further disturbance at the point of migration.

Violent territorial modification during construction

On the arrival of the dam, the whole region is thrown into turmoil. Such a large construction work has damaging consequences on the society and its land areas in many ways. So whether on an environmental, economic, political or social level, the building site of a dam affects everything and everyone in the region.

The first visible effect of the establishment of a dam is the environmental and landscape modification. A dam brings profound changes to the course of a river, as well as to its banks. The river must be diverted and the structure of its banks modified to install the dam wall. To illustrate this profound modification, we can see in Photograph 1 the impact of the building site, both on the course of the water, and also on the nearby hill. From an environmental perspective, it's the building site which starts off the modifications and disturbances. One of the strongest arguments against dam construction is the effect it has on the course of the water, its flow, the water quality and the ecosystem (fauna and flora). The building site, as well as cutting off the flow, gives rise to a certain amount of waste, which pollutes the environment. Once the dam has been constructed, the most contentious point is the effect of the dam on the environment - not only the water, but also the air (CO_2 emissions), the land (loss), fauna (mainly fish) and flora (deforestation). Discussions between decision-makers and environmental activists are increasingly fraught. There is a lot at stake, as hydroelectric dams represent a considerable investment and high financial returns are expected.

Photo 1 – View of the Foz do Chapecó dam – Alpestre/RS – G. Leturcq -2007

From an economic point of view, the effects of a dam on the region are also considerable. Positive or negative, the dam will have consequences for the local economy. It means employment creation, e.g. for the Sobradinho dam in the North-East, where an estimated 20 000 jobs were created. These have been highly diverse, as all economic sectors and professions can be brought in to work on such a project. As new jobs are created, so are new consumers.

Photo 2 – Bar under construction near the Foz do Chapecó dam – Águas de Chapecó/SC – G. leturcq 2007

Such wealth in the population benefits the services and companies on the periphery of the building site. As well as existing services, new ones are created, as we can see in Photograph 2, which illustrates the construction of a new type of temporary bar, near the Foz do Chapeco dam building site.

All this turmoil comes from the establishment of the company responsible for the dam construction and many others who work for it externally. So there are new sources of money and investment arriving in the region. These positive economic changes mostly exist for the duration of the construction, i.e. 4 to 5 years on average. Beyond that, the economic trickle-down effect of a hydroelectric power plant is minimal for the host region. This was demonstrated in a study of the Machadinho dam (UNIVERSIDADE DE PASSO FUNDO, 2001). In economic terms, negative effects go hand in hand with positive ones, for example the loss of the local fishing industry, as well as ferries carrying people and vehicles. Village enterprises are also disturbed economically by the departure of their inhabitants. But overall the economy on the edge of a dam prospers during the construction period, which can be conducive to the interplay of new interests, involving politics.

There are many actors involved in the construction of a dam, to the point that they are difficult to keep track of. There are actors on all political levels of the country, national, regional, local. Dam projects are initiated by the Federal government, which supports their construction to increase national electricity output levels. Regional and local authorities follow the progress of

the project, as they often have to invest in it or monitor the consequences. Economically, we have already explained briefly that many companies are involved in the dam construction, from start to finish. There are also environmental and social actors from all regional and administrative levels (Environment Minister, social movements, NGOs, etc.). Finally, local populations and their representatives can be more or less involved in the political game.

In social and in population terms, the dam construction also brings significant upheaval. So the mere announcement of an upcoming project in the region attracts families in search of employment or easy compensation gains from the company. The announcement of the construction of a factory is associated with economic growth, which encourages people in economic need or insecurity to travel to the construction site to try their luck and to take advantage of the circumstances, one way or another. These people in search of either official or unofficial employment arrive along with official employees working on the dam building site. As already mentioned, they may be very high in number, depending on the size of the project, and often come from other regions of the country, not hesitating to travel thousands of miles to obtain work on the site. For example, according to an unofficial source, most employees of the company responsible for the Foz do Chapeco dam come from the São Paolo region or from the North-East. These people are only present for a limited time, but once the deadline is reached, the region is 'abandoned' and emptied. We can see this in Photograph 3, where we can see a former workers' village in the factory of Sobradinho, now almost completely abandoned. In terms of abandonment, the region where the dam is built also experiences significant population loss, as people are forced to migrate. The large Brazilian dams may have forced up to 80 000 people to migrate (North-East) and around 15 000 people in the South (Foz do Chapeco, Machadinho). These migrant

Photo 3 –Former workers' village at the Sobradinho dam – Sobradinho/BA – G. leturcq 2007

populations are obviously a complex problem for the leaders of the dam construction project to keep track of and resolve. The migrations take place during the construction period so that there will be no inhabitants on the site of the dam lake once construction is complete. More or less well-organised, these migrations often lead to complex social problems. Migration leads to greater economic insecurity for families, causing great economic and residential instability, often leading to impoverishment. (CERNEA, MOHAN MATHUR, 2008).

We can conclude that the effects of the dams during construction are intense and varied. In the space of 4-5 years on average, the impacts are considerable and affect the whole of the existing society around the dam. Therefore, whether economically, politically, socially or environmentally, the construction of a dam throws the existing landscape into turmoil and causes profound change, even leading to complete rupture. All land areas are affected and transformed, causing unavoidable adaptations on all parts.

The after-dam and the profound changes

The after-dam is mainly the result of the intense activity during its construction. We can therefore analyse the land areas affected by the turmoil in two distinct locations - the area around the dam and the factory and the reception site for the migrants.

The main land use modifications around the factory are on four levels, already described here previously, but which taken on a greater amplitude once the works are complete. Firstly there are undeniable changes to the landscape, because the dam affects the local ecosystems almost irreversibly. The environment which existed before the dam has partly disappeared, notably forests, which are the most complex and take the longest to re-establish. There are sometimes changes to the climate, depending on the location of the structure and on local conditions. The waterway is particularly affected, notably the flow, the quality of the water and its fauna, which can no longer circulate as it did previously.

Photo 4 – abandoned house - Barração/RS – G. leturcq 2007

The other important repercussion of the new dam

is the loss or disbandment of local communities. With the departure of the forced migrants, two situations can arise for the communities: either a big loss of population, with a corresponding drop in activity, or total disappearance, turning them into abandoned ghost areas. In the South of Brazil, both situations can be observed, notably in the case of the Machadinho dam. Entire communities have been forced to migrate and have therefore abandoned everything in their wake. These communities have disappeared, leaving only a few marks on the landscape, notably churches and empty houses. Another common circumstance is the existence of communities which are more or less weakened by the departure of families.

Photograph 4 shows the existence of an abandoned house in the heart of a community (São Francisco, Barração village, Rio Grande do Sul) which is trying to survive following the departure of more than half of its original population. The priest now comes only once every two months, the church is closed, the community centre is gone and rural bus services have been cancelled due to the lack of wealth. These departures and the various disbanded communities have clearly had an impact on the local economy.

As a direct consequence of the departure of families, the local economy is reduced. Consumers, jobs, services etc. have all disappeared with these families. In these rural regions of Brazil, it's very difficult to reconstruct an economic activity after such losses. The arrrival of the factory does not compensate for these departures, because it only brings a few new activities. With regard to tourism, for example, it is always difficult to get started in poorly populated areas, with very few people on high incomes. So although the economic returns are often the strongest argument used locally to justify the dam construction, they remain very limited and often communities continue to go hungry in this respect.

Concerning the migrants' new sites of occupation, change is brought to the local communities who host them as well as to the displaced people. We will sum up the territorial changes with a few key points, as there are numerous ways to present this information and its implications.

The migrants see their entire living space change between the before and after-dam stages. Firstly from the landscape perspective, the river which occupied such an important place has mostly disappeared. Its absence changes the family lifestyle, their activities, their daily routines. Families are often rehoused on a plateau or plain, whereas previously they lived in valleys, particularly for the people of the South. This absence is often mentioned by dam victims during interviews, mainly for the families who were deeply rooted in their living

spaces, i.e. Indians or *caboclos*[1]. These families with roots which are often older than those resulting from the European colonisations, are the ones who miss the landscape, and particularly the river, the most.

Their new environment means new economic activity, particularly with regard to agriculture. The crops and techniques are different and they must be adapted to the new environment. This is the most complex adaptation for families, as many of them go from the status of micro-farmer to being small farmers. Whereas before they were subsistence farmers, their new arrangements stimulate them to produce for the market, no longer simply for survival. This fundamental difference requires a complete change in terms of agricultural production, mainly in terms of techniques, investment, knowledge, etc. The results can vary considerably. We have observed the full range of responses, from complete adaptation to total rejection. As well as the large psychological leap to be made, the financial conditions are not always easy. Migrants families are asked to start producing, and quickly, in order for their new space not to be under threat.

To help with these brutal changes, families have access to two sources of support. The first, provided by the dam construction company, is technical and financial, lasting for a limited period only. The second comes from the community. The migrant families make up a new space where they must form new communities, or sometimes integrate into an already existing one. The first solution is the most common one, but also the most complex. The difficulty comes from the diversity of families who make up the community and contribute to its creation in all respects. Therefore, we find families of diverse ethnic origin, from several villages and different regions, who must now construct new links and interpersonal relations. The families often receive a structural framework from the company responsible for the dam. In the new community, the families usually have access to a community hall, new communication routes, electricity, telephone lines, one or two churches and a school (if there are enough children). These structures are very useful for the families, in order to start the construction of a new community on a good basis, and in a framework which leaves room for growth. Unfortunately, this framework, offered by the company, does not always exist or is sometimes incomplete.

We have observed, in the South of Brazil, communities relocated after the construction of a dam, who barely received the construction materials needed to build new houses. They had to

[1] Varied population made up of a mix of Indians, Portuguese and black slaves who were esacaped prisoners

face some very hard times and a number of families have migrated again to try their chances elsewhere. However, after considerable effort, the community did manage to construct a new, highly fragile, social framework. Through mutual support and working together, they constructed a church and a social centre and invested in irrigation and the purchase of a tractor. This example shows that despite the difficulties, there are positive situations which come out of negative events (dam, migration, etc.).

To conclude this section, we note that the territorial modifications are profound and wide-reaching. Whether environmentally, economically or socially, peoples' circumstances are often precarious and there are great difficulties. Families experience profound change and must rapidly adapt to new realities in order to reconstruct their lives. The economy is thrown into turmoil, causing further damage to land which may already be under pressure. However, responses are sometimes positive and some families take advantage of the fresh start to build new lives. We interviewed some families who saw the dam as an opportunity, while their own neighbours were facing poverty. The responses to migration and territorial change were varied, but the more the social framework is adapted and prepared, the easier it is for families to start again.

Conclusion

Analysis of the land areas around hydroelectric power plants in Brazil reveals great modifications and disturbances. While they could be considered to be calm and stabilised, the rural areas in Brazil where dams are constructed are deeply agitated during the construction phase, and afterwards no longer resemble what they were.

In keeping with the characteristics described previously, the profile of the communities and the landscapes where the dam is constructed is simple. They are often in remote regions, i.e. far away from urban centres. The communities have roots going back several decades, have few resources and live mainly from subsistence agriculture. In these circumstances, neither the land nor the people are prepared to face the turmoil which follows inevitably from the construction of a hydroelectric power plant.

The situation is different during the years of dam construction. This period is mainly characterised by movement, of communities, money and political action. The area where the dam is built is full of energy, bringing in people from all over the country, and new wealth, as well as facing new social and industrial conflict. Once the works are complete, this activity level drops rapidly, leaving a variety of circumstances behind, which can be more or less positive.

We can conclude from this analysis that overall there are three responses to the disturbances caused. The first is impoverishment and the increased economic insecurity of families. Recognised by international studies, these cases are legion and the biggest negative outcome of hydroelectric dam construction. Families do not manage to recover from migration or to find a new economic and residential stability, often opting for secondary migration or long-term mobility. The dam construction is therefore the deciding factor in the instability and fragility of families. The second response is that of the status quo i.e. accepting the transformation and the changes it brings. In this situation, the problem is stagnation and reduced possibilities for improvement. It is particularly the case for families who stay near the dam, but who have lost most of their community. Finally the third response is that of improvement and progression. Families take advantage of the opportunity to change, develop and improve their standard of living. It is a new start, often perceived as such by families, who compare it to winning the lottery. Families with this attitude will try to adapt quickly to their new lifestyles, and to improve them, in the heart of the new communities.

The main question arising then is to know how to ensure this third situation as far as possible, with no families or territories left behind. Is it possible, through greater prevention, planning and monitoring, to control the negative effects of dams?

Bibliography

BERTRAND J.R., OUALLET A., 2002, Communauté(s), ESO Travaux et Documents, march 2002, No 17, p. 7---11.

CERNEA M. M., MOHAN MATHUR H., 2008, Can compensation prevent impoverishment?, Oxford : Oxford University Press, 441 p.

COELHO DOS SANTOS S., NACKE A. (org.), 2002, Memória do Setor Elétrico na Região Sul, Florianópolis/SC : UFSC, 240 p.

MENDRAS H., 1995, Les sociétés paysannes, Paris : Gallimard, 368 p.

SEVÁ FILHO A. O. (org.), 2005, Tenotã---Mõ: alertas sobre as conseqüências dos projetos hidrelétricos no Rio Xingu, São Paulo/SP : International Rivers Network, 344 p.

THÉRY H., 2009, Les dynamiques de l'agriculture brésilienne, Géoconfluence (en ligne) Dossier : Le Brésil, ferme du monde ?, disponible sur : <geoconfluences.ens---lsh.fr/doc/etpays/Bresil/BresilScient3.htm>.

UNIVERSIDADE DE PASSO FUNDO, 2001, Identificação e valoração das externalidades decorrentes da construção da usina hidrelétrica Machadinho no município de Maximiliano de Almeida, Passo Fundo/RS : Université de Passo Fundo : Centro Regional de Economia e Administração, septembre 2001, 64 p.

VAINER C. B., 2003, O conceito de atingido. Uma révisao do debate e diretrizes, Rio de Janeiro/RJ, s.n., 23 p.

VERDUM R., 2007, Obras de infra---estrutura no contexto da integração Sul---Americana. In : VERDUM R. (org.), 2007, Integração, Usinas Hidrelétricas e Impactos socioambientais, Brasília/DF : INESC, p. 13---40.