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## Discourse Analysis of the Debate on Hydroelectric Dam Building in Brazil

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**ABSTRACT:** In recent years new hydroelectric dam projects in Brazil have led to intense debate across society. A range of different social actors have been engaged in these controversies, all of them deploying different discourses to legitimise their postures. This paper addresses the study of the discourses emerging around this debate in the case of two hydroelectric projects in the Cuenca del Alto Paraná River, and examines the way the multiple arguments emanating from the social actors are grouped together. On the basis of a content analysis of qualitative interviews a factor analysis was carried out to identify the groups of arguments. One of the main outcomes of this analysis highlighted the discursive isolation of a single social group – the people affected by the construction of the dams – in contrast to the other actors, who shared arguments grounded in techno-economic rationales. As opposed to this, those affected by the dam projects used arguments based on their emotions, identities and daily experiences of place; their perspectives were absent from the discourses of other actors.

**KEYWORDS:** Discourse analysis, storylines, hydropower, social impact, Brazil

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### INTRODUCTION

In January 2007 the Brazilian government, headed by Lula da Silva, launched an ambitious plan of economic stimuli. The Growth Acceleration Programme (GAP from here on) was funded by a budget of 656.5 billion Reals (over USD225,000 million) to be invested from 2007 to 2010 in building infrastructures in transport, housing, education, the health service and the energy sector. In 2011 the programme was prolonged for four years with a budget of USD582 billion. In both programmes (GAP1 and GAP2) the energy sector was seen as key in supplying the growing demand for power from the productive sector and from households joining the consumer economy.<sup>1</sup> Thus GAP1 and GAP2 devoted 55 and 50% of their budgets, respectively, to increase energy production. Of the nine largest projects carried out under GAP2, five were in oil extraction and refinery, one in nuclear energy and three in hydroelectric power plants (the Usina Hidrelétrica Jirau, the Usina Hidrelétrica Santo Antônio and the

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<sup>1</sup> See [www.pac.gov.br/](http://www.pac.gov.br/)

Usina Hidrelétrica Belo Monte). The main objectives of the GAP programmes were to stimulate faster and more sustainable growth and to invest in basic infrastructures and services for the population.<sup>2</sup>

Building hydroelectric power stations is part of the complex social apparatus in place to control water resources and distribute their benefits and costs (CMR, 2000: 6). The planning, use of control and access to these facilities are disputed by groups and actors with different positions in the social structure. For this reason many analysts see water resources management as an inherently political process (Turton, 2002; Mollinga, 2003, 2008). According to Turton, legislation and policy are the main means by which particular agents – the state and large corporations – shape water management decision-making in their own interests, although these processes may be contested by other social groups.

The political nature of water resources management is evidenced by the fierce resistance which many hydroelectric projects have inspired across the globe. This contestation is built around the argument that, in too many cases, the building of large-scale public works has involved excessive economic and, sometimes, intolerable social and environmental costs (CMR, 2000). The failure of numerous mega-projects (Flyvbjerg, 2005), the unequal distribution of their costs and benefits (Adams, 2000) and the emergence of an ecological awareness (Martínez-Alier, 2002) have laid the foundations for opposition to large dam construction. In short, from the 1950s onwards widespread social awareness of the socio-environmental impact of these large-scale engineering works began to call into question the unassailable legitimacy they had enjoyed until recently (WCD, 2000: 18).

Around this conflict different actors emerge, struggling for the primacy of their own interests in the debate on hydroelectric plants, and to control the decision-making process, the approval of projects, their management, and the social distribution of their positive and negative effects. The various actors taking part in the debate produce and control different lines of discourses to articulate their positions and interests (Orlove and Caton, 2010). And so, discourse is used as a tool for legitimising and justifying each actor's position in the debate and, at the same time, for constructing a reality in line with each one's interests (Dryzek, 2013). These discourses mediate processes of hegemony, in that they are intended to become material realities ensuring the reproduction of specific social relations (Ekers and Loftus, 2008). And in the struggle over water resources management, the production of discourse articulates strategies favouring some groups and excluding others (Dominguez, 2012) in order to ensure control of decision-making, thus establishing who can speak and what can be spoken about (Herzog, 2011).

In this paper we analyse the discourses of the various actors involved in the conflict around dam building in Brazil. For this purpose, we use Hajer's (1995) framework, in particular his concept of 'storylines', according to which discourse clusters can be identified which articulate, through their relationships of affinity, a range of arguments reflecting a specific view of the world. Through this approach we seek to inductively construct the main storylines deployed in this social conflict. This inductive method enables us to avoid using a priori theoretical categories and to reveal the richness of the combinations of arguments in each discourse. Thus, the objective of this paper is to demonstrate the discursive complexity surrounding the building and management of hydroelectric power plants in Brazil, on the basis of two case studies: the socio-environmental conflicts provoked by the Porto Primavera and Tibagi dam projects.

## **DISCOURSE ANALYSIS AND HYDROELECTRIC DAMS: LITERATURE REVIEW**

Following the academic recognition and attention to the political nature of large-scale dam building (Nüsser, 2003; Baghel and Nüsser, 2010) there has been growing interest in studying the discourses

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<sup>2</sup> See [www.pac.gov.br/sobre-o-pac](http://www.pac.gov.br/sobre-o-pac)

surrounding these major infrastructural projects. Currently, there is a wide spectrum of research more or less explicitly analysing the discourses which underpin and structure the debate around these projects.

The political ecology approach, particularly its post-structuralist current, is often found in the discourse analysis of dam projects, for example in the work of Friedman (2006) in Namibia, Latta (2007) and Romero Toledo (2014) in Chile. This approach has succeeded in shedding light on the complexity of power relations and resistance processes, and has advanced a thoroughgoing critique of the twin concepts of modernisation and development (Escobar, 1984, 1995). On the basis of this theoretical approach, these studies analyse the role of social discourse as the expression and vehicle of the symbolic and political weight attributed by the various actors to dam projects.

Studies using Critical Discourse Analysis (CDA, based on the work of Van Dijk (1993, 2001) and Fairclough and Wodak (1997), are also frequent, as in the case of Lestinge and Almeida (2009), who analyse the damming of the River Madeira in the Brazilian Amazon and the role of media influenced by the elites in the social production of the environmental conflict. Likewise, Da Silva and Rothman (2011) show how the local Brazilian press criminalised the *Movimento dos Atingidos por Barragens* (Dam Victims' Movement) for their opposition to hydroelectric projects. Also, Romero Toledo (2014) combines CDA with political ecology to study the HidroAysén mega-project in Chile, demonstrating that in these mega-events, discourse legitimises large-scale techno-environmental transformations, thereby strengthening the position of the elites.

From the methodological point of view, the discourse analysis of large-scale hydroelectric projects has developed using various approaches. Some analysts focus their attention on the discourse of one specific actor, such as the resistance movements to dams on the River Narmada in India (Routledge, 2003; Couch, 2008) and the River Xingu in the Brazilian Amazon (Da Silva, 2011). Other studies take a comparative approach to analysing the discourse of various conflicting actors, for example Romero et al. (2009) and Merino and Bello (2014) for hydroelectric plants in Aysén in Chilean Patagonia, and Abbink (2012) for the River Oms in Ethiopia. Historical analysis is also important, for example the work of Baghel and Nüsser (2010), Trottier and Fernandez (2010), and Haines (2011) and Graef (2013), who extrapolate and explain the main features of the discourses around dams through descriptions of the events, processes and decisions shaping the development of the projects studied.

In the literature one can also detect two main lines of scientific reasoning. On the one hand, there are studies taking a deductive approach, such as those by Friedman (2006), Bingham (2010) and Bratman (2015), who analyse discourse in relation to preexisting 'grand narrative' models such as the theories of sustainable development, developmentalism and the green economy, studying how each actor's discourse corresponds or adheres to these narratives. Conversely, one may find clearly inductive studies, such as that by Romero et al. (2009), research with a marked ethnographic character, and investigations written from the emergent design perspective (Routledge, 2003; Couch, 2008; Mashingaidze, 2013).

However, one of the salient issues emerging from our literature review on the discourse analysis of hydroelectric projects is a certain weakness in scholars' explanations of their analytical procedures, which hinders both interpretation of outcomes and the chances of transferability (Guba, 1981) of the procedure to other case studies. While information sources are mostly made explicit, whether they are secondary texts and newspapers/periodicals (Latta, 2007; Baghel and Nüsser, 2010; Bingham, 2010; Da Silva, 2011; Abbink, 2012; Graef, 2013; Mashingaidze, 2013; Romero Toledo, 2014) or combinations of qualitative interviews, ethnography and documentation (Friedman, 2006; Couch, 2008; Lestinge and Almeida, 2009; Ahlers et al., 2014; Arnall, 2014; Bratman, 2015), the analytical procedure is clarified in very few cases.

In the specific case of Brazil, the literature taking a discursive approach to the study of conflicts around dams pays close attention to their communicative dimension and how the actors disseminate

their discourses. McCormick (2006), for example, analyses the production and transmission of knowledge on hydroelectric dams in Brazil, particularly focusing on discourse strategies such as the 'scientisation of Brazilian dam building policy' – in which scientific knowledge becomes the main communication vehicle for legitimising policies and taking decisions – and how experts and laymen work together; while Da Silva and Rothman (2011) study the role of the press in communicating the conflict and representing the movement against dam building, in this case using the double strategy of rendering it invisible and criminalising it. For his part Da Silva examines the discursive strategies used by the resistance movement to invalidate positions in favour of dam building and the diffusion of their discourse through the electronic media (2011). The Belo Monte Dam has caught the attention of many researchers. Bratman (2015), deploying the Gramscian concept of hegemony, shows how the state and its economic allies have weakened the anti-dams resistance movement through the argument of the common good and the environmental benevolence of hydroelectric power. Bingham (2010) also analyses this conflict, this time using Hajer's approach; she distinguishes between two a priori and opposed storylines struggling for control of the discourse: one prioritising economic growth and the other centred on socio-environmental issues.

The use of Hajer's framework offers an interesting line of analysis for environmental discourse. He argues that when social actors discuss or narrate an environmental issue they use different storylines (1993, 2006). Storylines are, according to this author, narratives in which actors combine diverse discursive elements "into a more or less coherent whole and the discursive complexity is concealed" (1993). Thus, storylines have the purpose of managing this complexity. As he puts it, storylines act as discourse clusters that "are held together by discursive affinity: arguments may vary in origin but still have a similar way of conceptualising the world" (1993).

In this paper we seek to identify inductively the different storylines which come together in the debate, and which are represented here by the clusters of arguments supporting the positions for and against building hydroelectric dams in the high Parana River Basin. For this purpose we analyse how these arguments are related in terms of affinity, resulting in various different storylines. To this end, a Principal Component Analysis (PCA) of the main elements was carried out, thus making the storylines visible in coherent groups of arguments with a high probability of being used jointly by the different actors. Also, the method used examines how these social actors group together around the various storylines (giving rise to discourse-coalitions, in Hajer's terminology<sup>3</sup>) and shows how these actors choose, share or ignore the storylines which shape the debate.

This paper thus joins the existing literature, bringing to bear an inductive approach which evidences the intrinsic complexity of discourses around the debate, and comparing the specific discourses of various actors. In this way we attempt to avoid reductionist positions which simplify environmental conflicts by narrowing them down to pairs of irreconcilable opposites. The following section is an account of the two case studies chosen, followed by an analysis of the discourses obtained from personal interviews.

## DESCRIPTION OF CASE STUDY

The Engenheiro Sérgio Motta hydroelectric dam, known as Porto Primavera, is located on the River Paraná, close to the point where the states of Mato Grosso, Sao Paulo and Paraná meet. The Paraná Basin, at 3,100,000 km<sup>2</sup>, is the second largest in South America after the Amazon. The average discharge of the dam is 11,500 m<sup>3</sup>/s, which can reach 60,000 m<sup>3</sup>/s in extremely rainy years. The source of the river is between the states of São Paulo, Minas Gerais and Mato Grosso do Sul, at the confluence

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<sup>3</sup> According to Hajer (1993) "a discourse-coalition refers to a group of actors that, in the context of an identifiable set of practices, shares the usage of a particular set of storylines over a particular period of time".

of the Río Grande and the River Paranaíba. Subsequently, it is joined by the River Paraguay, to flow afterwards into the Río de la Plata, which separates Argentina from Uruguay. In the upper reaches of the river gigantic dams have been built (such as those of Itaipú and Yacyretá) to exploit its huge volume and plentiful waterfalls and rapids (Ulloa, 2006). Currently, most of the hydroelectric power thus created goes to Brazil. Counting only those dams whose wall is higher than 10 metres, Brazil has 130 hydroelectric power stations in the river basin. Of these, 26 form reservoirs larger than 100 square kilometres. Around 80% of these were built after 1960 (Ulloa, 2006).

The building of the Porto Primavera Dam, begun in 1980 under the military dictatorship, was planned to be completed in 1988, but a series of setbacks delayed its opening until the year 2000. Porto Primavera has a very low wall, thus needing a huge volume of water to move its heavy generators, which produce an average of 900 MW. The dam holds a reservoir covering an area of 2,250 km<sup>2</sup>. The *Companhia Elétrica de São Paulo* (CESP), entrusted with its construction and exploitation, drew up a plan for the eviction and relocation of the peasant and indigenous population living on the islands of the river and on the shores of the area to be flooded. This process was not free from opposition and problems. The social movement organising resistance to the project was led by the Pastoral Care Ministry of the Catholic Church, supported by various NGOs (Ulloa and Bellini, 2010).

The second case study is the project for a series of dams on the River Tibagi (an affluent of the Paraná-Panema, which in turn flows into the Paraná) between the municipalities of Telemaco Borba and Ortigueira. The River Tibagi was the only river which had not yet been dammed in the whole of Paraná State. The Mauá hydroelectric power plant has a potential output of 363 MW, enough energy to cater for 1 million people, and submerged an area of 84 km<sup>2</sup>. Spurred on by the Lula government's Economic Acceleration Programme, eight dams on the river were planned. The project was surrounded by fierce debates in the state. Opposition groups pointed out that it would negatively affect an area rich in biodiversity. According to the NGO *Meio Ambiente Equilibrado* (Environment in Balance), the flooding of the land would also harm hundreds of people, including indigenous populations. To counter these arguments the project developers contended that Brazil needed to increase its hydroelectric power in order to fuel the economic growth required to wipe out poverty and underdevelopment.

## METHOD

Our analysis is drawn from the raw information gathered from 50 in-depth interviews carried out between 2009 and 2011. The choice of interviewees was made using intentional non-probabilistic sampling with five categories, each of which referred to a social group related discursively or materially to the dam construction industry. These five groups had actively and publicly manifested their interest in the issue, and had therefore developed a consciously articulated discourse on it. In selecting the groups of actors, we sought to account for all the most important social sectors (civil society, companies and the state). Our final selection was based on a prior exploratory study using interviews and participant observation (as in previous research by the authors), and resulted in the identification of the following groups: (1) people directly affected by the building of the dams (13 interviews), (2) university researchers (9 interviews), (3) NGOs (11 interviews), (4) public-sector experts (8 interviews), and (5) dam construction companies and large-scale end-point consumers of hydroelectric power (9 interviews). The identification of these categories did not involve an assumption on our part that they had any kind of internal discursive homogeneity. On the contrary, here we seek to demonstrate their discursive heterogeneity and complexity through an inductive analysis of their discourses: an approach distinct from those studies, typical in the literature, which centres on the actors themselves. The choice of these groups was therefore uniquely driven by the search for actors who had either experience or a manifest interest in the conflict around dam-building in Brazil.

For the selection of interviews within each group a snowball sampling approach was used. Thus the total number of interviews (50) was not determined in an a priori way but resulted from a process of theoretical saturation, a widely used criterion in non-probabilistic sampling.

The interview script included the following sections: arguments in favour of and against dams, causes and processes involved in their construction (social, economic, political), practices developed around these, and the impacts of the process. This paper studies in depth only the arguments in favour of and against dam building, since this dimension represents the core of the discursive strategies used, most efficiently summarising how the various actors' positions are legitimised. By investigating this dimension in the interviews, we were able to analyse in greater depth the storylines overlapping in the debate, and with them the ideas conditioning specific ways of acting. If as Hajer says (1993), "storylines are the medium through which actors try to impose their view of reality on others, suggest certain social positions and practices, and criticise alternative social arrangements", then arguments for and against dam projects represent in a summarised form the tools with which each of the actors justifies his or her position and articulates the self-made discursive strategy to the rest of society. Thus an inductive analysis of the arguments and the affinity relations between them – through a PCA of their main elements – was employed to yield the main storylines deployed in the context of this particular conflict.

For this analysis the interviews were coded using Atlas.ti software, thereby identifying all the arguments expressed by the interviewees. By way of an example, if the interviewee stated that "the costs of dams are greater than their benefits", this was taken as an argument against dam building and was coded as such in the programme. Occasionally, the same argument was used positively by one interviewee and negatively by another. For example, the 'previous experiences of dam projects' argument is cited by one interviewee in a positive sense (previous experiences mean that the errors of the past will not be repeated), while another uses it negatively (previous experiences argue against building dams). In this case, this was coded as a double argument (one positive and one negative) in order to reflect accurately the interviewees' positions. We explain below in more depth the analytical process and its main outcomes.

### **STORYLINES ON THE CONSTRUCTION AND MANAGEMENT OF DAMS IN THE ALTO PARANÁ BASIN**

The coding of interviewees' arguments yielded a total of 34 codes (arguments), 21 against and 13 in favour of, as outlined in Table 1.

Atlas.ti includes a function which quantifies citations for each of the codes assigned during the interview analysis. Using this function, a file containing quantitative data from the interviewees in the rows (cases) and their arguments in the columns (variables) can be exported to the statistical analysis programme SPSS. The data thus obtained from this file indicate the frequency of citation for each of the arguments and for each of the interviewees.

On the basis of the resulting data, a Principal Component Analysis (PCA) was made. This revealed the presence of four storylines, or coherent combinations of arguments in favour of/against hydroelectric dams (see Table 2). While in traditional discourse analysis it is the researcher who identifies the latent and manifest relationships between codes, in our case these relations were identified by the statistical analysis programme, thereby offering a more systematic analysis. Thus the PCA demonstrates the latent connections between arguments by grouping them into factors.

Table 1. Description of arguments and their codes.

Code	Argument
Costs	The costs of construction outweigh the benefits
City vs. Country	Living in the country is preferable to living in the city; the construction of dams involves the relocation of the population in cities
Questioned model	Building dams forms part of an economic model which should be questioned
Hegemonic discourse	The core of the hegemonic discourse is that it is something indispensable and necessary for the common good, when this is not really true
Reduction inequality and poverty	We should reduce the country's inequality and poverty, but not by building dams or commercially exploiting natural resources
Unequal distribution of costs	The costs of construction are unequally distributed
Renewable and alternative energies	There should be a shift towards renewables and/or alternative energies
Polluting energy	Hydroelectric energy is a polluting energy; it is not a cheap and clean option as has been argued
Expensive energy	Energy produced by dams is expensive
Necessary energy	Unreal estimates of the country's energy needs are put forward
Previous experience	The country has had bad experiences with the building of previous dams
Idealisation	This mode of energy production has been idealised
Inefficiency	Existing dams are inefficient and waste a lot of energy in transport and distribution
Commercially exploiting	Building dams involves commercially exploiting natural resources, which are already expensive for the least favoured social groups
Mitigation of impacts	The impacts of construction are not mitigated while building is in progress
Neocolonialism	Boosting hydroelectric energy responds for the interests of the big consumers, often foreign multinationals. Thus we see a process of <i>neocolonialism</i> , in which raw materials are exported and manufactured goods imported
Environmental Liability	Building dams contributes to Brazil's 'environmental liability'. That is, the benefits are shared with other countries, whereas Brazil alone has to deal with the consequences
Re-powering	Instead of building new dams, existing ones, which are old and obsolete, should be repowered
Rivers-wealth	Rivers represent wealth and resources for the whole population, and building dams privatises and controls them
Emotional value	Building dams alters and destroys the landscape and its elements, which gives them emotional value
Sustainability	Neither building dams nor the form in which they obtain energy are sustainable

	Abundance	In Brazil there is abundance of, and easy access to, water resources; it would be wasteful not to use them
	Economic growth	Building dams favours the country's economic growth and development
	Hegemonic discourse	Building dams is indispensable and necessary for the common good
	Reduction of inequalities and poverty	Building dams is a tool for reducing the country's inequalities and poverty
In favour of	Clean energy	Hydroelectric energy produced by dams is a clean form of energy
	Renewables and alternative energies	Hydroelectric energy is a renewable and/or alternative form of energy
	Cheap energy	Renewable energy is a cheap form of energy
	Necessary energy	The energy produced by the dams is essential
	Previous experience	Experience enables us to avoid errors made in previous projects
	Idealisation	Dams create no negative impacts
	Efficiency	Hydroelectric energy production with dams is highly efficient
	Legitimation of scientific knowledge	Building dams is always backed up by scientific studies attesting to their viability. When a building project is commissioned, innumerable and thoroughgoing scientific studies are carried out
	Mitigation of impacts	Impacts produced by construction are foreseen, and are monitored and mitigated from the design of the project onwards

In other words, the application of PCA to the study of the discourses around dam building enabled us to identify those arguments with the highest likelihood of appearing together. In the debate on dam projects in Brazil multiple arguments come together, each selected and deployed by the actors in the course of their discursive praxis; thus actors with different discursive positions may use similar arguments. The inductive construction of the storylines using PCA enabled us to identify discursive tendencies articulated in a complex way on the basis of the diversity of arguments in favour of and against dam building. Thus this approach allowed us to move beyond a priori classifications that separately analyse each social group's specific discourses (as has been habitual in the literature up to now). Our analysis seeks to avoid the risk of the simplification and compartmentalisation of discourses. This means that through the study of the diversity of arguments and the complex relationships between them, the storylines articulating the debate can emerge without our assuming that the actor is the differentiating and defining agent of discourse.

The storylines, as groups of arguments, show internal homogeneity based on the direct or inverse relationship (+ or – of R, respectively) of each argument with each component (storyline) (Table 2). This is useful for understanding how, on the basis of each storyline, a specific view of reality is put forward and others excluded. So, when the positive or negative relationship (and its measure) of each component with all of the arguments is determined, the discourses are not observed as belonging to each social group, but become storylines bringing together the arguments of various social actors.

Table 2. Matrix of rotated elements. R of each argument with each component.<sup>4</sup>

A: Against / IF: In favour of	Component			
	1	2	3	4
A. Costs	-.552	.611	.547	-.149
A. City vs. Country	-.334	-.264	-.904	-.042
A. Questioned model	-.201	.935	.226	.187
A. Hegemonic discourse	-.295	.554	.411	-.661
A. Reduction of. inequalities and poverty	-.204	.088	.283	.933
A. Unequal distribution of costs	-.525	.230	.765	.294
A. Renewables and alternative energies	-.343	.917	-.202	.033
A. Polluting energy	-.204	.088	.283	.933
A. Expensive energy	-.082	.916	.058	-.390
A. Necessary energy	-.201	.935	.226	.187
A. Previous exposition	-.376	.859	-.348	-.026
A. Idealisation	-.082	.916	.058	-.390
A. Inefficiency	-.201	.935	.226	.187
A. Commercial exploitation	-.325	.824	-.403	-.229
A. Mitigation of impact	-.201	.935	.226	.187
A. Neocolonialism	-.230	.840	.272	.409
A. Environmental liability	-.150	.972	.151	-.101
A. Re-powering	-.222	.875	.260	.343
A. Rivers-wealth	-.401	-.182	.627	-.643
A. Emotional value	-.540	-.211	-.727	-.368
A. Sustainability	-.535	.087	.790	.286
IF. Abundance	.980	-.180	-.022	-.027
IF. Economic growth	.978	-.197	-.019	-.024
IF. Hegemonic discourse	.971	-.195	-.025	-.026
IF. Reduction of inequality and poverty	.966	-.194	-.030	-.019
IF. Clean energy	.956	-.187	-.026	-.017
IF. Renewable and alternative energies	.962	-.192	-.028	-.021
IF. Cheap energy	.964	-.179	-.021	-.028
IF. Necessary energy	.856	-.311	-.412	-.046
IF. Previous experience	.943	-.191	-.016	-.016
IF. Idealisation	.953	-.189	-.024	-.020
IF. Efficiency	.932	-.190	-.015	-.025
IF. Legitimation of scientific knowledge	.970	-.183	-.020	-.030
IF. Mitigation of impact	.950	-.195	-.029	-.032

<sup>4</sup> Source: Created by the authors from the content analysis data. Parameters for the PCA: KMO 0,76. Bartlett's sphericity test  $p < .000$ . Total variance explained: 86%.

The storyline corresponding to element 1 (S1) is characterised by the marked presence of arguments in favour of hydroelectric dams. This element correlates with all of these arguments at very high levels. On the other hand, S1 correlates negatively with arguments against dam building. Thus we can affirm that S1 is the storyline with the most clearly defined posture in defence of these projects. In it, dams represent an indispensable means of supplying power for the economic growth needed to automatically reduce the country's poverty and inequality. This storyline argues that the country's wealth of water resources should, necessarily, be exploited for the production of energy. In addition, the choice of hydroelectric power is supported, according to interviewees, by the argument that it is an environmentally clean source of energy, as well as being efficient, cheap and renewable. Past construction errors, as in the case of the Porto Primavera dam, can now be avoided due to these very experiences, and furthermore the possible negative impacts can be mitigated by technical means. According to this storyline, scientific knowledge and research guarantee the correct building of these infrastructures. The component identifying this storyline correlates negatively with all arguments against dams. More significantly, it correlates negatively with arguments stressing the emotional importance of the territory, river or landscape, unspoiled for its inhabitants, and the river's inherent value (i.e. not as a source of energy or potential engine of growth).

The second storyline (S2) is marked by the majority presence of arguments against dams. Unlike S1, here there is no such an appreciable polarisation since it does not correlate positively with all arguments against, although it does correlate negatively with all those in favour of dam building. This storyline positions itself against the idealisation of hydroelectric power, arguing that it ignores the unequal distribution of construction costs since it does not reduce either poverty or social inequality. Dam projects produce, according to this set of arguments, a form of power which is neither clean nor sustainable. Nor is the construction of these infrastructures seen as sustainable. Other important arguments in this storyline affirm that behind the interest in boosting power production lie the interests of large multinationals. As these interviewees state, this is a form of corporate neocolonialism. Large corporations, whose production is heavily oriented towards the international market in raw and little-processed materials, require enormous amounts of energy for their production processes. The paradigmatic case is that of aluminium lamination, a power-intensive industry based on Brazil's huge bauxite reserves. For this industry to be internationally competitive the price of the energy it consumes has to be low, thus conditioning, among other things, hydroelectric dam production and management costs. This results in the refusal to recognise certain environmental and social costs which would push up the final price of energy and with it the price of aluminium. Thus the multinationals extract, commercialise and internationalise Brazilian natural resources (water and bauxite), leaving the environmental and social costs behind in Brazil. This storyline advocates the repowering of existing dams and enhancement of their efficiency, as well as improvements in the transport and distribution of the energy produced. It is argued that the costs of the construction of new dams are greater than the benefits, and do not even mitigate the impacts produced. A rethinking of the Brazilian power-producing network is demanded, in which, while energy is seen as necessary, it would not be obtained by building new dams. Arguments referring to the emotional value and the intrinsic value of the landscape or river have no place in this storyline.

The third storyline (S3), similar to the previous one, is characterised by the presence of arguments positioning themselves fundamentally against dam building. Again, the in favour of/against dichotomy is not as marked as in S1. This storyline correlates negatively with all arguments in favour of, which occurs with only some arguments against dam building. However, we could mention four important differences which shape it and therefore justify identifying a set of arguments distinct from S2. Firstly, among the arguments common to both S2 and S3 (A. questioning the model, A. hegemonic discourse, A. expensive energy, A. necessary energy, A. idealisation, A. inefficiency, A. mitigation of impacts, A. neocolonialism, A. environmental liability and A. re-powering) the correlations are, in general, less strong in S3. This is because the arguments in S3 are less cited by interviewees. Thus we could call S3 a

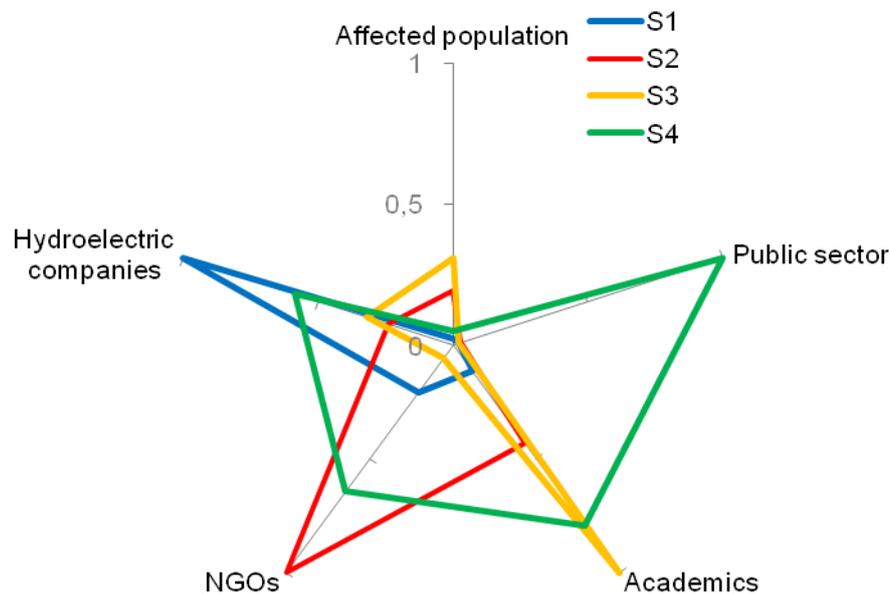
less saturated storyline, or we could say that its arguments are less common to the actors. Secondly, in S2 more structural or ideological arguments are found, such as the need to call into question the model of energy production and the debunking of the myth of hydroelectric power as sustainable, clean, cheap and necessary. Also there is condemnation of the appropriation of the power supply by foreign companies who then do not assume responsibility for the impacts caused. Thirdly, we find arguments which have greater presence and importance in S3. These are articulated around the calling into question of the sustainability of this form of energy production, since it negatively alters river ecosystems and privatises their use. Also notable are arguments referring to the high costs of this type of energy and its unequal distribution among the population. This unequal distribution of costs connects with another of its central arguments: the challenge to the view that economic growth fuelled by this type of power is the way to reduce inequality and poverty in Brazil, arguing that the benefits are not equally shared out. Fourthly, we should mention those arguments which, while they correlate positively with S2, have negative correlations with S3: first, the argument that there should be a shift towards renewable and/or alternative sources of energy; second, the argument stemming from the country's bad experience of dams; and third, the mercantilist vision of natural resources, which harms disadvantaged sectors of society. This could be interpreted as meaning that S3 is not as sure as S2 of the need for a radical move towards renewables; or that the country's experience of dams has been so negative; or that they conform so closely with the mercantile view of natural resources.

Finally, the fourth storyline (S4) is characterised by low correlations with the majority of arguments either for or against. Similar to S2 and S3, this storyline does not take up such a categorical and dichotomous standpoint as S1. While all arguments in favour of dam building have negative correlations, this does not occur with all the arguments against. Amongst these, S4's high correlation (the highest of all the storylines) with the argument that economic growth fuelled by dams leads to the reduction of poverty and inequality (A. hegemonic discourse) is clearly seen. Also noticeable is S4's high correlation with the argument calling into question the cheapness and cleanness of hydroelectric power. While this discourse includes the argument (against dams) that the conservation of the rivers represents a form of wealth for all the population, it does not acknowledge the landscape and its emotional value as part of this wealth.

Up to this point we have seen how, on the basis of the latent correlations between arguments provided by the PCA, we obtained four storylines or coherent groups of arguments in favour of and against dam building. The data exported from Atlas.ti also allowed us to determine the relationship of each group of actors with each storyline. In other words, the analysis enabled us to see which storyline corresponds most to each group of actors interviewed or to how the actors form discursive coalitions (sharing storylines completely or partially), in the terms defined above.

Figure 1 shows the factor scores of each social actor in each one of the factors or storylines. Each of the lines represents, therefore, one storyline. Its closeness or distance from each social actor indicates a greater or lesser participation of the actor in the storyline. Thus we see that four of the five social groups interviewed present high scores in one of the storylines. Companies see their way of thinking and acting better represented in S1, NGOs in S2, university researchers in S3 and public-sector experts in S4. However, the greater correspondence (highest score) of the actors with the specific storylines does not indicate an absolute correspondence. As we see in Figure 1, the scores of the groups interviewed fluctuate in the various storylines. So we observe that the NGOs, while they correspond most closely to S2, also show a strong affinity to S4. The same occurs for the business sector with S1 and S4, and the public sector with S3 and S4.

Figure 1. Factor scores of groups of actors according to storylines.



One of the most striking results of this analysis is that the group of those directly affected by dam building does not score highly in any of the four storylines. Bearing in mind that the PCA was carried out using the average frequency of citations of each argument by each group of actors, we may conclude that this is due to the low likelihood that the storylines found in the analysis contain arguments from this group. This does not mean that it has no discourse. As a social actor it has a discourse defining and defending its interests. But its arguments are simply not present in the views of the other groups.

A detailed observation of citation frequencies for the directly affected group's arguments shows that the most important are: A. emotional value and A. city vs. country – arguments which are ignored by the other groups. It is for this reason that the PCA did not identify these arguments as a storyline. However, given the internal consistency of this group of arguments we could interpret it as a fifth storyline (S5) associated uniquely with the category of those affected by the dams, identifiable by the negative correlation of its main arguments with all other storylines. The emotional value argument refers to this group's opposition to dams because they destroy and/or radically change the landscape and its natural resources, elements which are charged with emotional value for local communities. The city vs. country argument refers to all or part of the community's forced exodus from rural to urban areas as a result of the flooding caused by the dam. These, then, are arguments which evidence the heavy symbolic and emotional weight of the environment, altered or destroyed by the building of dams. Feelings stemming from people's day-to-day experience of nature and the threat of the disappearance of their signs of identity appear exclusively as arguments of those who know that their lives will be transformed by the dam. They are arguments which emerge most strongly in the social group which experiences in the flesh the environmental changes wrought by these projects; it is the group on which the most immediate consequences of these changes fall directly. No other group pays such a high price in its customs, daily living and way of life as those directly affected. For these reasons their arguments are not shared by the other groups, which, in turn explains why they do not appear in the PCA.

## DISCUSSION

We see, then, that in the conflict aroused by the building and management of hydroelectric dams in Brazil different storylines can be distinguished, articulating different social views on the issue. These different conceptions of reality are used to legitimise the positions of the different actors in the conflict and their particular interests. All the storylines analysed attempt to materialise their discourse – or institutionalise it, in Hajer's terms (1993, 2006) – but only those linked to the economic elites have been able to do so up to now.

In the case of S1, this storyline projects a reality based on the idea that in order to eradicate poverty in Brazil it is necessary to grow economically, and that to do this the production of hydroelectric energy is necessary. The discursive logic behind this storyline is characterised firstly by its reductionist view of reality and, secondly, by its success in becoming hegemonic. This is demonstrated by the Brazilian government's economic strategy, built on the same arguments as S1. The dominant discourses on hydroelectric power involve and legitimise practices which lead to the production of material realities such as the construction of dams (whose impacts are unequally distributed in society) and a form of water resources management which reduces and simplifies the value of these resources, turning them into saleable commodities.

This ruling discourse has been used to justify the construction of new hydroelectric projects during the most recent history of the Brazilian hydroelectric sector. According to the Lula government's Growth Acceleration Programme (GAP), an increase in energy production of 4.5% per year was needed to keep up a GDP growth rate of 3.5% per year. Thus it was seen as necessary to raise electrical energy production by 27,420 megawatts after the year 2000. Apart from the mega-dams to be built in the Amazon Basin (Antentas, 2008), a large hydroelectric programme was drawn up for the south of the country. In the states of São Paulo and Paraná, the GAP projected the construction of five new hydroelectric plants: Tijuco-Alto in São Paulo and Salto Grande, Telémaco Borba, Mauá and Baixo Iguazú in Paraná. This discursive logic legitimises and justifies the building of such dams on the basis of the reservoirs-or-poverty dichotomy (Mega and Mirumachi, 2016: 381; Crow-Miller et al., 2017), thereby sidestepping a more holistic appraisal which would include the social and environmental costs they produce and, especially, how these impacts are socially distributed. This reduction of a complex reality to a dichotomy of opposing pairs is typical of hegemonic discourses surrounding environmental issues. The reductionist position is directed towards obliging the population to choose between the immediate situation of poverty and an always distant and uncertain future of sustainability.

As this study has shown, to oppose the strength of these arguments, counter-hegemonic discourses appear, endeavouring to deconstruct the reservoirs-poverty dichotomy and introduce other variables present in the social field created by the production and distribution of hydroelectric power. These are characterised by a greater plurality and complexity than the hegemonic discourse and originate from different traditions and views of reality. They embrace a diverse range of arguments including ecology, indigenism, the left, feminism, the postmodern critique of developmentalism, etc. and bring new variables to the appraisal of environmental issues, attempting to go beyond the exclusively economic focus to engage in a political discussion of the unequal social distribution of impacts. They argue that reality cannot be reduced to profit-and-loss accounting, but should be seen as a social and political phenomenon. Thus they endeavour to bring into the debate the unequal social distribution of impacts and North-South differences, basing their arguments on theories of neo-dependence between centre and periphery. Likewise, they argue in favour of alternative technologies with lesser economic and environmental impact which would reduce the negative effects of new dam construction. So, they struggle to make environmental, social and cultural impacts visible, and argue for their inclusion in impact assessment at the same level as economic effects. These views have seen a certain amount of social support, as is reflected in the influence of activist groups such as the Dam Victims' Movement (MAB in its Portuguese acronym). These arguments are shared by storylines S2, S3 and S4, and also

appear in the arguments put forward by those evicted by dam projects. However, there are important differences which should be addressed.

We could state that although storylines S2, S3 and S4, take up a posture against dam building and management, organise their arguments according to the same discursive logic as S1. They share the same materialist, economic and structural logic as S1, and this distances them from directly affected groups. This is a materialist logic since material environmental impacts are foregrounded over socio-cultural ones. They dispute the economic efficiency of new hydroelectric projects, comparing them with the lower cost of re-powering, and cite centre-periphery structural relations and processes of neocolonialism. Therefore, they do not introduce other factors into the discussion, i.e. values and emotions which question techno-economic reductionism and the sometimes dehumanising approach of the structuralisms. They articulate their discourses, and then on the same pattern as S1, within the technological and economic debate. They play by the same rules: the logic of the market. They admit, therefore, that the social reality of the conflict follows a reductionist profits-and-losses logic, leaving out those factors which are not measurable or marketable. On the other hand, the group of those affected by hydroelectric projects use emotional and symbolic arguments linked to their ways of life which do not even come into the debate or form part of the prevailing discursive reality. In this way their arguments are downgraded and their demands obscured and excluded from the decision-making and compensation process.

In addition to the above, while the main focus of this article is to inductively identify the main storylines appearing in the conflict around dam-building in our two case studies, one of the most interesting outcomes is the finding that actors in different social categories share the arguments of different storylines in a complex way. Thus we can affirm that the storylines do not correspond in any clear and unequivocal way with the social categories identified here. While S1 does show a marked coincidence with the group of business leaders, the other storylines are seen to overlap between groups. Hence the concept of the discursive coalition is interesting in our context since we see here how such coalitions take shape across groups. This contrasts with the existing literature's habitual tendency to analyse the discourses of previously defined social groups individually and in opposition to the discourses of other groups.

Although our findings stem from two specific cases, the outcomes of this study may offer important data for designing strategies of contestation and resistance for groups opposing the developmentalist projects of the big-business sector, backed by governments. On the one hand those directly affected are introducing into their discourse new elements often originating in the scientific discourse of environmental sustainability, thus giving them a certain legitimacy, since they are deploying a logic which is 'admissible' to the other competing groups. And on the other hand, groups supporting those affected by dams should also endeavour to include in their discourse these other, emotional arguments, putting them forward to counter the reductionism of strictly economic logic. Otherwise, both scientists and technicians, and even NGOs supporting affected groups, will have little chance of winning the debate, since they are using the same arguments as the economic discourse, thereby implicitly accepting the rules this logic imposes.

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