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Media representations of socioenvironmental conflicts in Guatemala: The case of the hydroelectric expansion

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Abstract

The Guatemalan State demonopolized and privatized the electricity market between 1996 and 2000, with two main justifications: first, that rural electricity coverage, which at the time was less than 50%, was a significant obstacle to human development; and second, that there were large amounts of energy resources, especially hydroelectric, unexploited. The subsequent policies and strategies implemented led to quadruple the installed capacity of the network in twenty years, while private hydroelectric generation grew 6000%. However, the neighbouring rural communities received the hydroelectric expansion with protests because of their impact on water use, associating it with extractive industries such as mining or oil. Although these events have been studied before, the last fact points that a Science and Technology Studies (STS) could provide new insights to understanding them, since this representation of hydroelectricity challenges the conventional view of renewable energy as clean and sustainable in this sense: Why is "clean" technology such as hydroelectricity associated with "dirty" industries like mining?

The research objective broadens the scope of the previous question since it proposes to identify the fundamental social actors and processes for understanding the media representations of hydroelectric generation in Guatemala and the effects they have on hydroelectric conflicts.

Two parallel investigations were developed to confront results. The first was the cartography of the hydroelectric expansion (Venturini, 2010), based on Actor-Network Theory, “ANT”, (Latour, 2005), and postcolonial theory (Anderson, 2002; Marques, 2006; Escobar, 2004) to account for the influence of the Guatemalan colonial past on conflicts, which occurred in mostly indigenous areas. The second was the analysis of a corpus of opinion articles chosen using the methodology of digital media monitoring (Neresini & Lorenzet, 2014) in Guatemala and Colombia. The analysis of the media representations was based on Social Representations theory, “SRT” (Moscovici, 2000), especially the work done regarding environmental studies (Lovins, 1976; Devine-Wright, 2007; Brondi, Armenti, Cottone, Mazzara, & Sarrica, 2014) and the methodology, the quantitative content analysis based on the "bag of words" model (Roberts, 2000; Tuzzi, 2003). Finally, the results from the previous stages were compared to establish an enriched cartography of the controversy.

The analysis of the corpus points to significant differences in the representations of hydroelectricity. In Guatemalan media, the analysis of the corpus resulted on the prevalence of "soft-path" representation of energy transitions, which gives a more active role to the public; while in Colombian media, the texts were more associated with a "hard-path" representation, in which energy is a matter of national interest.

As for the cartography, the findings point to the role of actants as Chixoy, the largest hydroelectric power plant in the country, or “El Niño” Phenomenon, in the creation of the legal framework for the de-monopolization of the electric market. At the time, the interaction between these actants and others put at risk the stability of the national electricity network, contributing to emphasize in the new laws the dispositions that guaranteed the electrical supply, even when their public justification pointed to more developmental objectives. By prioritizing efficiency, the socio-environmental costs of the projects were transferred from the corporations to the communities, which fomented the conflict. This finding, which had been overlooked in previous research on the conflicts, shows how methodologies and theories conceived from the Science and Technology Studies field can bring better understanding to this kind of conflicts. Theoretically, this dissertation shows how research that works with combined theoretical approaches can produce results grounded in more evidence from different contexts. In particular, it points to an affinity between SRT and ANT as joint research frameworks that is worth exploring in future projects.

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Introduction

Before addressing socioenvironmental conflicts, before discussing their media representations, before mapping the public controversy around hydroelectric energy, let us make one point clear: This is a story about Development. Yes, the one with a capital "D". It is an example about how the concept has transformed from a beacon that has guided politicians, economists, activists, local and global institutions, and society in general over the past hundred years, to a contested pitch from not-so-credible salesmen with too strong and evident ties with the powers that be. And yet, development, or more specifically the indicators created to measure it, is still almost irreplaceable for understanding how a collective transforms and becomes a fairer and more inclusive environment to all its members (or sadly, the other way around).

This story is about Development because the matter of concern behind this dissertation and its parts, the research question, the objectives, the methodological and theoretical framework, is quite simple: Whose development? Which version of it? If we take as a starting point that a material improvement of the conditions of life for the poor, the deprived, is needed, the actions that follow pose some hard choices. Which conditions will be dealt with first, and to what extension? Which changes and impacts are acceptable? And of course, who makes these choices?

To try to give a comprehensive answer to these questions for the whole development debate in a single dissertation will be too big a problem to tackle–even in the case of a small country like Guatemala-, so it has to be reduced to one aspect of it. In this case, the aspect of the problem to focus on is renewable energy policies, and it is approached from one perspective, sociotechnical controversies and their representations on media. The case in question is what I have come to name as the "Hydroelectric Expansion" that started in Guatemala in the late Nineties and that is still developing, and the socioenvironmental conflicts that rose subsequently. This dissertation focuses on answering the following research questions about this case:

What are the actors and social processes that led to the current state of affairs regarding the Guatemalan hydroelectricity expansion and the conflicts surrounding it?

Which aspects of the media representations of hydroelectricity in Guatemala are locally bound and which are common with those of other countries in which environmental conflicts of this type exist?

What new insights could bring analysing the hydroelectric expansion using a sociotechnical approach, especially in regard to its representation as part of a large extractive complex?

In order to give a general direction to this research project on the basis of the questions formulated above, the main objective was constructed as follows:

> To identify the actors and social processes that are central to the current representation of hydroelectricity in Guatemala, and the effects of such a state of affairs on the power struggle that arises from the conflicts surrounding the development of hydroelectric power plants.

How is this objective relevant to the question of development raised in the first paragraphs of this introduction? Renewable energies have come into the spotlight of the public debate after worldwide issues like pollution and climate change became certain threats to our survival and way of life. They have become a non-controversial part of the proposed path to avoid these global environmental catastrophes, and their representations in media and public debate have also become positive and associated with the development agenda. But one must not lose sight that this fact does not mean that renewable energies have little or no social and environmental impacts. This is especially true in the case of hydroelectricity, a versatile technology that depending on the type of configuration can range from massive impacts to small and manageable ones, social and environmentally wise. Consequently, overtly enthusiastic (and simplistic) media representations of hydroelectric energy can contribute to obscure actual concerns of less powerful actors –like nearby communities – and help imposing an external development model that actually excludes those that it is supposed to benefit.

In order to operationalize the general objective, three specific objectives were devised. These three objectives, as they were outlined, divided this research project in two main parallel research phases, and a third phase that assembled and compared the results of them. The first two parallel inquiries were framed differently in both the theoretical and methodological sense. This division of the project led to the division of this dissertation in four parts.

In the First Part, which goes from Chapters One to Three, the research problem is presented (Chapter One), then its technical context (Chapter Two) and finally, its social, historical and political contexts (Chapter Three).

The Second Part of this dissertation is built around the first specific objective, which aimed at mapping the ongoing hydroelectric expansion in Guatemala and the conflicts that have risen subsequently, by taking into account the former's historic, economic, sociotechnical, political and environmental dimensions, and by identifying key actors, their individual and common trajectories, and their power struggles. Chapter Four shows how this first research line was theoretically based on the study of socioenvironmental controversies from a Science and Technology Studies (STS) perspective, and in particular nourishing from, Actor-Network

Theory (ANT) (Callon, 1986; Latour, 2005), Postcolonial STS (Anderson, 2002; Marques, 2006) and Development Studies (Escobar, 1995; 2004); this framework was selected also because previous studies on the matter gave little or no attention to the sociotechnical aspect of this problem. Methodologically, this research line applied methods from ANT like cartography of controversies, network mapping (Venturini, 2010) and media monitoring (Neresini & Lorenzet, 2014). Chapter Five presents the results from the cartography. The hydroelectric expansion was reconstructed historically by collecting information from documental sources, like journals, official government websites and other internet resources. The first result from this inquiry was in fact, the realization that the events that led to the current state of affairs could be seen as part of a multistage process that is called here, "The Hydroelectric Expansion". The second result showed that there was a valuable contribution from the STS and ANT approaches to the understanding of the research problem. In particular, two findings stand out: first, the role of the legal framework, in particular Guatemala's General Law of Electricity (GLE), in the expansion of the electrical grid and more critically, in the rise and latter handling of the socioenvironmental conflicts over hydroelectric developments. Although the GLE role in the conflicts has been pointed out elsewhere, an ANT approach took the research to dive into the network that materialized in the GLE and made it follow afterwards the actors that the law mobilised, showing how it became a mediator (Akrich, 1994), an actant, and transformed the network surrounding it, provoking effects unforeseen by its creators, who expected instead for it to be a mere intermediary. The second finding showed the influence of other actors and actants in the whole "expansion" model that was deployed in the early stages of the process. While previous studies make the argument that the expansion was mainly a result of the worldwide shift to neoliberal policies of privatization and deregulation that became popular in the Eighties and Nineties following the fall of the Soviet Union, this study shows that the emphasis in efficiency was not solely ideological. The influence of actants, like El Niño Southern Oscillation (ENSO) and the largest public hydroelectric dam in Guatemala, Chixoy –plagued with corruption and operation problems –, partially explained why the shift was made possible with little or no opposition from any of the actors involved. The problems raised by those actants shifted the conversation from the expansion of the electrical network, which was and is the real action to promote development, to the efficiency and reliability of the existing network, which involved more than an expansion in electrical distribution, an expansion in electrical generation.

Part Three presents the research phase that was developed from the second specific objective, which aimed at comparing the representation in the media of hydroelectricity projects in Guatemala and another Latin American country, in order to determine which aspects were common to both of them and which were not, with special interest on the representation of hydroelectricity as a part of a larger, all-

encompassing, extractive complex. Chapter Six presents the theoretical and methodological frameworks of this phase. To study the media representations, some concepts and theories from Social Representations Theory (SRT) (Moscovici, 2000) were used. In particular, the representations of hard and soft paths of energy transitions (Lovins, 1976; Devine-Wright, 2007; Brondi, Armenti, Cottone, Mazzara, & Sarrica, 2014) were used to compare the different discourses that emerged from the corpus. Regarding the methodology, the approach used was quantitative content analysis (Tuzzi, 2003), which overlapped also with methods from the field of text mining (Miner, et al., 2012). Chapter Seven presents the results of the data collection and analysis. To start the research process, the Latin American country chosen was Colombia, since it had the same type and approximately the same number of environmental conflicts (Lea, Del Bene, & Martínez-Alier, 2015; Observatorio de Conflictos Mineros de América Latina, 2015) as Guatemala and because both countries had similarities (colonial past, language, indigenous population), but there were enough historical, social and political differences between them to make the comparison an effective tool of analysis of the media representations in Guatemala. In regard to the selection of the corpus, only sources that were published by recognized media organizations or journalists and that had an online version were selected for the analysis. The sources were selected based on the amount of web traffic for each site, according the country statistics provided by the website www.alexa.com. This procedure resulted in ten websites in Guatemala and 16 in Colombia. Then, the opinion articles were selected from each site using a relevant keyword search, and limiting the result to the period from 2010 to 2015. Their content was extracted using data mining and web scraping software, resulting in 262 articles from Guatemala, and 303 from Colombia, for a total of 565 articles. The content of the articles was analysed with statistical techniques that use the bag-of-words approach (Tuzzi, 2010) and the assistance of the content analysis software QDAMiner and the online platform CorTexT Manager. Specifically, correspondence analysis (Benzécri, 1992; Greenacre, 1984) showed that there were significant differences in the media representation of hydroelectricity of each country. A second analysis, this time using network mapping (Blondel, Guillaume, Lambiotte, & Lefebvre, 2008), produced similar results. In general, the texts in the Colombian sub-corpus were more associated with a hard path narrative of energy transitions, which emphasizes the role of energy projects as strategic assets for national development, while the Guatemalan sub-corpus could be more associated with a soft path narrative, which views energy transitions as a process of negotiations among actors, in which the concerns of the public and potential and perceived impacts play a central role. The results obtained also offered evidence that the representation of hydroelectricity as a part, along with the mining industry and other large agro-industries, of a larger extractive complex, was more associated with the Guatemala media than with the Colombian. In conclusion, these results suggest that representations are more centred in conflict and the social and environmental impacts of

hydroelectricity in Guatemala, while in the Colombian media their representations covered a wider range of topics, although keeping an overall tone more akin to a hard path narrative, which views energy projects as a part of a national strategy of development.

Part Four brings together the previous research phases and presents the conclusions of the dissertation. It revolves around the third and last specific objective, which aimed at determining how the media representations of hydroelectricity affects the power relations among different social actors in Guatemala, and how they shaped and were shaped by the developments on recent years of hydroelectricity and the conflicts around it. This objective was actually planned to have a unifying function, aimed at confronting the results of both the preceding research phases in a way that each of them would be enriched by the findings of the other. One of the results of the analysis showed how mapping the hydroelectric expansion explained, at least partially, the representation of mining and hydroelectricity as part of a larger extractive complex. The joint analysis pointed to an explanation of the diverging hard-path and soft-path representations of hydroelectricity in Colombian and Guatemalan media, respectively; however, in this last case, further research is needed for it to be conclusive. Theoretically, this dissertation shows how research that works with combined theoretical and methodological approaches can produce results grounded in more evidence from different contexts. First, it can be pointed out that SRT provides a theoretical framework that can contribute to further understand processes of ANT such as translation and the agency of actants. Second, in the context of postcolonial states, and given the role that technoscience played in the colonial project, ANT in particular or a sociotechnical approach in general can unveil previously overlooked associations that can contribute to the understanding of current social problems and conflicts.

Part I
Problem statement:
Energy, development and conflict in Guatemala

Chapter One

The Guatemalan energy contradiction

Guatemala is a country of deep poverty and stark contrasts. The Human Development Index (HDI) places Guatemala in the 128th position globally, ranked just above Honduras and Haiti, placing it among the lowest ranked countries in Latin America, (United Nations Development Programme, 2016). Its GDP per capita is estimated to be USD 7,700 in 2015, the 149th lowest in the world. Its GINI Index (53.0, estimated for 2014) places it as the 13th most unequal country of the world. More than half of their population lives under the poverty line, and 23% in extreme poverty (Central Intelligence Agency, 2016). Despite this overall picture, Guatemala's contrasts stand out. Guatemala is the Central American country with the largest number of millionaires (260) (Summa Media Group, 2015), and the highest infant mortality rate (22 per 1000) (Central Intelligence Agency, 2016). Geographically, Guatemala's departments (political divisions like provinces) with the highest HDI of the country are in the central region –including the country's capital, Guatemala City–, while three of the four departments with the lowest HDI –Huehuetenango, Quiché and Alta Verapaz– are in the Northwest of the Guatemalan territory (United Nations Development Program, 2015). These wealth extremes and regional variations reveal that, even if the 128th place in the HDI ranking seems low, the reality of parts of the country that are much more underdeveloped is worse than that, with their inhabitants living in conditions of bare subsistence.

One key aspect of this poor development performance is the sources of energy used domestically. One of the indicators of the UNDP's Multidimensional Poverty Index on household living standards is the type of cooking fuel that is used; if the fuel used is dung, wood, charcoal or coal, the household is labelled as "deprived" (Kovacevic & Calderón, 2016). This factor results in multiple problems, especially in the case of wood and charcoal. The most evident is the pressure on forests, which does not exclusively mean loss of wood, but also of biodiversity (Arnold & Jongma, 1977), and the double impact on carbon emissions caused by the process, i.e., loss of forests that absorb emissions and generation of more of pollution by burning the wood (Andreae, 1991). Another problem strongly associated with the use of firewood for domestic cooking is the incidence in respiratory problems, especially respiratory infections in children and obstructive pulmonary disease in women (Torres-Duque, Maldonado, Pérez Padilla, Ezzati, & Viegi, 2008). In Guatemala, in particular, the study of Schei et al on Maya populations living in the Western highlands, found out that the "use of open fire for cooking, may be an important risk factor for asthma symptoms and severity" (Schei, et al., 2004, p. S110). It is also highly correlated with lack of access to electricity (Heltberg, 2004), and the improvements on health and living standards that the latter provides (Kooijman-van Dijk &

Clancy, 2010)[1]. It follows that reducing the use of unsustainably obtained biomass and replacing it with electricity or gas could be a good step in improving human development in the country.

The data regarding the energy balance in the country show how extensive is the use of wood as a cooking fuel. Figure 1 shows the Diagram of Energy Flux in Guatemala –also known as a Sankey Energy Diagram– as of 2014. As it can be seen, the biggest primary source of energy in the country is bio-waste, with more than 7.69 millions of tonnes of oil equivalents (Mtoe). If this was the case of a developed country this would be great news. However, in this case, notice that only 1.9 Mtoe are used as a source for electricity production and the majority (5.74 Mtoe or almost 75% of the total) are used for other purposes, mainly, as domestic cooking fuel. These numbers can be reduced to one astounding fact: residential biowaste for cooking accounts for 53% of all the energy consumed in 2014 in Guatemala. If we acknowledge that the majority of users are households near or below the poverty line, this means that the wood being used is obtained by manual collection, with no significant replenishing of the natural resources that are consumed.

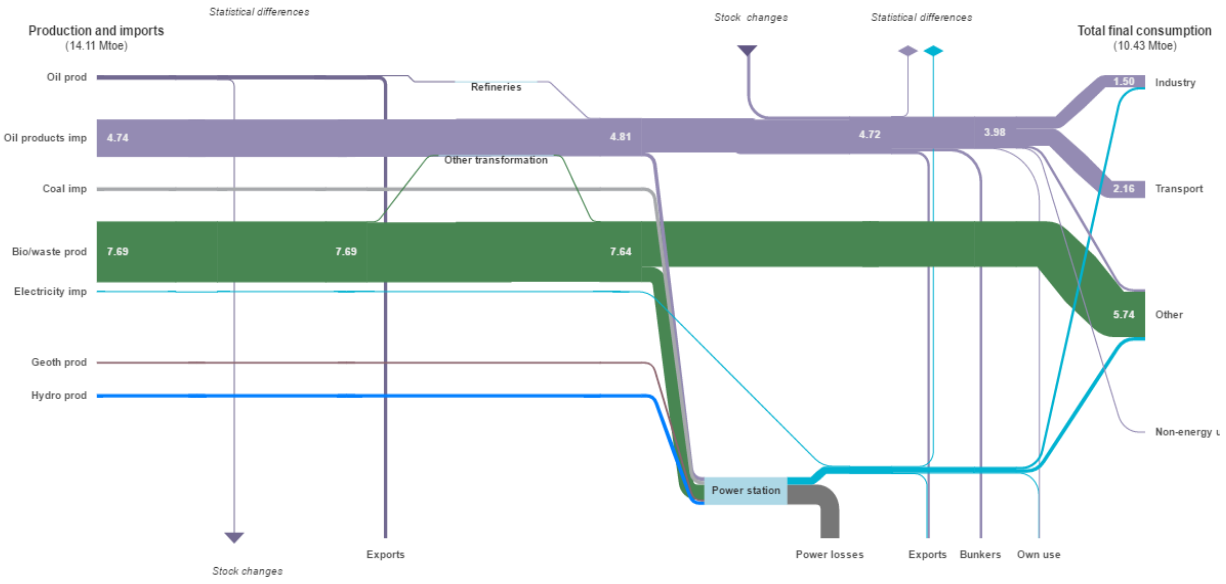

Figure 1. Guatemala's energy balance in 2014 (OECD / International Energy Agency, 2016). © OECD/IEA [2016], Guatemala Balance 2015, IEA Publishing. Licence: www.iea.org/t&c

On the other hand, expert assessments of the resources of the country stress the high potential for renewable energies that its territory offers: its position near the equator makes it an ideal place to use solar

[1] Pereira et al, however, warn against taking this relationship for granted, because "electrification does not in itself entirely resolve the issue of energy use by very poor populations in rural areas who frequently resort to other fuel sources, especially firewood, to meet their energy needs, particularly for cooking, even when electricity is available" (Pereira, Sena, Vasconcelos Freitas, & da Silva, 2011, p. 1440).

light as a steady source of energy; most if its territory is on the Central American Pacific Rim, a tectonic active volcanic region, which means that there are many locations suitable for geothermal energy production; and its many mountain ranges and high annual precipitation make it a country with a great hydroelectric potential (Meza, 2014). Table 1 shows the energy potential of the natural resources in the Guatemalan territory, according to the most recent revision to the energy policy of the Guatemalan Government (Guatemala. Ministerio de Energía y Minas, 2013).

Resource	Estimated potential supply	Current exploitation
Oil	195 million barrels reserve	10,500 daily barrels
Hydroelectric Potential	6,000 MW	15% of the total potential
Geothermal Potential	1,000 MW	5% of the total potential
Wind	280 MW	---
Solar	5.3 KWh/h/m^2/day	Only on isolated systems
Biomass	Not calculated	306.5 MW

Table 1. Energy potential from natural resources in the Guatemalan territory. Adapted from (Guatemala. Ministerio de Energía y Minas, 2013)

Oil reserves are low, even for a small country; moreover, the type of petroleum found in Guatemala is highly dense and rich in sulphur, which makes it more expensive to refine (Escalón, Guatemala y las petroleras: El socio tonto, 2016). On the other hand, the table shows a great potential for renewable sources, compared to the size and population of the country. As Table 1 shows, hydroelectric, geothermal, wind and solar resources are being underexploited way below their potential; estimates show that a substantial but yet rational increase in the energy output from these sources would be enough to satisfy current and future domestic demand; in fact, it could be exported to neighbouring countries, like El Salvador, Honduras and Mexico (Guatemala, Ministerio de Energía y Minas, 2014). The overall situation is ironic, since currently, 40 percent of the country's electricity is generated using imported fossil fuels (Guatemala, Ministerio de Energía y Minas, 2017) creating additional and preventable problems such as higher energy prices and larger carbon emissions.

So on one hand, there is a population that is deprived energy-wise (as the UNDP puts it), to an extent that takes a significant toll on their well-being; on the other hand, the failure to exploit Guatemala's renewable energy sources has led to an energy matrix that is dependent on imported fossil fuels, making electric energy expensive and high on carbon emissions. A common sense perspective would suggest that the two situations have a common solution: take advantage of the currently underused renewable resources, thus making the supply of energy larger and cheaper, especially for those on the lowest strata of human

development. In the process, this action would allow them to abandon their unsustainable energy use and its consequences. Moreover, since the other big source of carbon emissions are imported fossil fuels, such a development of renewable energy resources would reduce the country's carbon footprint and foster its energy independence. In conclusion, everybody would win in such a scenario.

The Guatemalan Congress claimed in 1996 that it would implement the common sense solution mentioned above by passing the General Law of Electricity (GLE), which de-monopolized the electricity market and privatized public electricity utilities. In its opening statement, the GLE declared that, since the supply of electrical energy does not satisfy the needs of the majority of the Guatemalan population, –which are not proportionate to the requirement of more supply in relation to a growing demand– and that the deficiency of the sector is an obstacle to the integral development of the country, it is necessary to increase the production, transmission and distribution of energy, by means of the liberalization of the sector[2]. Later, in 2003, Congress passed another bill, the Law of Incentives for the Development of Renewable Energy Projects (LIDREP), which set fiscal incentives to boost the exploitation of the natural renewable energy resources available. The strategy paid off: as of today, there are currently 19 hydroelectric power plants (of a minimum 5 Mw capacity) in operation, and another 30 have already been authorized to start operating within the next five years (Guatemala. Ministerio de Energía y Minas, 2016). The overall installed capacity of Guatemala's electrical grid went from 1,145.5 MW of power in 1996, with 50.8% of it coming from renewable sources (Paz Antolín, 2004) to 3,950.6 MW in 2016 with 59.7% from renewables (Guatemala, Ministerio de Energía y Minas, 2017). In the same period, the Rural Electrification Plan established by the same administration that enacted the GLE with the aim of expanding electricity coverage, managed to increase the electrification index from 48.3% of the population in 1996 (Paz Antolín, 2004) to 85.6% in 2012 (Guatemala. Ministerio de Energía y Minas, 2013). It would seem that this is another story of policy success, a government at work improving people's lives.

One would expect that such a great success would be received by the people of the country, especially those in the areas with lowest human development, with satisfaction and great expectations. However, the expansion of the electricity generation network, especially the hydropower projects, was received by a significant number of the communities nearby with protests and conflict. In one of the most comprehensive studies to date of the conflicts around hydroelectricity, Orantes et al., reported that as of

[2] In the Spanish original: "Considerando que la oferta de energía eléctrica no satisface las necesidades de la mayor parte de la población guatemalteca, que no son proporcionales los requerimientos de una mayor oferta en relación con su creciente demanda y que la deficiencia en dicho sector es un obstáculo en el desarrollo integral del país, por lo que es necesario aumentar la producción, transmisión y distribución de dicha energía mediante la liberalización del sector" (Decreto 93-96, 1996) Translated by the author.

2010, there were verified reports of 27 protests or conflicts in 9 departments, where a total of 18 projects were authorized or in operation (Orantes, et al., 2010). As it will be shown later, the situation since 2010 has only worsened, with escalating conflict and violence, and the issue becoming one of the most polarizing in the national debate in the media. This aspect of the expansion of the renewable energy pool was totally unexpected, and it has delayed, and in some cases completely halted, the development of new hydroelectric projects (Ramírez, 2016). Something clearly was not taken into account when this endeavour started.

As new projects developed, protests arose almost immediately, usually involving neighbouring communities (Mérida, 2014; Pitan & Vásquez, 2015), with all of them in rural areas of the country, with high levels of poverty and low human development indexes. This is the contradiction that was mentioned in this section's title. How can it be that those in most need of the accessible energy that this expansion is supposed to bring are the ones most fervently opposing it? Is this a case of extreme NIMBYism, as some claim? Or are they just uninformed peasants being manipulated by powerful actors with hidden agendas, as others claim? Or is it that the whole enterprise of the electricity expansion failed to account for their needs? Regardless of the rationale behind the protests, this is a case that is definitely worth tackling, if only in just one of its many aspects.

1.1 Problem statement

Within the many aspects of Guatemala's hydroelectricity expansion, this project is focused on how conflicts are perceived and represented in the public arena, and how that representation shapes (or is shaped) by those conflicts. Two examples from preliminary inquiries should make clear the scope of the project.

First, in the current conflicts, some essays and articles by activists mention hydroelectricity as part of a set of extractive technologies that take away all resources from the communities, without leaving any real benefits for them. As it is stated in this declaration by CUC (Comité de Unidad Campesina, an activist organization that describes itself as a peasants union): "We are gathered to start our process of social and historical struggle against any form of mining, petroleum and hydroelectric exploration and exploitation" (Comité de Unidad Campesina, 2008)[3]. This quote from the activist website *albedrio.org* shows it more clearly:

> On the last years, in the wake of the announced world energy crisis, national and foreign businessmen take away the hydric basins from these impoverished country, with the messianic promise of a development that

[3] "*Nos juntamos para iniciar nuestro proceso de lucha social e histórica contra toda forma de EXPLORACION, EXPLOTACION MINERA, PETROLERA e HIDROELECTRICA*" (sic). This and all translations made by the author.

> never comes (…) Indigenous communities (that unfortunately are near hydric basins) are visited and invaded by executives and technicians of these so-called hydroelectric corporations. With promises and money they buy leaders and divide communities. The Mayans on resistance know that there is no more territory to go as they run away from the "development of the others". (…) Based on this legal foundation [ILO Convention 169], organized communities have already made around 80 public consultations that have clearly rejected the *hydromining* invasion of their territories.[4] (Itzanmá, 2014)

This broad opposition to such a heterogeneous set of industries and technologies poses an interesting challenge to conventional knowledge on the matter (and makes the case interesting from a Science and Technology Studies viewpoint): Aren´t some technologies "cleaner" than others? And, in possession of the adequate information –the facts –, are we not supposed to differentiate them and thus, embrace the "good ones" and reject the others?[5]

Another example of a problematic ground in the media representation of the conflict is the role of public consultations. As a result of Guatemala's ratification of the International Labour Organization's Convention No. 169, public consultations regarding the use of the natural resources became part of the law of the country. As Article 15 of the Convention states:

> "The rights of the peoples concerned to the natural resources pertaining to their lands shall be specially safeguarded. These rights include the right of these peoples to participate in the use, management and conservation of these resources. In cases in which the State retains the ownership of mineral or sub-surface resources or rights to other resources pertaining to lands, governments shall establish or maintain procedures through which they shall consult these peoples, with a view to ascertaining whether and to what degree their interests would be prejudiced, before undertaking or permitting any programmes for the exploration or exploitation of such resources pertaining to their lands. The peoples concerned shall wherever possible participate in the benefits of such activities, and shall receive fair compensation for any damages which they may sustain as a result of such activities." (International Labour Organization, 1989)

Consequently, when any large project –including hydroelectricity– is developed or even planned, communities usually organize public consultations to determine whether they favour or oppose it. However, successive governments have taken the position that these consultations are not legally binding, and that they cannot determine the future of any industrial project.

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[4] *En los últimos años, ante la anunciada crisis energética planetaria (producto del agotamiento del petróleo), empresarios extranjeros y nacionales despojan de sus cuencas hídricas a este empobrecido país, siempre con la mesiánica promesa del desarrollo que nunca llega. (…) las comunidades indígenas (que por "desgracia" cuentan con cuencas hídricas) son visitadas e invadidas por ejecutivos o técnicos de las supuestas empresas de hidroeléctricas. Con promesas y dinero en mano compran dirigentes y dividen a dichas comunidades. Las y los indígenas en resistencia saben que no hay más territorio hacia dónde seguir huyendo de la desgracia del "desarrollo de otros".* (…) *Amparados en dichos sustentos jurídicos, en los últimos años, las comunidades organizadas en resistencia, ya realizaron cerca de 80 auto consultas en las que rechazaron expresamente la invasión hidrominera en sus territorios.* [emphasis added by the author]

[5] It should be noted that this is, evidently, a conventional approach on the subject of public participation; what Bucchi and Neresini (2007) call the deficit model.

Moreover, the Constitutional Court, the maximum legal authority in the country, has issued rulings that are contradictory: in one case in 2013 (Pérez, 2013), it declared a public consultation legally binding, but, in 2012 (Vásquez, 2012), it declared that another consultation was not. The preliminary research also points to the social aspect of this public controversy: a significant part of the public opinion (on conventional and on-line media) does not favour these public participation procedures, either. For instance, this quote from Alfred Kaltschmitt, a local columnist, regarding public consultations and environmental activism:

> Entire communities have been contaminated through the deception of populist politicians, manipulating them, as a flock, with lies from non-existing wolves and demons. Anywhere in the world, clean energy is in the throne of maximum esteem and value. Here, it is demonized at the level of Chupacabras [a Yeti-type mythological creature that feeds on goats]… [communities] are polarized to a degree that borders radical activism (…) Funding for these massive demonstrations against hydropower cannot come from no other than internal groups with links to radical groups nested even in the government itself, as they are aware that in the next elections these peasants are a valuable host of voters.[6] (Kaltschmitt, 2010)

These are two examples that show how social and more specifically, media representations play a role in the ongoing conflicts surrounding the hydroelectricity expansion. In the first case, if activists truly think that they are in front of a large extractive complex, their actions and strategies will be shaped by that fact. Or, in the second case, if public consultations are perceived just as the result of political manipulation, it undermines their credibility, making harder to defend in the public arena the case for public participation in the decision process of large projects. Hence, a better understanding of the hydroelectricity conflicts can be achieved from studying their social representations.

1.1.1 Research questions

In order to address the research problem described above, the following questions have been raised:

- **What are the actors and social processes that led to the current state of affairs regarding the hydroelectricity expansion and the conflicts around it in Guatemala?**
- **Which aspects of the media representations of hydroelectricity are locally bound and which are common with those of other countries in which environmental conflicts of this type exist?**
- **What new insights could bring analysing the hydroelectric expansion using a sociotechnical approach, especially in regard to its representation as part of a large extractive complex?**

[6] *"Se ha contaminado a poblaciones enteras mediante el engaño de politiqueros populistas, manipulándolas, cual rebaño, con mentiras de lobos y demonios inexistentes. En cualquier parte del mundo la generación de energía limpia está elevada al trono de la máxima estima y valoración. Aquí es demonizada al nivel del chupacabras y ahí viene el Cuco. (…) [las comunidades tienen un] grado de polarización tal que raya en el activismo radical. (…) El financiamiento de esas masivas movilizaciones contra las hidroeléctricas no puede provenir sino de grupos internos con vínculos en los grupos radicales enquistados hasta en el propio Gobierno, conscientes de que en las próximas elecciones estos campesinos son un valioso bolsón de votantes."*

1.1.2 Objectives

The above research questions therefore, lead to establishing a main objective for the project, which is, **to identify the actors and social processes that are central to the current representation of hydroelectricity in Guatemala, and the effects of such a state of affairs on the power struggle that arises from the conflicts surrounding the development of hydroelectric power plants**.

This man objective will be accomplished by means of the next specific objectives:

- To map, taking into account historic, economic, sociotechnical, political and environmental dimensions, the current hydroelectricity expansion in Guatemala and the conflicts around it, identifying key actors, their individual and common trajectories, and their power struggles.
- To compare the representations in the media of hydroelectricity projects in Guatemala and another Latin American country, in order to determine which aspects are common to both scenarios and which are not, with special interest on the representation of hydroelectricity as a part of a larger, all-encompassing, extractive complex.
- To determine how the media representations of hydroelectricity affect the power relations among different social actors, and how they relate to the developments on recent years of hydroelectricity and the conflicts around it.

1.2 Overview of the next chapters

The specific objectives provided the roadmap for the research project, and therefore, the structure of this dissertation. It is divided in four parts. In the first part, the research problem is presented, its conceptual framework and the necessary background information for understanding it. Part One consists of two chapters, including the current one, where the research problem and questions are stated, as well as the objectives of the inquiry. The background of the problem is provided in the next two chapters. In Chapter Two, the necessary technical information for understanding what renewable energy is, what hydroelectricity is and how hydropower plants do work, is discussed. In Chapter Three, Guatemala's current social and political situation is discussed, as well as a brief account of its history. To close Chapter Three, a review of the literature on socioenvironmental conflicts in the country, as well as on the history of Guatemala's electrical grid, is presented, with an emphasis on studies about hydroelectricity. Parts Two and Three reflect the concurring and parallel nature of the specific objectives, since they can be managed as if

they were independent inquiries, and then, Part Four brings together the overall work to its conclusion. Part Two presents the first line of research, which is related to the first objective: "To map, taking into account historic, economic, sociotechnical, political and environmental dimensions, the current hydroelectricity expansion in Guatemala and the conflicts around it, identifying key actors, their individual and common trajectories, and their power struggles".

The first chapter in Part Two, Chapter Four, presents the theoretical and methodological approach employed in studying the Hydroelectric Expansion. The first part gives a brief introduction to Postcolonial Science and Technology Studies, since, as the country's historic review shows, one key piece for understanding Guatemala's socioenvironmental conflicts is the influence of its colonial past. The next section discusses Actor-Network Theory as a theoretical and methodological framework, and its principal contributions to the STS field. Controversy mapping (Venturini, 2010) is a method that stems from actor-network theory (Latour, 2005), so the last section of the chapter reviews the controversy-mapping method and how it applies to this thesis, including a brief overview of current network mapping techniques. Chapter Five presents the cartography of the controversy around the Hydroelectric Expansion, starting with the early history of the Guatemalan electrical network, then going through the changes that started in the nineties and finally presenting both the hydroelectric expansion and the conflicts that followed. To close the chapter and also Part Two, a first, but partial, reading of the events described in the chapter is discussed.

Part Three is assembled around the second specific objective, i.e. "to compare the representation in the media of hydroelectricity projects in Guatemala and another Latin American country, in order to determine which aspects are common to both scenarios and which are not, with special interest on the representation of hydroelectricity as a part of a larger, all-encompassing, extractive complex". The first chapter in Part Three, Chapter Six, presents the theoretical and methodological framework developed for this second line of research. As it is discussed at the beginning of the chapter, the approach used in this dissertation is not situated exactly on the ground of Social Representations Theory (Moscovici, 2000); however, some very useful concepts and methods based on it are the basis of the research developed. Consequently, the first section, reviews Social Representations Theory, especially the studies within the fields of environmental and energy studies that have used this approach. The following sections discuss the methodological frame for the fieldwork; specifically, one section reviews data mining and data scraping methods and software, and the next one, statistical methods for qualitative data analysis, particularly discourse and content analysis. Chapter Seven presents the fieldwork, including the criteria for selecting the country for comparison, the news websites visited and the methods used. The last sections of Chapter Seven discuss

the corpus collected, the results of the analyses performed on it and the implications that they have for understanding the Hydroelectric Expansion.

The last part, Part Four, presents the last stage of the research project which aims at creating an enriched description of the Hydroelectric Expansion, based on the two previous lines of research presented. This stage completes the work for the third specific object: "To determine how the media representation of hydroelectricity affects the power relations among different social actors, and how it relates to the developments on recent years of hydroelectricity and the conflicts around it." It enriches the work carried out in the previous phases, as it joins together and the findings of both the controversy map and the article corpus analysis and the way those results enrich, complement or put to the test each other. The aim is to finally create a narrative of the hydroelectricity expansion strengthened by what was learned from the previous research phases. The last section of Chapter Eight discusses the overall findings of the project, its theoretical and methodological contributions to the field as well as to the research problem, and it proposes future directions of research on the subject.

Chapter Two

Brief review of hydroelectric energy technology

2.1 Renewable energy sources and their environmental impacts

Before going into the theoretical and methodological frameworks of this dissertation, it is necessary to review some basic concepts regarding hydroelectric energy and its environmental impacts, in order to avoid digressions when discussing the research problem later.

Renewable energy is, according to the International Energy Agency (2015), "energy derived from natural processes (e.g. sunlight and wind) that are replenished at a faster rate than they are consumed. Solar, wind, geothermal, hydro, and some forms of biomass are common sources of renewable energy." On the other hand, non-renewable energy sources are those that are replenished at a much slower rate than they are consumed. In the case of fossil fuels, the rate is so low that it is considered that there is a finite amount of these resources. Maczulak (2010, pág. 1) gives another definition of the concept: "Non-renewable resources can be thought of as depleted when the energy needed to extract them from the Earth costs more than the energy value of the resource itself". The most common sources of renewable energy worldwide are: hydroelectric, solar, wind, geothermal, and biomass energy. Hydroelectric energy will be discussed in detail in the next section; in Appendix No. 1, a brief review of the other sources is presented.

It should be noted that both definitions do not say anything about the environmental impact of renewable energy sources, a fact that leads to an interesting conclusion: their common perception as more environmentally friendly than those that are non-renewable is not necessarily correct. Let us turn our attention briefly to this matter. First, a clear definition of environmental impact is needed. According to the OECD, environmental impact refers "to the direct effect of socio-economic activities and natural events on the components of the environment" (2001). In this sense, any energy production technology has environmental impacts, even renewables. So what are the perceived advantages of the current shift to renewable energy sources? First, there is the geopolitical aspect; generally, renewable energy resources are used locally, so they contribute to the goal of achieving energy independence or at least a minimum dependence on foreign resources. Second, as the intensive use of energy of the last 100 years does not seem to lose much momentum, the peak oil event (the moment where the rate of oil extraction starts to decrease and eventually decline) is expected to happen sometime over the first half of the 21st century; consequently, renewable sources are seen as a significant part of the future energy matrix. Lastly, most renewable energy sources (not all) produce minimal carbon emissions, so switching to them is an effective

action to take in the face of man-made climate change. Table 2 presents the environmental impacts of different renewable and non-renewable energy sources.

IMPACT													
SOURCE	Air emissions lb/Mwh				Water resources			Water Discharges	Solid Waste	Land Resources			
	CO_2	NO_x	SO_2	Other	Qty	Use	Aquatic Life			Extraction	Plant Building	Aesthetics	Other
Oil	1,672	4	12	PM; lead, VOCs	Large	Steam & Cooling	Yes	Treated wastewater from refineries	Sludge from refining & other solid waste with toxics & metals	Yes	Yes		
						Drilling Water		Drilling can contaminate underground water					
						Refineries		Spills during shipping					
Hydroelectric				Methane from vegetation build-up	Large	Dam affects flow of rivers	Yes	None	None			Yes	Salmon in turbines
Municipal solid waste	3,685 (1/2 from fossil fuels)	6.7	1.2		Large	Steam and Cooling	Yes	Pollutants & heat	Reduces waste to landfills but makes possible toxic ash		Yes	Yes	
Biomass	Recycles carbon, less than fossil fuel				Large	Steam & cooling	Yes	Pollutants & heat	Ash		Yes		Competes w/food crops
Solar	Negligible				None unless making steam		No		Minimal hazardous waste from cell production				Possibly wildlife
Geothermal	Negligible				Small			Contamination from drilling & extraction					

Table 2. Environmental impacts of oil and renewable energy sources [Source: Adapted from (Klein-Banai, 2015)].

2.2 Hydroelectric energy

Hydroelectricity (or hydropower) is the generation of electricity by using the gravitational potential energy stored in water at a high level as it flows downwards. This action transforms the potential energy into kinetic energy, which then is transformed into electricity by a turbine located on a lower part of the flow. The potential energy in water is mostly heat from the sun, stored there as a result of the water cycle; therefore hydropower is considered renewable energy (United States. Department of Energy, n.d.). Hydropower is currently the largest renewable primary source for electricity generation in the world, accounting for 85% of all renewable electricity produced (OECD / International Energy Agency, 2017b). Note that the term hydropower does not include other types of power plants like tidal and wave power, which, although they also use energy stored in water, are considered a different technology.

2.2.1 Brief description of the generation process

As it will be shown in the next section, there are several types of hydropower plants. However, all of them rely on the same generation process. It starts with water in a higher level, in a point A, and then flowing downstream to a point B, where the turbine is located. The difference in elevation is called the "head" of the plant, and is, together with the water flow, its main parameter. As discussed above, in this process, the gravitational potential energy in the water transforms into electrical energy. It starts with the stream of water running downhill, and then, "water flow moves the turbine blades, thereby converting water's potential energy into kinetic energy. The turbine rotation forces the generator rotator to spin around the stator thereby converting kinetic energy first to mechanical energy, and then to electrical energy" (International Finance Corporation, 2015, p. 17). For a hydropower plant (HPP), the larger the head, the larger the energy that can be produced with a given flow of water. This is why some types of HPP use artificial means, i.e. reservoirs, to achieve larger heads.

The central part of the hydroelectric generation process is the turbine. There are different kinds of turbines, depending on the type and head of the HPP. The three most common types of turbines will be described briefly next.

- **Pelton turbine**. In this type of turbines, "water passes through nozzles and strikes spoon-shaped buckets arranged on the periphery of a wheel" (OECD / International Energy Agency, 2012, p. 14). This arrangement is useful for HPPs with low flows and large heads. This type of turbine works mostly with the kinetic energy of the flow, so it is called an action turbine.
- **Francis turbine**. These are the most versatile type of turbine and, for this reason, the most common. They are suitable for use in a wide range of flows, work with high and small heads (from 20 to 700 m), and have high hydraulic efficiency and capacity. It works by means of "guide vanes [that] direct the water tangentially to the turbine wheel; the water enters the wheel and exits it in the middle. The guide vanes are adjustable to optimise output and efficiency over the variations in head and flow conditions" (OECD / International Energy Agency, 2012, p. 14). One other advantage of the Francis turbine, which it shares with the next type, is that it does not capture only the kinetic energy of the flow, but also the pressure difference of the fluid between the entrance and exit of the turbine, making it more efficient.
- **Kaplan turbine**. This is a turbine that is similar to a propeller, and has adjustable blades. It is useful for large flows and small heads.

2.2.2 Types of hydropower plants

Hydropower plant design is site-specific, meaning that there is no one-size-fits-all blueprint for every project. Instead, local conditions (topography, hydrology, environment, social conditions and existing infrastructure) have to be taken into account for each plant (International Finance Corporation, 2015). That does not mean that there is no classification on the types of HPP most commonly built. The first classification is based on the size of the plant´s installed capacity (MW), which is an arbitrary parameter that varies from country to country. Table 3 shows an approximate classification that is accepted in many countries.

Size	Installed capacity (Power, in MW)
Micro	P < 0.1 MW
Small	0.1 MW < P < 10 MW
Medium	10 MW < P < 100 MW
Large	> 100 MW

Table 3. Classification of HPP by size. Source: *Hydroelectric power: A guide for investors and developers* (International Finance Corporation, 2015, p. 18)

In the case of Guatemala, the Ministry of Energy and Mines has a simpler HPP classification: small, i.e., those with an installed capacity of less than 5 MW; and large, those with a capacity larger than 5 MW (Guatemala. Ministerio de Energía y Minas, 2016). The Ministry's rationale for only two categories is, first, that most of the projects that fall in the small category are for isolated use (not connected to the electrical grid); and second, in Guatemala, there are very few HPP larger than 100 MW, partially because of the size and population of the country, so it seems fit to use only one category to encompass medium and large projects connected to the electrical grid.

The second classification (OECD / International Energy Agency, 2012) divides HPP into three functional categories: run-of-river (ROR), reservoir or storage (RHPP) and pumped storage plants (PSP). Each of them will be discussed briefly.

- **Run-of-river plants**

Run-of-river plants use only the available flow of the river to produce electricity, with only minor alterations, such as short-term storage (also known as pondage), that allows some flexibility on production.

Some of the ROR plants are downstream from a reservoir HPP, so they depend on the latter's releases of water. In any case, the generation in this type of plants is variable, not only on a daily basis, but also between different seasons and years (OECD / International Energy Agency, 2012).

- **Reservoir hydropower plants**

In the case of the RHPP, the water is stored in a reservoir in order to control the flux and head of the plant. This disposition guarantees flexibility, allowing the plant to operate in the periods where there is more demand. It also allows the plant to artificially achieve higher heads, since the course of the river can be altered dramatically. In most cases, reservoirs are artificial dams that alter the natural river flow, but there also cases of natural lakes used in the same manner for RHPPs. This configuration also allows for great stability in the production of electricity and is what makes hydropower capable of providing base load to an electrical grid (OECD / International Energy Agency, 2012). RHPPs can also be arranged in "cascade", i.e. a large reservoir upstream that distributes water flow to a series of smaller plants downstream, which increases the energy potential of the whole project. Figure 2 shows a general diagram of a RHPP.

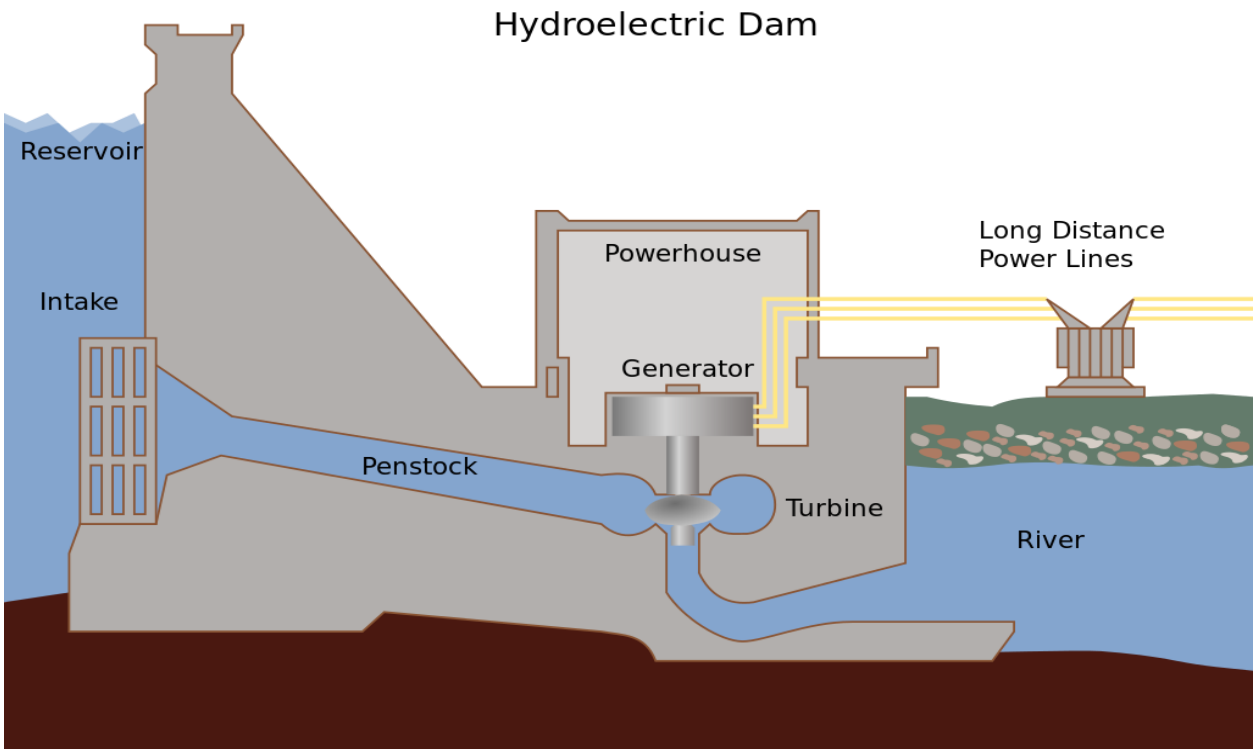

Figure 2. General schematic of a RHPP (Source: Tomia [https://commons.wikimedia.org/wiki/File:Hydroelectric_dam.svg], "Hydroelectric dam". License: https://creativecommons.org/licenses/by-sa/3.0/legalcode)

- **Pump storage plants**

As their name indicates, PSPs serve as storage of energy –just as a battery– for an electrical grid. This means that the water from a low basin or reservoir is pumped into one that is in a higher level using electrical pumps, in hours when the demand of electricity is significantly smaller than the total production of the grid, or in cases where there is a low generation cost. Then, in the hours when there is peak demand, or cheap sources are not available, the water flows from the high basin to the low one and electricity is produced as a regular RHPP. It should be noted that this process is actually a "net consumer of electricity [since] PSPs take energy from the grid to lift the water up, then return most of it later (round-trip efficiency being 70% to 85%)" (OECD / International Energy Agency, 2012, p. 13). Nevertheless, PSPs are still an efficient way to store energy that otherwise would not be used (International Finance Corporation, 2015), especially if they complement RHPPs. For this reason, PSPs' installed capacity worldwide has risen from 98 GW in 2005 to 140 GW in 2011 (OECD / International Energy Agency, 2012). Figure 3 shows the diagram of a typical PSP facility, the Raccoon Mountain HPP in Tennessee, U.S.

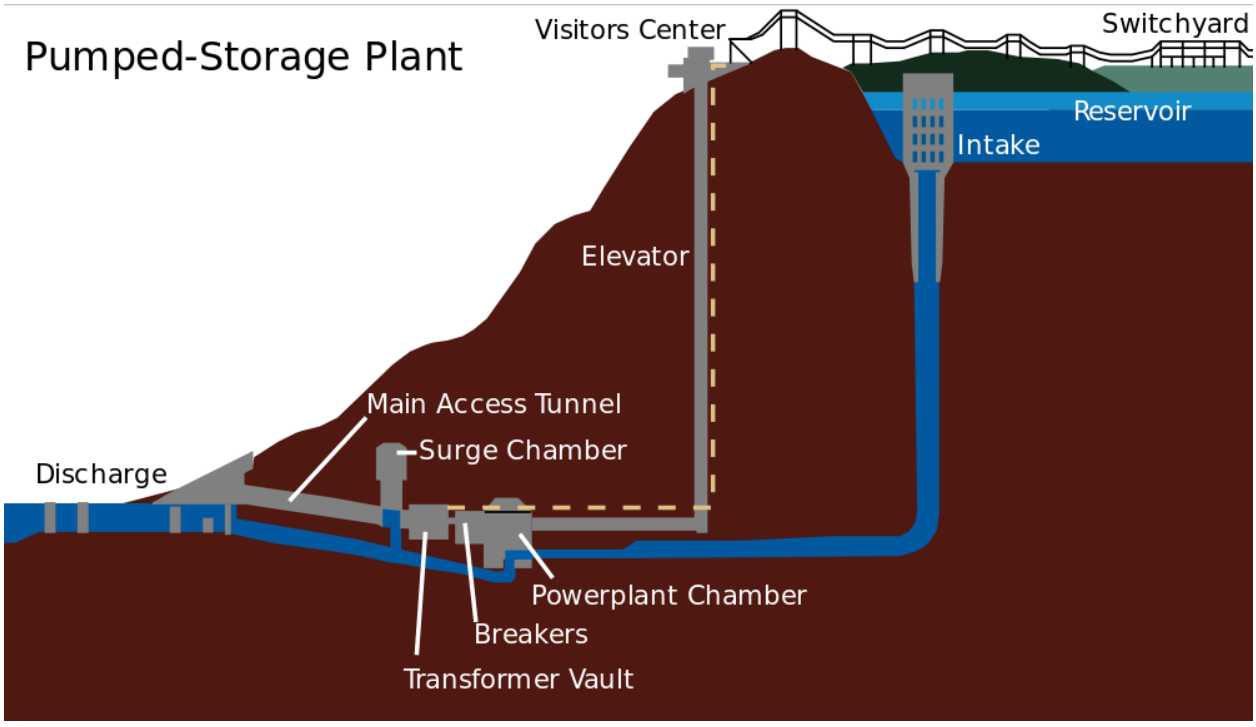

Figure 3. Raccoon Mountain pumped storage plant. (Source: https://commons.wikimedia.org/wiki/File:Raccoon_Mountain_Pumped-Storage_Plant.svg, public domain)

2.2.3 Environmental advantages and impacts of hydroelectricity

Carbon emissions associated to hydroelectric plants are low, and most of them are from the development stage. Since ROR plants do not have a reservoir, their development is on a smaller scale than the other types, making them the category of HPP with the fewest emissions. However, as it was discussed above, RHPPs are preferred over them since they can provide base load for an electrical grid. In the current trends toward more sustainable energy sources, this is also why RHPPs are perceived to be an integral part of the future energy mix, since they are reliable enough to provide constant energy at almost zero carbon emissions. This factor also means that hydropower can be an enabler for other, more variable renewable sources, as wind or solar, providing the stability needed –for example, by using PSPs– to maintain an entire electrical grid only on renewables (OECD / International Energy Agency, 2012).

Other advantages associated to hydropower are that it is a mature technology, so the outcomes of the HPP development are predictable and reliable. It is also versatile, so it can adapt to different contexts, not only topographical and hydrological but also environmental and social. Hydropower reservoirs can also play a positive role in water management, helping to control floods, drinking water, irrigation and other uses (Locher & Scanlon, 2012).

But the environmental and social impacts of hydropower should not be overlooked. Artificial reservoirs have significant environmental impacts, affecting biodiversity and water supply for communities, irreversibly altering landscapes, and causing erosion and reservoir sedimentation. Table 4 describes in more detail the economic, social and environmental advantages and disadvantages of HPPs**.**

	Advantages	**Disadvantages**
ECONOMIC ASPECTS	Provides low operating and maintenance costs Provides long life span (50 to 100 years and more) Meets load flexibly (i.e. hydro with reservoir) Provides reliable service Includes proven technology Can instigate and foster regional development Provides highest energy efficiency rate (payback ratio and conversion process) Can generate revenues to sustain other water uses Creates employment opportunities Saves fuel Can provide energy independence by exploiting national resources Optimizes power supply of other generating options (thermal and intermittent renewables)	High upfront investment Precipitation dependent In some cases, the storage capacity of reservoirs may decrease due to sedimentation Requires long-term planning Requires long-term agreements Requires multidisciplinary involvement Often requires foreign contractors and funding

	Advantages	Disadvantages
SOCIAL ASPECTS	Leaves water available for other uses Often provides flood protection May enhance navigation conditions Often enhances recreational facilities Enhances accessibility of the territory and its resources (access roads and ramps, bridges) Provides opportunities for construction and operation with a high percentage of local manpower Improves living conditions Sustains livelihoods (freshwater, food supply)	May involve resettlement May restrict navigation Local land use patterns will be modified Waterborne disease vectors may occur Requires management of competing water uses Effects on impacted peoples' livelihoods need to be addressed, with particular attention to vulnerable social groups Effects on cultural heritage may need to be addressed
ENVIRONMENTAL ASPECTS	Produces no atmospheric pollutants Neither consumes nor pollutes the water it uses for electricity generation purposes Produces no waste Avoids depleting non-renewable fuel resources (i.e., coal, gas, oil) Very few greenhouse gas emissions relative to other large-scale energy options Can create new freshwater ecosystems with increased productivity Enhances knowledge and improves management of valued species due to study results Can result in increased attention to existing environmental issues in the affected area	Inundation of terrestrial habitat Modification of hydrological regimes Modification of aquatic habitats Water quality needs to be monitored/managed Greenhouse gas emissions can arise under certain conditions in tropical reservoirs Temporary introduction of methylmercury into the food chain needs to be monitored/managed Species activities and populations need to be monitored/managed Barriers for fish migration, fish entrainment Sediment composition and transport may need to be monitored/managed, including measures to limit reservoir sedimentation Introduction of pest species needs to be monitored/managed

Table 4. Advantages and disadvantages of HPPs. Source: Locher & Scanlon (2012)

Chapter Three

Guatemala: The country and its conflicts

Guatemala is a country in Central America, bordered to the North and West by Mexico, to the East by Belize, the Caribbean Sea, Honduras and El Salvador, and to the South by the Pacific Ocean. According to the World Bank it has a population of 16.34 million people (estimate of 2015) and its territorial extension is 108,890 Km² (Guatemala. Ministerio de Energía y Minas, 2013). Guatemala is divided in 22 departments and 340 municipalities. The departments are generally grouped in 8 regions, although the latter are administrative entities, not factual political ones. According to the World Bank classification, it is a country in the medium-low income level (The World Bank Group, 2016). However, as discussed in the previous section, inequality is a great problem, with 20% of the population accounting for 51% of the country's consumption; 59% of the people live in conditions below the poverty line and 23% live in extreme poverty. This difference is more so relevant when ethnicity is taken into account: the percentage of indigenous people living in poverty rises to 79% and in extreme poverty, 39.8% (Central Intelligence Agency, 2016). In the next section, a brief history of the country and its current political and social situation is presented. For those looking for a broader context, in Appendix No. 2, some demographic and economic aspects of the country are presented.

3.1 History and current political situation

3.3.1 Brief history of Guatemala

The territory now known as Guatemala is part of the region known to anthropologists and other social scholars as Mesoamerica, populated by pre-Columbian societies, and defined as "one of our planet's six cradles of early civilization" (Foundation for the Advancement of Mesoamerican Studies, Inc., n.d.). Particularly, today's Guatemala was at the heart of the Mayan region. In its territory, Mayan cities like Tikal, Uaxactún and Mirador flourished (Pohl, 2003), in what is called the Classic Period. After a series of wars, these cities were abandoned and new cities established in the Western Highlands, by descendants of the Maya, like the K'iche and Kaqchikel (Grupo Internacional de Trabajo sobre Pueblos Indígenas, n.d.). These new societies were the ones that faced the arrival of the Europeans after Columbus journeyed to the American continent. In 1524, Pedro de Alvarado, a lieutenant of the Spanish Army that conquered what is known today as Mexico under the command of Hernán Cortés, arrived in Guatemala with a company of Spanish and native soldiers and conquered the territory for the Spanish Empire after a series of battles with

the K'iche and Kaqchikel. This war lasted at least a decade, between the initial battles and the rebellions and counterattacks of the conquered peoples (Luján Muñoz, 2007).

The Colonial Period lasted from 1524 to 1821, the year of the Declaration of Independence of Guatemala and the other countries of Central America. Starting in 1609, the territory that goes from the South of Mexico (modern day Mexican states of Chiapas and Soconusco) to Costa Rica, was a division of the Spanish Empire known as the Captaincy General of Guatemala (also known as the Kingdom of Guatemala). It had political and administrative autonomy from the Viceroyalty of New Spain (modern day Mexico and other North American territories) (Editors of Encyclopædia Britannica, 2007). In the three centuries that followed, the social relations in the territory were basically feudal. There were five classes in the colonial society, presented here in order of the power and liberties that they enjoyed. There was a small dominant class, mostly composed of Spanish officials ("peninsulares" because they came from the Iberian Peninsula), who were the only people allowed to hold the top administration positions; then there were the creoles ("criollos", people of proven Spanish descent that were born in the Colonial territory), who owned the majority of the land and had nobility titles. Next were the "ladinos" (of mixed Spanish and Amerindian descent) and other mixed race types; below them the "indios" (of Mayan or other Amerindian descent) and finally the slaves, of African descent. The society's wealth was based on the work of the "indios" (who outnumbered vastly the slaves). They lived in conditions of servitude that were enabled by colonial practices like the "encomiendas" and "repartimientos". These institutions assigned a number of "indios" to a wealthy "criollo" or "peninsular", which then could take a certain amount of their yearly work for free and tax them. The Guatemalan historian Severo Martínez Peláez gives an insightful and powerful account of the social relations in this period in his classic work "La Patria del Criollo" (Martínez Peláez, *Homeland of the Criollo*, 1994), which describes thoroughly the institutions mentioned above. He goes beyond the Colonial Period and shows how these relations of exploitation between "criollos" and "indios" shaped Guatemalan history after its independence and into the 20th century. In fact, it will be argued in a later section of this dissertation that those relations inform even today's environmental conflicts.

Guatemala's and Central America's Independence was declared in 1821. This event followed the Declarations of Independence by the United States, South America and Mexico, and was partially driven by them. However, its motivations were different, as the opening statement of the Declaration of Independence explicitly puts it: "1st. That, since the Independence of the Spanish Government is the general will of the Guatemalan People, (…) the Political Chief must publish it officially, *to prevent the*

consequences, which will be fearsome in the case the people would proclaim it by itself."[7] (Acta de Independencia de Centroamérica, 2015) In other words, the governing class (mostly "criollos", but also some "peninsulares" that took the side of the new country) proclaimed Independence from Spain out of the fear of losing their privileges and status. It could be argued that similar motivations could as well have been behind other independence movements of the time, but it is still remarkable that in this case they were so poignant that they ended in the text of the Declaration of Independence. A comprehensive study of the resilience of the "Criollo" network of relations and its influence from colonial times to the present day is Marta Elena Casaús's, *Guatemala: linaje y racismo* (Guatemala: lineage and racism, Casaús Arzú, 2007).

After a brief annexation to Mexico (1821-1823) and a longer but failed attempt to create a Federal Republic of Central America (1824-1841), in 1847 Guatemala became a fully independent nation-state (Pérez Brignoli, 1989). In the following years, a conservative dictator, Rafael Carrera, undid the few political changes that were made during the first years of the independence, and reestablished the Colonial elites in power, in what was called the "Conservative Restoration" (Torres-Rivas, 2008). It was not until 1871, when the Liberals took power after a revolution, that more aggressive changes were made, in an effort to modernize the country. However, for the Mayan and all the indigenous peoples, things took a turn for the worse, since a new crop, coffee, was introduced and it was very labour intensive. This led to the enacting of laws that restored forced labour practices from the Colonial period in order to benefit the new elite, the coffee land-owners. Although some social progress was made, and some power was taken away from some of the traditional members of the Colonial elite (the Catholic Church and the "criollos") the return to forced labour was clearly the most damaging legacy of that time (Cazali Ávila, 1976).

The first half of the 20th century did not offer much of a change, with dictators and coups following one another. It was not until 1944 that more drastic social changes took place, when a new Revolution -this time led by the bourgeoisie, students and the military- took power. The new Constitution and the governments that came from this revolution (Juan José Arévalo 1945-1951; Jacobo Árbenz 1951-1954) brought modernizing reforms like the first Labour Law, that mandated the abolition of forced labour and freedom of association (especially recognizing the legal existence of labour unions); social security, universal education, and a controversial land reform program, meant to break the control of land

[7] "1º Que siendo la independencia del Gobierno Español la voluntad general del pueblo de Guatemala, y sin perjuicio de lo que determine sobre ella el Congreso que debe formarse, el Sr. Jefe Político lo mande publicar para prevenir las consecuencias, que serían temibles en el caso de que la proclamase de hecho el mismo pueblo" (All translations by the author, italics not in the original)

ownership that was held in that moment by the "criollo" elite and big U.S. businesses like the United Fruit Company (UFCO) (Morales Modenesi, 2016).

The last action, the land reform program, was the main motivation behind the U.S. sponsored counterrevolution of 1954. This was one of the first acts of foreign government interference executed by the United States' Central Intelligence Agency (CIA). According to declassified documents, it had the name Operation PBSUCCESS (Barret, 2011). It was given the green light by John Foster Dulles, Secretary of State at the time, and his brother Allen Dulles, Director of the CIA; both had economic ties to UFCO, John as part of the legal firm that worked for the company and Allen serving on the Board of Directors (Schlesinger & Kinzer, 2005). The operation led to the resignation of President Jacobo Árbenz in June 27th, 1954. The United States-backed leader of the operation, Carlos Castillo Armas, took power and reversed the land reform program. However, a significant part of other reforms were kept in place.

Another series of military governments and coups followed suit. In the Sixties, after the election of the civilian president, Julio César Méndez Montenegro, the military found a way to retain power for them behind the scenes, by holding fraudulent elections that gave the appearance of democracy. In the meantime, in 1962, after a failed coup, young army officers deserted and started the first guerrilla movement of the country. This was the origin of the Guatemalan Civil War or Internal Armed Conflict (Oficina de Derechos Humanos del Arzobispado de Guatemala, 1998), whose first stages will not be discussed here. Nevertheless, it should be noted that to understand this conflict, it has to be framed in the context of the Cold War, taking into account the U.S. intervention discussed above, and also the role of Russia, but mostly Cuba, in supporting the guerrilla army (Rosés, 2013).

By the mid Seventies, with a growing guerrilla movement and the state increasingly concentrated on counter-insurgency strategies, the situation became horrifically worse. As the guerrilla moved from the East to the West of the Country –where a majority of the Mayan people lived-, their support among the indigenous population started to grow. In the beginning, the guerrilla was formed mostly of middle-class "Ladinos", mostly ex-military, students and union leaders. However, the Military Command realized that the true danger for their regime could be an increasing support for the guerrilla movement among the Mayan people, which were numerous and the most oppressed class in Guatemala. So, in the late Seventies and Early eighties they launched a wide operation in the Western Highlands that was known as the "Policy of Scorched Earth" that sought to "take away the water from the fish", i.e., defeat the guerrillas by exterminating the indigenous population that could provide support to them (Oficina de Derechos Humanos del Arzobispado de Guatemala, 1998a). Simultaneously, a fierce campaign on the urban areas of the country targeted guerrilla members and sympathizers, killing, kidnapping or torturing anyone suspected

to have any connection with the movement. The total number of killed or disappeared people in the 35 years of war is estimated to be around 200,000 (Comisión de Esclarecimiento Histórico de Guatemala, 1999). One of those massacres, known as the Rio Negro massacre (Comisión de Esclarecimiento Histórico de Guatemala, 1999a), will be discussed with more detail later, since it has a close relationship with the current conflicts around hydroelectricity.

The three years between 1980 and 1983 would become the fiercest period of the war. After a coup in 1982, Efraín Ríos Montt, a retired general, took power and the counterinsurgency efforts intensified. The massacres and repression reached a peak at the time, leading to worldwide accusations of genocide against the military regime; thirty years later, in 2013, Ríos Montt faced trial, accused of genocide (Human Rights Watch, 2013). The military, under pressure from the international community, called for elections, and in 1985, a new Constitution was sanctioned. The first democratically-elected government in 20 years took office in 1986, with President Vinicio Cerezo leading the centre-left party Democracia Cristiana (Galicia, 2016).

3.3.2 The Peace agreements and the current political situation

The 1985 Constitution is still today the rule of the land. Free elections have been held since 1985, and even though there have been some attempted coups[8], the continuity of the transmission of power has been maintained. Since Cerezo's time, and under pressure of the international community, peace negotiations were going on with the Guerrilla Command. However, it was not until 1996, under the administration of President Alvaro Arzú, from the right-wing party Partido de Avanzada Nacional, that an agreement was reached. The Peace Agreements were signed in December 26th, 1996 (Guatemala. Secretaría de la Paz, 2017). As part of the accords reached, a Constitutional Reform that would acknowledge the multi-ethnicity and plurinationality of the country was to be passed. However, on May 16, 1999, with very low participation (less than 20% of the population registered to vote) the Reform was rejected by the voters (Georgetown University, 2001).

Arzú's administration is not remembered solely for the Peace Agreements. It was the administration with the clearest neoliberal agenda. It privatized electric utilities, telecommunications, the post office and the railroads, all either state-owned companies or corporations where the Guatemalan State was the major

[8] The most successful was the brief shutdown of Congress and the Courts by President Jorge Serrano in 1993, who was then ousted by the Constitutional Court, supported by the Guatemalan Army (Shetemul, Mazariegos, Blanck, & Morales, 1993).

shareholder. It also sought to de-monopolize and open the electricity and telecommunication markets and to reduce the size of the government, closing some public offices and outsourcing to the private sector a significant amount of public services (García Kihn, Los planes privatizadores del PAN, 1996). While some of the measures were popular, like the large investments in infrastructure such as roads and the electrical network, others became a political burden. Consequently, in 2000, Alfonso Portillo, of the opposition right-wing party Frente Republicano Guatemalteco (FRG) was elected as president. FRG was the party of Efraín Ríos Montt, the 1982 coup leader accused of genocide, who was very popular with the Guatemalan people based on an image of authority, values and severity on crime, but who could not run for office since the Guatemalan Constitution forbade the participation of anyone who broke the Constitutional order.

In the early 21st century, Guatemala went into a downward spiral of violence due to the rise of the illegal drug trade and criminal gangs, and became one of the most violent countries in the world. Successive governments were incapable of containing it, and in 2006, the International Commission against Impunity in Guatemala (Comisión Internacional contra la Impunidad en Guatemala, CICIG) started operating. This is an UN-sponsored prosecutorial commission with full power to pursue criminal cases in collaboration with the Public Ministry, Guatemala's Prosecutorial Office. It was the first, and so far, the only of its kind in the world (CICIG, 2016). As this brief review shows, the idea of the need of such a commission comes from the notion that the Guatemalan State was seized by or under threat by powerful interest groups for a long part of its history: for example, the "Criollos" in the colonial period and after the Independency, the U.S. Government and the CIA during the counter-revolution of 1954, or the Guatemalan Army during the Civil War. This is especially true since the Seventies, when, in order to deploy a pervasive repression apparatus, the Guatemalan Army took over control of almost all sectors of the government. The networks of control gradually became networks of corruption and later, of crime (Barreto & Hernández, 2015).

In 2015, CICIG presented a case that showed the extent of these criminal networks, called by them "La Linea" ("The Line"). This case detailed the networks of corruption in the customs of the country (Barreto & Hernández, 2015). It eventually led to the arrest of President Otto Pérez Molina, a former army general that fought in the Civil War and later worked on the peace process, and the arrest of his Vice-president, Roxana Baldetti (Barreto, 2015). The crisis that ensued afterward led to the dissolution of two major political parties and put the whole political model into question. The current president, Jimmy Morales, a comedian with no experience in public service, seized the opportunity presented by this climate of distrust by the people of the political class to win the 2015 presidential election (Martínez Arehns, 2015). The current environment in Guatemala is one of persistent instability, since the clandestine networks, with the

aid of some part of the social and economic elite are resisting the efforts of CICIG and the Public Ministry to dismantle them (Arrazola & Barreto, 2016).

3.2 Scientific literature on the research problem

This dissertation applies the Science and Technology Studies (STS) framework to the research problem. Since STS has seldom been used before to study environmental conflicts in Guatemala, and given that this issue has a strong sociotechnical component, it was considered that such a framework could produce a more complex and insightful picture of the problem than previous studies. The literature review that follows can help to understand why a sociotechnical approach is useful in this case.

The research problem discussed here rises from the convergence of two situations that have developed in recent years: the expansion and privatization of the electricity market in Guatemala, and the increasing amount of agrarian and environmental conflicts in the rural areas of the country. Accordingly, the literature review will cover the studies in both areas in general first, and then will go through the specific literature on hydroelectricity conflicts.

The scientific literature that analyses the transformation undertaken by the Guatemalan electrical energy market is scarce; even scarcer, the one that assesses it or discusses its broader effects on the country. It is more common to find articles that describe Guatemala's energy market in a broader context, for example, the Central America region (Meza, 2014). However, there are a few works that undertake the task of analysing the profound changes in the Guatemalan electricity market that started in the decade of the 1990s. One of the first, only six years after the legal changes that enabled the entrance of private generators in the market, is the study for the World Bank by Harris (2002); it focuses on the distribution and consumption side, particularly on the subsidy-based policy that was used to promote the expansion of rural coverage. An analysis of both ends of the market is made by Paz Antolín (2004); it is critical of the first results of the expansion of the market, particularly on the distribution side, and it anticipated some of the problems faced currently by that part of the business, like the dissatisfaction of rural consumers with its model. Another critical study on the subject also focuses on the distribution side of the business, this time by surveying the residential users of the rural electrification program; it finds, interestingly, that "rural residents prefer other forms of development, like the introduction of potable water, or improved schooling. Electricity, farmers state, only provides rural families with a few hours of light at night because they cannot afford to pay for appliances or for increased consumption of electricity." (Taylor, 2005, p. 173).

On the other hand, there is a significant amount of studies regarding the rising environmental conflictivity in Guatemala. One of the first comprehensive efforts to approach the subject is the book by Margarita

Hurtado, *Protestas sociales y recursos naturales* (Social protests and natural resources, 2006). In it, Hurtado maps the geographical location of the natural resources and the incidence of social protests related with them from 1997 to 2004. In another study, Castro Soto (2005) broadened the subject, arguing that free trade agreements like DR-CAFTA or regional plans promoted by the United States, like the Puebla-Panamá plan, threatened the conservation of natural resources of Mesoamerica (although he includes in Mesoamerica, all of Central America and the south of México). A more detailed account of the agrarian and environmental conflicts in Guatemala is found in the book by Martínez Aniorte and Villagrán García (2009), where they cover a broad set of conflicts across the national territory. Another project, that complemented the previous work, is the book *Gestion ambiental y gobernabilidad local* (URL; IARNA; INGEP, 2009) –Environmental Management and Local Governance– which presents an analysis of the situation of environmental management at the local level in Guatemala, i.e. municipalities and communities, and two case studies of environmental conflicts. The case studies selected were one conflict regarding a mining project and another, around a hydropower plant. The institution that published the two last studies mentioned, the Institute of Agriculture, Natural Resources and Environment (IARNA) of Rafael Landívar University of Guatemala, also presented a compilation (Instituto de Agricultura, Recursos Naturales y Ambiente - IARNA, 2014) of their most recent publications on the subject of socio-environmental conflicts. It covers different topics, but mostly conflicts regarding mining projects. One of the concepts central to their analysis of these conflicts is *extractivism*. This concept, which will be discussed in a later section, also is used in a study on large-scale projects in indigenous territories in Guatemala (Elías, 2009), which links it to a neo-colonization of Latin America by transnational corporations. Villafuerte (2014) also works around the concept –this time calling it neoextractivism – and compares the situation in Guatemala and Nicaragua, and focuses in the megaprojects developed for interoceanic canals in each country and how they fit into the neoextractivism's frame and logic.

As it can be seen from the previous references, there has been a far greater amount of studies about environmental conflicts concerning mining than hydropower, with diverse approaches and methodology. Since a part of the objectives of this work is to study the representation of hydroelectricity and mining as part of a larger extractive complex, it is useful to go through some of the inquiries on the latter. Some studies aim at tracing back in history the origins of conflicts, as Rasch (2013) does, connecting past experiences of the communities in Huehuetenango, Guatemala, with mining projects during the armed conflict and the contemporary defence of natural resources in that territory. There is one case that has drawn attention not only from the academy but even the media (Guest, 2014): the Marlin Mine conflict. For example, Yagenova and García (2009) describe and discuss the resistance of the Sipakapan people against the opening of the Marlin gold mine by the Canadian Goldcorp. Another study (Fulmer, Snodgrass

Godoy, & Neff, 2008) questions the role of national and international law, as well as corporate social responsibility, in addressing the concerns of democratic governance regarding the public consultations held in the municipalities affected by the Marlin mine operation. In another case study, the focus is shifted to the mental health problems experienced by members of the community of San Miguel Ixtahuacán in connection with the same conflict (Caxaj, Berman, Varcoe, Ray, & Restoulec, 2014).

But the Marlin Mine case is far from the only mining conflict in Guatemala. For example, the case of a nickel mine in El Estor, Izabal, owned by the Canadian corporation HudBay is also approached from the legal perspective in another study (Imaia, Maheandiranb, & Crystal, 2014) that analyses how accusations of assault, rape and murder against the corporation found their way to be judged in Canadian courts.

There are also studies that have a more broad approach, trying to frame mining conflicts in Guatemala in a more general context. That is the case of the study by Aguilar-Støen and Bull (2016), which discusses the role of the elite in the recent mining conflicts, concluding that the violent response from the government to the conflicts is the result of the perceived threats to the hegemonic power of the elites. A study from an opposing perspective, is a report (Lee & Bonilla, 2009) released by the conservative Guatemalan think-tank *Centro de Investigaciones Económicas Nacionales* (CIEN), in which they analyse what are the social problems that have held back the growth of the mining industry in Guatemala.

Some of the studies mentioned above (Elías, 2009; Villafuerte Solís, 2014) take an approach close to the representation discussed in the first chapter, the one of an all-encompassing large extractive conflict. Other articles do put together mining and hydroelectricity controversies in the same inquiry, but by indicating explicitly that it is done as either a universe/sample of study; or as a way of performing a comparative analysis between the two types of conflict. One example is an analysis of both industries (Aguilar-Støen & Hirsch, 2015) that focuses on the effectiveness of the Environmental and Social Impact Assessments (ESIAs) developed for hydroelectricity and mining, and arrives to the conclusion that those sociotechnical instruments deliver poorly the mitigation and control that they are supposed to, due, in part, to the weakness of the government agency that should oversee their compliance. Aguilar-Støen and Hirsch follow up the work on ESIAs (Aguilar-Støen & Hirsch, 2017) by confronting the former situation with a bottom-up approach in which communities and activists challenged developers' ESIAs by relying on independent ESIAs produced by international independent professionals. Finally, an example of a study that tackles both hydropower and mining conflicts in a comparative manner, using spatial and multilevel regression modelling, is the paper by Kuniholm and Wayland. In it, they found out that while, "the presence of metals mining concessions also significantly increased the probability of protest (…) the rate of

deforestation and the number of hydroelectric dams both had a negative and statistically significant impact on the incidence of protest" (Kuniholm & Wayland, 2016, p. 400). It also found a strong correlation between the historical legacy of conflict –for example, civil war incidents or crimes–in a municipality, and the incidence of protests and conflict whenever a project is developed, either mining or hydropower.

Now, let us review the studies that deal directly with the conflicts around hydroelectric projects. The first that should be mentioned, given the scope and depth of the research developed is the book by Orantes et al (2010). It is the first comprehensive study of the conflicts surrounding hydropower plants at the national level, and combines a detailed map of the projects and conflicts, as well as a round of interviews with relevant actors on the conflict. As part of its conclusions it finds that most of the conflicts derive from two old problems of the Guatemalan State: a weak institutional framework, and a historic mistrust of "the other", from all the parties involved. Another study that discusses the conflicts in the national level was the report (De León, 2016) prepared by the think tank Central American Business Intelligence. This report takes into account the energy market in Guatemala, and projects future scenarios depending on how the conflicts are handled. It concludes that the legal framework of the energy market, especially regarding generators, has to be reformed to address the concerns and needs of communities if the Guatemalan State wants to reduce conflictivity.

Most of the existent literature focuses on case studies of single conflicts. There is, for example, a report sponsored by OXFAM (Guereña & Zepeda, 2012) on the conflict that erupted around the development of the Hidro Santa Cruz project, in Huehuetenango, owned by the Spanish corporation Hidralia. The report notes that in this case it is astounding that the conflict escalated to levels of violence and repression quickly, especially since the project was of small dimensions (even in the Guatemalan context) and its environmental impacts were manageable. The authors attribute partially this situation to the policies of the new government, the Pérez Molina administration, which campaigned based on an image of a strong hand against crime. Another report (Viaene, 2015), this time prepared for the Municipality of Herent (Belgium) and Gent University, discusses the conflict around the Xalalá hydroelectric project, located in the frontier between the Alta Verapaz and Quiché departments. The difference in this case is that Xalalá was going to be the first public-sponsored hydropower project in years, although it was going to be developed by private companies; nevertheless, it was halted after protests and allegations of corruption were raised. Viaene concludes that one key factor in conflictivity is the historic and systematic exclusion of the indigenous peoples, that manifests in this case, in the decisions taken around the transformation of Guatemala's energy matrix.

As it can be seen from the brief review of literature, the studies so far pay little attention to the sociotechnical angle of the conflict. For example, Aguilar-Støen & Hirsch (2015) do discuss the role of ESIAs as sociotechnical artefacts with embedded politics. However, there are no studies that approach the whole expansion of the electricity market in Guatemala –including the hydroelectricity projects– from a sociotechnical perspective. The approach to the electrical grid or the hydropower plants is almost technologically deterministic (Roe Smith & Marx, 1994). There are few studies that, for example, explore the development of hydroelectricity projects from a governance perspective. One case that takes such an approach is presented by Cofiño (2014). In it, a community develops and manages their own hydroelectric plant; it is an especially relevant one, since the community was formed mainly by members of Comunidad de Poblaciones en Resistencia (CPR), a group of Mayan villages that hid in the mountains in the most violent years of the civil war and that only returned after the Peace Accord was signed in 1996. Another study in the same direction (Pérez Sián, Morales, & Enríquez Salazar, 2012), discusses the results of the PURE (Productive Uses of Renewable Energy) project that was developed by Fundación Solar with funds from the United Nations Development Program in the departments of Alta Verapaz, Baja Verapaz, San Marcos, Quiché y Huehuetenango. This project installed micro hydropower plants in rural communities, assisting them with management and operation and eventually leaving them in charge of the plants.

But apart from these few examples, most of the connections between society and technology are made with the conventional technologically deterministic approach, in the sense that technical aspects are discussed only to point out the consequences of these large technical projects on the environment, health, and well-being of the communities affected. Even when giving social explanations for large extractive complexes, the former are aimed only at the existence of the latter, but are rarely used to account for their organization, their shape or their scale.

That is why an STS approach can give a broader and more complete narrative than previous studies. Since part of the project aims to tackle the question regarding the representation of a large extractive complex that comprises hydroelectricity, instead of assuming that such a representation is “correct” (or “wrong”), the methods developed within STS –and more specifically in Actor-Network Theory (Latour, 2005)- are fitting to the case. In the next chapter, this issue, as part of the controversy map, will be addressed.

Part II

First research phase

Mapping the hydroelectric expansion of Guatemala

Chapter Four

Controversy mapping in the periphery: A theoretical and methodological approach

This chapter aims at retelling the history of the hydroelectric expansion and the conflicts that later emerged around it in Guatemala using approaches and methods originated in the field of Science and Technology Studies. The idea behind this approach is that so far, the studies published have paid little or no attention to the socio-technical aspect of the issue. And –as it was discussed in the first chapter – there are several aspects of these events that are worth tackling from an STS perspective. On the other hand, this type of controversy can also be an appropriate "trial of strength" for the application of STS theory and methods in neighbouring fields, like environmental studies.

The first two sections of this chapter will discuss the theoretical framework under which the map of the controversy was constructed, namely, postcolonial science and technology studies and Actor-network Theory (ANT). As the country profile of Guatemala showed, any historical analysis of rural conflicts – or social conflicts in general – has to take into account the role of colonialism in the current state of affairs; as the literature review will show, there have been significant contributions to STS from the field of postcolonial studies and viceversa. The second section will discuss and present Actor-Network Theory – arguably, one of the most recognized contributions from the STS Field to social theory in general – and how it frames the inquiry presented here. Finally, the third section will present the main methodological framework, controversy mapping, which in fact emerged within ANT, and discuss how it was applied in this particular project.

4.1 Postcolonial studies and STS

Postcolonial studies, "are based in the 'historical fact' of European colonialism, and the diverse material effects to which this phenomenon gave rise" (Ashcroft, Griffiths, & Tiffin, 1994, p. 2). An interdisciplinary field, the academic interest in post-colonialism started within cultural and literary studies, but it rapidly expanded to other fields in the social sciences and the humanities (Fischer-Tiné, 2010). Post-colonialism should not be simply understood as "after-colonialism", but rather as an approach that views the current state of affairs –in former colonies, but also on a global scale – from the perspective of how structures, relations and events in colonial periods shaped it, making post-colonialism, "a continuing process of resistance and reconstruction" (Ashcroft, Griffiths, & Tiffin, 1994, p. 2).

Science and Technology Studies first focused on the development of technoscience in the places of the world at the centre of this enterprise, the so-called "developed countries" – which were, not by coincidence, the ones that colonized the rest of the world. As STS started to turn its gaze to the practice and development of science and technology outside these core countries, it started to cross lines into Postcolonial Studies territory. One issue that is a good example of this transition is what first was known as knowledge and technology transfer. Before STS, it was argued that the scientific and technological divide between "developed" and "underdeveloped" countries –or centre and periphery – was a matter of insufficient education, and that cooperation and investment could reduce the gap. However, studies have shown that is not simply a matter of education, and that cultural, political and social aspects cannot be taken out of consideration. It did not take long to realize that this technology divide could not be fully analysed without considering the effects of the colonial past on the periphery and the current neo-colonialism that informs a great part of the political and social relations between countries and within societies.

One of the first works that presented a comprehensive theoretical framework to the conjunction of Postcolonial Studies and Science and Technology Studies –under an umbrella that also included Feminist Theory – was Sandra Harding's *Is Science Multicultural?* (1998). Addressing the role of science and technology in development, Harding stressed that,

> Since moments of scientific and technological change are always sites of political struggle over who shall get the benefits and who bear the costs of such changes –and over who gets to make such decisions –the majority of the world's peoples will loose such struggles. Under such circumstances, it is difficult to understand how "more science and technology" of the kind favored by the world's "haves" can fail to further enlarge the gap between themselves and the "have nots" (Harding, 1998, p. 22).

So the necessity for a strong conceptual framework on postcolonial science and technology studies not only comes from to the scholar ground but also is fuelled by the high political stakes of growing inequality, Harding argues (1998, p. 21). She proposed a redefinition of some of key concepts for this new framework; for example, not confining the term "science" to describe Western Science but also use it "to refer to any systematic attempt to produce knowledge about the natural world, just as 'social science' refers to systematic attempts to produce knowledge about social worlds" (Harding, 1998, p. 10). She discussed also how to frame eurocentrism, distinguishing five levels, from the personal types (overt and covert) to the more general: institutional, societal and civilizational. Referring to the last one, Harding remarked:

> As a civilizational practice, eurocentrism is a "discourse" in the rich, materialist sense that includes, but is not restricted merely to, ways of thinking or speaking. Central among the presuppositions of eurocentric discourses are that peoples of European descent, their institutions, practices, and favored conceptual schemes, express the unique heights of human development (Harding, 1998, p. 14)

This is an important point which other authors in the field also made, as it will be shown later in this section. However, the implications of this belief as stated by Harding, was that it disregards as inferior any alternative version –not only discursively but more importantly, institutionally and practically– of how human development is supposed to be.

In the development of her framework, Harding tried to avoid the absolutism of previous approaches (mostly the positivistic and the internalist) by stressing that the postcolonial and feminists are standpoints:

> Postcolonial and feminist are not identities in the sense of pre-existing natural or social roles into which one is born or which one otherwise unreflectively acquires. However, if one conceptualizes identities in a different way, as commitments to chosen political struggles or to distinctive visions of the future … the "postcolonial" and "feminist" could usefully be thought of as identities (Harding, 1998, p. 17).

In this way, rather than absolute categories, the postcolonial and the feminist become "thinking spaces" where "new kinds of questions can be asked and new kinds of futures can be articulated and debated" (Harding, 1998, p. 17). However, Harding warned that this framework is in no way a type of epistemological relativism; on the contrary she argued for "strong objectivity", which "rejects the epistemological or judgemental relativism that assumes that because all such assumptions and claims have local, historical components, there is no rational, defensible way to evaluate them" (Harding, 1998, pp. 18-19). Strong objectivity then led to the conclusion that "different cultures' knowledge systems have different resources and limitations for producing knowledge; they are not all 'equal' but there is no single possible perfect one, either" (Harding, 1998, p. 19).

After Harding's contribution, there was a growing interest from both postcolonialism and STS scholars on the common lines of research that could be pursued. One example of this interest is the 2002 special issue of the journal Social Studies of Science, called precisely, "Postcolonial Technoscience", which was edited by Warwick Anderson. The purpose of the issue was to suggest, "fresh ways to study the changing political economies of capitalism and science, the mutual reorganization of the global and the local, the increasing transnational traffic of people, practices, technologies, and contemporary contests over 'intellectual property'" (Anderson, 2002, p. 643). For Anderson, the association between postcolonial studies and STS was something to be expected, since "postcolonial theory has often worked to destabilize, or at least challenge, the assumption that Western knowledge is objective, authoritative and universally applicable" (Anderson, 2002, p. 646), and also because, "science and technology, especially in their medical forms, are already recognized as significant colonial projects" (p. 648). However, in a later review Itty Abraham criticized Anderson's approach to postcolonial technoscience, stating that "by treating local knowledge primarily in terms of political economy, and to a lesser extent in terms of ethics, Anderson fails to see the

power of modern science in political terms, as ideology" (Abraham, 2006, p. 210) and that " 'postcolonial techno-science' as a way of doing science studies may not be commensurable with 'postcolonial techno-science' as a way of thinking about alternative and local knowledges" (Abraham, 2006, p. 211). Abraham's criticism in fact brought to the spotlight an interesting argument for approaching from a sociotechnical perspective a wide range of problems in a postcolonial context:

> Due to the complex intersection of science, colonialism, and modernity, postcolonial techno-science can never be only about science. Science helped bring the nation under colonialism into being; now, it is central to the forging of the postcolonial state. As a result, science exists simultaneously as history, as myth, as political slogan, as social category, as technology, as military institution, as modern western knowledge, and, as instrument of change. This excess of postcolonial science stands as a constant reminder that this process is still underway and incomplete. This excess defines postcolonial techno-science and refuses to let it settle into a stable ideological position, making it eminently available, but never complete, as a political instrument. (Abraham, 2006, p. 213)

In other words, this excess of postcolonial technoscience is an integral part of the colonial project, and later of the formation of the postcolonial state. This implies that there is a possibility of new insights if social problems are approached from a sociotechnical perspective in a postcolonial context, as is the case of the research problem that this project addresses.

Returning to the issue edited by Anderson, it is worth reviewing some of the papers presented since they also offer other concepts and findings relevant to the postcolonial issue. For example, Hecht's study on mining for nuclear materials in Madagascar and Gabon, which showed how "sociotechnical practices 'conjugated' colonial power relations, creating real and imagined technological futures in which nuclearity and decolonization confronted and shaped one another" (Hecht, 2002, p. 691); or the study by Verran in which she compares the firing regimes of aboriginal landowners and environmental scientists, and how, while both groups needed to maintain the differences between each other's practices and knowledge, at the same time both of them needed also to establish some links between them, and consequently engage in "an alternative form of generalizing, promoting a transformative moment in both knowledge traditions" (Verran, 2002, p. 729).

The case of the role of the Rockefeller Foundation (RF) in developing agricultural science in Peru presented by Shepherd (2005) points to another field of inquiry in which postcolonial technoscience can be developed. In this article Shepherd argued that in order, "to implant a US model of scientific practice, the RF had to filter out 'hybrid' knowledge and discourse that threatened to compromise –and hybridize – the attested purity of the RF's scientific modus operandi" (Shepherd, 2005, p. 114). Shepherd categorically speaks of "Imperial Science" when he discusses the RF efforts, since "philanthropy and enterprise, scientific method and agricultural extension, were connected in ways that were historically specific and contingent

yet also embedded in the legacy of colonialism" (Shepherd, 2005, p. 132). It was because of these specific conditions that Andean local knowledge and practices were made invisible in favour of a standardized model of research. This shows that even the most well-meaning efforts to bridge the scientific and technological divide, or to promote development, can be part of a hegemonic project that can eventually fail because of its plain indifference of the knowledge, practices, and even the rights of the "other".

Another interesting issue tackled with a combined approach of postcolonial studies and STS is the legal framework, especially in the case of property rights. One insightful case was presented by Ivan Da Costa Marques (Marques, 2006), in which he discussed the legal dispute that took place in Brazil in the 1980s over the intellectual property rights of UNITRON, a Brazilian-made computer that was reverse engineered from the original Apple Macintosh design. This device was produced under a special protection policy of the Brazilian government that assigned a share of the market to locally developed technology. Marques shows in his article, how Apple and the U.S. Government successfully lobbied the Brazilian Government and blocked the commercialization of the UNITRON computer, despite the facts that, first, at the time of its production, Apple had no patents filed in Brazil on their own computer; and second, that UNITRON, "was able to produce 'a respectful enough account of its deeds to go to trial with'" (Marques, 2006, p. 142). The case showed how such a dispute between a local industry ("the colonized") and a powerful foreign company ("the colonizers") is dangerous for the former, since "the material capacity of the apparatuses of production of meaning on the colonizers is incomparably greater than that of the colonized. An asymmetrical situation is easily established, where the colonizers' categories stabilize and acquire Bourdieu's 'opacity of things' hiding what lies behind them" (Marques, 2006, p. 156). Although this case revolves around intellectual property rights, it is easy to see that this conclusion is also applicable in the case of the right of use of natural resources, where there are also categories imposed and promoted by the colonizer.

Marques is one of the Latin American scholars who have studied sociotechnical problems with the help of Postcolonial Theory. However, it should be noted that there are other important contributions from Latin America in the field. One example is the Latin American Group of Subaltern Studies (*Grupo Latinoamericano de Estudios Subalternos*), which was founded in 1994 in the United States with the goal of putting the area of Latin American Studies in US American universities through a postcolonial renovation (Grupo Latinoamericano de Estudios Subalternos, 1998). Members of this group include Norma Alarcón, John Beverley, Alberto Moreiras and Walter Mignolo, all of whom have made significant contributions to Postcolonial Theory. According to Castro-Gómez (1998, p. 176), the theoretical and political project of the group aimed at the deconstruction the epistemologies of the humanities and the opening of new spaces of

political action, by articulating a criticism of the epistemological subalternization strategies developed by modernity; clearing, in this way, the path to a stage in which the subaltern subject articulates his/her own representations. Castro-Gómez himself weighed in the postcolonial debate by arguing that, the whole idea of an entity called "Latin America" –the idea of *latinoamericanismo*, as he called it in the original Spanish text – is also a result of the colonial enterprise, and that even after the end of the colonial period, the same disciplinary mechanisms of modernity where deployed; mechanisms that were not reduced only to a technical component, but that also included a hermeneutic, cognitive and aesthetic rationality that articulated the practices that set up today's Latin American countries (Castro-Gómez, 1998, p. 197). This argument shows that the modernist ideas of progress and development through science and technology are fundamental for understanding the current social processes and more importantly the struggles that take place in contemporary Latin America.

Another Latin American scholar that has made significant contributions to Postcolonial Theory is Arturo Escobar, whose work will be reviewed in the next paragraphs, since he addresses key aspects of the concept of development from this perspective. Escobar's book *Encountering Development* (1995), approaches the concept of development as a discourse, and how, "reality, in sum, had been colonized by the development discourse, and those who were dissatisfied with this state of affairs had to struggle for bits and pieces of freedom within it, in the hope that in the process a different reality could be constructed" (Escobar, 1995, p. 5). Escobar engages in a history and critique of development, showing how to fully understand it, one cannot untangle it from colonial discourse. In his words:

> I propose to speak of development as a historically singular experience, the creation of a domain of thought and action, by analyzing the characteristics and interrelations of the three axes that define it: the forms of knowledge that refer to it and through which it comes into being and is elaborated into objects, concepts, theories, and the like; the system of power that regulates its practice; and the forms of subjectivity fostered by this discourse, those through which people come to recognize themselves as developed or underdeveloped. (Escobar, 1995, p. 10)

Almost ten years later, Escobar followed with an incisive critique of "the idea of a relatively single globalisation process emanating out of a few dominant centres" (Escobar, 2004, p. 211). In that paper, he argued that "there are no modern solutions to many of today's problems" and that "the modem crisis is a crisis in models of thought; modem solutions, at least under neoliberal globalisation only deepen the problems" (Escobar, 2004, p. 209); consequently, he proposed to start radically and rethink the entire idea of modernity and with it, the notion of a Third World in need of development. Next, he described the development of an ongoing "global coloniality", driven economically and militarily by the United States, that "incorporates colonialism and imperialism but goes beyond them; this is why coloniality did not end with the end of colonialism (formal independence of nation states), but was rearticulated in terms of the

post-World War II imaginary of three worlds" (Escobar, 2004, p. 219). Finally, he analysed the emergence of "self-organising social movement networks, which operate under a new logic, fostering forms of counter-hegemonic globalisation", that "represent the best hope for reworking imperial globality and global coloniality in ways that make imagining after the Third World, and beyond modernity, a viable project" (Escobar, 2004, p. 207).

In 2007, Escobar focused his analysis of modernity and coloniality on Latin America (Escobar, 2007) and how the novel work of a group of Latin American researchers, "seeks to make a decisive intervention into the very discursivity of the modern sciences in order to craft another space for the production of knowledge – an other way of thinking, un *paradigma otro* , the very possibility of talking about 'worlds and knowledges otherwise'" (Escobar, 2007, p. 179). While discussing this new paradigm, Escobar stated that in order to succeed it has to engage in some pressing issues, particularly, gender, the environment and the economy. In the case of the environment:

> The Latin American political ecology effort attempts to construct an ethics and culture of sustainability; this entails the rethinking of production towards a new environmental rationality; and a dialogue among forms of knowledge towards the construction of novel environmental rationalities. This ecology's ethical perspective on nature, life, and the planet entails a questioning of modernity and development, indeed an irrefutable indictment of the developmentalist fallacy (Escobar, 2007, pp. 197-198)

What Escobar's work shows clearly is that some concepts whose meanings are taken for granted in the day-to-day public debate – development, modernity, globalisation, centre, periphery, among others – are currently being disputed and contested by scholars from the fields where they originated and more importantly, by social movements everywhere. And consequently, the versions of these concepts that lay people are familiar with, are actually part of the hegemonic discourse of modernity-coloniality, and come from a Eurocentric standpoint that makes subaltern knowledges and practices invisible. As it will be shown later, this point is one of the key elements to understand the conflicts over natural resources in Latin America.

4.2 Actor-Network Theory

Without a doubt, Actor-Network Theory (ANT) is among the most successful outcomes of the whole field of Science and Technology Studies, and arguably, the most controversial. ANT, according to Bruno Latour (2005) –one of its original proponents– is both a theoretical and a methodological approach to social research. Many of the concepts that would become central to ANT, started to be developed on works like Latour and Steve Woolgar's book *Laboratory life: The construction of scientific facts* (1986) or Callon's *The Sociology of Translation* (1980). But it was in 1986, with the publication of classic works by Latour (1987),

and Callon (1986) that ANT finally started to be seen as a full theory on its own. Although ANT originated within STS, it has become increasingly applied on a significant number of fields, including economics, organizational studies, international relations and design.

ANT started within science and technology studies, as a constructivist and materialistic approach for studying how scientific facts and technological artefacts came into being. The novelty of ANT, but also of STS in general, is that in regard to studying science and technology, they refused to stay on the outside ring of the scientific process without questioning how the core process of research was developed, as early sociology of knowledge did. Instead, they aimed at coming up with social –not technical o scientific- explanations of scientific knowledge – even though later Latour himself would reject the application of the word "social" to ANT (Latour, 2005). One of the most relevant of these early contributions was an adaptation of a concept from the strong programme of the sociology of knowledge (Bloor, 1991 [1976]) that eventually would become central to ANT: the principle of symmetry.

The principle of symmetry is part of the four tenets that Bloor deemed necessary for a strong sociology of knowledge, along with causality, impartiality and reflexivity. In particular, symmetry meant that "the same type of cause would explain, say, true and false beliefs" (Bloor, 1991 [1976], p. 7). In ANT the principle of symmetry is developed further, as Sismondo explains:

> Whereas the strong programme was "symmetric" in its analysis of truth and falsity and in its application of the same social explanation for, say, both true and false beliefs, ANT is "supersymmetric," treating both the social and material worlds as the products of networks. Representing both human and non-human actors, and treating them in the same relational terms, is one way of prompting full analyses, analyses that do not discriminate against any part of the ecologies of scientific facts and technological objects. (Sismondo, 2010, p. 87)

Therefore, non-humans can be actors (or as Latour calls them, "actants", since the former word is in most cases associated with human beings) and are capable of agency in the face of others. This particular version of symmetry is one of the most controversial results of ANT and has been disputed by other scholars within STS, such as the famous response to Callon by Collins & Yearley (1992). One of the main criticisms is that attributing agency to "actants" implies that objects have intentionality, or that intentionality is not a crucial and distinctive feature of humans –at least if symmetry is to be taken as a principle. Addressing this concern, Sismondo observes that, "in practice, though, actor-network analyses tend to downplay any agency that non-humans might have. Humans appear to have richer repertoires of strategies and interests than do non-humans, and so tend to make more fruitful subjects of study" (Sismondo, 2010, p. 90).

Actor-network theory, thus, sees technoscientific endeavours –but not only them, as its application in other fields of study has shown – as the result of building heterogeneous networks of humans and non-humans. These networks eventually become stable thanks to the enrolling efforts of some of the actors within them. Moreover, every actor or actant within the network could also be analysed as a network on its own, which is the reason why there is a hyphen in "actor-network".

Actor-network Theory maintains that networks remain stable thanks, among other things, to the effect of translation on them. Latour goes as far as saying that "sociology of translation" is a more accurate name for ANT (Latour, 2005, p. 106). According to Latour,

> To designate this thing which is neither one actor among many nor a force behind all the actors transported through some of them but a connection that transports, so to speak, transformations, we use the word translation (…) A relation that does not transport causality but induces two mediators into coexisting (Latour, 2005, p. 108)

Translation is described as a four-phase process (Callon, 1986). Each phase is described briefly next:

- Problematization. An actor (or actors) determines a set of actors, and simultaneously defines them "in such a way as to establish themselves as an obligatory passage point in the network of relationships they were building" (Callon, 1986, p. 201).
- Interessement. This, "is the group of actions by which an entity attempts to impose and stabilize the identity of the other actors it defines through its problematization" (Callon, 1986, p. 203).
- Enrolment. The interessement phase does not necessarily ends successfully. If it does, then it can be said that the actors have been "enrolled". The enrolment phase then includes, "the multilateral negotiations, trials of strength and tricks that accompany the interessements and enable them to succeed" (Callon, 1986, p. 206)
- Mobilisation of allies. Once the actors (human and non-human) have been enrolled, some of them become speakers or representatives for each of their groups. But they are not useful to the network as a whole if at the time they "speak" the network does not act accordingly. This mobilisation implies a displacement, a transformation, and an eventual re-assemblage of the network, probably in different terms than the originals.

The displacement and transformation that translation implies is what accounts for the difference between mediator and intermediary. An intermediary does not transform the network; it is just a vessel that transports a previous cause, which remains the same across the network. A mediator, on the other hand, transforms and is transformed by other mediators as an effect of translation (Latour, 2005, p. 107). However, if a mediator, especially a non-human actor, is performing adequately its role in a given network,

it could seem as it simply "transports a cause", since, "technical objects not only define actors and the relations between them, but to continue functioning must stabilize and channel these" (Akrich, 1994, p. 220). In other words, in a stable network, the multiple transformations underwent by the actors –and mostly by the actants – become invisible; hence the term "blackboxing", "a process that makes the joint production of actors and artifacts entirely opaque" (Latour, 1999, p. 183). "When a machine runs efficiently, when a matter of fact is settled, one need focus only on its inputs and outputs and not on its internal complexity" (Latour, 1999, p. 304). It is only when failure occurs and a smooth process is halted that all the invisible mediators are rendered visible again.

The last point is central to ANT theorists –especially Latour –since it is the one that makes starkly clear the difference between ANT and other social theories. Social theory since Durkheim claims that there is a distinguishable and separated social realm, or as Durkheim himself states, that there are "social facts" (Durkheim, 1982, p. 59). This social realm or its social forces exert an influence over the individual and makes him or her act in a certain, socially motivated, way. For ANT, there is no social realm out there, no social influence or social facts other than the associations made between actors and actants, between humans and artefacts, between mediators and networks. This is what Latour calls the difference between the "sociology of the social" and the "sociology of associations", being ANT the latter. According to Latour,

> There is no society, no social realm, and no social ties, but there exist translations between mediators that may generate traceable associations … We will hopefully learn to widen the gap between an account that makes use of the social as traditionally construed and this other one that purports to deploy strings of mediators. To learn ANT is nothing more than to become sensitive to the differences in the literary, scientific, moral, political and empirical dimensions of the two types of accounts. (Latour, 2005, pp. 108-109)

This is the reason why studying controversies is one of the preferred research methods in ANT: controversies show networks in the making, failing, or simply not coalescing into a stable form. In such a state, is easier to trace the associations between actors and to observe how mediators shift and transform each other at every passage.

As Actor-network Theory abandons concepts like "society", or "nature", it needs to replace them with new ones more suitable for its new approach to the social. In the case of "society", a different term is needed, one that accounts for the role of nonhumans in keeping the "social" together. The concept of "collective", which refers to all the manners in which humans and non-humans are associated, can be used as a suitable replacement:

> Society is not stable enough to inscribe itself in anything. On the contrary, most of the features of what we mean by social order –scale, asymmetry, durability, power, hierarchy, the distribution of roles –are impossible

> even to define without recruiting socialized nonhumans. Yes, *society is constructed, but not socially constructed* [emphasis in the original] (Latour, 1999, p. 198).

One conclusion that can be drawn from this definition, is that historically, instead of "humanity" separating itself gradually from "nature" and "objects", there has been, as collectives grow in complexity, a growing entanglement of humans and nonhumans; an entanglement that has increased exponentially with science and technology (Latour, 1999, p. 200). Is in this sense that Latour has famously claimed that "we have never been modern" (Latour, 1993), since the modern distinction between "nature" and "society" has never existed.

4.3 Controversy Mapping

As it was stated early, ANT is not only a theoretical framework, but it also constitutes a method of research. An important part of the methodological dimension of ANT is what is usually referred to as cartography of controversies (Latour, 2005). As it was explained in the previous section, controversy mapping is a very effective tool for ANT since it allows retracing associations between actors and artefacts; in other words,

> Controversies help to reveal events that were initially isolated and difficult to see, because they bring forward groups that consider themselves involved by the overflows that they help to identify. As investigations go on, links from cause to effect are brought to the fore. The controversy carries out an inventory of the situation that aims less at establishing the truth of the facts than at making the situation intelligible (Callon, Lascoumes, & Barthe, 2009, p. 28)

A good introduction to the cartography of controversies is the article by Venturini (2010) in which it is described how Actor-Network Theory becomes a research methodology as well as its basic guidelines. Venturini describes the cartography of controversies as,

> the exercise of crafting devices to observe and describe social debate especially, but not exclusively, around technoscientific issues. It was initiated by Bruno Latour at the École des Mines de Paris some twelve years ago and it is currently taught in several European and American universities (…) we can describe the cartography of controversies as the practice of ANT unburdened of all theoretical subtleties" (Venturini, 2010, p. 258)

Venturini explains that mapping controversies is defined by a simple command: "Just observe and describe controversies", and then adds that it actually would be an easy task, if it were not for the words *just* and *controversies* (Venturini, 2010, p. 259). Regarding the word "just", the problem is that it implies three consequences: "1) You shall not restrain your observation to any single theory or methodology; 2) you shall observe from as many viewpoints as possible; 3) you shall listen to actors' voices more than to your own presumptions" (Venturini, 2010, p. 260). Although this "commandments" seem to plea for a return to a

modernistic idea of objectivity –an observer detached from its object of study and unprejudiced– Venturini warns us that that is not the case: “Far from being a clear substance distilled from collective chaos, scientific knowledge is the result of as many contaminations as possible. Such is the lesson of “just”: observation devices are the more valuable, the more they let those who are observed interfere with those who observe” (Venturini, 2010, p. 260).

Mapping controversies is a complex task because their existence implies some degree of uncertainty. But this fact shall not be seen as an obstacle, since “a controversy reveals uncertainties and, as a consequence, new lines of research to be explored” and also because controversies “formulate a triple inventory of actors, problems, and solutions, [they] are a highly effective apparatus for the exploration of possible states of the world when these states are unknown, owing to uncertainties” (Callon, Lascoumes, & Barthe, 2009, pp. 31-32). This means that mapping them is an effective way of tackling and handling the growing uncertainty in a world populated with new potential hazards every day.

Controversies can be seen as hybrid forums: “forums, because they are open spaces where groups can come together to discuss technical options involving the collective, hybrid because the groups involved and the spokespersons claiming to represent them are heterogeneous, including experts, politicians, technicians, and laypersons who consider themselves involved” (Callon, Lascoumes, & Barthe, 2009, p. 18). This concept is useful, since it recognizes the open and heterogeneous nature of controversies, and goes again one common misconception, the idea that controversies should be limited to experts, and that participation of other actors or groups affects negatively their outcomes. Instead, the concept of hybrid forums is coherent with a vision of controversies in which they come to being partially because technologies or artefacts bring unforeseen –even by the experts – consequences on the life and activities of persons and communities.

It is important to recognize the complexity of controversies, and resist the temptation of simplifying them for research purposes. Sometimes ANT or controversy mapping seem to become overwhelming tasks given that following every move, every association of the actors can lead to an exponential complexity. However, this is not a defect of the method but a reflection of the world it studies, because “Controversies are complex because they are the crucible where collective life is melted and forged: they are the social at its magmatic state. As the rock in magma the social in controversies is both liquid and solid at the same time” (Venturini, 2010, p. 264).

To face this task Latour, as cited by Venturini (2010, pp. 269-270), gives the following recommendations or requirements:

- First requirement: You shall not simplify the number of propositions to be taken into account in the discussion. *Perplexity*.
- Second requirement: You shall make sure that the number of voices that participate in the articulation of propositions is not arbitrarily short-circuited. *Consultation*.
- Third requirement: You shall discuss the compatibility of new propositions with those which are already instituted, in such a way as to maintain them all in the same common world that will give them their legitimate place. *Hierarchization*.
- Fourth requirement: Once the propositions have been instituted, you shall no longer question their legitimate presence at the heart of collective life. *Institution*. (Venturini, 2010, pp. 269-270).

The main objective of the first stages of the cartography of controversies is deploying their complexity; while the task in the final ones has to be ordering their complexity (Venturini, 2010, p. 259), because the job of the researcher is to bring a ray of clarity over a muddled state of affairs: "To be of any use, social maps have to be less confused and convoluted than collective disputes. They cannot just mirror the complexity of controversies: they have to make such complexity legible" (Venturini, 2012, p. 797).

To arrive to a level of simplification that also succeeds in representing the complexity of a controversy, it is suggested to aim for 'second-degree' objectivity:

> Unlike positivistic 'first-degree' objectivity, second-degree objectivity is not interested in identifying the matters of facts that arouse everyone's agreement, but rather in revealing the full range of oppositions around matters of concern (…) Being attentive to all viewpoints does not mean granting everyone the same status. Objectivity does not come from crediting the same weight to all perspectives, not even from balancing the space allotted to each side. Second-degree objectivity comes from attributing to each actor a representation that fits its position and relevance in the dispute. (Venturini, 2012, pp. 797-798)

Representing complexity in a controversy does not mean to give voice to all actors, to stage a cacophony that adds nothing to the current understanding of an issue. Neither does it mean to give a "balanced" representation, as news organizations have done in recent years by admitting discredited views as equally worthy of reporting as serious and well-supported theories or positions. In this sense, Venturini suggests a proportional social cartography, in which points of view are highlighted according to three criteria (Venturini, 2012, p. 798):

- Representativeness. How many on the actors involved on the controversy subscribe a specific point of view? Are there views shared by a larger part of the actors involved? The classic example is the climate change debate; mainstream media narratives have given the same space and

attention to climate change denialists than to supporters of the theory, while the split is largely in favour of the latter, as John Oliver showed in a poignant TV segment (LastWeek Tonight, 2014)

- Influence. It is not only a matter of numbers it is also a matter of the alliances and networks built by each of the actors. One actor could have enough influence to mobilize other influential allies and consequently his position –as well as his or her views – is magnified by it.
- Interest. "Controversy mapping cannot content itself with majority reports, as the very rise of disputes depends on the presences of disagreeing minorities. It is disagreeing minorities who bring controversies into existence by refusing to settle with the mainstream and reopening the black boxes of science and technology. No matter how marginal, disagreeing viewpoints can be interesting because they offer original perspectives and question what is given for granted" (Venturini, 2012, p. 798).

The first two criteria, as they are articulated, open the door for a quantitative treatment of the information collected, while the last one implies more of an arbitrary decision taken by the researcher, based on the context of the problem and his or her previous research experience.

One last feature that a good controversy map needs is resistance. A social cartography should be able to resist the scrutiny not only of other experts, but also the one coming from the actors themselves. As Latour's actors have to go through and win trials in order to transform into facts (Latour, 1999, pp. 122-124), controversy maps also have to resist disputes and examination. This is achieved through three precautions (Venturini, 2012, p. 799):

- Adaptation. A map should be made in such a way that it can adapt to the abrupt changes in the terrain. To do so, it has to remain as close to the ground as it is possible. This means that adding to the description layer after layer of interpretation can make it unstable and weak. Most interpretations, most narratives should come from the actors themselves, not the researcher; in that way, the cartography remains free to change accordingly to new actors' perspectives and accounts.
- Redundancy. "How is it possible to fit a plurality of opposing accounts in a single and simple map? It is not, of course, but no one ever asked cartographers to produce just one map. The key to drawing effective representations is drawing many of them: each one dedicated to a different aspect of the phenomenon. Even if each map fails in capturing the richness of the disputes, all together they may do the trick" (Venturini, 2012, p. 799)

- Flexibility. Although it seems as a similar property as adaptation, flexibility refers to the fact that the representations made by the researcher need to be traceable and reversible, in the sense that no connection is lost or obscured but can be brought to light easily. There should be, "no interruption, no break, no gap, and no uncertainty along any point of the transmission… no discontinuity allowed, which is just what ANT needs for tracing social topography" (Latour, 2005, p. 229).

As this brief summary of Venturini's and Latour work on the cartography of controversies shows, the task presented to the researcher is one that is complex and labour-intensive. To keep track of every single event and actor in a controversy and at the same time being able to produce a coherent and understandable map could seem as a titanic endeavour. Such a minutious work is precisely of the kind that information technologies were made to deal with in the first place: "Thanks to digital mediation, 'observing controversies from all the concerned viewpoints' becomes more than a wishful slogan: it becomes actually possible" (Venturini, 2012, p. 802) So it should come as no surprise that many of the top research teams in the field have developed software tools to aid in the process of mapping controversies not only spatially –by representing them as networks –but also following their changes over time, thus allowing researchers to organize, analyse and visualize information on actors and events (Medialab - Sciences Po, 2016). In the next paragraphs, some of the theoretical and methodological developments behind these tools will be briefly reviewed. Before proceeding, a fair warning is needed: "the digital is not the world" (Venturini, 2012, p. 803) . The amount of information that is not available digitally is still the overwhelming majority, and this should always be kept in mind.

The last sentence should not be interpreted as if there were little information on digital media and the Internet. On the contrary, the information available to researchers today thanks to information technologies is astoundingly larger than any other period in the history of humanity. This poses a challenge to some social scientists, and specifically to some sociologists, who, as Callon puts it, "turn away from the analysis of large numbers. They have the feeling that it inevitably leads to outrageous simplifications and huge inaccuracies, the extent of which is difficult to measure, and that it is largely unsuited to the study of emergent phenomena" (Callon, 2006, p. 8). However, the use of information technologies, which has the power to handle this huge amount of data, allows arriving to meaningful conclusions without sacrificing complexity and accuracy. In the next chapter, for example, some of the quantitative models developed to analyse the content of large amounts of text will be reviewed. In this section the focus will be on the tools developed to map networks, using as starting material textual information gathered by the researcher.

The concept of network, at least from a sociological viewpoint, stands in contrast to a more conventional approach to studying actors, one that views them as, "caught up in a web of relations they are unaware of. The task of the analyst is precisely to make them visible" (Callon, 2006, p. 9). The negative side of this approach is that it dismisses the explicit associations that actors make with others as if they were superfluous; in other words, for the researcher, the important links are those invisible. On the contrary, the concept of network relies on the accounts of the actors themselves, and those associations they claim to have with others, thus, making them the origin of the categories and classifications that the researcher develops. As Callon puts it,

> Why not change the starting point and consider that what counts for the analyst is to let the actors establish relations between themselves, which eventually lead to categories that are no longer imposed a priori but gathered a posteriori by the observer. The actors would be told not 'Here is the (multidimensional) space of possible positions', but 'Show us how you define the space and positions in that space, and how you spread yourselves out between those positions' (Callon, 2006, p. 9, emphasis in the original).

And this is what a network is, both as a concept or a methodology. The task is to register this association and categories from the recorded information from the actors, whether it is directly shared with the researcher –as in interviews or questionnaires – or discovered in previous records or texts. However, there are still different ways in which the network can be constructed. Callon distinguishes two different approaches or dimensions. The first, "characterizes these analysis techniques in terms of the diversity of the regimes of action they tolerate (a regime generally being identified by the nature of the *mise en relation* which may, for example, be economic, friendly, scientific or political)" (Callon, 2006, p. 9); the most known of these kind of methods is the structural analysis of social networks. The second approach, "contrasts those methods which consider the existence of a unified social space as obvious, with those which aim to study the actors in their dual capacity to construct local spaces and (possibly) to unify them" (Callon, 2006, p. 9). In this case, Callon uses as an example of this dimension, "the composition of heterogeneous egocentric networks" (Callon, 2006, p. 9).

The first method discussed by Callon, the structural analysis of social networks, adjusts to the first definition since it takes as a given that all relations can be considered to take place in a single social space. That is because "the position of entities in the network is defined on the basis of a calculation that compares each relation between two entities to all bilateral relations" (Callon, 2006, pp. 9-10). The method can be described as follows (Callon, 2006, p. 9):

- A list of actors is compiled either by an arbitrary selection and definition of the actors by the researcher or using "snowball" sampling, in which every actor points to other actors to include on the list.

- A matrix of relations registers the relations between each pair of actors. In its basic form it is a binary registry (related / not related) but it can also measure the strength of each relation in comparison to the others.
- The matrix is then analysed using mathematical and statistical models to generate a structure of the network. This network can be visualized with the aid of mathematical models, showing connections between actors, their strength, principal actors (by means of how many connections to other actors they have and how strong the connections are), and the structure of the network by showing clusters or groups formed.

Powerful algorithms have been created to handle the vast amounts of information on the internet, and also the emerging social networks that populate it. The largest social network on the planet, Facebook, has currently two billion monthly active users (Zephoria, Inc., 2017); online repositories hold millions of research papers on every subject imaginable; and news websites keep record of almost every possible event and action in public life. For this reason, algorithms are valued in terms or their speed and efficiency when processing these large amounts of information. One of such algorithms was presented in 2010, and has the additional advantage that it extracts "the community structure of large networks", i.e. has the capacity of representing networks whose nodes are simultaneously smaller networks, using "a heuristic method that is based on modularity optimization" (Blondel, Guillaume, Lambiotte, & Lefebvre, 2008, p. 1). Some of the methods spawned by this algorithm and approach will be applied in the next chapter to create networks based on the contents of the articles collected in the second stage of this project.

The second approach, the composition of heterogeneous networks, aims at reconstituting, "the dynamics of these networks and their connections, in such a way as to maintain the singularity and heterogeneity of the *mises en relations*" (Callon, 2006, p. 10). To achieve this goal, any numerical or mathematical approach to determine the structure of the network is therefore excluded, since their premise is that there is something in common –a unified space –among every relation in the network. This different direction can be summarized in the following requirements:

> (i) Do not lose the richness of egocentric networks; (ii) do not limit the entities on the list to human actors (i.e. individuals) only, but include collective actors and non-humans who are believed to play a part in establishing categories; and (iii) obtain the overall network through the most painstaking and exhaustive composition of egocentric networks (Callon, 2006, p. 10).

By including institutions or collective actors and non-humans, the relations on heterogeneous networks cannot be assumed to operate on a same, unified space. It is in this sense that this approach allows actors

to create their own hybrid spaces; these, in turn, can become unified social spaces if their network is stabilized by the work of a hybrid collective of humans and non-humans.

After reviewing the theoretical and methodological frameworks for developing this part of the project, we are ready now to retrace the development of the Guatemalan hydroelectric expansion and the conflicts that followed suit.

Chapter Five

The Guatemalan hydroelectric expansion

This account of the hydroelectric expansion is based mostly on documental research and journalistic coverage of the events. Internal documents of the Economic Commission for the Development of Latin America and the Caribbean (CEPAL) were the sources for the history of Guatemalan electrical grid before the 1990s. For the period in which Guatemala's General Law of Electricity came to being, it was especially useful the online archive of *Crónica* (Universidad Francisco Marroquin, 2013), a Guatemalan magazine that was published from 1987 to 1998, and was one of the most credible sources of the time. Although *Crónica*'s Editorial Board and Executive Editor were closely identified with conservative sectors of the country, their model of journalism was inspired on US American magazines as Time and Newsweek, and its op-ed pages were open to different political and ideological positions. Consequently, using *Cronica's* editorial pages and articles to compare them to the official history of government reports was very fruitful for mapping the events and actors. The final stage, the hydroelectric expansion, was followed mostly via online news sites available and research papers.

The method used to organize and analyse the information gathered was simple. Every document, news story, opinion article or small note related to the Guatemalan electrical grid was registered in a spreadsheet. In this spreadsheet, the source, author, date, entities mentioned, and a summary of the content of each item were registered. This spreadsheet served as a timeline that pointed to key actors and events. Afterwards, a second register was opened in which main events were filtered from the original one. For this register, additional sources were used to establish connections among them and enrich the cartography, with the aid of digital tools.

5.1 Early development of the Guatemalan electrical grid: 1884 - 1980

The early history of the Guatemalan electrical grid can be divided in two stages. In the first one, which can be roughly dated from 1884 to 1940, public and private electric utilities coexisted without extensive national regulation. According to the website of Guatemala's National Institute of Electrification (*Instituto Nacional de Electrificación*, INDE), the first generation facility was in fact hydroelectric, and it was privately owned and located in *Finca El Zapote*, an estate just outside the limits at the time of Guatemala City (Instituto Nacional de Electrificación, 2013). As the demand grew, mostly industrial, but also in the urban residential sector, more power plants were developed. The first distribution company was founded in 1894, the Guatemalan Electrical Company (Empresa Eléctrica de Guatemala, Sociedad Anónima, EEGSA)

and among its founders were Enrique Neutze, Antonio de Aguirre and Victor Matheu (Corporación EEGSA, 2017), which were all members of prominent Guatemalan families of German and Spanish descent (Casaús Arzú, 2007). This company, along with others that were founded in the early 20th century, was purchased by the Electric Bond and Share Co., an US American Company that became the largest distributor of energy in the country. In this period there were also state-owned companies and other companies owned by municipalities. Generation came mostly from two sources: thermal and hydroelectric (Comisión Económica para América Latina y el Caribe, 1959). However, there was no national entity that supervised, developed or regulated the electricity market or the national electrical grid.

In 1940, under the government of General Jorge Ubico –a dictator that lasted 14 years in power – the National Department of Electrification was established. It was the first public entity created with the objective of regulating the development of the national electrical grid. This can be considered the event that started the second stage in the history of the electrical market in Guatemala. In this stage, the electrical grid transitioned from a non-regulated and very diverse mixture of private and public companies, to a highly regulated and standardized state-run market. The lack of regulation in the first stage led to problems of incompatibility among networks: for example, the state-owned and municipal companies had systems that worked with 50 cycles, transmission voltages from 12 Kilovolts (KV) to 50 KV and distribution voltages of 380/210 volts, while the private Electric Bond and Share (EBASCO) worked with 60 cycles, transmission voltages ranging from 4.2 to 66 KV and distribution of 220/110 volts (Comisión Económica para América Latina y el Caribe, 1959, p. 3) This incompatibilities meant technical and economic problems for the whole grid, which a small Department in the Ministry of Communications of Guatemala did not had the resources to handle. For this and other reasons, in 1959, the National Institute of Electrification, INDE was established (Pereira E. , 2005, p. 14), with the purpose of standardizing and expanding the national electrical grid. INDE was an autonomous and decentralized entity. Through it, the Guatemalan government started developing large generation projects. In the 1960s, two large hydropower plants, *Los Esclavos* and *Jurún-Marinalá*, and a large thermal power plant in Escuintla, near the Pacific Coast, were built by INDE. Eventually, the state bought the US American owned shares of EBASCO, after the concession granted in 1922 to the company to operate expired. EBASCO's properties, including EEGSA, were going through some financial problems, and became mixed-capital companies that were controlled by the Guatemalan State (Corporación EEGSA, 2017).

By the mid-seventies, the Guatemalan Government controlled practically all the generation, transmission and distribution of electricity, displacing private generators to isolated systems that provided energy mostly to large rural private properties. This arrangement lasted until 1996, when the General Law of Electricity

(GLE), that demonopolized and privatized the sector, was passed by the Guatemalan Congress. However, the events that took place from 1980 to 1996, and eventually led to the sanctioning of GLE, are worth of a more detailed account.

5.2 Assembling the GLE or how El Niño, neoliberalism and an armed conflict materialized in a game-changing bill

It became clear, while going through the events that led to the passing of the GLE, that Actor-Network Theory (ANT) could provide a different and broader account than previous studies. In this section and the next, the GLE will be analysed as a non-human actor-network, and this methodological move will show a new way of understanding the privatisation and expansion of the electrical market in Guatemala that. The first insight brought by ANT is the fact that a researcher, when describing a controversy, is also developing a narrative. In this sense it is essential the selection of the starting point, since as Latour points out (2005, p. 135), the account itself becomes a part of the state of affairs it is describing. In the case of the Guatemalan hydroelectricity expansion, which is the broader subject of the research project, the starting point could go as far as its first electric power plant, since their development has been tied to the evolution in the relations among the Guatemalan elite. However, here that first stage was reviewed briefly, since it was considered that the best starting point for a thorough description of the controversy is the construction of the largest publicly owned hydropower plant in Guatemala, named Chixoy (1978-85). Located in one of the poorest departments of the country, Alta Verapaz, this project was supposed to bring stability to the electrical network, since it was designed to provide more than 50% of the energy needed in those times. However, its development turned out to be a managerial and governance nightmare: it took more than twice the time projected to finish it, its cost surged from the original USD 187 million roughly USD 1 billion, and a good part –between 350 and 500 million (Las miserias de Chixoy no son solamente de los guatemaltecos, 1990) – of the additional financing actually ended up in the pockets of corrupt government officials. Moreover, when the Chixoy hydropower plant was finally opened in 1983, a critical flaw in the tunnels was discovered and the operation was delayed until 1985, when it was finally fixed (Velásquez & Mazariegos, 1991). Chixoy was like a vortex that attracted all sorts of problems.

But the real issue was not sole inefficiency; it was a state that was de facto seized by the military, since at the same time an armed conflict was taking place in Guatemala. As it was discussed in Chapter Three, the conflict was instigated by the ousting of the democratically elected government of Jacobo Árbenz in 1954, by a CIA-backed military operation. The successive changes eventually drove young military officials to rebel against the Guatemalan Government in 1962. The peak intensity of the conflict overlapped with the

development and construction of the Chixoy dam, which was the largest engineering project ever developed in Guatemala at the time. But the overlap was not only temporal. The Guatemalan Army started a strategy of "scorched earth" in which its units massacred entire Maya villages, and forcibly disappeared thousands of political enemies, in an effort to take away from the guerrillas the support of the indigenous Mayan people in the Western highlands; this situation led to the international condemnation and isolation of the military governments of the time (Comisión de Esclarecimiento Histórico de Guatemala, 1999). And the overlap between Chixoy and the armed conflict was that one of the best documented war crimes of the time was perpetrated in order to evict Maya Villages that were in the area that was going to be flooded by the Chixoy dam. It became to being known as the Rio Negro Massacres and over 500 people were killed in sadistic and cruel ways, including pregnant women and children (Comisión de Esclarecimiento Histórico de Guatemala, 1999a). In 2012, the Interamerican Court of Human Rights condemned the Guatemalan State to the payment of reparations to the survivors of these massacres (Caso masacres de Río Negro vs. Guatemala, 2012). The repercussions of these crimes are still relevant today: Orantes et al (2010, p. 46) cite the collective memory of the Chixoy development and the Rio Negro Massacres in the Mayan population in that department as a probable cause of the current animosity and conflicts toward hydropower projects in Alta Verapaz.

5.2.1 Two public utilities in a military-dominated State

The events narrated above are enough to declare the Chixoy Dam one of the most shameful events in modern Guatemalan history. But they also account for the inefficient management of the project, and generally of the Guatemalan State in those times. In order to minimize the threat of the guerrilla army, the Guatemalan Army infiltrated strategic institutions of the Guatemalan State, like its ports, immigration offices and customs (Barreto & Hernández, 2015). As the conflict escalated, the presence of the Army all over the public sector expanded, reaching its highest level in 1982, after the coup that put retired General Efraín Ríos Montt in power. His de facto Government issued the National Plan of Security and Development which subordinated the entire Guatemalan State to the Army and its Commander (Rostica, 2005). Although Rios Montt himself was ousted in 1983, the Guatemalan State remained de facto captured by counterinsurgent operations. Military commanders and others devised corruption networks that were so powerful that have survived even to the present day, with links to other factions of organized crime, like drug smugglers and human traffickers; criminal networks so stable and ubiquitous that made Guatemala the first country in the world to have a UN approved foreign Prosecutorial Commission, the International Commission against Impunity in Guatemala (CICIG) to fight them (CICIG, 2016).

In 1983, Chixoy finally started operations, although not at full capacity. In 1985, a section of the adduction tunnel collapsed and left major leaks, so Chixoy practically stopped operations; the thermal plants in Escuintla, which by that time were two, took over as the main sources of electricity for the country (Chixoy se evapora, 1987). With this crisis in mind, just before passing the power to a newly elected civilian administration, the military government issued the Decree 20-86 that opened the door for small, alternative and renewable generation projects to connect to the electrical network (Velásquez & Mazariegos, 1991). This law was the clearest precedent of the GLE of 1996, although its scope was much more limited.

Back to the political environment, after the sanction of a new Constitution in 1985, Vinicio Cerezo, in 1986, from the left-centre party Democracia Cristiana, became the first democratically elected president of Guatemala in decades. His administration was welcomed with a great deal of hope, with the expectancy that it would end the armed conflicted and also that it will improve the social, economic and political conditions that led to it in the first place (Galicia, 2016). But his term was ridden with attempted coups from the military, an inherited corrupt and inefficient bureaucracy, repression towards workers unions and civil society activists and straight-up opposition from the private sector (ODHAG, 1998). Focusing on the electrical network, it was during the Cerezo Administration when a first crisis on the electricity sector happened in 1987, when the water level in the Chixoy Dam descended below its functioning levels. A report from *Crónica* at the time blamed the problems on the inadequate operation and maintenance of the plant and the deforestation in the surrounding area; old thermal power plants had to re-enter the electrical grid to avoid a shortage of electricity in the national electrical network (Chixoy se evapora, 1987). By this time, Chixoy was irreversibly associated with failure and corruption by the public and in the media; a 1988 article in *Crónica* called Chixoy, "a synonym of a curse word for thousands and thousands of Guatemalans" (Piden emisión de 20 millones en bonos, 1988).

As it was pointed out before, the government entity in charge of electricity generation, transport and distribution in most of the country was the Instituto Nacional de Electrificación (INDE); while in Guatemala City and three departments it was the Empresa Eléctrica de Guatemala (EEGSA), which at that moment was a mixed-capital company with more than 95% of its shares owned by the Guatemalan Government. EEGSA and INDE were not immune at the corruption and incompetence pervasive at all levels of the Guatemalan Government. As an example, INDE's situation at the time is described in the webpage of INDE's workers' union, STINDE, in the following terms: the organization was full of cronies and overstaffed; management considered themselves the owners of INDE and treated employees in ways that reminded of how colonial lords treated peasants; abuses arrived to the level of physical assault, especially in the case of low-level

field workers; women had to deal with constant sexual harassment, and unjustified layoffs were business as normal; the institution was buried in tremendous corruption on every single hierarchical level; and to complete the picture, the maximum authority at the time was a military commander, General José Oscar Sandoval Torres, who was put by the government to intervene INDE –since, as it was discussed before, INDE was supposed to be an autonomous institution (STINDE, 2015).

Problems related with energy supply and distribution continued over the years: operational deficits, equipment malfunctions and overall mismanagements. In 1991, a new President took office, Jorge Serrano Elías, from a new right-wing political party, *Movimiento de Acción Solidaria* (Solidarity Action Movement, MAS). Both Cerezo and Serrano were from middle-class background with no familiar connections to the Guatemalan elite. Serrano would face in his first year as president the first energy crisis of the INDE-EEGSA era that resulted in power outages. This time, in addition to the usual problems mentioned above, a severe drought caused by the climate phenomenon known as El Niño[9], took the level of water inside Chixoy dam to a historic low and, as a consequence, two months of programmed power cuts had to be scheduled in order to keep the network from reaching total collapse (Velásquez & Mazariegos, 1991). Public outrage against the authorities ensued, and the situation of the national electrical grid, became a regular theme in news media. The year had not even ended when a new corruption scandal emerged, involving INDE, Chixoy and the insurance company *Granai & Towson*, owned by one of the largest banks in the country, which in turn was owned by the Granai family, one of the most prominent families in the financial sector (Casaús Arzú, 2007, p. 99). The accusation was that INDE's authorities did not filed a claim to the insurance company when the collapse of the adduction tunnel happened in 1983, and the Guatemalan State took a loss of over 200 million quetzal –around USD 40 million at the time – (Mazariegos, 1991). It was suspected that the authorities were bribed in order not to file a claim. The public image of the electrical utilities was rapidly deteriorating.

To deal with the energy shortage, the Serrano Administration, using as legal base the Decree 20-86, issued an emergency call for private generators to supply electricity. This was the first time since its foundation that private generators were going to sell energy to INDE. By 1996, the following generators were supplying energy to the Guatemalan electrical grid: two power barges in Puerto Quetzal, in the Pacific, then owned by ENRON, with a capacity of 110 Mw (Barillas Wilken, 1992); five sugarcane mills, producing energy

[9] Or as it is known in climate science, El Niño Southern Oscillation (ENSO). "Every five years or so, a change in the winds causes a shift to warmer than normal ocean temperatures in the equatorial Pacific Ocean. This shift is known as El Niño, and it has a counterpart, La Niña, which leads to cooler than normal ocean temperatures. Combined, the two phases together are known as the El Niño Southern Oscillation (ENSO), and are responsible for most of the fluctuations in global weather we see from one year to the next" (Carbon Brief, Ltd., 2014)

from the combustion of sugarcane bagasse, with a capacity of 80 Mw (Paz Antolín, 2004, p. 151); a thermal power plant, *Alborada*, owned by the US American corporation Tampa, with a capacity of 65 Mw (García Kihn, 1995); and one hydropower plant, with a capacity of 10 Mw, owned by Hidronorte, a company with links to Manuel Ayau Cordón (Centro de Medios Independientes Guatemala, 2015), whose role in the development of the hydroelectric expansion will be discussed in the next section. Since these contracts were negotiated after an energy crisis, and there was public pressure to prevent the next energy shortage, the prices of electricity established on them were overestimated and subjected to very favourable conditions for the generators (Paz Antolín, 2004). This was a first distortion on an electricity market that did not even exist at that moment; it had significant consequences on the future prices of energy as it will be discussed in the next sections.

In 1993, there were reports of possible energy cuts (Arroyave, 1993), although finally there were avoided. After a failed auto-coup by President Jorge Serrano Elías (Shetemul, Mazariegos, Blanck, & Morales, 1993), Congress appointed ombudsman Ramiro De León Carpio (1993-1996) to finish the former president's term. During his time in office, there was a second period of programmed power outages. The causes cited in the article in Crónica were almost the same as the 1991 crisis, including the return of the El Niño phenomenon (Mazariegos & Morales, 1994). This second appearance of El Niño in this story is not a coincidence or an act of God. It was in the late 1980s and in the 1990s when climate scientists finally arrived at a coherent model of how El Niño Climate Oscillation (ENSO) worked (Zebiak, et al., 2015). The increased understanding of the phenomenon, as well as particularly strong occurrences of it in 1982 and 1997, made ENSO a global issue, so even mild occurrences of it, like the one that affected Guatemala in 1994, were a matter of public concern.

The sum of these factors: the progressive deterioration of the Chixoy hydropower plant, the constant corruption problems of the public electrical utilities and the increased awareness of the vulnerability to global climate phenomena like ENSO, made the situation of the electricity sector a matter of national concern. By the mid-1990s, there was already a very public discussion on what kind of reforms should be made to guarantee the energy supply for the country. At this point of the account it will be useful to go back a few years and change the focus on the political and ideological debates of those decades, locally and globally.

5.2.2 A turn to the right everywhere

It's almost common knowledge by now that politically, the tide turned to the right worldwide in the late seventies and early eighties, in what became to be known as the rise of neoliberalism (Monbiot, 2016). In

the United States and the United Kingdom, Ronald Reagan and Margaret Thatcher took office and started their "conservative" revolutions. In Latin America, Chile started its economic reforms, with the advice of the famous "Chicago Boys" –members of the School of Economics of the University of Chicago, with Milton Friedman as their frontman; other Latin American countries followed suit in the late 1980s. Guatemala was not the exception. A key figure in promoting this shift to the right was Manuel Ayau Cordón, a member of the Guatemalan elite (Casaús Arzú, 2007, p. 138). He was an engineer and a successful business man, but he gained notoriety nationally as an advocate of the ideas of Ludwig Von Mises and Friedrich Hayek, prominent members of the school of thought known simply as the Austrian School. Ayau Cordón was arguably the most vocal and influent Guatemalan right-wing intellectual of the late 20th century. He was one of the first Latin American members of the Mont Pelerin Society, an international organization founded by Hayek with the purpose to reunite academics and intellectuals that were akin to classic liberal ideas and that saw "danger in the expansion of government, not least in state welfare, in the power of trade unions and business monopoly, and in the continuing threat and reality of inflation" (The Mont Pelerin Society, n.d.). In Guatemala, he founded the Centre of Economic and Social Studies (CEES) in 1959, which was the first conservative think tank in Guatemala. Then, in 1971, he was also part of the founders of Francisco Marroquin University (UFM) (Ibargüen, 2010). UFM is an academic institution that, according to an article in the conservative U.S. magazine *National Review* (Nordlinger, 2016), "classical liberals or Reagan conservatives [call] too good to be true" and "virtually the only one in the world [that is] an island of [classic] liberalism". The website The Best Schools ranked UFM as the No. 1 University in the world for studying classical economics (The Best Schools, 2017).

Ayau's efforts gained traction, and by the 1990s, academics that graduated from UFM and himself were writing opinion articles on newspapers and hosting shows on radio and television. In fact, the founder of Crónica, Francisco Pérez de Antón, is a member of the Board of Trustees and a Professor at UFM (Universidad Francisco Marroquín, 2010). In the years that followed the collapse of the Berlin Wall and the dismantling of the Soviet Union, this group of academics took advantage of the *zeitgeist* and promoted tirelessly the classic neoliberal agenda: deregulation, privatization, downsizing of the government, and the rule of the free market. Although it was perceived as trendy at the moment, the consistency of their ideas over time is remarkable: as early as 1972, Ayau argued in one of his books that, "one of the most expensive lessons for society is learning why companies that provide services or manufacture and distribute goods should not be on the hands of the government on a liberal democracy" (Ayau, 1972). Their ideas started to permeate on political parties and government officials. According to the website of STINDE, the first failed privatization attempt on the electric public utilities in Guatemala took place in 1986 (STINDE, 2015), during the Cerezo Administration, which, it should be recalled, was supposed to be left-centre leaning. However,

Cerezo successfully transformed the national airline, AVIATECA, into a mixed-capital venture, with the Guatemalan state owning only a fraction of its shares (En alas de Aviateca, 1989). Today, the company brand survives only as a code of the International Air Transport Association, but the airline has been fully absorbed by the Colombian AVIANCA (El Espectador, 2012)

Successive administrations were gradually more right-leaning –Ayau Cordón himself ran unsuccessfully as a vice-presidential candidate in 1990 (Un matrimonio de conveniencia une a Jorge Carpio con Manuel Ayau, 1990) – and more pro neoliberal ideas. President De León Carpio, for example, was from a centrist party, but in power, his policies became very conservative and business friendly. The media at the time, especially op-ed columnists, subscribed the neoliberal agenda, which was pushed also by business associations and think tanks. As a first example, an article in *Crónica* (Blanck & Hernández, 1995) called *La reforma en cuatro opiniones* (The reform in four opinions) interviewed four experts: all of them were right leaning (two of them connected to UFM, and an Argentinian former government official who ran a modernization program); and all were in favour at least partially of the privatization of public companies, and even other, more essential, services, like education and healthcare. A second example is this advertisement in issue No. 476 of Crónica magazine from 1997 (Figure No.2).

Figure 4. Ad in an issue of Crónica Magazine (Anahté, S.A., 1997). Licensed under a Creative Commons Attribution-NonCommercial–NonDerivative license 3.0 (http://creativecommons.org/licenses/by-nc-nd/3.0/). Available at: http://cronica.ufm.edu/index.php/DOC468.pdf.

It reads: "What did Francois Miterrand, socialist president of France, do to modernize its economy? *Privatize* (…) to privatize is not ideological, to privatize is to modernize". Notice that there is no sponsor of the ad. The rationale behind it is flawless: by stripping the privatization proposal of its ideological component, it was represented as a common-sense solution for a practical problem. The deteriorate state of the publicly-owned companies fitted perfectly on this narrative, although, as it was discussed above, their situation was not simply a consequence of being owned by the Guatemalan State.

De León Carpio named Ayau Cordón to oversee the privatization process (Bull, 2005, p. 90). During Ayau's tenure, in 1995, the President submitted to Congress a first bill of the General Law of Electricity, which was portrayed to the public as a solution to all the problems plaguing the electrical network. Simultaneously, a counterproposal from Congressman Leonel López Rodas, from the opposition party *Partido de Avanzada Nacional* (National advancement Party, PAN) was also put forward (Mendoza Yaquián, 1995). Eventually both bills failed to be approved and the destiny of the GLE was left in the hands of the next legislature.

The next presidential election was won by Alvaro Arzú, presidential candidate from PAN. Unlike Cerezo and Serrano, Arzú was a member of the conservative white elite of Guatemala (Casaús Arzú, 2007, p. 92). He named the proponent of their party's GLE bill, Leonel López Rodas, Minister of Energy and Mines. Just as Manuel Ayau Cordón had some interests in the energy sector (as it was discussed in the previous section), so did López Rodas, whom in 1992 founded CECSA, a company dedicated to the commercialization of electricity (Investigación elPeriódico, 2016). Arzu´s administration advanced a clear privatization and deregulation plan, including the sale of the public electric utilities and the opening of the electrical market (García Kihn, 1996). The most important piece of legislation for all of these transformations was the GLE, in the version presented by López Rodas in the past legislature. The influence of Manuel Ayau Cordón's ideas in Guatemalan policy had reached its highest point, although Ayau himself was not a member of Arzú's administration; however, a significant part of government officials were academics from the University he founded and politicians akin to his ideas.

The passing of the bill proved to be difficult, since most opposition parties disagreed with some if its dispositions or plainly opposed it. The public efforts to support the bill centred on the inefficiency of the system as it was, and the problems faced by those that were already users. For example, in an interview to INDE's General Manager, Edgar Pereira, he pointed as the benefits of the new GLE that it would establish clear rules for the electric sector and that its mandate to divide the stages of the electricity process in different businesses would increase efficiency and generate competition (González, 1996, p. 46). There is no mention of expanding electricity coverage or making more accessible the price of electricity for those who could not afford it. After all, the problem at the centre of the public debate was the fragility of the

electrical grid, not the lack of access for the majority of Guatemalans. It is worth mentioning that, in another interview, the newly appointed Minister of Energy and Mines, Leonel López Rodas, did mention increasing electricity coverage, as one of the main goals of the PAN administration; however, his line of reasoning was that by selling the Guatemalan State's participation in the electric utilities, and by giving incentives to the private sector to develop new projects, the supply would increase, and energy crisis like the ones from the previous years would be avoided. And then, he just added that the goal was increasing electricity coverage to 70 % of the population by the year 2000 (Morales Monzón, 1996a, p. 35). His argumentative made it sound as if it was a corollary to his previous statement, when in fact he previously was discussing his strategy for generation, which not necessarily translated into an increase in coverage.

On the other hand, the arguments of those who opposed the GLE or the privatization of the utilities –which mostly were left-wing academics – tried to see through the "efficiency" argument. One particular article warned that the GLE might be used to introduce nuclear plants to the country, and listed the risks that it carried (Mejía, 1996) However, there was even a sense of resignation in those criticisms, since one of the most commonly used arguments was that if the changes in the law required the sale of the publicly owned electrical utilities, at least it was needed to make sure that their price was fair and that it reflected the value of each company's assets (Velásquez E. , 1996).

The GLE bill had initially the support of three major political parties. However, the party *Frente Republicano Guatemalteco* (Guatemalan Republican Front, FRG) –which was formed to promote former dictator Efraín Ríos Montt as their presidential candidate– withdrew from the alliance and put the approval of the bill in danger. After some back and forth moves, PAN secured the support of the left-wing party *Frente Democrático Nueva Guatemala* (New Guatemala Democratic Front, FDNG)[10], and the law was finally passed in October 7th, 1996 (Morales Monzón, 1996b).

To summarize the events discussed so far, Figure 5 provides a visual presentation of the array of actors and events that led to the GLE, which can be described as follows:

(a) A weak state controlled by the military in the midst of a counterinsurgency war resulted in the inefficient and corrupt management of the public electricity utilities.

(b) The El Niño Southern Oscillation repeatedly led to droughts that affected the capacity of Chixoy, the largest hydroelectric power plant in Guatemala, creating an energy crisis.

[10] The reason a leftwing party supported the GLE was that the President of the Congress (also from PAN) offered them in exchange, support for a bill proposed by FDNG, the Children Rights Law. However, almost a year later, PAN broke the agreement and withdrew its support of that bill (Los más marrulleros, 1998), which could not be approved until 2004, four years after the PAN administration ended.

(c) The inadequate government response of a series of programmed power cuts and a return to importing fuel for power generation made energy policy a national matter with public pressure to restructure the electricity sector.

(d) An international political turn toward neoliberalism manifested in Guatemala as progressively more right-wing administrations that were sympathetic to the ideas of deregulation and privatization.

(e) The advancement of the neoliberal agenda by think tanks, conservative elite members and "Reagan conservative" academics in Guatemala led to privatization being the preferred policy response.

(f) And all of the above converged into a ready-made solution to the electricity problem: the GLE of 1996.

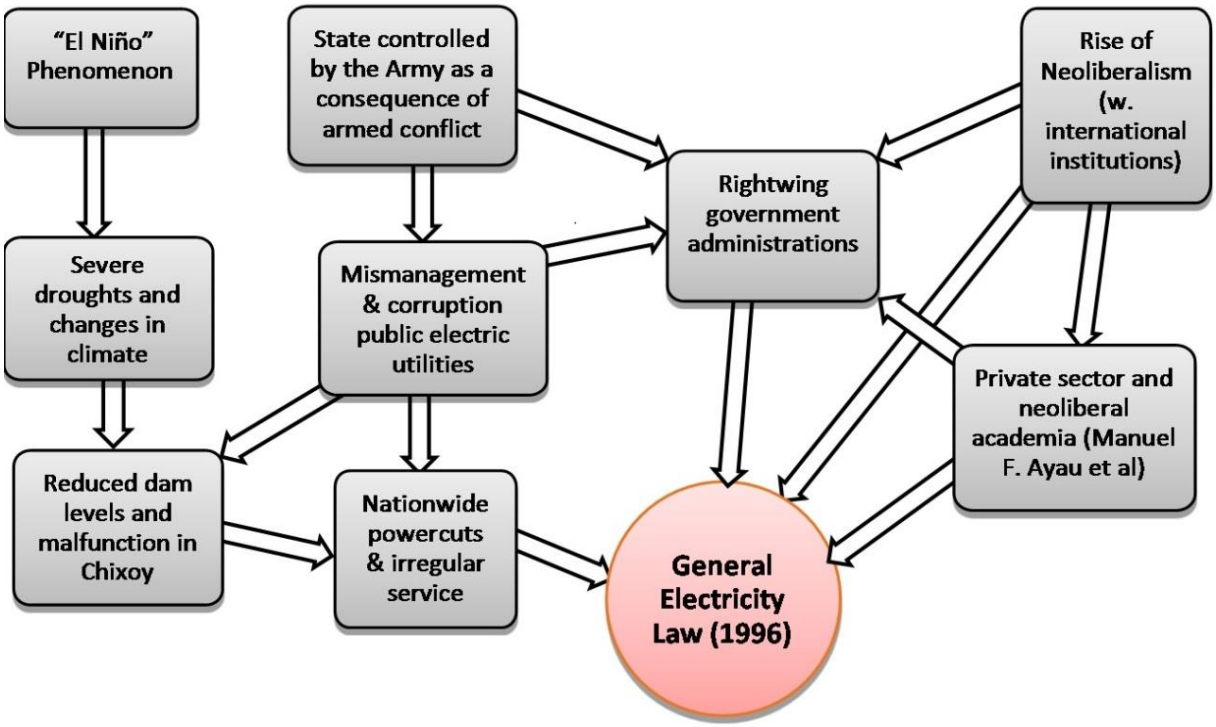

Figure 5. The network that originated the GLE. Prepared by the author.

5.3 How the GLE became an actor against the network that originated it

5.3.1 A law for expanding the energy market

In its opening statement the GLE states that, since, "the supply of electric energy does not satisfy the needs of the majority of the Guatemalan population (…) and since the deficiency of that sector is an obstacle for the integral development of the country, it is necessary to increase the production, transmission and

distribution of it, by means of the liberalization of the market"[11] (Decreto 93-96, 1996, p. 1). Notice that this declaration of intentions states unequivocally that the solution is the liberalization of the market and does not explicitly mention increasing access to electricity. These are not minor details, since they clearly point to the main concerns of the GLE proponents.

Regarding its contents, the law assigns to the Ministry of Energy and Mines the responsibility of the electricity sector, and among other provisions, it also:

1. Declares that the generation of electricity does not need special permits in addition to those required by the Guatemalan Constitution and the laws of the country, unless it uses state property. That is the case of hydroelectric plants using water from rivers, which according to the Constitution belong to the Guatemalan State.
2. Declares that transmission and distribution of electricity are free activities except on the cases specified in the law.
3. Declares that the prices of electricity between the agents of the market (generators, distributors, transportation and commercialization companies, and wholesale buyers) are established freely.
4. Creates the *Comisión Nacional de Energía Eléctrica* (National Electrical Energy Commission, CNEE) which is the authority in charge of applying and enforcing the GLE, especially in relation to pricing for small users and cases of arbitration between agents of the market.
5. Creates the figure of the *Administrador del Mercado Mayorista* (Wholesale Market Manager, AMM), whose functions are coordinating the energy market, guaranteeing its safety and the constant supply of energy.
6. Establishes that no company, public or private, can operate simultaneously two or the three main activities of the electricity business, i.e., generation, transportation and distribution, and gives INDE and EEGSA (although to this last one, not explicitly) one year to separate their activities into different businesses. This provision was introduced to mitigate the "natural monopoly" status of the electrical network[12].

Orantes et al, in their study on conflicts over hydroelectricity stated that with the intention of gaining efficiency, the GLE reduced substantially the roles of the Ministry of Energy and Mines, and deregulated

[11] In the original Spanish text: "La oferta de energía eléctrica no satisface las necesidades de la mayor parte de la población guatemalteca, (…) que la deficiencia de dicho sector es un obstáculo en el desarrollo integral del país, por lo que es necesario aumentar la producción, transmisión y distribución de dicha energía mediante la liberalización del sector".

[12] "Both high-voltage transmission and low-voltage distribution are most economically performed by a single line or a single network of lines. Because a single high-capacity line minimizes both capital costs and losses to electrical resistance per unit of power carried, transmission and distribution are natural monopolies" (Michaels, 1993).

private investment, in such a way that it provoked unbalances between private and public interests (Orantes, et al., 2010, p. 48). The tracing of associations displayed in the previous section helps to understand why the focus is on efficiency. Rather than the human development narrative presented on the introduction of this dissertation –which was also the way government officials portrayed the bill-, the network of actors that converged on the GLE was more oriented towards solving current problems in the current electric network, i.e. towards guaranteeing the supply of electricity to those already connected to it and reducing the inefficient management that prevailed in the electrical sector. But before expanding the last argument, let us turn to the events and actors that followed the approval of the GLE.

5.3.2 The first wave of the energy expansion: thermal power plants

Following the approval of the GLE, the Guatemalan Government signed an agreement with the Mexican Government to launch their electrical interconnection. Although it was not a part of the provisions of the law, this action was meant as an additional incentive for the development of new generation projects (Interconexión eléctrica, 1996), since it broadened the market for Guatemalan generators. In May, 1997, the first National Electrical Energy Commission (CNEE) was appointed (Comisión Nacional de Energía Eléctrica, 2001), and almost immediately four electricity companies and 6 sugar cane mills registered to be the first private bidders participating in the new market (Nuevos generadores, 1997). Later, in August, Constellation Power Development (CPD) became the first private bidder to win a contract with EEGSA. The auction included assets from EEGSA and energy generation contracts for a fixed 18-year term (Al fin, precios más bajos, 1997). In October, the same year, the first mandate of the GLE was executed: INDE was divided in three different companies: EGEE (generation), ETCEE (transmission), and EDEE (distribution & commercialization). Later, EDEE would be divided in DEORSA (Electrical Distributor of the East) and DEOCSA (Electrical Distributor of the West) in preparation for its privatization (Empresas - INDE, 2013).

Although the GLE did not have an explicit mandate to privatize the public electricity utilities, it was part of the Arzú administration objectives to sell them. This was part of a broader policy of privatization of the Executive Branch. The Presidential Commissioner for Modernization, Gustavo Saravia, declared in an interview that the administration planned to sell the following public assets in the next two years: EEGSA, INDE, GUATEL (telephones), FEGUA (railroads), the ports and the airports (Blanck, 1997). The process was remarkably smooth, even though it met some opposition and suffered some delays; even EEGSA's unions agreed to the sale of the company, in part because a small percentage of the company's shares were to be sold exclusively to its workers (Promocionan venta, 1998). On July 31st, 1998, the Spanish company Iberdrola, together with the Portuguese EDP, and the US American Tampa Energy, won the auction to buy 80% of the shares of EEGSA that belonged to the Guatemalan Government with a bid of USD 520 million,

the largest amount of money ever paid to the Guatemalan Government by a private organization (El País, 1998). Other three bidders participated in the auction; the payment was made 45 days later. The Minister of Energy, Leonel López Rodas, claimed that the sale was a complete success, since the price went above the amount expected by the government, and he stressed how part of the incoming money was going to be used for expanding electricity coverage for the poor (Blanck & Robles, 1998). López Rodas was not alone in his satisfaction; many columnists and experts considered the sale as a success and a step in the right direction. There were also critical voices: Mario Roberto Morales, a left-wing academic, was very critical of the sale, questioned the very idea of its necessity, and asked if this version of the state was worth fighting for. The most absurd aspect of the sale, according to Morales, was the fact that 50% of the payment for EEGSA was stipulated by law to be used in the expansion of rural coverage. This meant that this essential investment was going to be done with the Guatemalan State's money, but the profits would go to a private Spanish company; this was equivalent, he said, to sell your car and then pay for fixing it with the money made from the sale, in order for the new owner to maximize her profits (Morales M. R., 1998).

INDE's new distribution companies, DEORSA and DEOCSA, would subsequently be sold in December, to another Spanish company, Union Fenosa, for USD 101 million (Harris, 2002). INDE kept the generation, transmission and commercialization businesses. Meanwhile, in November, the first Wholesale Market Manager (*Administrador del Mercado Mayorista*, AMM), José Luis Herrera, was appointed (Tárano, 1998), being his main task to coordinate (not regulate) the electrical energy transactions between agents of the market, which were: generators with more than 10 Mw capacity, distributors with more than 10,000 users, the owners of the transmission lines, the commercialization companies and the users with a power demand over 100 Kw (Se abre el mercado de energía en Guatemala, 1998). Finally, in 2000, the National Association of Generators (Asociación Nacional de Generadores, ANG) was founded, which is an industry association that aims at promoting and representing the private generation sector's interests (Asociación Nacional de Generadores, n.d.). Starting with the approval of the GLE, these events can be grouped together as the set-up stage of the new electricity market of Guatemala.

These measures were successful in promoting the growth of electricity generation in Guatemala. New private generators joined the bidding for government contracts every month, and new projects were regularly started. Table 5 shows the increase in installed capacity per primary source from 1985 to 2001. The data shows that in the period between 1996 and 2001 the overall capacity grew 527 Mw, while in the previous eleven years it only grew 362 Mw. When analysed by source, it shows that most of the increase in 1996-2001 came from thermal plants (351 Mw increase), which use fossil fuels, and cogeneration plants (120 Mw increase), which use mainly sugarcane bagasse; meanwhile, the increase in non-carbon emitting

renewable energies was minimal, only 22 Mw from hydropower and 33 Mw from geothermal. This was not an ideal path, partly because of the environmental impact, but mostly because it augmented the dependence in imported fossil fuels, which are scarce as natural resources in Guatemala. Paz Antolín argued that since most of the generation companies were foreign (with the exception of the sugar mills, which are all owned by Guatemalan corporations) and the Guatemalan market was too small to generate significant profits, these companies opted for a rentier strategy, which means high annual returns and easy dismantling of the facilities. That is why they opted for thermal power plants, since it is the technology more suitable for that strategy (Paz Antolín, 2004); a fitting example were the power barges that ENRON installed in the Pacific coast during the electricity crisis of the early nineties.

Year	Total	Hydro	Geothermal	Thermal	Cogeneration
1985	783.4	488.1	--	295.3	--
1990	810.9	488.1	---	322.8	--
1996	1145.5	502.1	--	563.4	80.0
2001	1672.1	524.9	33.0	914.2	200.0

Table 5. Guatemala: installed capacity per year and per primary source (Mw). Adapted from (Paz Antolín, 2004)

Before moving on to the second phase of the Guatemalan energy expansion, one quick observation is necessary. The Arzú administration, in addition to the GLE, passed, in 1997, a new Mining Law (Decreto 48-97, 1997). Its objective was to promote the development of mining projects in Guatemala, and in the same tone as the GLE, it did take only a minimum concern about any possible interaction with the nearby communities (Instituto Centroamericano de Estudios Fiscales, 2014). The law succeeded in its purpose of attracting foreign investment in mining and an industry boom followed; however, as it was reviewed in the previous chapter, this boom also led to the rise of conflicts involving nearby communities as well as environmental activists. The fact that both industries contemporary expansions were ignited by the Arzú Administration is a key factor in the representation of them as portions of a single, larger, extractive complex.

5.3.3 The second wave of the energy expansion: hydroelectricity

In 2002, the then relatively few renewable energy companies established the Association of Renewable Energy Generators (*Asociación de Generadores de Energía Renovable*, AGER). In its website, AGER states that its main objective is to organize all the entities in the private sector that have as main activity the generation of electrical energy from new and renewable sources of energy, and to set among them a unified position on the matters that affect them in relation to the electricity sector in Guatemala and abroad (Asociación de Generadores de Energía Renovable, 2016).

One year later, in 2003, the Guatemalan Congress passed the Law of Incentives for the Development of Renewable Energy Projects, LIDREP (Decreto 52-2003, 2003), which gave fiscal incentives to the developers of renewable energy plants. This law was an initiative from the Executive Branch; the new President was Alfonso Portillo, from the right-wing party *Frente Republicano Guatemalteco* (FRG), the main opposition party during the Arzú administration. The leader of FRG was Efrain Ríos Montt, who was, as it was mentioned above, a dictator (1982-1983) whose de facto government was allegedly responsible for a significant part of the massacres perpetrated during the armed conflict. Ríos Montt, as the leader of the coup, was forbidden from running for President by the Guatemalan Constitution, so in his place ran Portillo, a popular politician that started as a leftist but gravitated toward the right after joining FRG. FRG ran their campaign on a populist "tough on crime" platform, due to the rising levels of crime in the country, so LIDREP seemed an odd departure from their usual policies. However, the timing of the bill, approximately one year after the foundation of AGER, fits within a scenario where the LIDREP was a result, at least partially, of the lobbying efforts of the association with the FRG administration. This law, together with the demand created by the expansion of the electrical grid, the already underway electrical interconnection with Mexico, and a similar project for connecting all Central American electrical networks (Echevarría, Jesurun-Clements, Mercado, & Trujillo, 2017), gave way to the second wave of the energy expansion.

After the approval of the aforementioned law, there was a sustained growth of hydroelectric power plants. The graph in Figure 6 shows the total number per year of hydropower plants of more than 5 Mw capacity, either in operation or approved. It shows that while in 1995 there was only one private plant operating, in 2015 there was 49 hydroelectric plants, in operation, under construction or just authorized.

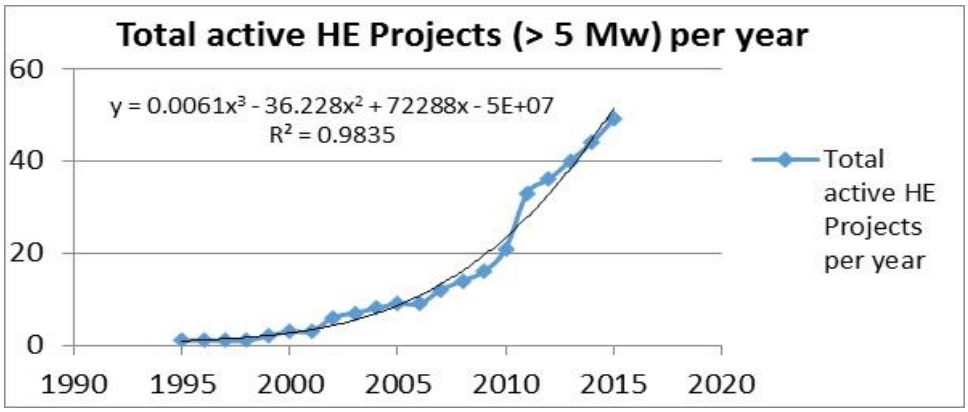

Figure 6. Total number of HE active projects per year, either in operation, under construction or authorized. Data compiled by the author from (Guatemala. Ministerio de Energía y Minas, 2016)

Project Name	Corporation	Rivers	Department	Installed Capacity	Start-up year
Hidroeléctrica Río Bobos	Hidronorte, S.A.	Bobos	Izabal	10	1995
Hidroeléctrica Secacao	Grupo Secacao, S.A.	Trece Aguas	Alta Verapaz	16.6	1999
Hidroeléctrica Pasabien	Inversiones Pasabien, S.A.	Pasabién	Zacapa	12.75	2000
Hidroeléctrica Río Las Vacas	Hidroeléctrica Río Las Vacas, S.A.	Las Vacas	Guatemala	42	2002
Matanzas-Chilascó	Tecnoguat, S.A.	Chilascó	Baja Verapaz	12	2002
San Isidro	Tecnoguat, S.A.	Chilascó	Baja Verapaz	3.9	2002
Hidro Canadá	Generadora de Occidente, Limitada.	Samalá	Quetzaltenango	47.4	2003
Renace	Recursos Naturales y Celulosas, (RENACE S.A.)	Cahabón	Alta Verapaz	68.1	2004
Poza Verde	Papeles Elaborados, S.A.	Aguacapa y La Plata	Santa Rosa	12.17	2005
Central Generadora Eléctrica Montecristo	Generadora Montecristo, S.A.	Samalá	Quetzaltenango	13	2007
Hidroeléctrica El Recreo	Hidrotama, S.A.	Samalá	Quetzaltenango	26	2007
Hidro Xacbal	Hidro Xacbal, S.A.	Xacbal	Quiché	94	2010
Hidroeléctrica Panán	Inversiones Atenas, S.A.	Panán	Suchitepéquez	6.9	2011
Hidroeléctrica Cuevamaría	Recursos Energéticos Pasac, S.A.	Samalá	Quetzaltenango	9.3	2011
Santa Teresa	Agro-Comercializadora Del Polochic, S.A.	Polochic	Alta Verapaz	24	2011
Hidroeléctrica La Perla	Hidrosacpur, S.A.	Sacpur	Alta Verapaz	3.7	2011
Hidroeléctrica Cholomá	Hidroeléctrica Cholomá, S.A.	Cholomá	Alta Verapaz	10	2011
Palo Viejo	Renovables de Guatemala, S.A.	Cotzal	Quiché	85	2012
Hidroeléctrica El Manantial	Alternativa de Energía Renovable, S.A.	Ocosito	Quetzaltenango Retalhuleu	40	2014
Oxec	Oxec, S.A.	Oxec y Cahabón	Alta Verapaz	25.5	2015
Renace II (Fase I)	Recursos Naturales y Celulosas, (RENACE S. A.)	Cahabón	Alta Verapaz	120	2014
El Cóbano	Hidroeléctrica El Cóbano, S.A.	María Linda	Escuintla	7	2015

Table 6. Hydropower plants with capacities larger than 5 Mw currently in operation in the Guatemalan Territory. Source: Prepared by the author, with information adapted from (Guatemala. Ministerio de Energía y Minas, 2016; Guatemala. Comisión Nacional de Energía Eléctrica, 2017)

At the same time, the number of new thermal power plants declined, heralding a shift in the energy matrix of the country. By 2017, more than 61% of the electricity generation came from renewables and almost 39% of the total came from hydropower plants (Guatemala, Ministerio de Energía y Minas, 2017). However, the second renewable source was biomass –mostly sugarcane bagasse – which still produces substantial carbon emissions. The shift from public to private generation was even sharper: by July, 2017, 86% of the electrical energy produced came from private power plants, while only 14% came from publicly owned plants. Even inside private generation, the hydroelectric expansion did mean a significant change in the national origin of the companies, shifting from a foreign dominated matrix in the years of the thermal plants expansion (Spanish, US American, and Italian corporations), to a more balanced composition in which major Guatemalan corporations were developing new projects, either alone or in alliance with foreign ones. Table 6 shows all the private hydropower plants in operation in the year 2015, and general information about each of them. In the next paragraphs, some key information that can be extracted from the table will be discussed, and then a brief overview of the main developers and some of the connections among them will be presented.

There are 22 hydropower plants with a capacity larger than 5 Mw already in operation in the country, distributed over 10 departments. However seven of them are in one department, Alta Verapaz, which makes it the one with the largest amount of private plants in the country. To that fact it should be added that the largest dam in Guatemala, Chixoy, is also there, so basically, the department can be considered the hydroelectric heart of Guatemala. Moreover, if the focus is broadened to the Northern Region (Alta Verapaz, Baja Verapaz, Quiché, Izabal and Zacapa), the number of hydropower plants increases to 13, almost 60 % of all the projects currently in operation. This fact is even more interesting when it is taken into account that some of the communities with the lowest Human Development Indicators are in that region, as it was discussed in Chapter Two.

The largest development to date is Project Renace, a multi-stage endeavour that consists of five hydroelectricity plants in cascade over the course of the Cahabón river; the five plants together will have a capacity larger than Chixoy (more than 300 Mw). Renace is being built by Grupo Cobra, part of the Spanish conglomerate ACS (*Actividades de Construcción y Servicios*, Activities of Construction and Services), whose public face is Florentino Pérez, known around the world because he is also President of the soccer club Real Madrid. However, the owner of the Project is the Guatemalan *Multi Inversiones Corporation* (ICEX España, 2014), probably the largest corporation in Guatemala owned by a single family, the Gutiérrez-Bosch clan. This family, of Basque and German descent, rose to prominence in the 20th century, and quickly surpassed

in influence and power other older and more traditional groups of the Guatemalan elite (Casaús Arzú, 2007, p. 100).

The Ayau family was also one of the key players in the hydroelectric expansion. As it was told in the previous sections, Manuel Ayau Cordón was a key figure in the public ideological debate over privatization; his role as a businessman and promoter of this projects, on the other hand, is lesser known. However, there are at least four hydropower plants in which companies linked to the Ayau family have participated (Illescas, 2014). These companies have also worked together with the Italian ENEL Greenpower in the development and construction of other projects. ENEL Greenpower owns two large hydropower plants, Canadá and Paloviejo, which together generate more than 160 Mw of power (Enel SpA, 2015).

Another corporation that owns four hydropower plants, although two of them are below the 5 Mw capacity threshold, is Grupo Secacao. Most of them are located in the Alta Verapaz Department. This group is owned by members of Guatemalan families of German descent, Jacobs Ast and Dorión Ferber. There are other important actors of the Guatemalan business and financial world that have ventured in the hydroelectricity business. J.I. Cohen, a company that has been in the public eye in recent years because of its role in financing political campaigns and also because it is the largest provider of medicines to the Guatemalan State, is behind *Hidroeléctrica El Manantial*, a 40 Mw capacity plant in the department of Quetzaltenango (Gobierno otorga concesión a J. Cohen por 50 años, 2009). The plant *Hidroeléctrica Cuevamaría*, in Cantel, Quetzaltenango, is the project of the late José Habie, owner of one of the largest textile companies in Central America and real estate developer (José Habie, 2015).

5.3.4 The rise of the conflicts over hydroelectricity

One fact that must be evident by now is that, through all this account, there has been no connection traced, no action taken, and no transformation went through, by the rural communities that the expansion of the electrical coverage was supposed to benefit. They were not affected or mobilized by the failures of the dams and the electrical grid, they did not lobbied for or against the approval of the GLE, they were not represented in the governments that advanced the modernization and privatization agendas and they are nowhere to be found among the developers and advocates of this new wave of renewable energy. This is, of course, no coincidence. As it has been seen along the whole account, most of the people involved in these events were members of the Guatemalan economic and social elite; even in the case of the politicians and elected officials, those that came from middle or popular classes were few, and those few had small roles to play in the development of the hydroelectric expansion. This whole endeavour was a project of the Guatemalan elite and there is probably no other way to frame it.

Before continuing, however, I will depart from other, more conventional accounts of these events. Although, undoubtedly there was clearly an agenda being promoted by the Guatemalan elite, it did not advance solely on its own power and momentum. As the first part of this account showed, the non-humans in the network were key pieces in the processes that coalesced on the GLE, because they helped to maintain the focus of the public discussion on the efficiency and stability of the electrical grid and not its expansion. This point will be more thoroughly developed in the conclusion of the chapter.

Yet another point needs to be made before going through the rise of the hydroelectric conflicts. The very fact that the hydroelectric expansion is a project of the Guatemalan economic and social elites in alliance with foreign corporations raises the question of the role of neocolonialism in this story and the insights that focusing the postcolonial lens on it could produce. As it was noticed at the end of section 3.2, Escobar points out (2007) that concepts like development and sustainability need to be stripped of their thick coloniality and need to be rethought from a perspective that does not render invisible, subaltern knowledges and practices. The case of the hydroelectric expansion is fitting example of Escobar's thesis. The "sustainable development" that was at the heart of the changes made on the laws that allowed the transformation of the Guatemalan energy matrix, was probably neither "sustainable" nor "development" for the communities that it was supposed to benefit; however, since they were excluded from the network that gave way to the expansion, there was no way for their perspective on the matter to become embodied in laws like GLE and LIDREP. Once again, this point will be revisited at the end of the chapter as we draw some conclusions about the whole Guatemalan hydroelectric endeavour.

The first conflict over a hydroelectric project was the Rio Negro Massacre that was discussed above, which, as recently as 2014 was still subject of reparation lawsuits, nationally and internationally (Morales, Sion, & Grave, 2014). This conflict ended in the worst way possible: the slaughter of almost all the members of those communities that were concerned over the flooding of the land they lived, which they feared would be a consequence of the construction of the Chixoy dam. However, at the time, the community's objections and the subsequent conflict did not give way to a public controversy that could be followed through national media. Not even the massacres had wide coverage, since the Army had a strict censorship over any news related to the civil war that was published on newspapers or broadcasted over radio and television. The Chixoy episode and the Rio Negro massacres are central to understanding the current ones, since they can explain to a great extent the mistrust that rural communities –especially in that region of the country- have in regard of megaprojects (Orantes, et al., 2010). For our research timeline, however, this conflict happened before the private hydroelectric expansion and is therefore, an antecedent of the

research problem. The conflicts that will be discussed next are those that have risen after the approval of the GLE and that involve mostly private companies.

- **Pasabién and Rio Hondo hydropower plants**

In this new stage, the first reported conflict was in the municipality of Rio Hondo, on the department of Zacapa. According to Hurtado (2006), concerns were raised by members of the community about a first hydroelectric plant, *Hidroeléctrica Pasabién*, which started operations in 2000, after evidence of its environmental impacts on nearby communities was made public. The complaints of the community were that the water flow into the community had ostensibly diminished, that the water itself was polluted, and that the ecosystem in the river basin was in danger (Hurtado, 2006, pp. 105-106). The concerns escalated to protests after it was revealed that there were plans for two other projects in the area, and that for both of them there were preliminary studies already underway. The new power plants were being developed by companies linked to the same parent company that owned the first one, the transnational Hydrowest (Hurtado, 2006, p. 105). The conflict eventually was covered by the media so this added public pressure for its resolution. After years of opposition, town hall meetings and protests, in 2005, a public consultation vote was held, taking as legal base, Article 64 of Guatemalan Municipal Corporations Act (Decreto 12-2002, 2002), which states that citizens have the right to ask the City Council of every Municipality to organize popular consultations in matters that could affect all members of the community. The results were against the construction of the plant. As a result, the Municipality of Río Hondo, Zacapa, denied the necessary permits for the construction of the plant, and the project was stopped. However, since the first hydropower plant was not affected by the consultation and still operates, the concern remained among the population that another power plant would be eventually given permission to start operations.

- **Hidro Xacbal hydropower plant**

This project is located in the Municipality of Chajul, in the northern Department of Quiché. Its development started in 2004, when the Arenas Menes family sold part of their Estate, La Perla, to the Hidro Xacbal Corporation, which is part of the Honduran Grupo Terra, one of the largest conglomerates of Central America. The first problem was that the property rights of part of the land sold were being disputed by nearby communities. A second issue was raised when community leaders expressed concern over the environmental and economic impact that the hydropower plant would have on their communities, especially in the case of a road that was built without adequately compensating the owners of the land it passed (Martínez Aniorte & Villagrán García, 2009, p. 122). However, the project stayed in course of completion and it finally started operations in 2010 with a capacity of 94 Mw, one of the largest in the

country (Dardón, 2010). The plant was registered in the Clean Development Mechanism of the UN, which means that it is recognized as a carbon-emission reduction project in the quantity of 250,000 tonnes of CO_2 (Temper, Del Bene, & Martínez-Alier, 2015; United Nations Framework Convention on Climate Chagne, 2014). Meanwhile, the disputes over the property of the land are still ongoing, as well as the reclamation of compensations over the alleged impacts.

- **Hidro Santa Cruz hydropower plant**

The conflict around this project attracted significant media attention, because it rapidly became violent. At the heart of it was the opposition of the communities of Santa Cruz Barillas, Huehuetenango, to the hydroelectric plant Hidro Santa Cruz, which started developing in 2007. Hidro Santa Cruz belonged to a Spanish corporation, Hidralia Energía (today, Ecoener-Hidralia), owned by the Castro Valdivia family (Economía Digital Galicia, 2016). In 2008, there was a public consultation vote in Santa Cruz Barillas that rejected the project, but nevertheless, its development continued (Vizoso, 2013). After the intensification of the protests, the conflict escalated to a degree that a community leader was killed by security guards of the company; there were riots in the town, and then attacks to the plant facilities and to the barracks of the military unit in the county. The Government responded by declaring a state of emergency and suspension of some constitutional rights in the area (Hernández, 2013). After the State of Emergency finished, the tensions remained and the project was paralyzed, while the parent company was involved in a series of lawsuits as a result of the events of 2013. In December, 2016, Ecoener-Hidralia announced the termination of the Hidro Santa Cruz project (Economía Digital Galicia, 2016).

- **Hydropower plants La Vega I and II**

This project, located in Santa María Nebaj, Quiché, started developing in 2011, when a 50-year concession was given to the Spanish corporation Hidroxil. The tensions began when the communities near the proposed site for the hydropower plant stated that there was no consultation process or communication on behalf of the company. In 2011, the communities filed a lawsuit against Hidroxil, demanding for a public consultation to be held and the revocation of the licenses for the hydropower plant (Vásquez B. , 2013). After a long legal process, in 2016, Guatemala's Constitutional Court ordered the Ministry of Energy and Mines to organize the public consultation vote (García Kihn, 2016). The project is still underway, and the consultation has not taken place yet.

- **Renace Hydropower plants**

As it was mentioned before, the most ambitious development in Guatemala is Renace, with its 5 hydropower plants arranged in cascade and its more than 300 Mw expected capacity, which will make it the largest hydroelectric project in the country, public or private. Just based on its dimensions, the possible impacts of the project cannot be dismissed. But there are other facts that make Renace almost the perfect candidate for conflicts to develop. First, it is located in one of the areas of the country with the lowest Human Development Index, in which, for example, electricity coverage is below 33% of all the households (Castro Sáenz, 2016). Second, the Cahabón River basin, where the hydropower plants are located, is part of the biome of the Guatemalan tropical rainforest, which is one of the most biodiverse in the country, and comprises the Semuc Champey Protected Area, one of the most important ecotourism destinations of the country. Third and finally, the Gutiérrez-Bosch family, owners of Grupo Multi Inversiones, the conglomerate behind the Renace project, is one of the most influential and visible groups of the Guatemalan elite. This is a fact that makes every business decision they take a matter of public debate in the country, especially if it involves one of the most famous businessmen in Spain, as is the case of Florentino Pérez, president of Real Madrid FC.

Consequently, it should not come as a surprise that protests have emerged around the Renace projects. Although they have not escalated to the level of those in Santa Cruz Barillas, the exposure brought by the factors mentioned in the previous paragraph has already put the conflicts in the spotlight nationally and internationally (Paullier, 2016; Trotta, 2016). In this case, one important actor has been the activist group *Colectivo Madreselva*, which argued that the Renace project harms the biodiversity, despoils the communities of hydric resources, impacts communities along 30 km of the river shore, and that its corporate responsibility program is just a series of handouts with no real benefits for the nearby population (Trotta, 2016). On the other hand, spokespeople for the Renace project stated that they have complied with all the requirements of the law, and that this was a case that activists single out because of the media presence of Florentino Pérez (Paullier, 2016). In an article in the Spanish newspaper El País (Tristán, 2016), locals complained about the damages they've seen in the Cahabón River since the first two Renace hydroelectric plants were built; and lately, about the decrease in the river current, now that a third project is being finished. In one interview, one community member complained that the company gave away shovels, pickaxes, fumigators, offered jobs for those interested to work in the construction of the power plant and built a school for the community, but it never offered to supply them with electricity or potable water (Tristán, 2016). The tensions have grown as activists and *Colectivo Madreselva* denounced that they were being object of intimidation (Colectivo Ecologista Madreselva, 2017), and the company accused the

protestors of not even being members of the affected communities (Castro Sáenz, 2016). The project is still going on, and the development of its stages IV and V is underway.

- **Oxec I & II hydropower plants**

This project, in many of the reports and stories on hydroelectric conflicts, is grouped together with Renace (Temper, Del Bene, & Martínez-Alier, 2015; Castro Sáenz, 2016), probably because both are developed in the same region and rivers. However the Oxec hydropower plants are being developed by a different corporation, Oxec, S.A., whose parent company is Energy Resources Capital Corp, a corporation registered in Panama. The construction of the hydropower plant started in 2013, but in 2015, Bernardo Caal, a teacher in a public school and activist, filed a lawsuit to stop it, arguing that the project failed to comply with the requirement of a popular consultation prior to its start (Pradilla, 2017). In this lawsuit, Caal was supported by the environmental group *Colectivo Madreselva*. In February, 2017, Guatemala's Constitutional Court halted the construction of the hydropower plants until a public consultation procedure would be held. However, it later allowed continuing with the project while the consultation was being prepared. Caal was arrested and released in July, 2017, under charges of abandoning his job as a teacher without authorization, an action that he interpreted as an intimidation for his activism (Pradilla, 2017). The Oxec case draw so much attention on the national level that the largest association of private business owners in Guatemala (*Comité Coordinador de Actividades Comerciales, Industriales y Financieras de Guatemala*, CACIF) joined the controversy by filing lawsuits in defence of the project and pleading the courts for legal certainty in order to not lose foreign investments (Castañeda, 2017). Currently, the plant is still in operation and the public consultation has yet to be held.

5.4 Conclusion: A network in need of decolonization

There is a quote in the case of the *Renace* project that gives an indication about the role of the GLE in the development of the conflicts, and it is when a community member points out that there have been many handouts given by the developers, but no offerings of electricity or potable water. It is a powerful example of the limitations that the GLE imposes on the stakeholders that are negotiating the resolution of a conflict. It has been pointed out before the irony that more than 30 years after the Chixoy dam started operations, there are still nearby communities that neither have access to electricity (Godoy, 2012) nor to potable water. One could only wish that Chixoy is the exception to the rule, but the reality is that that is still the case with a majority of the new projects. In the study referenced above, Orantes et al (2010) found out through a survey passed to community leaders that, for the communities in the zones near hydroelectricity projects, the main causes of conflicts were: the approval and development of hydropower projects without

a consultation to the population in the municipalities affected (52%); the resulting pollution of the environment and the damages to the health of the population that the development of these projects meant (62%); and the plundering of the natural resources of their territory by private companies that left no substantial benefits to the communities affected and did not improve in any way their living conditions (38%). The text of the GLE did not take into account any of these concerns, because, as it was discussed earlier, the communities that lacked access to electricity were in no way part of the network of actors that got that law sanctioned by the Guatemalan Congress. On the contrary, it materialized the vision of a free electricity market that was proposed by right-wing intellectuals, by forbidding generation companies that own hydropower plants of installed capacity larger than 5 Mw, to sell, distribute or transport electricity (Decreto 93-96, 1996, Article 7) –unless they create another company explicitly to do so. It also forbids those companies to use the electricity service as a payment or as medium of exchange for goods or services (Articles 34 and 61). These dispositions make perfect sense, given the network that the GLE embodies, since they prevent the distortion of the market, and the purpose of the law is to have a market as free as possible. It should be remembered that electrical networks are natural monopolies (Michaels, 1993), so the law was written with the thought of avoiding such a natural tendency at any cost possible. However, in the context of negotiations with the surrounding communities, it became an obstacle, since one of the greatest bargaining assets for both companies and the population would be a guaranteed access to electricity at a low cost or no cost at all. Instead, the GLE contributes to create a scenario in which the greatest good produced –electricity- is taken away from the region where it is made and used to fuel activities in distant, more urbanized towns and cities. This fact is relevant to one of the research questions of this work, since it shows that actually, there is an extractive component in the whole hydroelectric industry; and therefore, it justifies its representation by some activists with access to a public platform (Gómez Grijalva, 2014; Itzanmá, 2014) as an extractive industry, and to some extent, grouping it along with mining as a part of a larger industrial complex.

There is another instance in which the network that embodies the GLE becomes easily discernible by looking at the effects it has on the hydroelectric expansion and its conflicts. As Martínez & Villagrán analysis of the conflicts in rural areas (2009), the legal frame for electricity (GLE, LIDREP, even the Guatemalan Constitution) is designed with one purpose only: the success of the energy projects, without taking into account whatever effects their development could cause environmentally or socially on rural communities in their proximity. Orantes et al (2010) in their analysis of the legal and policy framework summarizes the problem as follows: policy and laws about exploiting natural resources ignore a key aspect, interdependency. Since the GLE and LIDREP do not take into account any of these impacts, private companies are not bound by anything, except their own goodwill. There could be two other laws that

could distribute costs and responsibilities among all parties, but unfortunately both face their own obstacles. First, there is the legal void generated by the absence of a General Law of Water[13], which has faced such opposition that one article in the Guatemalan news website Plaza Pública calls it "the cursed law" (Escalón, 2016a). Second, the Environmental and Social Impact Assessments (ESIA) regulations, in theory, provide a way of quantifying the potential impacts of large projects, as well as measures to ensure participation and information to nearby communities. However, as previously cited studies (Aguilar-Støen & Hirsch, 2015; Aguilar-Støen & Hirsch, 2017) have shown, ESIAs, instead of the powerful accountability instruments they were supposedly designed to be, became mere bureaucratic requirements to fullfil. In conclusion, by ignoring interdependency, the legal framework shifted the burden of the cost of these projects to communities, and liberated the government and private companies of responsibility, so they could focus instead on getting the maximum efficiency in their intent of expanding to the supply for the energy market in Guatemala and abroad. This was not an unintended consequence, but the materialization of the network that created the GLE and LIDREP.

To summarize the role of the GLE in this second stage, Figure 7 presents the network of actors and events that it mobilized after its sanction. The GLE, a law made with a vision of expanding the market and increasing efficiency, mandates the demonopolization of the market and the disintegration of the vertical structures of the public utilities. The Arzú administration, as part of its privatization policy, sells EEGSA and the distribution companies of INDE created by GLE to Spanish corporations. These actions cause a boom of the generation business, attracting foreign companies. However, the first wave of the expansion was almost entirely composed of thermal power plants owned by foreign capital, which produced expensive energy from imported fossil fuels, with the exception of the sugar cane mills. These first corporations will eventually organize in industry associations like ADG and AGER. Their lobbying and the plans of the next administration, Alfonso Portillo's, coalesced in the new law of incentives for renewables, LIDREP. With it, which gave tax incentives to new renewable energy projects, the second wave of the electricity expansion began, based mostly on renewables, especially hydropower. However, a significant amount of these new projects were met with protests and conflict by the nearby communities, mostly in the northern part of Guatemala, where a large part of the population lives below the poverty line. These conflicts can be attributed at least partly to a history of distrust of the government by the communities, and of foreign interventions in their territories, but also to their exclusion of the political process, exemplified in the objectives and spirit of both GLE and LIDREP.

[13] The General Law of Water, which would regulate the usage of superficial and subterranean bodies of water, is mandated in the Guatemalan Constitution of 1985. Over more than 30 years, there have been more than 12 bills proposed to Congress, but none has been enacted, since the law has many and diverse opponents, including indigenous communities, agro industries and rightwing parties (Escalón, 2016b)

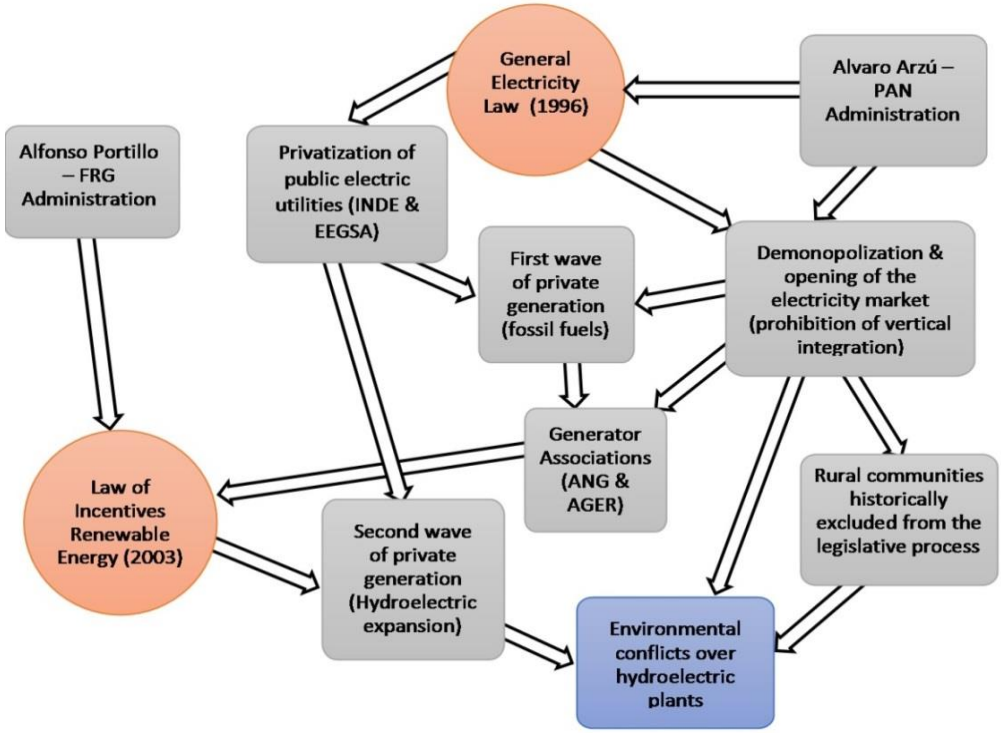

Figure 7. The network driven by GGEL and its role in the conflicts over hydroelectricity (Prepared by the author)

This account shows some of the insights that the ANT approach has to offer. Previous studies on the electrical network's expansion (Paz Antolín, 2004) and on hydroelectricity conflicts (Orantes et al, 2010) come to a similar conclusion: that the legal framework for the former was made within the neoliberal paradigm, which relied on efficiency and the free market as the solution to the urgent needs of bringing stability to the electrical network and expanding electricity coverage. Both studies attributed the approach of that frame to the agency of the international wave of neoliberalism of the time and its national counterparts, right-wing governments. This study shows that such a picture is incomplete since it depicts the legal frame as a mere intermediary, a vessel of the values and motives of the political elite of the period. Instead, the GLE is shown here as a mediator (Latour, 2005), an actor that not only embodied the network that created it, but also modified it. As Akrich (1994, p. 220) puts it, "technical objects not only define actors and the relations between them, but to continue functioning must stabilize and channel these". The focus of the GLE on efficiency and the free market eventually destabilized the hydroelectric expansion, since the network it embodied did not include the rural communities it was supposed to benefit. In other words, the GLE failed to shift to the role of mere "silent intermediary", as technical objects are supposed to do.

Approaching the GLE as the materialization of a specific network also helps understanding the connection between the hydroelectric industry and the mining industry, or, in general, to extractivist industries. This

connection is based not only in the obvious fact that it was Alvaro Arzú's administration which enacted both the GLE and the Mining Law, which points out to a specific set of policies designed to exploit the Guatemalan natural resources within a capitalist-extractivist framework. However, as it was discussed earlier in this section, the text of the GLE is also the result of a heterogeneous network centred on guaranteeing the stability and efficiency of the electrical grid by reducing any distortions to the electrical market; which in turn led to a situation that made illegal for generation companies to sell, distribute or exchange the energy they produced directly to local communities. In practical terms, this meant that what was locally produced could not be locally consumed, and at the same time, any social or environmental impacts would definitely have to be locally dealt with. If that situation is not plain and simple extractivism, it certainly looks very similar to it. These considerations on the link between hydroelectricity, mining and the extractive industry in general, will also be useful in Part Four, when they will be brought up together with the media representations of the hydroelectric industry in Guatemala in order to draw the general conclusions of this dissertation.

This cartography also shows partially why the GLE came into law, since it takes into account the agency of other non-human actors, beyond the political and social elite and international neoliberalism: Chixoy Dam, with its maintenance and structural problems that increased the risk of failure of the electrical grid, and the "El Niño" phenomenon, which brought climate instability and droughts that bared the fragility of the system. Let us examine in more detail their role in the next paragraphs, starting with Chixoy Dam. As it was shown before, every possible problem happened in the development and operation of Chixoy: insufficient planning, rampant corruption, harsh weather conditions and even a massacre. Even the day-to-day operation of the power plant was constantly on the news, mostly because of its frequent operation and maintenance problems. Although social and media representations will not be discussed until the next chapter, one cannot avoid thinking in terms of these concepts when reading that the word Chixoy was almost a "curse word" for Guatemalans, as a previous quote showed.

The *Crónica* archive is again a useful example of how Chixoy was an ever-present theme on the Guatemalan debate in the Eighties and Nineties and how it was represented in the public arena. In the period of four and a half years since the foundation of *Crónica* in the second semester of 1987, until the end of 1991 – the year the first major crisis of the electrical grid occurred – there were a total of 24 published feature articles (including interviews and opinion columns) in which Chixoy was the principal subject discussed or an important sub-theme. This is more than five articles per year, which is significant for a magazine of weekly circulation. There were other 23 small news pieces that also referred to Chixoy, for a total of 47 articles in the period. This means that in *Crónica* there was almost one monthly mention of Chixoy in those years,

and at least a feature article every trimester, on average. This signals a remarkable interest in the functioning of a technological device. One just needs to remember that Chixoy at the time provided almost 60% of all the electrical supply in the country to understand, at least partially, this strong interest in the power plant.

But the most important insight that a review of these articles provides is that all of them presented Chixoy in a negative manner, as a source of problems and corruption. A significant part of them dealt with the lawsuits that INDE filed against the insurance company Granai & Towson and the German firm LAMI for the collapse of the adduction tunnel, a matter that was discussed in a previous section of this chapter. Others addressed the likely collapse of Chixoy in the next years due to lack of maintenance and the severe droughts that affected the country and the probable impacts it would have on the supply of energy and its price. The negative connotation associated with Chixoy was so strong that, as early as 1988, the imminent collapse of the dam was already been used to publicly justify the rise of the electricity price in order to deviate the attention from other more pressing issues. An article in Crónica described the situation in the next terms: "the announcement [of the rise] was made with the warning that the Chixoy River basin faced a grave drought because of deforestation, lowering the flow and negatively affecting the electrical generation of Chixoy" (El descontento crece, 1988, p. 20). But later in the same article, the real reason emerged:

> However, the reality is different. INDE's external debt, which is over one billion dollars, tends to double as the local exchange rates unify. To pay it, it is needed a larger share from the end-users … in fact, it is now been accepted that the overwhelming debt of INDE is what drives the price adjustment (El descontento crece, 1988, p. 20).

This example show how the representation of Chixoy on the media and on public opinion was so negative at the time that it was already been mobilised as an ally (Callon, 1986) to advance a price adjustment agenda to the public; in the same way it would be used years later for promoting the passing of the GLE. Moreover, it took place years before the major energy crises of 1991 and 1994, events that could only contribute to increase the representation of Chixoy as a looming danger for the country. It is in this sense that the role of Chixoy as an actant in the network that materialized in the GLE cannot and should not be dismissed.

A similar argument can be made for El Niño Southern Oscillation (ENSO) but in this case, on a global scale. As it was discussed above, it was in the Eighties and Nineties that a full functioning understanding of ENSO was reached by climate scientists. This, together with the fact that it was precisely in those decades that ENSO had its two strongest occurrences of the 20th century, made it a matter of global concern. The book

Flood, Famines and Emperors: El Niño and the Fate of Civilizations (Fagan, 1999), for example, showed that there was archaeological evidence and historical records of past occurrences of ENSO that affected even early civilizations as the Egyptians and the Maya, and addressed how future events could be faced considering our current globalized social hazards and the technology and the knowledge available. ENSO is arguably, along with Climate Change and the Ozone layer hole, the most known among the recently-discovered climate events around the world. It is so widely known, that many events or disasters have been attributed to its occurrence despite the fact that the connection cannot be easily made (Briones-Gamboa, 2008). This growing global awareness of the potential of ENSO for creating local climate disasters such as droughts and floods was the last piece in the representation of Chixoy as a clear and imminent hazard. This fact will be revisited in the concluding chapters, after discussing social and media representations in Part Three, since it points out to one specific way in which an actant's agency can be exerted onto a network. This is an issue of ANT that has been frequently debated by STS scholars.

To conclude the discussion on the role of the actants in the hydroelectric expansion: It has been shown that, although they were not accounted for in previous studies, making them visible helps explaining why efficiency was a central part of the proposed solution; why the purpose of the law was not expanding electricity coverage but rather preventing the collapse of the current network; why these laws, GLE and LIDREP, passed with little resistance from opposing parties; and finally, why legislation that was supposed to bring a new era of wide electricity access, ended up fuelling conflicts against the very expansion it was supposed to create.

However, the last phrase, "bring a new era of wide electricity access" only makes sense within the big narrative of development that framed the hydroelectric expansion. That is the narrative that opened this dissertation and that was used as a justification for all the reforms that led to these events. And yet, if one aims at fully understanding the hydroelectric expansion, one also needs to frame this narrative and place it on the right spot among the other elements of its network. And this is where the postcolonial approach helps to make the connections necessary for the task. As it was discussed above, the first insight from the post-development framework (Escobar, 2007) was that the concept of "development" was itself heavily charged with coloniality and that it usually rendered invisible other types of subaltern knowledges and practices. The version of development that was put in motion with the hydroelectric expansion definitely fits this description. As the network analysis showed, whatever version that rural communities could have was made invisible by excluding them from the network that gave way to the reforms of the electrical market's legal framework, including the GLE and the LIDREP. It was in this sense that Marques warned that "the material capacity of the apparatuses of production of meaning on the colonizers is incomparably

greater than that of the colonized. An asymmetrical situation is easily established, where the colonizers' categories stabilize and acquire Bourdieu's 'opacity of things' hiding what lies behind them" (Marques, 2006, p. 156). In the case of the expansion of the electrical network of Guatemala, the role of the colonizers is played by those members of the Guatemalan social and economic elite that promoted the expansion, like Manuel Ayau and Alvaro Arzú. Most of these actors were of European descent and members of families with historical roots in the country that went back decades or even centuries before, a fact that provided them easy access to national networks of power (Casaús Arzú, 2007). And as these actors recruited other members, they showed the powerful capacity of their "apparatuses of production of meaning", by completely leaving out of their network those that were going to be supposedly benefited by their version of development.

This last action was a remarkable move, worth of retelling one more time –with the aid of ANT – as we draw the conclusions for this chapter. First, as the network was assembling around the GLE, the public debate shifted from human development and expansion of the electric coverage to protecting the stability of the electrical grid and fostering its efficiency, partially because of the role of critical actants like the "El Niño" Southern Oscillation and the Chixoy Dam. By making this move, it was avoided to engage in critical matters, like deciding which kind of development, for whom and at what cost. The few dissenting voices, the ones that raised precisely these concerns, were drowned by the increasingly louder manifesto of privatization and deregulation. But the critical shift came next. Once the GLE was approved, the actors that promoted it managed to return the debate to its previous themes: human development and expansion of electricity coverage. The GLE became once again the vehicle of development that was promised; the device that was designed to bring it to those that needed it more. But as Harding warned when she discussed the Eurocentric civilizational discourse (1998, p. 14), the version of human development that took back the centre of the stage was that of the European descent (post)colonizers, with no input whatsoever of the (post)colonized people that it was supposedly helping. And this was the original sin of the hydroelectric expansion. At the core of this shifting-out and shifting-in back again from different frames of reference (Latour, 1999, pp. 129-130), was one of the seeds of the conflicts: the promise of an alien development, one that eventually would not be delivered.

The last statement does not mean that the ideal scenario was one in which no conflicts whatsoever would have erupted.[14] Megadevelopments will always raise concerns and the active involvement of nearby communities in the form of questioning and opposition is one of the few ways to put them on the spotlight

[14] I am grateful to Adela Parra from Campinas University, for her valuable feedback regarding this point during the V ESOCITE Doctoral School that took place in Colombia, in September of 2017.

and centring the public debate on their adequacy or even their necessity. However, the fact that along with the hydroelectric expansion there were several conflicts and that most of them erupted in the regions with the lowest human development index in a relatively short period of time, clearly points out to a situation that merits an explanation, or better, as Latour would say, a thorough description, which is in itself an explanation. Arriving to this description is, in fact, the purpose of mapping the controversy.

The last point brings us back to postdevelopment. Abraham, as it was discussed in the previous chapter, reminded us that, in the postcolonial context, "science exists simultaneously as history, as myth, as political slogan, as social category, as technology, as military institution, as modern western knowledge, and, as instrument of change" (Abraham, 2006, p. 213), a phenomenon that he calls "the excess of postcolonial technoscience". This excess is clearly seen in the case of the hydropower expansion; in the development narrative of the Guatemalan elite there is no room to question the adequacy of "renewable", or more precisely, their version of renewable, which, as this chapter shows, is based mostly on privately owned hydroelectric plants with large dams. The legal framework, with its distinction of "agents of the market" – which are basically large stakeholders – and end-users, incentivized precisely this kind of large projects. And in contrast, the review of hydroelectric technology in Chapter Two showed that one of its advantages is precisely its versatility, especially in regard of scale. Moreover, the capitalistic nature of the law, which made the market the central component of the electrical network, discouraged other ways of governance and management, like community or public projects; the type that have been shown to produce less social and environmental impacts (Cofiño, 2014). In conclusion, the version of development materialized in the GLE and the hydroelectric expansion, made invisible other ways, other practices, other knowledges. It became exactly the kind of situation that Escobar described when he stated that, "reality, in sum, [has] been colonized by the development discourse" (Escobar, 1995, p. 5). And the Guatemalan hydroelectric expansion is with no doubt, a clear example of this colonization.

Part III
Second research phase
Media representations of hydroelectricity in Guatemala and Colombia: A comparative analysis

Chapter Six

Media representations:
Theoretical and methodological framework

The inquiry presented in the previous chapter aimed at assembling a narrative of the events that led to the hydroelectricity expansion and the conflicts that followed. In this chapter, the objective is to look into the representation of the current state of affairs of hydroelectricity on mainstream media in Guatemala. One would be tempted to put it in a naïve, positivistic way, by saying that, if before it was the facts, now it is the turn of the perceptions. But that description will be not only misleading but mostly, limiting. Especially since the ultimate task of this work is to combine both inquiries to produce, as Latour puts it (2005, p. 146), a description of a complex and multilayered object, and reach objectivity by traveling from one frame of reference to the next.

In any case, if the buzzword here is "representation", the first task is to clarify what does it mean, or better, what the word "representation" is supposed to mean in the context of this work. So, the first section of this chapter will review social representations theory (Moscovici, Social representations: Explorations in social psychology, 2000), not as the main approach of this inquiry, but as a provider of insights that can contribute to describe the hydroelectric expansion and the conflicts that have risen around it. The next section presents a brief overview of its theoretical developments, the criticism raised by it, and finally its application on the study of environmental issues.

6.1 A brief overview of social representations

It was Emil Durkheim the first to put forward the necessity of a concept of social (or collective) representations (Durkheim, The rules of sociological method, 1982). However, the Social Representations Theory (SRT) of today started with the study of Serge Moscovici (1961) on the public image of psychoanalysis in France. Moscovici wrote that the difference of SRT with the original concept by Durkheim, was that, "if, in the classic sense, collective representations are an explanatory device, and refer to a general class of ideas and beliefs (science, myth, religion, etc.), for us they are phenomena which need to be described and explained" (Moscovici, 2000, p. 33). In the same book, he also remarked, that, for the purpose of the theory, the social representations to be studied are those "of our current society, of our political, scientific, human soil, which have not always had enough time to allow the proper sedimentations to become immutable traditions" (2000, p. 32). According to Moscovici, the purpose of social

representations is to “make something unfamiliar, or unfamiliarity itself, familiar” (2000, p. 37). They allow us to take something new or previously unknown, and make it, with the help of previous categories and conventions, accessible. Moscovici used the example of how psychoanalytic treatment –seen in the beginning as a strange, new method for dealing with mental illness– was made more familiar by comparing it to the catholic rite of confession. Eventually, psychoanalysis did not need the comparison anymore and became a social representation on its own (2000, p. 39). Wagner et al. gave this summarized definition of the concept: “a social representation is the ensemble of thoughts and feelings being expressed in verbal and overt behaviour of actors which constitutes an object for a social group” (1999, p. 96). As a theory, SRT is social constructivist, since an object is a socially constituted entity, i.e. in order to figure in a group or collective’s world it has to be socially represented. It also is a discursively oriented research approach (Wagner, et al., 1999).

According to SRT, social representations are generated by a process made up by two phases, anchoring and objectification. Anchoring, in Moscovici’s words, is a process “which draws something foreign and disturbing that intrigues us into our particular system of categories and compares it to the paradigm of a category which we think to be suitable” (2000, p. 42). An example of the process of anchoring is how the public coped with the first appearance of AIDS in the early eighties, associating it with venereal diseases or as some kind of “gay cancer” that was a punishment from God (Wagner, et al., 1999, p. 97). They also described anchoring as part of the responses to unfamiliar or disruptive events that amount to a “symbolic coping”, contrasting it with “material coping” which is a task for engineers and scientists. They stated that SRT’s objective is describing and defining exactly this process.

Objectification, on the other hand, is,

> ...a mechanism by which socially represented knowledge attains its specific form. It means to construct an icon, metaphor or trope which comes to stand for the new phenomenon or idea. (…) Sometimes called the ‘‘figurative nucleus’’ of a representation, an objectification captures the essence of the phenomenon, makes it intelligible for people and weaves it into the fabric of the group’s common sense. (Wagner, et al., 1999, p. 98)

In this sense, an example of objectification is how, in Austria, the role of the sperm in the fertilization process was seen as more active and dominant, while the role of the ovum was seen as passive, replicating the roles assigned to man and woman from a socially conservative perspective (Wagner, Elejebarrieta, & Lahnsteiner, 1995). Wagner et al. also noticed from this example that objectification “depends upon the characteristics of the social unit where a social representation is elaborated” (1999, p. 99). In other words, if two groups have differences regarding culture, literacy, history, socioeconomic situation, etc. their social representations of the same event or phenomenon will be different.

The last example allows understanding why SRT, as proposed by Moscovici, concerns mostly with current societies. Most of the disruptions or unfamiliar situations that give way to the two-phase process of anchoring-objectification, come from the realm of science, and happen when a discovery, concept, technology or product enters everyday life or attracts public attention. Moscovici saw it as two realms: a consensual universe, where society is a group of humans that relate to each other freely, and where everybody is allowed to speak on every subject with equal authority, and a reified universe, where society is a system of roles and classes where people have specific knowledge and expertise (Moscovici, 2000). Science belongs in the reified universe and society at large on the consensual universe. And so, social representations are the way that scientific knowledge finds its way to the consensual universe.

Another important concept for SRT is cognitive polyphasia. First developed by Moscovici himself (1961), in the last years it has gained a renewed attention among social representations scholars (Jovchelovitch, 2002). This concept refers to the fact that in the same individual, or collective, can coexist different types of knowledge, and with it, different kinds of rationalities that are used interchangeably (Jovchelovitch, 2002). Cognitive polyphasia can contribute to clarify debate on the distinction between knowledge and belief, by showing that knowledge is variable, and can assume different forms, depending on social and cultural context. Social representations theory can provide a frame for empirically study this process.

What is the purpose of studying social representations? Wagner et al. argued that when a social object is incorporated into everyday life, by means of its representation being understood by a significant part of a group, it also makes actors behave as if the object had those characteristics that they think it has. This makes even intangible objects, like “love”, “God”, or “common good”, become physical and material, through the actions and behaviour of actors within the group (1999, p. 100). They concluded from this reasoning that the social representations of a group lead to social identity, define how representations of new events or phenomena are going to be, and consequently, how social change takes place and its potential trajectories.

In the same paper, Wagner et al. reviewed some examples of the empirical research conducted using SRT and the different methods used. They showed how SRT can be applied with a wide range of research methods, like ethnography, interviews, focus groups, media analysis, content analysis, lexical analysis, questionnaires and even experimental approaches. A detailed account of empirical research examples, focused on studies that apply SRT to environmental issues using diverse methods, will be given in section 6.1.2.

6.1.1 Criticism of Social Representations Theory

Although SRT has become an established theory that is followed by researchers in Europe and other regions of the world, in the United States its impact has been minor. Some point out that mainstream U.S. research programs in psychology are more focused on the cognitive and individual perspectives, leaving behind the social (Howarth, 2006). However, it has been in Great Britain where the theory has found its more poignant criticism.

One of the most well-known critiques is the paper by Potter & Litton (1985). They listed four problems or ambiguities that, according to them, SRT needed to address:

- How social groups and social representations are related, i.e., are groups defined by social representations? Or are they natural and unproblematic categories to which social representations are applied? In any situation, serious problems for empirical research arise from this inconsistency, Potter & Litton claimed.
- The role of consensus and agreement in social representations. As social representations are the result of consensus in social groups, how do researchers deal with it in empirical research? Potter & Litton claimed that for SRT to work, it should specify the particular level of consensus necessary for a given social representation. They also pointed that the vagueness in which SRT is formulated makes it easy to overlook or discard disagreeing or alternative representations.
- The role of context when researching social representations. In this case, it is argued that although social representations scholars recognize that interpretive contexts can influence the outcome of representations, they fail to grasp that this fact makes representations variable; hence, rendering problematic their role in consensual universes as sources of agreement and containers of conflict.
- Finally, the role of language when researching social representations. In this case, more than a critique to the theory, Potter & Litton went after the research methods in the SRT publications that they analysed, and how they do not give language a proper treatment. Since language is central to a social representation, as Moscovici and other SRT writers claim, it should be analysed thoroughly using appropriate methods, and that is not the case in the publications they reviewed, they argued.

To the critique of theoretical ambiguity, Voelklein & Howarth responded that Moscovici, “rather than using a hypothetic-deductive model that formulates clear guidelines for testing and operationalising a theory, he follows a more inductive and descriptive approach in the study of social representations”

(2005, p. 435). They continued to discuss how the criticism has in fact been addressed in subsequent studies and pointed out that, "the theoretical ambiguities discussed here do not seem to have caused a rejection of social representations within the discipline but rather provoked interest in refining and developing it, as its rich history of more than forty years of stimulating research and debate demonstrates" (2005, p. 438).

Another aspect of SRT that has been criticized is its distinction between the "consensual" and the "reified" universes (Colucci, 1998; de Rosa, 1994). It has been said that this is an a priori categorization that also needs an explanation; and also that it implies that in the sciences, or the reified universe, there is no place for common sense thought, which seems unlikely. Farr (1987), cited in de Rosa, explained that,

> By insisting that scientists live in a "reified universe", that is virtually sanitised of all social representations, Moscovici may be restricting, unwittingly, the application of its own theory so that it does not apply to the activities of scientists […] Scientists in their everyday activities have as much need of social representations as lay men and women have. (de Rosa, 1994, p. 295)

One of the ways proposed for dealing with this problem in SRT, is to approach not only from social psychology, but with the help of other fields, in a transdisciplinary or "non-disciplinary" manner, as Ibañez remarked,

> "Social Psychology can not do much by itself and it must integrate, at least, the tools elaborated by Michel Foucault and the knowledges generated by the New Sociology of Scientific Knowledge (Latour, Woolgar, etc…). This integration is indeed the task we should face in the present time" (Ibañez, 1991, p. 25)

So this critique opened a path for a connection between STS and SRT. And in fact, as the next section will show, both fields have found a common ground, and common research interests; among them, the social problems raised in the context of environmental issues.

6.1.2 Social representations theory and environmental issues

Environmental issues have provided new challenges for the social sciences and also for social psychology. In this section, some relevant studies that use SRT to face some of these challenges will be reviewed, discussing not only their theoretical approaches but also their methods. SRT is especially useful to study how people respond to environmental hazards and concerns. Lima & Castro (2005), for example, have shown how environmental hyperopia (Uzzell, 2000), i.e. the incongruity between global and local environmental concerns, is related with cultural views about nature. Using as departure point a project on the environmental impact of a waste incinerator, the researchers interviewed 300 people that lived in a 6 km radius from the facility. They devised a 14-item scale to determine the four views on nature that

previous studies in cultural theory have identified. Their findings supported the notion of environmental hyperopia, since in general their interviewees', "concern for local environmental issues was more attenuated than for worldwide ones, risk perception of local sources of pollution was perceived as lower than global, distant threats and global sources of information about the environment were considered more trustable than local ones" (Lima & Castro, 2005, p. 33). More interestingly they found out that, "these effects proved to be influenced by general views of nature. In particular, egalitarians were the ones who exacerbated these effects, whereas individualistic persons were the ones who were more immune to them" (p. 33). These findings are coherent with SRT, in the sense that show how previous social representations influence how new ones are developed.

In another exploratory study on environmental attitudes (Castro, Garrido, Reis, & Menezes, 2009), they surveyed 394 person in the area of great Lisbon on their attitudes toward metal cans' recycling. The study paid particular attention to the role of ambivalence and contradiction, i.e. how the respondents felt that their attitudes toward separating and deposing waste matched their behaviour on the issue. They found a moderate effect of ambivalence, and showed "how beliefs, particularly negative ones, present a higher predictive capacity of the attitude in the high-ambivalence group, and personal identity plays a relevant role in predicting behaviour in both groups" (2009, p. 25). In this case, the ambivalence can be linked to competing social representations.

Brondi, Sarrica, Cibin, Neresini & Contarello (2012), on the other hand, aimed at studying the effects on social representations of environmental regulations. Their objective were the social representations of the Chiampo River, and how they changed over a period of 30 years, taking as pivots the moments that followed legislative changes for more restrictive environmental regulations. They used archived material, interviews and self-reports; then they analysed texts with lexicometric and qualitative analysis techniques and quantitative data with descriptive and inferential analysis. Their results showed that regulations exerted a positive influence in the social representations of the river. However, they also showed that, overtime, "when tensions are not explicitly acknowledged citizens tend to dismiss their voice and the opportunity to develop representations consistent with the objectives of the community" (Brondi et al., 2012, p. 298).

Finally, another research team led by Brondi produced a study (Brondi, Armenti, Cottone, Mazzara, & Sarrica, 2014) in which they analysed, using SRT, the parliamentary and press discourses on sustainable energy in Italy. Using the distinction between hard and soft energy paths (Lovins, 1976), they look for arguments that advocate each of them (Devine-Wright, 2007). Arguments for hard energy paths, "are based on the idea that energy is a matter of national interest, largely use techno-scientific rhetoric, and

propose a deficit representation of the public as lacking knowledge or capacities for dealing with such difficult issues" (Brondi et al., 2014, p. 39). Whereas, arguments for soft energy paths, "are based on representations of energy as an ecological resource that should be saved, insist on the idea that energy systems can be decentralised, give value to lay knowledge and propose a view of the public as active and environmentally concerned" (2014, p. 39). Both texts were analysed with the help of content analysis software, and the conclusion reached was that, while in news media soft path views prevail, parliamentary debates are not there yet; although they have been displaced from a hard path view, suggesting that the energy transition is far from being completed. The study also found a significant degree of cognitive polyphasia in the corpora of articles, as well as competing social representations.

6.2 Quantitative text analysis methods

Now that it has been described how the concept of representations was undertaken theoretically, the next step is to frame methodologically how the information was gathered and analysed. Due to administrative constraints of the scholarship programme (AMIDILA – Erasmus Mundus) that funds this project, this part of the study limits only to online sources, and that is the reason why it refers to representations in digital media. However, the advantage of relying on sources on the Internet is that it allows gathering large amounts of information in a relatively small time and with significantly less effort. In order to use this advantage, it was decided to collect as much information as possible –within the research parameters – and then perform the texts' analysis with the aid of text-mining and content-analysis software. For this reason, in this section it will be reviewed the methods used, as well as the theoretical approaches they are based on.

The methods used and discussed here are normally classified in one of two major approaches to text analysis: content analysis and text mining. Although sometimes these terms are used interchangeably, they actually are different approaches, originated in different fields and with diverse theoretical premises. Both approaches are seen as umbrella terms for a wide variety of methods and techniques for analysing text (Miner, et al., 2012; Tuzzi, 2003). However, content analysis was developed first, in the social sciences, specifically communication studies, with a methodological approach that started as qualitative and then incorporated quantitative methods; while text mining was developed in the information sciences, particularly computer science, and although it has been mostly a quantitative approach, recent methodological developments have brought it closer to qualitative research (Aureli, 2017). Some of the methods that will be discussed in this chapter are seen as prevalently from the content analysis domain, while others are more linked to text mining; but there is also a significant amount of methods that,

although devised in one approach, are used in both. In order to keep the discussion clear, instead of trying to sort out the differences and similarities of text mining and content analysis from a general perspective, in this section, individual methods will be presented separately. Where necessary, a brief discussion of the theoretical and historic background of each method will be presented.

First, the methods for scraping data on the web that were used for collecting the corpus of articles will be presented. Then, methods for lexical analysis, document classification and clustering will be discussed. Finally, some specific methods used for this project, like correspondence analysis, will be presented.

6.2.1 Web scraping and text mining

Gathering information from the internet could seem at first look an easy task, but given the fact that the web, "passes and connects to one of the largest bodies of unstructured text on earth" (Miner, et al., 2012, p. 11), it rapidly becomes clear that collecting text manually is a very time-consuming and labour-intensive activity. However, with the aid of the appropriate software, it can be manageable and moreover, powerful, as it allows gathering vast amounts of information. Collecting data in this way is known as web scraping, and it can be defined as "the process of using an automated method to simulate human interaction with a web page, capturing the web page information that is presented by [the web] application" (Ridge, 2015, p. 43). There is a great variety of software available online for web scraping, free or commercial; and it is also a relatively easy task that can be performed by writing your own program. However, web scraping is not a one-size-fits-all type of task, even when using commercial software. Since there is not a uniform structure for all websites, scripts for extracting information have to be adapted to every particular site; in fact, as sites are regularly changing their user interface,

> the success and accuracy of scraping often depends on a website's output display remaining static. Even small changes in a website's display may disrupt scraping. This instability represents a key tradeoff when scraping to collect data: scrapers can access large amounts of data, but any changes by data hosts can be very disruptive" (Hirschey, 2014, p. 906).

Nevertheless, web scraping is still a powerful technique that can dramatically reduce the time invested in collecting data from the internet. According to McSweeney (2015), there are two types of web scraping, "collecting data from a structured website or news feed and collecting network information and content from users". In the case of this research project, as it deals with content created by news websites, the appropriate type is the first one.

There have been some concerns about copyright infringement in the case of web scraping. There have been even lawsuits from major websites like Craigslist, Facebook and Ticketmaster over the use of web

scraping by third parties on their websites. In all of these cases, there was intent of profiting from data collected without permission from the website (Hirschey, 2014); however, in the case of research or academic use, it can be considered a fair use of data that is anyway, publicly available.

As it was discussed earlier, web scraping is part of a larger field known as text mining. Text mining has attracted attention from researchers in a great variety of disciplines in the last decades, especially since the moment when the processing capacity of computers allowed them to manipulate great quantities of data. However, text mining as an emerging field has proven to be difficult to define. For example, Miner et al. give this definition:

> Text mining and text analytics are broad umbrella terms describing a range of technologies for analysing and processing semistructured and unstructured text data. The unifying theme behind each of these technologies is the need to "turn text into numbers" so powerful algorithms can be applied to large document databases. (Miner, et al., 2012, p. 30)

Miner et al. (2012) continue to define text mining by dividing it in seven practice areas, which are: (1) search and information retrieval; (2) document clustering; (3) document classification; (4) web mining; (5) information extraction; (6) natural language processing; and (7) concept extraction. Each of these practice areas belongs to other fields, and text mining emerges from their intersection. It is noteworthy that statistics is a discipline that has a transversal role in this arrangement, since it gives a methodological base to all others.

Web scraping is on its own an intersection of the practice areas of web mining and information extraction. In the case of web mining there are three categories: web content mining, which analyses unstructured texts and information to produce structured data; web structure mining, which analyses how hyperlinks connect pages and generate network-type representations; and web usage mining, which analyses the data generated by the use of the webpages by their visitors (Gök, Waterworth, & Shapira, 2015). In the case of this project, it inserts into the first category, web content mining.

6.2.2 Text analytics: The bag-of-words approach

As Roberts remarks in his classic paper on quantitative text analysis, "formal analyses of linguistic data are pursued from three academic orientations: linguistics, computer science, and the social sciences" (Roberts, 2000, p. 259). On recent years these orientations have converged, as rising computer processing power has allowed the development of quantitative methods more capable of tackling questions from linguistics and social sciences (Miner, et al., 2012). These methods are based on an approach to text analytics that starts with allowing machines to process the text prior to more complex analyses, performing automatic

text coding (Tuzzi, 2003, p. 37). In this section, the details of this first stage of text analysis will be presented.

To adequately discuss the process of automatic text coding, some definitions are needed first. Let us start with the concept of corpus, which is "a set of homogeneous texts collected in order to answer a specific research question" (Trevisani & Tuzzi, 2015, p. 1289). This means that the extent of the corpus, as well as the type of texts that belong in it, depends on the nature of the research problem. After the corpus has been collected, the next step is to define the following work entities (Tuzzi, 2003, p. 33):

(a) The statistical unit of analysis (called also statistical unit or unit of analysis), which is the smallest single portion in which the text is divided.
(b) The variable (or variables) that will be measured on each statistical unit, articulated in all the categories that can be attributed to each variable.
(c) The organization criterion of the texts in the corpus, which represents a way of aggregating the texts in groups or to divide in it in groups larger than the statistical units.

Whereas in the classical qualitative paradigm of content analysis, these three entities are defined ex ante by the researcher, in the quantitative approach –or also within the text mining framework– they can be defined ex post, usually with the assistance of appropriate software (Tuzzi, 2003, p. 35). One of the frameworks that allows ex post classification comes from natural language processing, and is known as the bag of words model. In this model, the unit of analysis is a single word, in the sense that it is a collection of characters that have a meaning in the language of the text and that is separated from others by a space or other symbol. In fact, it can be called a "textual unit" (Tuzzi, 2003). This approach does not need to take into account the order in which the words are arranged when analysing a text, and consequently, the grammar and syntax employed; hence, the name "bag of words". Other important basic concepts are word-tokens and word-types. According to Trevisani and Tuzzi,

> A corpus contains a limited set of different word-types and a word-token is the particular occurrence of a word-type, e.g., word-type *statistics* has many tokens in our corpus, and there are also many word-types which only appear once, e.g. *hemocytometer*. The frequency of a word-type is the number of corresponding word-tokens in the whole corpus or in a subset of texts (*subcorpus*). The number *N* of word-tokens is the size of the corpus in terms of occurrences; the number *V* of word-types is the size of the corpus in terms of different words; and the *V/N* type-token ratio provides a rough measure of lexical richness (Trevisani & Tuzzi, 2015, p. 1290).

In order to apply the methods based in the "bag of words" model, there are further transformations or operations that can be applied to word-tokens. Some of them are always used, while others depend on the

type of analysis that the researcher wants to perform or the theoretical approach she takes on the corpus. These operations are grouped under the umbrella of text pre-processing, and are performed by the software. The next list shows the most commonly used; most of the descriptions are from the built-in documentation from RapidMiner Studio (Version 7.4; RapidMiner GmbH, 2017).

- Tokenization: Splits the text into a sequence of tokens, which usually are words, but can also be sentences or phrases, and also strips the text from symbols that are not letters or numbers.
- Transformation of cases: Switches all the upper-case letters to lower-case (or vice versa). The goal is that a capitalized word will not be counted as a different word-type than its non-capitalized form.
- Filtering: There are diverse ways to filter tokens, but, as the word implies, the basic function is to exclude from the list of word-tokens and word-types some specific type of words according to a previous set of rules. The most common is the filter by length, which excludes from the list words below certain length (as a general rule, words of two characters or less are excluded from the corpus).
- Filtering stopwords: In this case the filter is applied to a specific list of word-types that are excluded because they are too frequently used in a language, like prepositions, conjunctions and articles. These word-types are called stopwords. Including them in the text analysis will likely increase similarity between different texts. These words have to be selected from a file previously compiled by the researcher (called sometimes a stopword dictionary) or already existing in the software documentation.
- Lemmatization: There are different word-types that are variations of one word, for example, *work, works, worked, worker*, etc. Lemmatization is the process that allows reducing all of the word-types that are just variations of another, to a single word-type. This is a process that comes from the field of Natural Language Processing, as it has to take into account vocabulary and morphology to adequately work (Manning, Raghavan, & Schütze, 2009, p. 32).
- Stemming: This a more crude approach to the lemmatization process, in which word-types are "chopped" to their shorter versions instead of being analysed, as in the case of lemmatization (Manning, Raghavan, & Schütze, 2009, p. 32). For example, for the

variations of the word *work* in the previous paragraph, all the words will be reduced to *work* by both a stemmer and a lemmatization process. However, in the case of irregular verbs, for example the past and present tense of the verb *to go* (*go, went*), a stemmer will not group the two words together, while a lemmatizer would do it.

- N-gram generation: Instead of generating tokens of one word, tokens of two, three or n words are generated. This operation is useful when multiple-word terms are essential for the investigation. For example, if "human rights" is part of the research question, a one-word tokenization process would leave the term out of the set of words, so it would be better to generate 2-grams in order for "human rights" to be included.

These are the most common text pre-processing operations, although this list is not exhaustive. For example, there are more filter operations, which can be applied with rules regarding the content of the word-token, or its position in relation to another word-token, etc.

Once the corpus has been processed, the next step necessary to analyse it is to create vectors. "In the bag-of-words model, each word corresponds to a dimension in the data space and each text is a vector consisting of non-negative values on each dimension. The similarity of two texts corresponds to the correlation between their vectors" (Tuzzi, 2010, pág. 86). There are different options for creating the vectors, "each of which represents the relationship between the words/terms and the documents with different numbers" (Delen, 2012, pág. 387). The four most common are the following:

- Binary Term Occurrence: This assigns a value of 1 in the cell in the intersection between the document (unit of analysis, usually a row in the matrix) and the word-type (a column), if the word-type appears at least one time in the document, and a value of 0 if there are no occurrences of the word-type in the document.
- Term Occurrence: In this case, the exact number of occurrences of a word-type in a specific document is placed in the cell in which the document and the word-type intersect. The value of 0 once again means that there are no occurrences.
- Term Frequency: The value placed in the cell is the relative frequency of the word-type in the document, i.e., the number of occurrences of the word-type divided into the total number of words in the document.
- TF-IDF (Term Frequency / Inverse document frequency): This is the scalar product of two vectors, the Term Frequency that was discussed above and the IDF, i.e. "the log of the total number of texts

in the corpus divided by the number of texts containing a given word" (Tuzzi, 2010, pág. 85). The larger the TF-IDF is for a cell, it means that the word-type has a larger frequency in the document and at the same time it occurs less in other documents in the corpus. Thus the TF-IDF shows the degree of association of a word-type with a specific document in relation to other documents in the corpus. TF-IDF is for this reason, "the most commonly used representation in text mining" (Delen, 2012, pág. 388).

These vectors or weights can also be applied to n-grams, not only single word tokens. The values generated by the four types indicate a relation of a particular word-type to a particular document. Through them, by applying more complex statistical and computational techniques, it can be performed the ex post classification of documents. In the next section, the methods for doing it will be discussed.

6.2.3 Document classification and clustering

In order for a machine to be able to classify documents, that is, group them together under some type of rule, first, it should be able to discern if a pair of documents are similar or different. The vectors or weights discussed in the previous section provide a way to assess similarity between two documents, as a previous quote from Tuzzi in the last section states. However, a small warning is necessary before going forward: since the "bag of words" approach does not take into account order, there is a possibility that similarity tests can give false positives. Imagine if a new text is created from a previous one by randomly rearranging the order of the words in the old text. The vectors for both texts (if the word-tokens are single words) will be the same; however, it is very likely that the second text, which consists of the same words in random order, would not make sense at all. The point here is that although two texts may have a vector score that makes them similar, other factors (syntax, homophones, homographs, etc.) could make them actually very different. Nevertheless, the "bag of words" approach has proved to be very effective on the task of assessing similarities between documents.

One of the most common measures of similarity is the cosine similarity. Cosine similarity is a concept that comes from the graphic representations of vectors of two and three components, where an angle between vectors can be represented. As the angle becomes smaller the vectors tend to point in the same direction, and they, for our purposes, become more similar. When an angle tends to zero, its cosine tends to one. Although the vectors for documents have large numbers of components and thus, they cannot be represented graphically, the concept of similarity still can be introduced, since a general equation (Equation No. 1) for the cosine between two vectors of any number of components is available:

$$c(1,2) = \frac{\overrightarrow{v_1} \cdot \overrightarrow{v_2}}{|\overrightarrow{v_1}| \times |\overrightarrow{v_2}|} \quad \text{(Equation No. 1)}$$

Where $\overrightarrow{v_1}$ and $\overrightarrow{v_2}$ are the word-vectors for documents 1 and 2 respectively, $|\overrightarrow{v_1}|$ and $|\overrightarrow{v_2}|$ are the magnitudes (size) of the word-vectors 1 and 2, and $c(1,2)$ is the cosine of the two vectors. The number of components (or dimensions) of each vector depends on the number of word-types in its correspondent document. One of the reasons that cosine similarity is widely used as a measure in text mining, information retrieval and text clustering is that it is independent from the length of the texts (Tuzzi, 2010, pág. 87).

There are other measures of similarity that usually are part of text analytics software packages. The Euclidean similarity, for instance, measures directly the distance between the word-vectors of each document. However, it has the disadvantage that it only works with documents of relatively the same size. There is also the Jaccard Coefficient, which values similarity between two sets A and B as the quotient between the intersection of A and B, ($A \cap B$) and their union, ($A \cup B$). This measure can be applied to texts, if they are considered as sets of words, which is consistent with the "bag of words" approach. Another instrument for measuring similarity is intertextual distance, first developed by Muller (1968). In the version of Labbé (2007), the sum of the differences between the frequencies in a text *A* and a text *B* of a given word *i* are divided into the size of the text *A*, N_A, if its smaller than the size of the text *B*, N_B, i.e. $N_A \leq N_B$, as Equation No. 2 shows:

$$D(A,B) = \frac{\sum_{i \in V_{A \cup B}} |f_{i,A} - f^*_{i,B}|}{2N_A} \quad \text{(Equation No. 2)}$$

In this equation, $f_{i,A}$ is the frequency of the word *i* in text A, while $f^*_{i,B}$, is the frequency of the word *i* in text B, adjusted for the larger size of text B by the factor N_A/N_B. Both Jaccard Coefficient and Intertextual Distance have been tested in empirical studies against cosine similarity and produced better results than the latter in the task of classifying tests (Sandhya & Govardhan, 2012; Tuzzi, 2010).

Word-vectors allow describing numerically a document; and the measures described in the previous paragraph provide a way to determine, on the basis of word-vectors, how similar two documents in a corpus are. The next step is to devise a process that can lead to an accurate document classification using as starting point these elements. These type of processes are called clustering algorithms. "Clustering, or cluster analysis, is the process of automatically identifying similar items to group them together into

clusters. Clustering is an unsupervised learning method, which means no labelled training examples need to be supplied for the clustering to be successful." (Miner, et al., 2012, p. 960). There are three categories of clustering algorithms: hierarchical, partitioning and spectral clustering. In this section the first two categories will be discussed.

6.2.3.1 Hierarchical clustering

This category of clustering algorithms does not start with a fixed number *n* of clusters (or partitions) into which to divide the units of analysis (in this case, texts or documents). On the contrary it is precisely the point of hierarchical clustering to find the optimal number of *k* clusters, according to a defined set of rules for dividing the set, or in this case, the corpus. Hierarchical clustering algorithms are subdivided into two main types, "agglomerative methods, which proceed by a series of successive fusions of the n individuals into groups, and divisive methods, which separate the n individuals successively into finer groupings" (Everitt, Landau, Leesen, & Stahl, 2011, p. 71). The agglomerative methods are also referred to as "bottom-up" methods, and the divisive, as "top-down". Hierarchical clustering methods group documents according to their word-vectors by using a similarity measure like the ones discussed before, going from n clusters to an optimal number, in the case of agglomerative methods, and from one cluster to an optimal number in the case of divisive. The results of either agglomerative or divisive methods can be represented graphically by a dendogram, a two-dimensional diagram that illustrates the groupings as well as how strong is the similarity among members of each cluster.

Between the two categories, bottom-up methods are the most commonly used. As it was pointed out before, in a set of *n* elements, agglomerative methods start with *n* clusters, each containing exactly one element, and finish with a single cluster, which contains all *n* elements. All methods operate in this way, but "differences between methods arise because of the different ways of defining distance (or similarity) between an individual and a group containing several individuals, or between two groups of individuals" (Everitt, Landau, Leesen, & Stahl, 2011, p. 73). Some of the most used agglomerating methods include the single linkage method, the complete linkage method, group average linkage and centroid clustering.

On the other hand, divisive methods start with a single cluster, containing all *n* elements, and start dividing it, until they reach *n* clusters, containing each a single element. These methods can be, "computationally demanding if all $2^{k-1} - 1$ possible divisions into two subclusters of a cluster of k objects are considered at each stage" (Everitt, Landau, Leesen, & Stahl, 2011, p. 84). However, under certain conditions, there are algorithms that can work with the divisive approach on a set of data. The divisive methods are divided in monothetic (one variable at a time) and polythetic (multiple variables) methods.

6.2.3.2 Partitional clustering

Unlike hierarchical clustering methods, which generate their clusters incrementally, partitional methods, also known as optimization clustering, generate all the clusters at the same time (Miner, et al., 2012). In this category the number of clusters is fixed before starting the operation. They are also called optimization methods because they "produce a partition of the individuals into a specified number of groups, by either minimizing or maximizing some numerical criterion" (Everitt, Landau, Leesen, & Stahl, 2011, p. 111). The most widely known of these methods is the k-means method, which has other variants, such as k-mediods or k-medians. Explaining briefly how the k-means method works is a good example of how the other algorithms of this category work. The k-means algorithm starts by setting number of clusters k that will be generated. Then,

> a random set of k points are selected as centroids. (…) The algorithm proceeds iteratively until conversion, alternating between two steps: assignment and recentering. In assignment, each of the data points is compared to each of the k centroids and assigned as a member of the closest cluster. In recentering, the location of the mean of each cluster is recalculated. The algorithm converges when no point changes cluster membership (Miner, et al., 2012, p. 960).

Unlike hierarchical methods, partitional clustering methods do not lead directly to dendograms, because of the way the algorithm works. However, depending on the method used, there are ways to induce a dendogram, starting from the first partition of the set (Zhao & Karypis, 2002).

Finally, there is another way of visualizing the results of clustering, the cluster heat map. Wilkinson and Friendly describe it as

> an ingenious display that simultaneously reveals row and column hierarchical cluster structure in a data matrix. It consists of a rectangular tiling, with each tile shaded on a color scale to represent the value of the corresponding element of the data matrix. The rows (columns) of the tiling are ordered such that similar rows (columns) are near each other. On the vertical and horizontal margins of the tiling are hierarchical cluster trees (Wilkinson & Friendly, 2009, p. 179).

The cluster heat map is appreciated because it synthesizes a great amount of information in a relatively small display. It shows not only the clusters for each variable but also how they relate to each other. In the case of content analysis, it could show which word-type clusters are more closely associated to clusters of other attributes of the texts, like their authors, publishing date, country, etc.

6.2.4 Correspondence analysis

Correspondence analysis is a multivariate statistical technique that has been used in a wide range of fields in recent years, mostly because it provides a way of representing and interpreting large amounts of categorical data; it was initially conceived by J.P. Benzécri (1992) and then was further developed by other researchers (Greenacre, 1984; Murtagh, 2005). In its simplest form, correspondence analysis starts as a contingence table, i.e. a table of the joint distribution of two qualitative variables, as Table 7 shows. The number of rows, *m*, is equal to the number of categories of the first variable (if it is X, then there are m categories: $x_1, x_2 \dots x_m$), and the number of columns, *p*, is equal to the number of categories of the second variable (if it is Y, then there are p categories: $y_1, y_2 \dots y_p$). Each cell represents the joint frequency, which is the number of cases that fall on both the category of X represented by the row and the category of Y represented by the column. The row totals represent the observed frequencies of the category of X, and the column totals represent the observed frequencies of the category of Y (Tuzzi, 2003, p. 91).

Correspondence analysis (CA) aims at representing graphically in a Cartesian plane what is observed in the contingency table, in a way that the categories that are more alike to each other, are in close positions in the graph; in the words of Greenacre, "the ultimate aim of CA is to produce a map of this table, where each row and each column is represented by a point" (2002, p. 7).

	y_1	y_2	...	y_j	...	y_p	
x_1	n_{11}	n_{12}	...	n_{1j}	...	n_{1p}	$n_{1.}$
x_2	n_{21}	n_{22}	...	n_{2j}	...	n_{2p}	$n_{2.}$
:	:	:	...	:	...	:	:
x_i	n_{i1}	n_{i2}	...	n_{ij}	...	n_{ip}	$n_{i.}$
:	:	:	...	:	...	:	:
x_m	n_{m1}	n_{m2}	...	n_{mj}	...	n_{mp}	$n_{m.}$
	$n_{.1}$	$n_{.2}$	...	$n_{.j}$	...	$n_{.p}$	n

Table 7. Model of a Contingency table

Let us use an example to illustrate what similarity between rows or columns is intended to mean. Table 8 shows the classification of the opinion articles of five authors in a newspaper during a fixed period of time according to their main topics, which have been divided into four categories. Each cell shows how many articles on each topic every author has written. Since the number of variables is small, a simple inspection of the table gives already information about authors and topics. The table shows that Authors A and C tend to write about the same topics, mostly politics and security, over the other two; Author B writes more on

the environment, while Author E's preferred topic is poverty. Author D seems to be the one that addresses more equally all the topics, although more than 50% of her articles are about politics and environment. This simple observation means that authors A and C are more similar (regarding to topics) while authors B and E seem to be more focused in one different issue each. Finally, Author D is the one least likely to be associated with a particular subject. The same can be said of the topics: politics and security are more similar (regarding to authors) and environment and poverty seem to be independent from each other and the other topics.

	Politics	Environment	Security	Poverty	Total/author
Author A	10	5	8	1	24
Author B	3	9	2	5	19
Author C	14	2	16	3	35
Author D	7	8	6	5	26
Author E	2	5	4	11	22
Total/topic	36	29	36	25	126

Table 8. Opinion articles classified by author and subject (Prepared by the author).

How can this kind of similarity or difference be measured statistically? In CA it is used the chi-square distance, which, using the notation of Table 5, is,

$$d_{ik}^2 = \sum_{j=1}^{p} \frac{n}{n_{.j}} \left(\frac{n_{ij}}{n_{i.}} - \frac{n_{kj}}{n_{k.}} \right)^2 \qquad \text{(Equation No. 3)}$$

for any given row x_i and x_k on the table (Tuzzi, 2003, p. 93). Note that this is not an absolute distance, but a weighed one, which is useful because it leaves out the difference in sizes of each row. The more similar two rows are, the close to zero is the chi-square distance. Evidently, everything said here is valid if the comparison is made between columns instead of rows.

The next step is to verify if the variables in the rows and columns are independent from each other, or if there is a statistical association between them. In the case of CA, "The total variance in correspondence analysis is measured by the so-called inertia, which is simply the usual Pearson chi-square statistic calculated on the cross-tabulation, divided by the total sample size n" (Greenacre, 2002, p. 9). The Pearson chi-square Statistic, $\mathbf{X^2}$, can be determined with the next formula:

$$\mathrm{X}^2 = \sum_{i=1}^{m} \sum_{j=1}^{p} \frac{(n_{ij} - n_{ij}^*)^2}{n_{ij}^*} \qquad \text{(Equation No. 4)}$$

In which the term n_{ij}^{*} is defined as:

$$n_{ij}^{*} = \frac{n_{i.}n_{.j}}{n} \qquad \text{(Equation No. 5)}$$

This last term corresponds to the expected frequency of the cell *ij*, i.e. the frequency that the cell will have if the two variables were completely independent from each other (Tuzzi, 2003, p. 98). The value of the Chi-square statistic is then compared to the critical value in the associated with $(m - 1)(p - 1)$ degrees of freedom and a certain significance level literature –see for example, the tables in NIST/SEMATECH (2012). If the former value is greater than the latter then it means that the variables in the contingence table are not independent from each other (Bendixen, 2003).

The total inertia contains the information that renders possible a graphic representation of rows and columns. Beh, remarks:

> By decomposing the total inertia the researcher can identify important sources of information that help describe this association. Using different decompositions will yield different interpretations of the association, and lead to different graphical outputs. The most common type of decomposition used, with a few exceptions, in correspondence analysis is singular value decomposition (SVD) (Beh, 2004, p. 262).

Singular value decomposition is a linear algebra method that is used also in principal component analysis, with the same objective: "to reduce the dimensionality of a data matrix and visualize it in a subspace of low-dimensionality, commonly two- or three dimensional" (Nenadic & Greenacre, 2007). In particular, SVD transforms a rectangular matrix in the product of two unitary matrices and a rectangular diagonal matrix. This last matrix is the one of interest in correspondence analysis; since it can reduce the chi-square statistic to a minimum number of components (the ones in the diagonal), it can reduce the dimensions to two or three, without losing significant representation of the data. As Bendixen puts it:

> For instance, it would be necessary to resort to 15-dimensional space for perfect graphical representation of a 16x16 contingency table, perhaps 75% of the subtlety of the table could be retained in just two dimensions. This represents an enormous gain in simplicity (2 versus 15 dimensions) for an acceptable trade-off in accuracy of representation (75% versus 100%). (Bendixen, 2003, p. 5)

Once this reduction is achieved, it is only a matter of applying it to the data of the rows and columns to produce coordinates that will represent them in the same Cartesian plane. The equations and transformations necessary are clearly listed and explained in Greenacre (2002). In the case of graphic representations, the two dimensions that correspond to the largest chi-square values are the ones that account for most of the inertia, and are called principal dimensions. Three-dimensional charts can also be represented, with a third component with less weight than the first two.

There are two standard ways of present the correspondence analysis maps. The simplest is the asymmetric map, which presents the coordinates of the rows in principal coordinates, while those of the columns in units of profile vectors. However, "the practical problem with the asymmetric map is that the column points are spread out much more than the row points (…) The more conventional joint map is the symmetric map, in which both row points and column points are represented in principal coordinates" (Greenacre, 2002, p. 10).

As an example, Figure 8 shows the correspondence analysis map for the data in Table 6. The CA map also shows the clusters formed by the authors according to the k-means algorithm.

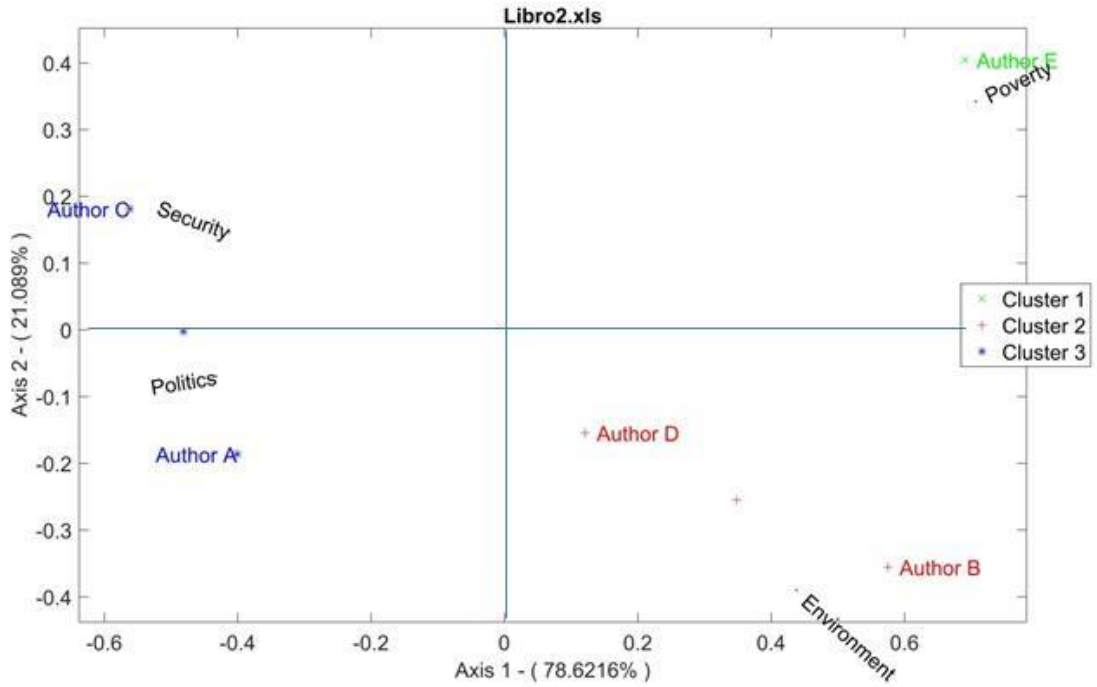

Figure 8. Correspondence analysis graph for the data in Table 6. Prepared by the author. Software: Multibiplot (Vicente, 2014)

This small example can be used to discuss some of the essential guidelines for interpreting a correspondence analysis chart (Tuzzi, 2003, p. 100):

(a) The first and foremost rule is that the position in which a category is located makes sense only in the context of the graph, i.e. only when compared to the positions of the other categories and variables in relation to the axes and the origin.

(b) The categories that have the largest contribution to the solution, and consequently, the most important in the chart are the ones that are the outermost from the origin of the axes. In Figure 8, Authors C, B and E, are the ones that are the farthest from the origin, and are also the authors that,

as a simple inspection of the table shows, write primarily about one topic above the others. Author D is the one closest to the origin, and as the table shows, is the one that writes more evenly on all subjects, so he would be less likely to be associated to a specific topic.

(c) If two categories that belong to the same variable are close in the graph, then they have similar profiles. As it was discussed above, Authors A and C were evidently the most similar row profiles, and Figure 8 shows that that appreciation is correct, including the association with the topics of politics an security.

(d) The relative position of two categories that belong to different variables cannot be directly valued, since the distance within the graph cannot be automatically interpreted in terms of statistical association. Instead, it has to be assessed in relation to the positions of all the categories, i.e. to the graph as a whole. For example, the reason why Author E is associated with poverty is not only because they are close, but also because there are no other topics close to Author E.

(e) If two categories that belong to different variables (one from a row, another from a column) are in the same space in relation to the origin of the axes, they can be considered to be positively associated. In this case, Author A and politics; Author C and security; Author B and environment; and Author E and poverty.

(f) If two categories that belong to different variables are diametrically opposed in relation to the origin of the graph, they have an inverse association. In this case, Figure 8 shows that Author A and poverty, and Author B and security have inverse associations, a fact that can also be checked in Table 6.

(g) More than distance, it is the angle formed between two categories and the axes of the graph that accounts for association between them: the more similar are the angles of the categories, the stronger the association between them, even if the distances make them seem apart from each other. The case that makes more evident this guideline is the association of Authors B and D; although they are not very close, the angle they form with the axes is very similar. This fact is confirmed by cluster analysis, which groups them together.

(h) The grouping of categories in an area of the graph that can be singled out from the rest of the group can be interpreted as a semantic area. The cluster analysis makes clearer the three distinct areas of the CA map: Authors A and C, and politics and security; Authors B and D and environment; and Author E and poverty.

And this is why correspondence analysis is a method that is frequently used in text analytics. In the same way that word-vectors are used for classifying documents, if there is a prior classification of the latter (date, author, media outlet, etc.), new word-vectors can be created for each category. Consequently, it can be

performed a correspondence analysis that uses as rows the word-vectors and as columns the categories of a given variable, allowing the association of specific terms of the corpus' vocabulary and those categories.

Chapter Seven

Hydroelectric energy representations on online media: between national hope and environmental crisis

The second specific objective aimed at exploring the representations of the hydroelectric industry on online media in Guatemala. In order to be able to understand which of them are particular to the country and which others could be considered as part of a broader representation of hydroelectricity, it was decided that a comparative study was necessary. This kind of comparative studies usually undertake three or more analysis units. However, in this case, the comparison was made just with one more country, to keep the study on a level that was manageable and also to keep it from overshadowing the inquiry presented in the previous chapter. In the next sub-section it will be discussed the criteria to select the second country, Colombia.

7.1 Selection of the second country in the corpus

The first guideline for selecting the country was simple: it had to be a Latin American country. The reason for establishing this guideline was because Guatemala shares, with most of them, a common history and language. Consequently, it is more likely that some representations are shared, since representations are bound to cultural, social and historical context (Moscovici, 2000). However, it was decided also to exclude Central American countries and Mexico, since in this case, on the contrary, it was deemed that their common history could result in representations that were too similar . This left as possible candidates for the comparison, the South American, Spanish-speaking countries.

The next guideline for picking a country was that it had to have a history and a current situation of environmental conflicts, especially if they involved rural communities. The chosen one would need to have conflicts around hydropower plants, and also, conflicts over mining developments. This more specific guideline was included to address the results of the preliminary inquiry of this project, which hinted at a representation of the hydroelectric industry as part of a larger single extractive complex that includes the mining industry. If both countries in the survey had hydroelectric and mining industries, and for both of them there was evidence that conflicts about them have emerged, then it could be expected some similarity in their media representations of them. Then it would be plausible to assert that any difference between those representations could be a consequence of different national and social contexts.

With these guidelines in mind, a search for the country that better fit them was conducted on available databases of environmental conflicts. Two databases were of particular help for the choice: the Environmental Justice Atlas (Temper, Del Bene, & Martínez-Alier, 2015) and the Map of Mining Conflicts of Latin America (Observatorio de Conflictos Mineros de América Latina, 2015). The information gathered produced the candidate countries that can be seen in Table 9.

Country	Mining Conflicts	Hydropower Conflicts
Argentina	26	2
Chile	35	5
Colombia	12	8
Ecuador	7	5
Peru	35	2

Table 9. South American countries with environmental conflicts over mining and hydropower; the numbers correspond to the year 2015. Prepared by the author with information from (Temper, Del Bene, & Martínez-Alier, 2015; Observatorio de Conflictos Mineros de América Latina, 2015).

Argentina, Chile and Peru had an exceeding quantity of mining conflicts over hydropower, so they were discarded. This left the choice between Colombia and Ecuador. Colombia was finally selected because the number of conflicts was closer to those in Guatemala.

7.2 Selection of the news websites

After selecting the country, the next step was to choose the websites from which to scrape the opinion articles. For this inquiry, an opinion article was considered to be a written text in an online news medium, in which the author discusses current or past issues while giving his or her point of view on the matter. An online news medium was defined as a regularly maintained and updated website whose principal purpose was to publish news, local or international. The website had to be produced in one of the two countries of the study and directed to the same national audience. It did not matter if the website had a printed version or a radio and/or TV broadcast, of it was exclusively online. The criteria for selection were two: first, the websites had to be among those with the most internet traffic in the country; second, the websites had to be reputable, i.e. from a company, organization or journalist that is trusted as a reliable source in its national context. A valid criticism of this approach is that it could fail to take into account alternative journalistic sources that could give voice to dissenting perspectives on the subject. Nevertheless, it was decided to keep these criteria, since the objective was not a broad social representation of the hydroelectric industry but the representation that the online media of each country construct about it, and with that regard, a selection based on traffic seemed more appropriate.

In order to determine which news websites in Guatemala and Colombia had the most web traffic, the site alexa.com was consulted (Alexa Internet, Inc., 2017) on September 18th, 2015. The website explains how it ranks the webpages as follows:

> Alexa's Traffic Ranks are based on the traffic data provided by users in Alexa's global data panel over a rolling 3 month period. Traffic Ranks are updated daily. A site's ranking is based on a combined measure of Unique Visitors and Pageviews. Unique Visitors are determined by the number of unique Alexa users who visit a site on a given day. Pageviews are the total number of Alexa user URL requests for a site. However, multiple requests for the same URL on the same day by the same user are counted as a single Pageview. The site with the highest combination of unique visitors and pageviews is ranked #1 (Alexa Internet, Inc., 2017a)

Alexa creates dedicated pages for the rankings of each country, showing the top 500 websites. In the date mentioned above, the pages of Guatemala (Alexa Internet, Inc., 2015) and Colombia (Alexa Internet, Inc., 2015a) were visited and the information on each country's rank was retrieved. The 500-sites original list was browsed in search for news websites that met the criteria described at the beginning of this subsection. After a verification of each entry, the list was refined. The websites that were selected to be searched for opinion articles are listed in Table 10, which shows also the type of medium that it was connected to. If the news outlet is not connected to any traditional medium, and only has an Internet version, it is listed as "online". As it can be seen, there are fewer websites from Guatemala (19) than Colombia (28) among each country's top 500 websites. This is an expected result because in general there are fewer news outlets in Guatemala than in Colombia; the reason being the size of their populations and economies, both of which are smaller in the case of Guatemala.

The next step was to search the websites for opinion articles. In general, the trend was that the sites that were exclusively online and the sites that were connected to newspapers had opinion sections, while sites related to other media (TV and radio) had no opinion articles or very few. The list of websites was refined accordingly, resulting in five websites from Guatemala removed from the list (*Guatevision.com, Canalantigua.com, Sonora.com.gt, emisorasunidas.com* and *pedrovision-noticias.com*) and three from Colombia (*canalrcn.com, noticiasrcn.com,* and *noticiascaracol.com*). The number of websites was reduced to 14 in Guatemala and 25 in Colombia.

Guatemala	Type of news medium	Colombia	Type of news medium
Soy502.com	Online	Eltiempo.com	Newspaper
Guatevision.com*	TV	Minuto30.com	Online
Prensalibre.com	Newspaper	Canalrcn.com*	TV
Elperiodico.com.gt	Newspaper	Elespectador.com	Newspaper
Publinews.gt	Newspaper	Semana.com	Magazine
Canalantigua.tv*	TV	Noticiasrcn.com*	Radio
S21.com.gt	Newspaper	Elcolombiano.com	Newspaper
Emisorasunidas.com*	Radio	Las2orillas.co	Online
Nomada.gt	Online	Elpais.com.co	Newspaper
Diariodigital.gt	Online	Pulzo.com	Online
Lahora.gt	Newspaper	Caracol.com.co	TV
Republicagt.com	Online	Eluniversal.com.co	Newspaper
Contrapoder.com.gt	Magazine	Elheraldo.co	Newspaper
Plazapublica.com.gt	Online	Noticiascaracol.com*	Radio
Pedrovision-noticias.com*	Online	Larepublica.co	Newspaper
Elquetzalteco.com.gt	Newspaper	Soho.com.co	Online
Sonora.com.gt*	Radio	Diarioadn.co	Newspaper
Cronica.gt	Magazine	Dinero.com	Magazine
Lanacion.com.gt	Online	Lafm.com.co	Radio
		Enter.co	Online
		Wradio.com.co	Radio
		Kienyke.com	Online
		Bluradio.com	Radio
		Publimetro.co	Newspaper
		Lapatria.com	Newspaper
		Rcnradio.com	Radio
		Lasillavacia.com	Newspaper
		Cablenoticias.tv	TV

Table 10. News websites in Guatemala and Colombia and their types, in order of their Alexa ranking as of September 18th, 2015. Prepared by the author with information from (Alexa Internet, Inc., 2015; Alexa Internet, Inc., 2015a). Sites marked with (*) had no opinion articles section at the time they were analysed.

7.3 Scraping the websites for opinion articles

The next step was to search the websites for opinion articles, and afterwards, scrape the texts and integrate them into the corpus. As part of the research design it was decided that the articles to be collected were those that were written between January 1st, 2010 and December 31st, 2015. It was considered that a six-year window would be long enough to attenuate the effects of news trends and would also produce a corpus of articles that was worth analysing with the aid of quantitative methods.

Searching websites for opinion articles seems an easy task to those not familiar with data scraping; however, it becomes complex because most of the websites have different types of internal search engines, and their pages are not indexed and tagged correctly. This fact leads to results that have either, an exceeding amount of articles that are not of the opinion type, or less articles than the actual number. There were some websites that had very efficient search engines and allowed to filter opinion articles from

news or investigative pieces. However others had engines with very limited search options, so they produced bulks of items that did not fit the criteria.

In general, if the internal search engine of the website did not produce the appropriate results, the search then would be performed with Google advanced search commands. The keywords (in Spanish) that were used to perform the searches were*: hidroeléctrico, hidroeléctrica, hidroeléctricas, hidroeléctricos*, (all Spanish derivatives for hydroelectric) or the lemma *hidroeléctric** with the wild card character, in the sites where the search engine allowed it. The search would then be refined to reduce the results to those that were opinion articles, in the sites that allowed it. If there was no chance to refine the search results, then the search would be repeated on Google, with the following Google search commands:

- *site:,* followed with the link of the principal webpage of the site. This was used in all searches to limit results only to pages from the website.
- *inurl:,* followed by the words used by the websites to identify their opinion articles, for example: *opinion* or *editoriales*. Some websites would include in the URL of each page the type of content it contained; others used an alphanumeric code. This was the most common way of refining the search to opinion articles.
- *daterange:,* followed by dates in the format YYYYMMDD, to filter the dates of the webpages to the ones needed for the corpus. This command stopped working with Google searches a few months after the corpus was collected, although there is still a way to restrict dates from the search tools menu after a first attempt is performed.
- *intitle:,* followed by the identifying word for opinion articles, as it was the case with the *inurl:* command. In some websites, the title contained also the type of content on the webpage.
- *intext:,* followed by the words used by the websites to identify their opinion articles, as with the *inurl:* or *intitle*: commands. This command was used when all the others could not be applied, since it was the most likely to produce articles that did not fit the guidelines.

Most of these commands produced the desired results. However, it was necessary to review manually all the URLs collected in order to filter out those entries that did not fit the search guidelines. Before being able to perform that task, it was necessary to scrape the URLs for the opinion articles, so let us focus on that process in the following paragraphs.

The first tests of the scraping method were done with Google Sheets' *ImportXML* function. This command extracts data from any website that contains structured data of many types, including XML, HTML, CSV, and RSS feeds. For doing so, it only needs two parameters, the URL that contains the information to be

extracted and the *XPath* query necessary to find the data in the page. *XPath* is a query language that "uses path expressions to select nodes or node-sets in an XML document. The node is selected by following a path or steps" (Refsnes Data, 2017), in the same way files in a computer are organized in directories. The *XPath* language has different expressions that allow selecting specific parts of an XML document, or all the nodes that have the same name, for example. However, the initial tests with *ImportXML* did not retrieve the desired information from the search results, so it was decided to use another data mining tool.

The tool that finally was selected was the Data Miner extension (Software Innovation Lab LLC, 2017)for the Google Chrome browser. This extension allows scraping data with a few clicks, using a feature called "Get Similar". This command works as follows: by right-clicking on a specific part of a webpage and then selecting the option "Data Miner – Get similar" the extension retrieves all the nodes of the page with the same *XPath* name. For example, in a page that displays a list of telephone numbers, by right-clicking in one of them and then selecting "Get Similar", Data Miner creates a CSV (comma-separated values) file with all the numbers on the page. The extension has also a feature for creating "recipes", which are scripts that, after the user recognizes the structure of a webpage, allow automating the task of scraping the same specific information from multiple webpages. Using these options of the program, the procedure for scraping the opinion articles (in the majority of the news websites that did not have refined search options) was the following:

a. Perform a search with Google, refining it with the commands *site:, intitle:, inurl:, intext* and *daterange:* when needed and using the keywords mentioned above.
b. When the search results page is displayed, use the "Data Miner – Get Similar" tool to scrape all the URLs and create a spreadsheet with them in the first column.
c. After inspecting one of the webpages in the spreadsheet from (b), create a "recipe" with Data Miner and the appropriate *XPath* queries, for scraping from each webpage the following information: Title, author, date, and full text.
d. Apply the "recipe" and the tool for scraping multiple pages of Data Miner to the spreadsheet from (b) to retrieve all the specified data and then paste it back in the said spreadsheet.
e. Add to the spreadsheet two more columns, one indicating the name of the news medium and other the country of publication. This task can be performed without the assistance of software since this two attributes are the same for all the elements in a particular spreadsheet.
f. Browse the spreadsheet created in search of any articles that do not fit into the guidelines or any other easily recognizable mistake.

Guatemala		Colombia	
News medium	**No. of articles**	**News medium**	**No. of articles**
Contrapoder	4	Dinero	8
El Quetzalteco	5	El Colombiano	13
elPeriódico	41	El Espectador	60
La Hora	12	El Heraldo	17
La Nación	11	El País	19
Plaza Pública	50	El Tiempo	44
Prensa Libre	82	El Universal	10
RepúblicaGT	39	Kienyke	17
Siglo 21	18	La Patria	33
		La República	4
		La Silla Vacía	10
		Las 2 Orillas	40
		Publimetro	1
		Pulzo	1
		Semana	26
Total – Guatemala	**262**	**Total – Colombia**	**303**
Total		**565**	

Table 11. Number of articles included in the corpus classified by country and news medium, in alphabetical order. Source: Prepared by the author.

As it was stressed before, this procedure did not work all the time. Nonetheless, it was the most successful strategy to gather data for the article corpus. There were other problems as well, which will be discussed briefly. First, as websites constantly change their design and layout, one problem was that a single recipe did not work for all search results. In those cases, a specific recipe had to be made for every different web design; for some websites, up to three different recipes had to be made. This problem is linked to other, more serious one: because of those changes, some websites' archives did not reach too far in the past, meaning that articles as recent as 2013 or 2012 were not available. This, in addition to the fact that the trend of online news media is relatively recent, translated into a scarce sample of articles from the years 2010, 2011 and 2012. Finally, some of the searches turned no results, even though the websites had opinion sections. Table 11 shows the news media that were included in the final corpus and the number of articles scraped from of each of them. As it can be seen, there were nine websites from Guatemala, with 262 articles, and fifteen websites from Colombia, with 303 articles, for a total of 565 articles. Before discussing the corpus, it is appropriate to briefly introduce each of the news websites to which the articles belong.

7.3.1 News websites from Guatemala

- Contrapoder (2013): Printed magazine owned by Grupo A, a multimedia conglomerate property of the Archila Marroquín family, which also owns one of the largest radio broadcasting corporations in Guatemala. Contrapoder's Editor-in-chief (at the time the articles were collected) and founder, Juan Luis Font, is a respected Guatemalan journalist. Currently, Contrapoder is in a hiatus since its former president, Erick Archila, is sought by Guatemala's justice on corruption charges, related to his public service as Minister of Energy and Mines (Soy502, 2016).
- El Quetzalteco (1984). It is owned by Casa Editora Prensa Libre, whose main newspaper is Prensa Libre, the largest in Guatemala. It is a regional newspaper, focused on the Western region of the country, and published in the second largest city of Guatemala, Quetzaltenango. It was founded by Rodolfo Custodio and Manuel Zarco and first started as a weekly publication (Custodio, 2009); later it became a daily newspaper and nowadays it is biweekly. El Quetzalteco had an online version in 2015, but it currently has stopped publishing new content. The Editorial Board announced in August 2016 that they were cancelling its news site, keeping the publication only in print and with a social media presence (Ediciones Regionales, S.A., 2016).
- elPeriódico (1996). It was founded by José Zamora Marroquín, grandson of reputed journalist Clemente Marroquín Rojas (see the next entrance on the list), after he left the position of editor-in-chief at the newspaper Siglo 21. This newspaper has had a significant impact on Guatemala's public opinion thanks to its investigative journalism and its openness of its opinion pages to voices from all over the political spectrum. This critical position of elPeriódico has made it target of cyberattacks, one of which wiped-out their entire historical archive; Zamora was even kidnapped once and his family had to exile from the country (Martínez, 2013).
- La Hora (1920). It is the oldest newspaper in Guatemala that is still in circulation. Its founder was Clemente Marroquín Rojas, one of the most prominent Guatemalan journalists of the 20th century; the newspaper has been critical of politicians and presidents to the point that it has been censored twice in its history by some of Guatemala's fiercest dictators (Rodríguez, 2007). The current editor-in-chief is Marroquín Rojas grandson, Oscar Clemente Marroquín.
- La Nación (2014). This newspaper is a strange case, if the digression from the academic tone is forgiven by the reader. While the site was listed as one of the most read websites in Guatemala in 2015, it seemed to be –although, in good faith, the link was never officially proven– a propaganda outlet for a former presidential candidate in Guatemala, Manuel Baldizón (García, 2014). It belonged to what by all means seemed a shell corporation called Nacional, S.A. and after the presidential election of 2015, it was shut down along with other three news outlets that were

propriety of the same corporation. Nevertheless, the articles gathered from this website were kept, since their authors' credibility could be verified.

- Plaza Pública (2011). This is an online news medium that specializes on analysis, research and public debate. It is mostly financed by Rafael Landívar University, which in turn is an academic institution founded by the Society of Jesus, a major religious congregation of the Catholic Church. In their editorial line page, Plaza Pública states that: "we write about how inequality, inequity and injustice go through our society and shape it, and what consequences it has for our good life" (Plaza Pública - Editorial Board, 2014). Their investigative journalism has been recognized with awards at the international level (Deutsche Welle, 2013).
- Prensa Libre (1951). Although it is not the newspaper with the widest circulation in Guatemala, it is considered to be the most dominant in the Guatemalan market thanks to its online version (Centro Civitas, 2014). It is highly influential, and although it has been criticized by other Guatemalan media of being too conservative (Nómada, 2014), its opinion section is open to a significant range of political positions.
- RepúblicaGT (2014). Currently known simply as República, it is an online news medium that was created as a reaction to other online media like the aforementioned Plaza Pública and Nómada, which were viewed as left-leaning. As its webpage states, it is a "digital communication medium whose pillars propose [sic] the rescue and strengthening of republican values" (República - Editorial Board, 2017). It has been criticized by other media as being more of a platform of ideas than a serious news organization (Rodríguez Pellecer, 2016).
- Siglo 21 (1990). It was founded by José Zamora Marroquín, in co-ownership with some of Guatemalan most powerful businessmen, who established its parent company, Corporación de Noticias, S.A. After Zamora was ousted in 1995, the newspaper has changed ownership various times. In 2015 it was involved in a scandal when it was revealed that its president, Salvador Gonzalez, was a straw person for the vice-president of Guatemala at the time, Roxanna Baldetti, in the major corruption case known as "La Línea" (La Hora, 2015).

7.3.2 News websites from Colombia

The information about the news media from Colombia that is presented here –unless another source is mentioned– was obtained from the website www.monitoreodemedios.co (Federación Colombiana de Periodistas, 2015) which is an initiative of Reporters without Frontiers and the Colombian Federation of Journalists, with the objective of adding transparency to the country's public debate.

- Dinero (1993). It is part of the journalistic corporation *Semana*, and it specializes in economic and financial issues.
- El Colombiano (1996). It is the most important daily newspaper of Medellín, the second largest city in Colombia. It is owned by a corporation whose main stockholders are the Gómez and Hernández families, two of the most powerful in the region. The website follows the editorial line of the newspaper, positioned in the conservative side of the political spectrum. It is one of the most influential news organizations in Colombia.
- El Espectador (1887). It is a daily newspaper owned by the corporation *Grupo Empresarial Santo Domingo*, which controls also magazines, TV and radio stations. It is the oldest newspaper in Colombia that is still in circulation and it was founded by the journalist Fidel Cano Gutiérrez. Its editorial line leans to the liberal side and it is considered one of the most credible and independent news sources in Colombia. Due to financial problems, from 2001 to 2008 it circulated weekly, and it was not until 2011 that it returned to the daily format. The website follows the editorial line of the print version.
- El Heraldo (1933). It is a daily newspaper of liberal tendency with headquarters in Barranquilla, the fourth largest city of Colombia. It was founded by Alberto Pumarejo, Juan Fernández Ortega and Luis Eduardo Manotas and it is famous because one of its columnists was the Nobel Prize winner, Gabriel García Márquez ('El Heraldo' de barranquilla celebra sus 80 años, 2013). It is the third largest paid newspaper in the country in terms of circulation. Its editor-in-chief since 2012 is Marco Schwartz.
- El País (1950). It is the newspaper of largest circulation in the Colombian Southwest. It is owned by the Lloreda family, which has always been involved in the management and publishing process. Nowadays, their third generation is in control of the newspaper. It has a conservative editorial line with great influence in the public opinion of the region. Its headquarters are located in Cali, the third largest city in Colombia.
- El Tiempo (1911). It is the national daily newspaper with the largest circulation in Colombia, if free newspapers are not taken into account. At first its editorial line was of liberal tendency but successive changes in its ownership have shifted it towards a more conservative stance over time. It is the most important company of the media conglomerate *Casa Editorial El Tiempo*. It has been historically associated with the Santos' family, one of the most influential of the Colombian elite, to which belongs the country's current President, Juan Manuel Santos. Nowadays the owner of El Tiempo is the richest man in Colombia, Luis Carlos Sarmiento Angulo.

- El Universal (1948). Founded by Domingo López Escauriaza, its current CEO is Gerardo Araújo Perdomo and its editor-in-chief, Germán Mendoza Diago. Its headquarters are in Cartagena de Indias, on the Colombian Caribbean region, where it is one of the most influential news sources (Información institucional, 2017). In its beginning it was associated with the Liberal Party. It belongs to the corporation *Compañía Editora del Mar* and it has regional issues for other cities in the Caribbean region. Its website mirrors the contents and editorial line of the print version.
- Kienyke (2010). It is an exclusively online medium, in the format of digital magazine, and includes a wide variety of topics, from politics to entertainment. It was created by Adriana Bernal, Fabio Echeverri (both with ties to the conservative party) and María Elvira Bonilla. In 2012, the website went through a change of editorial line, after a scandal over the firing of one of its columnists over an opinion article, in which he criticized the publicity practices of mainstream media.
- La Patria (1921). Founded by Francisco José Ocampo, this newspaper has its headquarters in Manizales, Capital City of the Department of Caldas. It is a regional daily newspaper and its current owner is the Restrepo family (La Patria, 80 años, 2001).
- La República (1954). It is a newspaper specialized in economic, financial and business issues, and it is one of the most influential media in this area. It is part of the media conglomerate *Grupo Editorial El Colombiano*, owned by the Gómez and Hernández families of Medellín. Its headquarters are in Bogotá. It was founded by the former Colombian president Mariano Ospina Pérez and businessman Julio C. Hernández, with the support of a network of conservative businessmen (Navia, 2014).
- La Silla Vacía (2009). It is an online news medium, specialized in political news. It is owned by *Blogosfera Producciones*, whose main shareholder is the journalist Juanita León García. It promotes the participation of its audience in the production of material for the website. According to its founder the website aims at expanding the political plurality in opinion and content. It has received international awards for its investigative journalism (Prince Claus Fund, 2016).
- Las 2 Orillas (2013). Another online news medium, property of Las 2 Orillas Foundation. It offers the possibility of access to different information sources than those of the traditional media. It has a feature called *Nota Ciudadana*, where readers can publish their own news on the portal. It was founded by the journalist María Elvira Bonilla who also founded the website Kienyke, one of the previous entries in this list. It has been awarded for its journalistic coverage in various occasions.
- Publimetro (2011). This is a free newspaper that circulates on Colombia's major cities. Is part of the Publimetro network, owned by the Swedish corporation *Metro International*, which has papers in 22 countries worldwide. At first, Publimetro started as the result of an alliance of the Swedish

company and the Colombian *Grupo Nacional de Medios*, but the latter was bought out of the deal in 2015. As it is usual with this type of newspapers, their opinion sections are relatively small.

- Pulzo (2013). It is an online news media that works with the model of news curator and aggregator, in the style of The Huffington Post or The Daily Beast in the United States. It is owned by the INQLAB Corporation and its editor-in-chief is Guillermo Franco. In recent years it has been object of complaints of disloyal competition by other news outlets, but the claims have been dismissed by the Colombian government agency that oversees the sector, stating that its use of other websites' materials falls into the fair use category.
- Semana (1982). It is the most important news and opinion magazine of Colombia. Although it circulates weekly, its website keeps an updated feed of political and economic news. It is one of the most credible news sources in the country, independent and of liberal tendencies. Some of its columnists are among the most respected in Colombia, and its owner Felipe López Caballero and its current editor-in-chief, Alejandro Santos Rubino are among the most influential personalities in the country.

7.4 The corpus

The corpus, as it was stated in the previous section, consists of 565 opinion articles, 262 from Guatemala and 303 from Colombia. For each text in the corpus the following attributes were recorded: country, website, date, author, title and URL. The complete list of the articles in the corpus can be found in Appendix No. 3. The corpus was pre-processed using the operations described in section 4.2.2; the ones specifically used in this stage were: tokenization, transformation of cases, filtering (by size) and filtering stopwords. The stopwords were filtered using an appropriate Spanish stopwords dictionary. In the exploratory analysis stage, the operations of lemmatization and stemming were left out. The corpus was pre-processed using RapidMiner and QDAMiner (Provalis Research, 2014). After the pre-processing stage, the corpus was searched for typos and other types of errors and the necessary corrections were made. Table 12 shows the basic lexicographic characteristics of the corpus.

Corpus	w-tokens N	w-types V	hapax H	texts T	mean tokens	min tokens	max tokens
Colombia	219172	20203	10162	303	723.33	197	4413
Guatemala	177894	18067	9438	262	678.98	283	4912
Total	**397066**	**28798**	**13888**	**565**	**702.77**	**197**	**4912**

Table 12. Basic lexicographic characteristics of the corpus. Prepared by the author.

Regarding the authorship of the corpus, there were 121 authors from nine news websites in Guatemala, and 192 authors from 15 websites in Colombia, for a total of 313 authors in the whole corpus. The author from the Guatemalan news websites with the most entries was Kajkoj Máximo Ba Tiul with 16 texts; from the Colombian websites, the ones with the most entries were the Editorial Staff (as in the writers of the Editorial) of *El Espectador* and *La Patria* newspapers, with 10 texts each. In Guatemala, 53 authors (43.8%) wrote two or more articles, accounting for 194, or 74.0% of the total number of texts; while in Colombia, the authors of two or more articles were 49 (25.5%), accounting for 160 articles, or 52.8% of the total. Figure 9 shows the top ten authors, in terms of number of articles written, for each country.

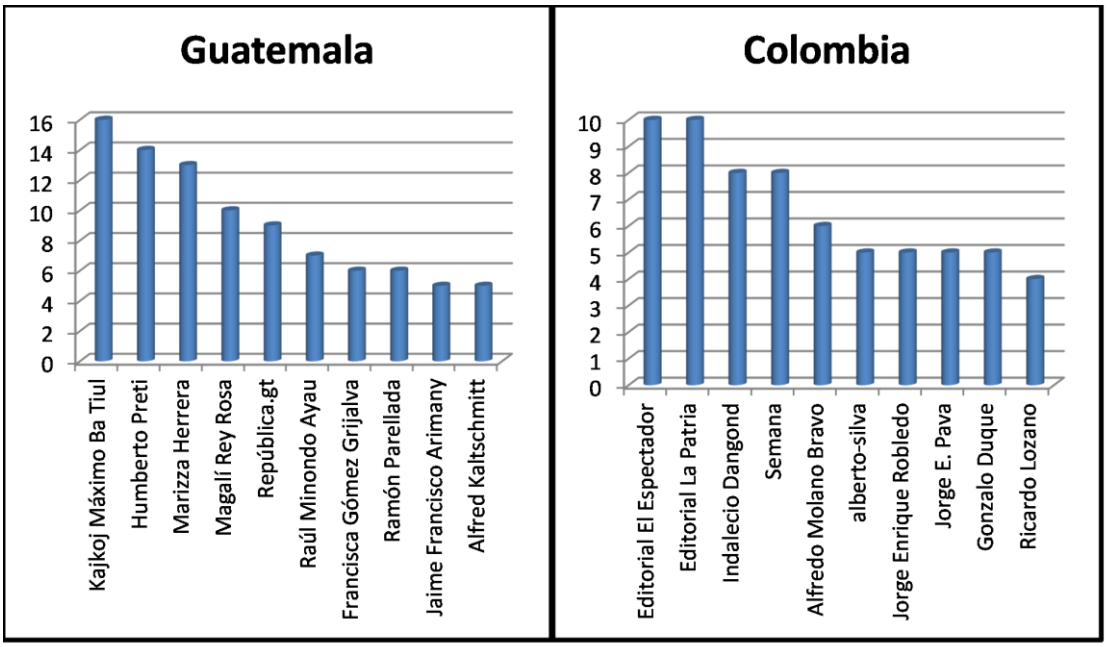

Figure 9. Top ten authors by number of articles for Guatemala and Colombia. Prepared by the author, with data from the corpus.

Regarding the dates of the articles, there was a larger amount of texts from 2014 and 2015 in comparison to the 2010-2013 period. This tendency was both in the general corpus and in the sub-corpora by country. Figure 10 shows the articles published by year for both countries in the 2010-2015 period.

As it was discussed in the previous section, the difference between the first years and the last two cannot be attributed to a surge in the interest in the subject of hydroelectricity; as it was noted there, the most probable cause for this difference is that most news websites surveyed do not keep their online news archives complete and updated (not even under subscription access). At this point, it was decided that if more in-depth analysis involving the date of publication was needed in a later stage, it would be performed only for the 2014-2015 period.

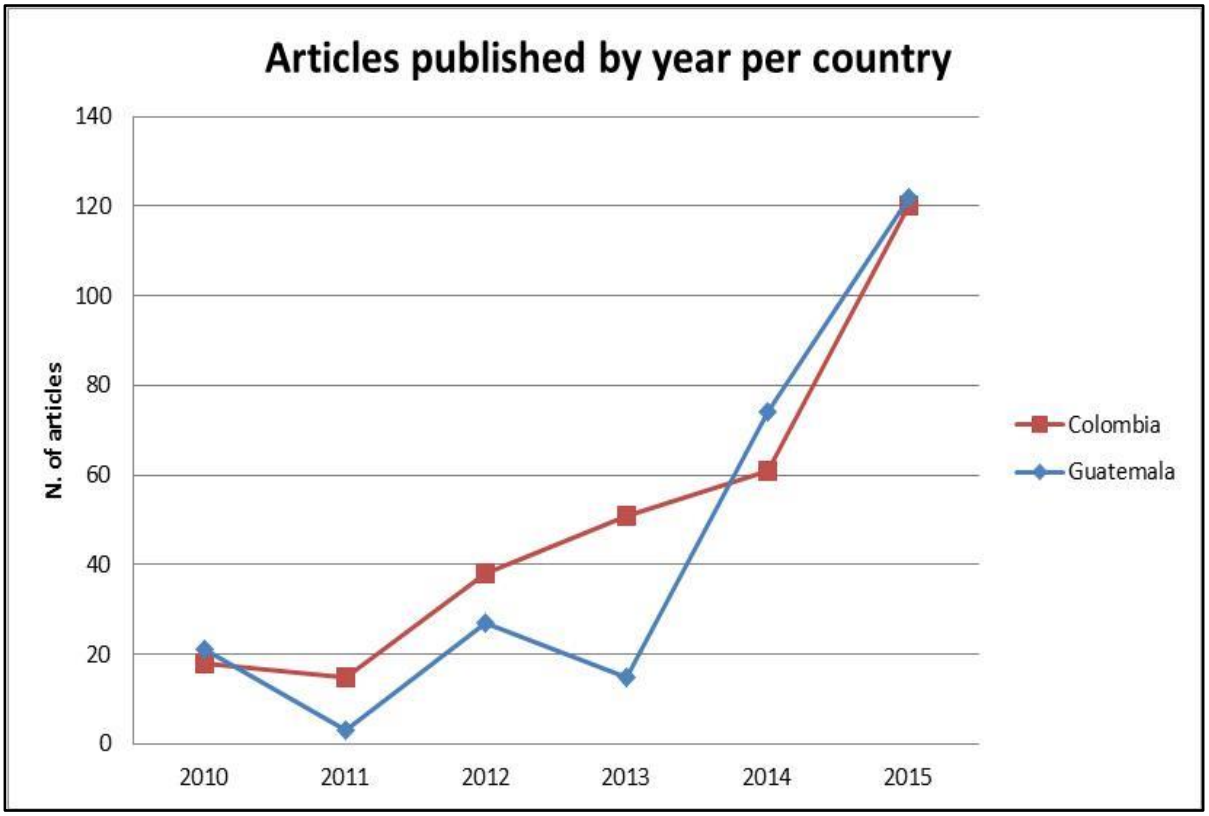

Figure 10. Articles published by year per country. Prepared by the author, with data from the corpus.

7.5 Analysis of the corpus

The first stage of the text analysis involved using the "bag of words" approach in order to describe the corpus. In particular, word-vectors were created using term occurrence, binary term occurrence, term frequency and TFIDF. These word vectors then were used to produce a ranking of words (or terms, if n-grams are used), which served as a first indicator of the main topics on the texts. Since, as it was discussed in section 6.2.2, TFIDF is preferred as an indicator of a word-type "importance" in a text, this measure was used for the first comparison. Table 13 shows the single word-types with the highest TFIDFs in the general corpus and in the Guatemalan and Colombian sub-corpora.

This table already gives some interesting, although preliminary, information. The word-types in the coloured cells are the ones that are common to all three lists, suggesting that, although they are important for describing the general corpus, they probably are not that important for distinguishing each sub-corpus from each other. This last statement is put to the test over the next analyses, as it will be shown. Regarding to the sub-corpora, it can be said that the word-types that appear solely in one list are the strongest candidates to describe the contents of each sub-corpus. In the case of Guatemala, those eight words are: *Pérez* (the last name of the Guatemalan President during 2012-15), *pueblos* (a word that can be translated as peoples or towns), *grupos* (groups), *Santa* (Saint, which is part of the name of many rural

communities), *países* (countries), *personas* (persons), *recursos* (resources), and *paz* (peace). In the case of Colombia, those words are: *gas* (gas), *ISAGÉN* (a Colombian public electricity generation company), *campesinos* (peasants), *Caldas* (a Colombian province and hydropower plant), *empresas* (companies), *política* (which can be translated as politics or policy) and *precio* (price). It is evident that proper nouns have an impact in the results, so subsequent analyses have to take account of them.

Corpus	TF • IDF	Guatemala	TF • IDF	Colombia	TF • IDF
ENERGÍA	279,7	INDÍGENAS	114,6	AGUA	155,4
AGUA	271,6	ENERGÍA	111,1	ENERGÍA	154,0
COMUNIDADES	258,0	COMUNIDADES	110,2	COMUNIDADES	148,3
GUATEMALA	255,0	AGUA	104,3	PROYECTO	141,3
PROYECTO	225,1	GOBIERNO	100,8	RÍO	131,1
GOBIERNO	218,7	DERECHOS	88,6	GAS	122,7
INDÍGENAS	212,1	PROYECTOS	86,5	GOBIERNO	116,8
RÍO	209,9	PUEBLOS	84,8	EMPRESA	114,9
COLOMBIA	208,0	PÉREZ	82,0	AMBIENTAL	114,2
DERECHOS	196,9	SOCIAL	80,3	MILLONES	113,2
MILLONES	194,6	DESARROLLO	79,8	ISAGÉN	110,5
EMPRESA	191,7	GUATEMALA	79,2	DERECHOS	104,0
PROYECTOS	190,6	VIDA	79,1	PROYECTOS	102,9
AMBIENTAL	187,1	GRUPOS	78,6	CAMPESINOS	101,4
DESARROLLO	180,6	SANTA	77,7	DESARROLLO	100,9
SOCIAL	175,4	PAÍSES	75,8	CALDAS	99,7
EMPRESAS	171,2	PERSONAS	75,7	EMPRESAS	96,5
VIDA	170,7	RECURSOS	75,2	POLÍTICA	95,9
NACIONAL	167,1	PAZ	75,1	PRECIO	95,7

Table 13. List of the 20 word-types with the higuest TFIDF in the general corpus and in the Guatemalan and Colombian sub-corpora. The coloured cells indicate the words that are common to the three lists. Prepared by the author, using QDAMiner software, with data from the corpus of articles.

The last paragraph already shows what was done in a second, but still exploratory stage. These word-vectors were used along with the ex-ante attributes discussed above (country, news medium, date, and author) as contrasting variables, in order to apply more complex methods, such as correspondence analysis and network mapping. The software used to perform these exploratory analyses was QDAMiner, for correspondence analysis, and CorTexT Manager, for network mapping.

7.5.1 Analysis of the corpus by country

As Table 13 showed, the first variable to be contrasted using word-vectors was country. There was already a hint to a difference between the sub-corpora in the list of words ranked by TFIDF. In the case of countries, since it was a dichotomous variable, the analysis did not need to be thoroughly complex to arrive to significant conclusions. However, it was used correspondence analysis to determine which words

associated strongly with each country. Words that would have obvious strong associations with each country (like *Guatemala, Colombia, guatemalteco, colombiano*, etc., and other names of geographical locations, unless there were specific hydroelectric conflicts associated with them) were removed from the corpus for this analysis, since their presence in a contingency matrix would definitely increase their distances and affect the resulting graph. Since there were only two categories, the correspondence analysis did not produce a two-dimensional graph, but rather a one-dimensional continuum in one axis. Instead of presenting the graphic result, Table 14 shows the words which were further from the origin according to the correspondence analysis performed to the 100 words with the highest frequency in the corpus. The ones with negative magnitudes were associated with Guatemala, while the ones with positive magnitudes were associated with Colombia. This time the term lists were supported by a more standard method, and it can be seen that there were significant differences in the sub-corpora. The list of terms associated with Colombia included the words *proyecto* (project), *ambiental* (environmental), *millones* (millions), *generación* (generation), *producción* (production), *proceso* (process), *inversión* (investment), *construcción* (construction), *empresa* (company) and *cambio* (change). These terms, and others on the list, pointed to a similar direction as the arguments advocating for hard energy paths (Devine-Wright, 2007; Brondi, et al., 2014) that were discussed in section 6.1.2. On the other hand, the list of terms for Guatemala included: *derechos* (rights), *población* (population or town), *seguridad* (security), *social* (plural), *vida* (life), *intereses* (interests), *mayoría* (majority), *comunidades* (communities), *público* (public), which also seemed analogous to Devine-Wright's soft-energy-path's argumentative lines.

As for the conjecture regarding the role of word-types that were common to the three lists, it can be seen from Table 14 that some of the terms that were supposed to be non-significant to either country, actually finished on the lists, like *energía* (energy) and *agua* (water) in the Colombian one, and *derechos* (rights) and *comunidades* (communities), in Guatemala's. One fact that can account for that difference is that the TFIDF list was made taking into account all the word-types in the corpus, while the correspondence analysis only included the 100 words with the highest frequency, which certainly influenced the final outcome. However, even after increasing the number of words significantly, the groups of words on the extremes of the axes still kept the same tendency shown here.

If this evaluation is repeated, this time with n-grams (phrases) up to 5 word-tokens, the results still mirror those obtained with single word-types. For clarity, the correspondence analysis over one axis included all those n-grams with frequencies larger than 25 on the corpus. The list of the 10 phrases with the largest distance to the origin for each country is presented in Table 15.

Colombia		Guatemala	
Word	**Distance to the origin**	**Word**	**Distance to the origin**
Región	2.759	Derechos	-1.886
Proyecto	2.109	Población	-1.77
Ambiental	2.076	Seguridad	-1.689
Río	2.031	Sociales	-1.615
Sector	1.905	Vida	-1.471
Millones	1.857	Caso	-1.391
Generación	1.727	Intereses	-1.386
Producción	1.662	Poder	-1.31
Energía	1.292	Hidroeléctricas	-1.297
Proceso	1.23	Derecho	-1.286
Agua	1.181	Personas	-1.281
Frente	1.065	Social	-1.253
Nacional	1.028	Ley	-1.219
Año	0.901	Forma	-1.216
Ambiente	0.885	Ver	-1.216
Cambio	0.836	Naturales	-1.211
Inversión	0.83	Público	-1.042
Construcción	0.802	Sistema	-1.023
Empresa	0.74	Mayoría	-0.993
Grandes	0.722	Comunidades	-0.857

Table 14. Top 20 words for each country in terms of distance to the origin, according to correspondence analysis made with the 100 words with the highest frequency. (Prepared by the author with data from the corpus. Software: QDAMiner)

In this table, negative values were associated with Colombia and positive ones with Guatemala. As it can be seen, the type of phrases on the Colombia list fitted again in a hard-path argumentative: *billones de pesos* (billions of *pesos*, Colombia's national currency), *cargo por confiabilidad* (a surcharge in the Colombian electrical system for guaranteeing the electricity supply), *gobierno nacional* (national government), *licencia ambiental* (environmental permit), *energías renovables* (renewable energies) and *millones de dólares* (millions of dollars). These phrases emphasize the role of hydroelectricity in the national context, as a strategic asset against threats like the *El Niño* Phenomenon (*Fenómeno del Niño*) or global warming (*calentamiento global*), n-grams that were also on the list.

Colombia		Guatemala	
Phrase	**Distance to the origin**	**Phrase**	**Distance to the origin**
Billones_de_pesos	-1.384	Ministerio_público	1.969
Cargo_por_confiabilidad	-1.384	Derechos_humanos	1.491
Fenómeno_del_niño	-1.384	Pueblos_indígenas	1.354
Gobierno_nacional	-1.384	Proyectos_hidroeléctricos	0.926
Licencia_ambiental	-1.384	Medios_de_comunicación	0.869
Gas_natural	-1.133	Comunidades_afectadas	0.839
Calentamiento_global	-1.014	Conflicto_armado	0.759
Central_hidroeléctrica	-0.978	Construcción_de_la_hidroeléctrica	0.587
Millones_de_dólares	-0.944	Banco_mundial	0.523
Energías_renovables	-0.763	Energía_eléctrica	0.376

Table 15. 10 top phrases for each country in terms of their distance to the origin, after performing correspondence analysis to phrases with frequency larger than 25. Prepared by the author, using QDA Miner software, with data from the corpus.

On the other hand, the phrases on Guatemala's list gravitated more around the idea of a participatory (yet conflictive) vision of energy transitions, as it is the matter of fact for soft paths. The most distant were social or judiciary terms: *ministerio público* (Guatemala's prosecutorial office) and *derechos humanos* (human rights). The next terms were also on the social realm, not on the technical: *pueblos indígenas* (indigenous peoples), *medios de comunicación* (communication media), *comunidades afectadas* (affected communities) and *conflicto armado* (armed conflict). Even more technical terms like *proyecto hidroeléctrico* (hydroelectric project) and *construcción de la hidroeléctrica* (construction of the hydropower plant), seem to fit in this narrative when they share the spotlight with the other, more socially associated, phrases. Finally it should be noted that, while the maximum distance in the Guatemalan list (1.969) of terms was larger than the one in Colombia's (1.384), the 10 terms on the Colombian side were more compactly grouped far from the origin (range of distances: 0.763-1.384) than the terms on the Guatemalan side (range of distances: 0.376-1.969). This hints that the association of the terms is stronger for the Colombian sub-corpus, than for the Guatemalan. In the next sections this assertion will be revisited to determine whether other analyses confirm it.

A final analysis on the country level of the entire corpus was performed using CorTexT Manager (Institut National de la Recherche Agronomique, 2017), which is a cloud-based web application developed by the Interdisciplinary Laboratory on Science, Innovation and Society of the French National Institute for Agricultural Research. This web application is capable of producing some of the results that also QDAMiner and RapidMiner offer, using also the "bag of words" approach. Additionally, it can produce

network maps based on term-extraction and word-vector algorithms. It was applied to the corpus, first by creating a list of 300 extracted terms –this time, the terms were n-grams up to four words– that was then manually refined and filtered. Then, this new list was used as an index in the general corpus, to create a network map of these terms, taking as base the co-occurrences in all the texts. CorTexT Manager produced as a result a network map, and also a partition in clusters that were automatically tagged according to the most central terms in each of them (although the tags could be changed manually). The resulting network map is presented in Figure 8, together with the clusters that were generated.

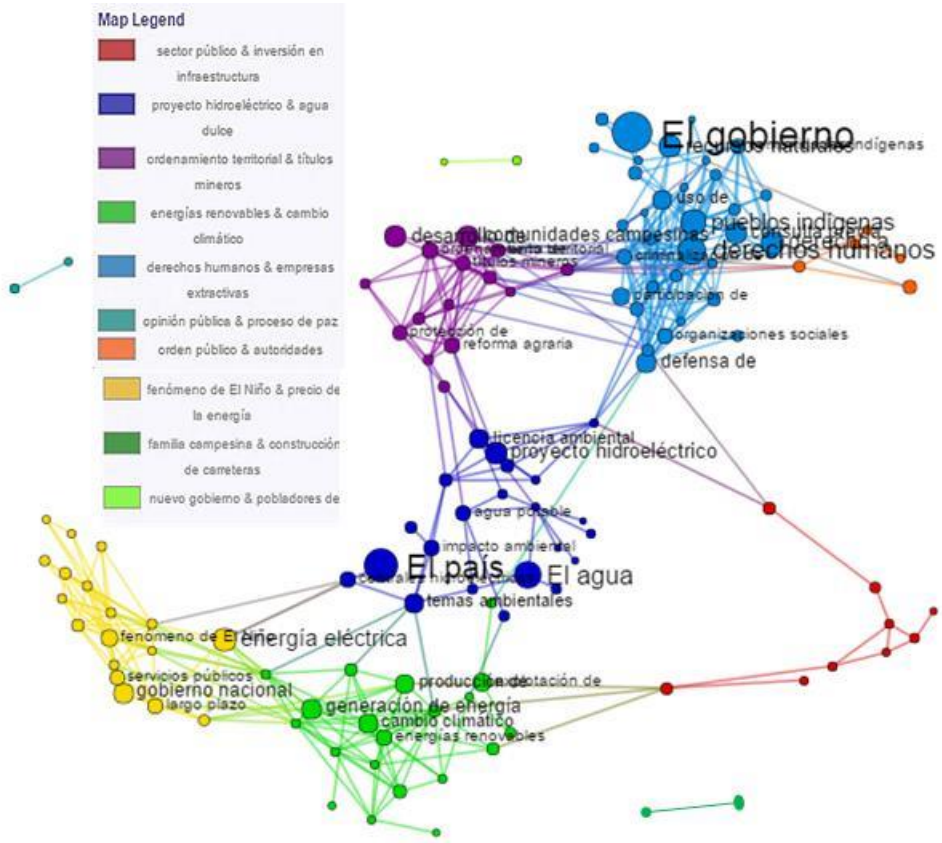

Figure 11. Network map of the general corpus with the extracted terms as nodes, and the resulting 10 clusters, shown here with different-color nodes. (Prepared by the author with data from the corpus. Software: CorTexT Manager)

As their translations show, most of the topics represented by each cluster were relevant thematic areas related to hydroelectric energy:

- *Ordenamiento territorial & títulos mineros*: spatial planning and mining charters
- *Fenómeno del Niño & precio de la energía*: *El Niño* phenomenon and energy price
- *Energías renovables & cambio climático*: renewable energies and climate change
- *Derechos humanos & empresas extractivas*: human rights and extractive corporations

- *Sector público & inversión en infraestructura*: public sector and investment in infrastructure
- *Proyecto hidroeléctrico & agua dulce*: hydroelectric project and freshwater
- *Orden público & autoridades comunitarias*: public order and community authorities
- *Familia campesina & construcción de carreteras*: peasant family and construction of highways
- *Nuevo gobierno & pobladores*: new government and settlers
- *Opinión pública & proceso de paz*: public opinion and peace process

The last three topics were the ones that seem least related to the subject of hydroelectric development, a fact that fits the network map, since those were the three isolated clusters in Figure 11.

CorTexT Manager allows combining the precedent map with a heat map in the background that shows the proximity of the clusters to one specific category of a selected variable. This feature is the one that allowed connecting the network map to the "country" variable. Figure 12 shows the same network map of Figure 11, combined with a heat map for the category "Guatemala" of the "country" variable, using as metrics Chi-Square. The redder the area, the closer the cluster was to "Guatemala", while the bluer the area, the further the cluster was from "Guatemala". Since this was a dichotomous variable, the blue areas could be interpreted to be associated with Colombia.[15] As Figure 9 shows, the clusters more associated with Guatemala were the ones in the top-right corner, which are labelled *Derechos humanos & empresas extractivas* (human rights and extractive corporations) and *Orden público & autoridades comunitarias* (public order and community authorities).

This last evidence adds up to the previous analyses supporting the fact that the representation in mainstream media was different in each country. The two clusters associated with Guatemala were also the ones with topics associated with conflictive situations, as they included as principal terms "public order", "violent evictions" and "community authorities". Of special interest was the term "extractive companies" which also supported the representation of the hydroelectric industry as part of a larger extractive complex, a matter that is part of the research question and objectives of this inquiry.

[15] In fact, with the aid of CorTexT Manager, it was also created the heat map for the "Colombia" category, resulting in the exact opposite of the version presented here.

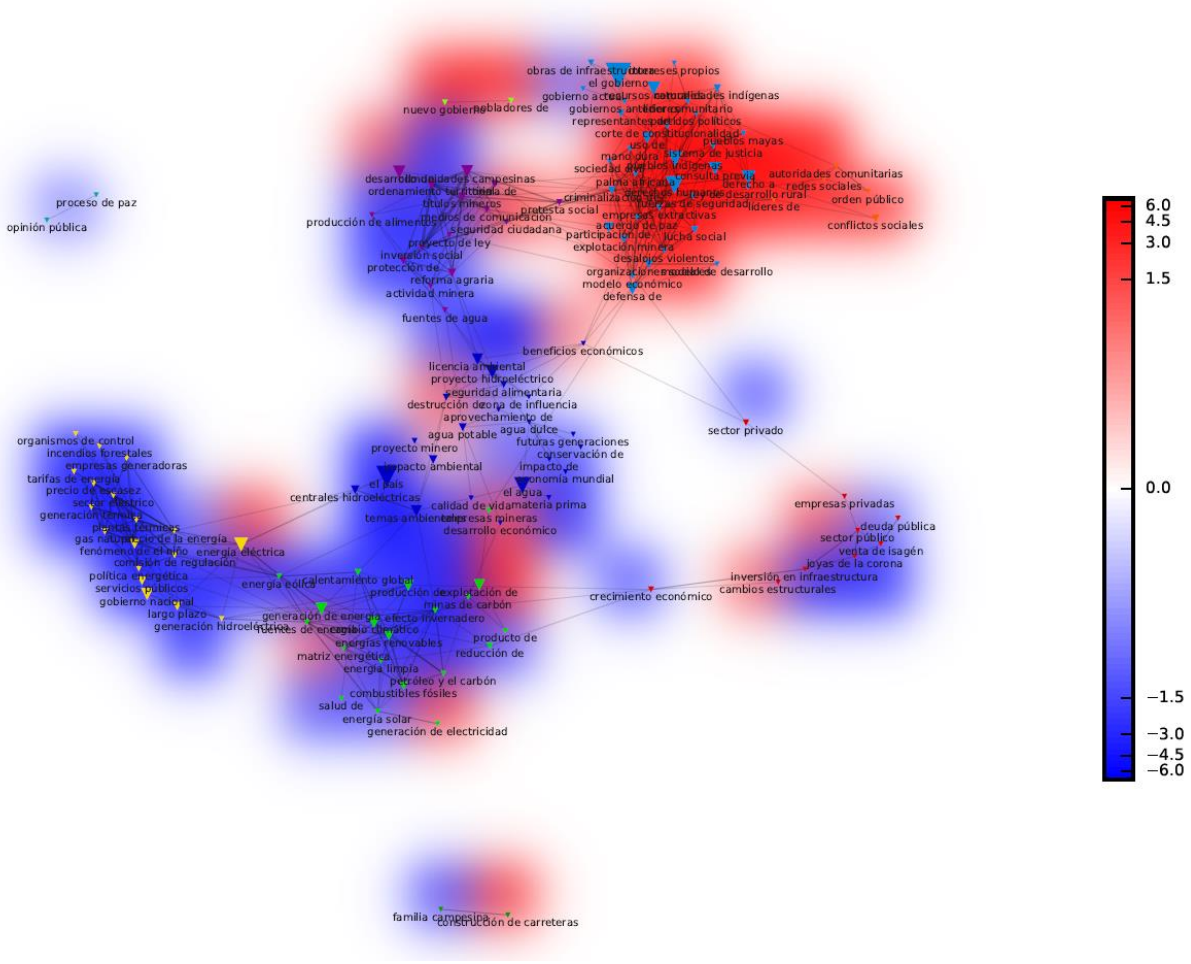

Figure 12. Network map and the superimposed heat map for the clusters formed by terms in the corpus. The heat map shows their proximity (red areas) or remoteness (blue areas) to the category "Guatemala", from the "Country" variable. (Prepared by the author with data from the corpus. Software: CorTexT Manager).

On the other hand, the blue clusters in Figure 12 were more associated with Colombia. The section of the network map that has the bluest clusters is the bottom-left; although that color seems predominant in the entire map, with the exception of the top-right. When the comparison was made with Figure 8, it could be seen that the clusters more associated with Colombia were: *Proyecto hidroeléctrico & agua dulce* (hydroelectric project and freshwater); *Fenómeno del Niño & precio de la energía* (*El Niño* phenomenon and energy price); and, *Energías renovables & cambio climático* (renewable energies and climate change). There were other clusters that were predominantly associated with Colombia, and at the same time mildly associated with Guatemala, like *Ordenamiento territorial & títulos mineros* (spatial planning and mining charters) and *Sector público & inversión en infraestructura* (public sector and investment in infrastructure). Once again, the topics or clusters associated with Colombia pointed out to a representation of hydroelectricity as part of a national project of infrastructure; or as part of the renewable energy mix that is a strategic asset against natural threats as climate change; or as a an economic asset threatened by *El*

Niño phenomenon. Any of these cases fitted into the hard-path narrative of energy transitions. The heat map also shows that while the Guatemalan sub-corpus concentrated in a few topics related with a representation of hydroelectricity as a contested industry, the Colombian sub-corpus covered a wider range of topics, all connected, however, to the representation of hydroelectricity as a national strategic asset.

7.5.2 Analysis of the corpus by news website

The next variable analysed was the news medium in which each article was published, and how the content of the texts in the corpus could be associated with it. In this case, a general correspondence analysis of news media from both countries was the first step taken. The correspondence analysis was performed to the top 100 word-types in order of frequency, using as software QDAMiner. Figure 13 shows the resulting graph. The remarkable result that this graph revealed is that the Colombian websites were to the left side –in the second and third quadrants– while the Guatemalan sites were to the right side –in the first and fourth quadrants. In other words, the correspondence analysis by news medium also shows a country-divide in terms of the content of the texts. There were only two websites that cross the vertical axis: the Colombian *Las 2 Orillas*, and the Guatemalan *El Quetzalteco*. A green discontinuous line was added to show the resulting division in two regions of the graph. It should be stressed that the distinction is not be taken as a very strong one, since most of the news media were not positioned too far away from the origin. Although the eigenvalues of the two principal axes accounted only for a cumulative percentage of 40.7%, which means that the graph is not strongly representative of the other dimensions of the word-vectors, in the context of text analysis that is still a strong association. However, the associations between the news media sub-groups and the word-types in the graph were consistent with the analyses of the previous section. For example, on the Guatemalan side, there were words like *derechos* (rights), *comunidades* (communities), *social* (social), *vida* (life), *territorio* (territory), and *personas* (persons); whereas on the Colombian side there were words like *generación* (generation), *proyecto* (project), *producción* (production), *inversión* (investment) and *empresa* (company).

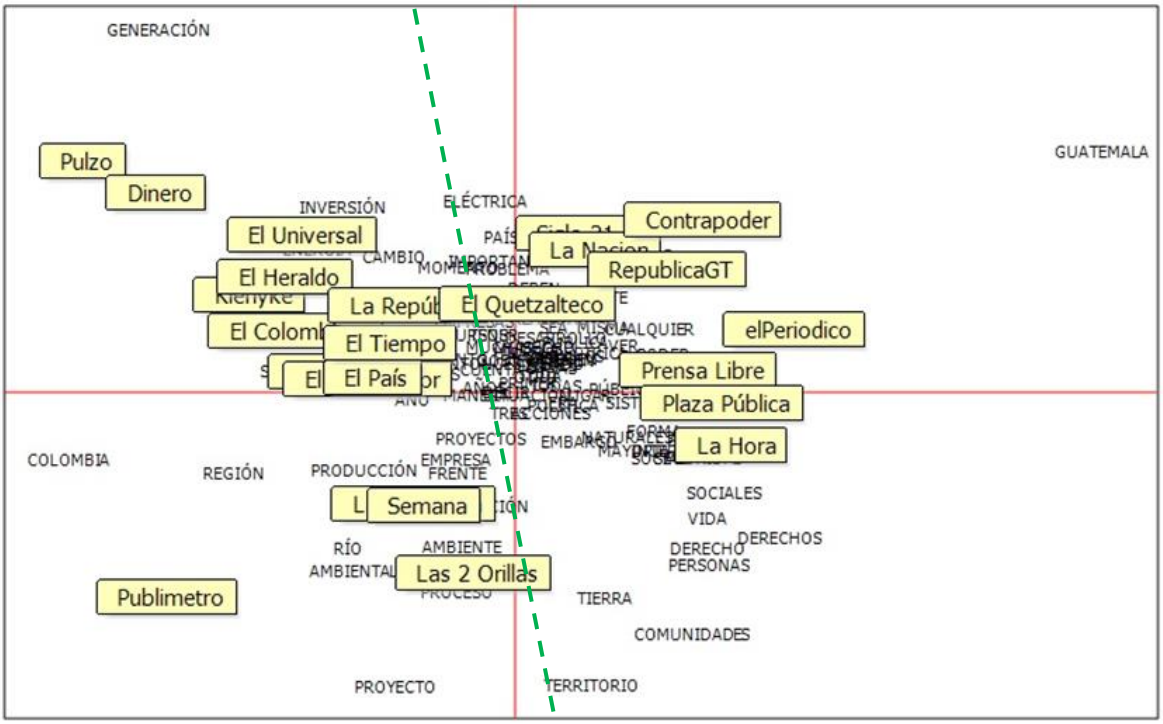

Figure 13. Correspondence analysis of the general corpus, showing the Top 100 words in terms of case occurrence. The green line –added by the author– divides the graph in two regions: to the left side are the Colombian news media and to the right the Guatemalan. (Prepared by the author with data from the corpus. Software: QDAMiner).

Next, another correspondence analysis was performed using phrases whose frequency was higher than 25 in the corpus, and its result is the graph shown in Figure 14. This graph is also consistent with previous findings. As it can be seen, once again the news websites were almost completely separated according to the country in which they are published, with the Colombian sites on the left side, and the Guatemalan sites on the right. The Guatemalan regional newspaper El Quetzalteco, was again the website closest to the origin, joined on this graph with the Colombian digital magazine *La Silla Vacía*. Most of the terms associated with each side were already presented in the previous section, connected to the same country. For example, there are terms like *cargo por confiabilidad* (surcharge for reliability), *billones de pesos* (billions of *pesos*), *energías renovables* (renewable energies) and *cambio climático* (climate change) on the side of Colombia. On the Guatemalan side there were other terms already linked to the country on the previous section, like *ministerio público* (prosecutorial office), *comunidades afectadas* (affected communities), *pueblos indígenas* (indigenous peoples) and *conflicto armado* (armed conflict). In general, the association of the Colombian texts with a hard-path argumentative and of the Guatemalan ones with a soft-path argumentative still held when analysing the corpus by medium.

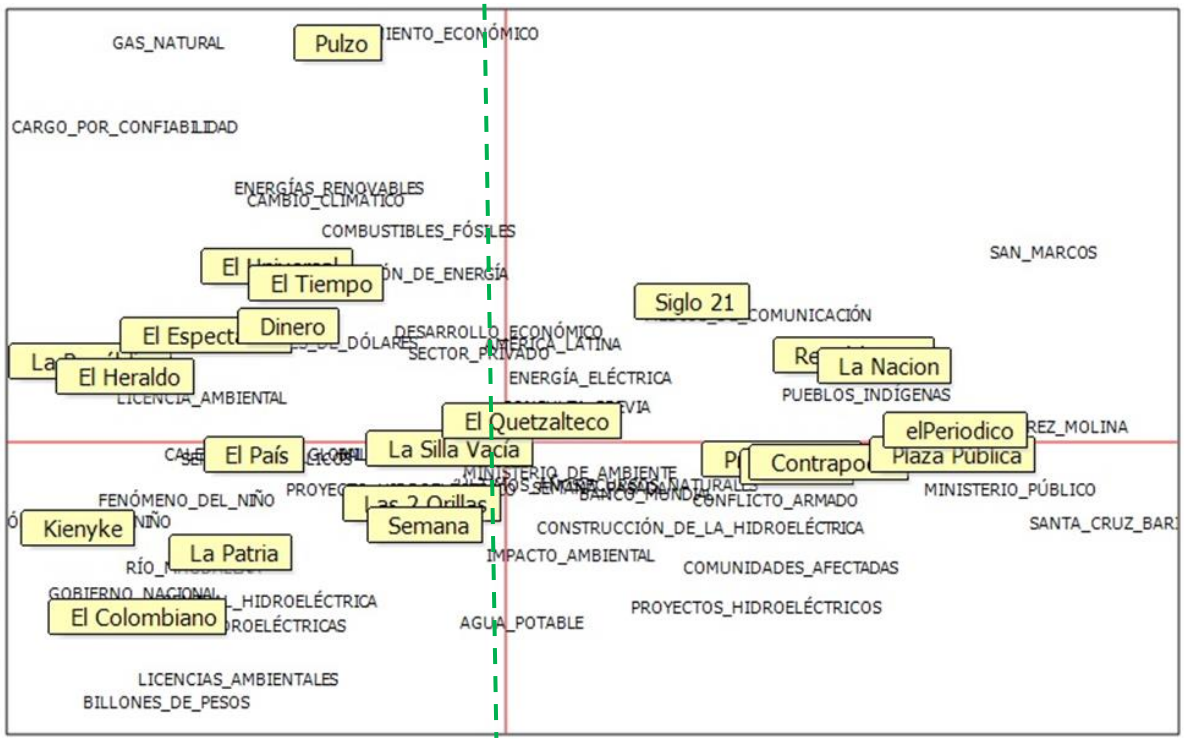

Figure 14. Correspondence analysis using phrases (n-grams) with frequencies larger than 25. Once again the green discontinuous line (added by the author) divides the graph in two regions, the one on the left with the Colombian digital media and on the right the Guatemalan (Source: prepared by the author with data from the corpus. Software: QDAMiner)

Both graphs in Figures 14 and 15 were consistent with previous analyses in another way. Both showed Colombian digital media spread over a significantly larger area than the Guatemalan side. This can be interpreted as wider topic diversity if compared with the Guatemalan media. The Guatemalan media were spread over a smaller area, as were the phrases on their side, which also seemed to be thematically closer than those on the Colombian side.

On the next stage, additional correspondence analyses on the variable "news medium" were performed, but focusing in each country's sub-corpora. Since there was already evidence of a thematic divide between countries, the next logic step was to look into the sub-corpora for thematic differences among the digital media belonging to each of them. Figure 15 shows the correspondence analysis for the Colombian sub-corpus, performed on the top 150 single word-types in order of term occurrence. The graph shows the words and the news media spread all over the plane. The way in which they were distributed suggests that they could be arranged in four or five groups in terms of their proximity: A first group in the top part, including *La Patria*, *El Colombiano* and *Kienyke*; a second group on the right side with *El Heraldo*, *Dinero* and *El Universal*; a third on the bottom-right with *El Espectador*, *El Tiempo*, *Pulzo* and *La República*; a fourth on the bottom left with *Semana* and *La Silla Vacía* and a fifth on the centre-left with *Las 2 Orillas* and *El País*. These last two groups could perhaps form a single one together.

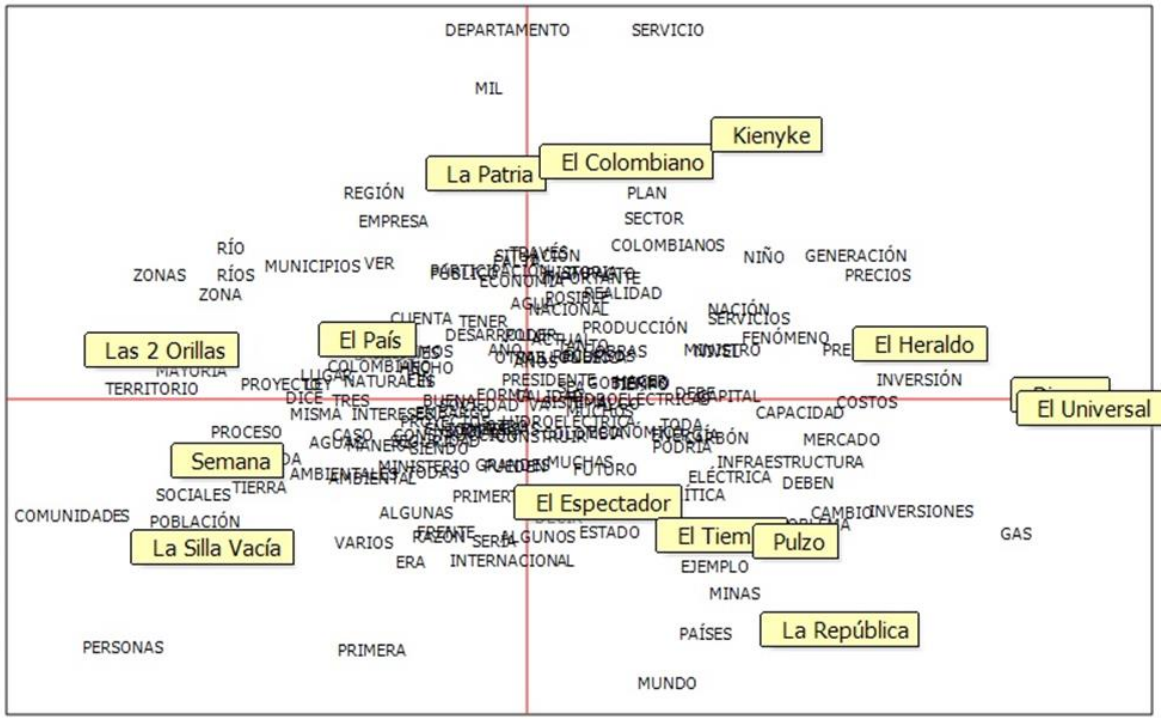

Figure 15. Correspondence analysis for the news media on the Colombian sub-corpus, using the 150 words with the highest term occurrence. (Source: prepared by the author, with data from the corpus. Software: QDAMiner).

In a correspondence analysis graph, the further an item (word-type or news medium) is from the centre, the more it can be considered to be significant in discerning other items on the graph from each other. Take for example the word *comunidades* (communities): it appeared to the far left, in the bottom section, in the same direction as the news media *La Silla Vacía* and *Semana*. It can be inferred that this word was more strongly associated to these two websites, while words like *ministerio* (ministry) and *construcción* (construction) which also were in the same direction, but closer to the origin, were not. In this order of ideas it can be argued, as well, that the news media that were closer to the centre are the ones that were less associated with specific word-types, i.e. the ones more "neutral", regarding their association to specific word-types. While there was no news medium that was distinctively on the origin, the closest ones were *El Espectador* and *El País*. On the other hand, news media like the *La Silla Vacía*, *Las 2 Orillas*, *La República*, *El Universal*, *Dinero* and *Kienyke*, which were the farthest, can be considered to be associated with specific sub-sets of word-types. For example, the words in similar directions as *La Silla Vacía* and *Semana* and further located from the origin, were *personas* (persons), *comunidades* (communities), *población* (population or town), *sociales* (social) and *tierra* (land).

However, if the correspondence analysis is performed to phrases in the Colombian sub-corpus, the graph changes significantly. Figure 16 shows the resulting graph, applied to the phrases with a frequency higher than 30. Some of the news media that were far in Figure 11, ended up far from the origin in Figure 12 too:

La Silla Vacía, *Las 2 Orillas*, *El Colombiano* and *El Universal*. In the case of the first two, they were closely positioned to each other on the previous graph as well as on this one. It can also be seen that some of the phrases associated with *La Silla Vacía* and *Las 2 Orillas* were *derechos humanos* (human rights), *consulta previa* (previous consultation), *proyecto hidroeléctrico* (hydroelectric project) and *recursos naturales* (natural resources). These phrases indicate that these two websites were likely associated with a soft-path argumentative. Other news media appear closer to the origin on Figure 16 than they were on Figure 15, like *Dinero*, *La República*, *Semana* and *Kienyke*, while El *Espectador*, *El Tiempo*, *El País*, and *El Heraldo*, remained with similar distances as in the previous graph.

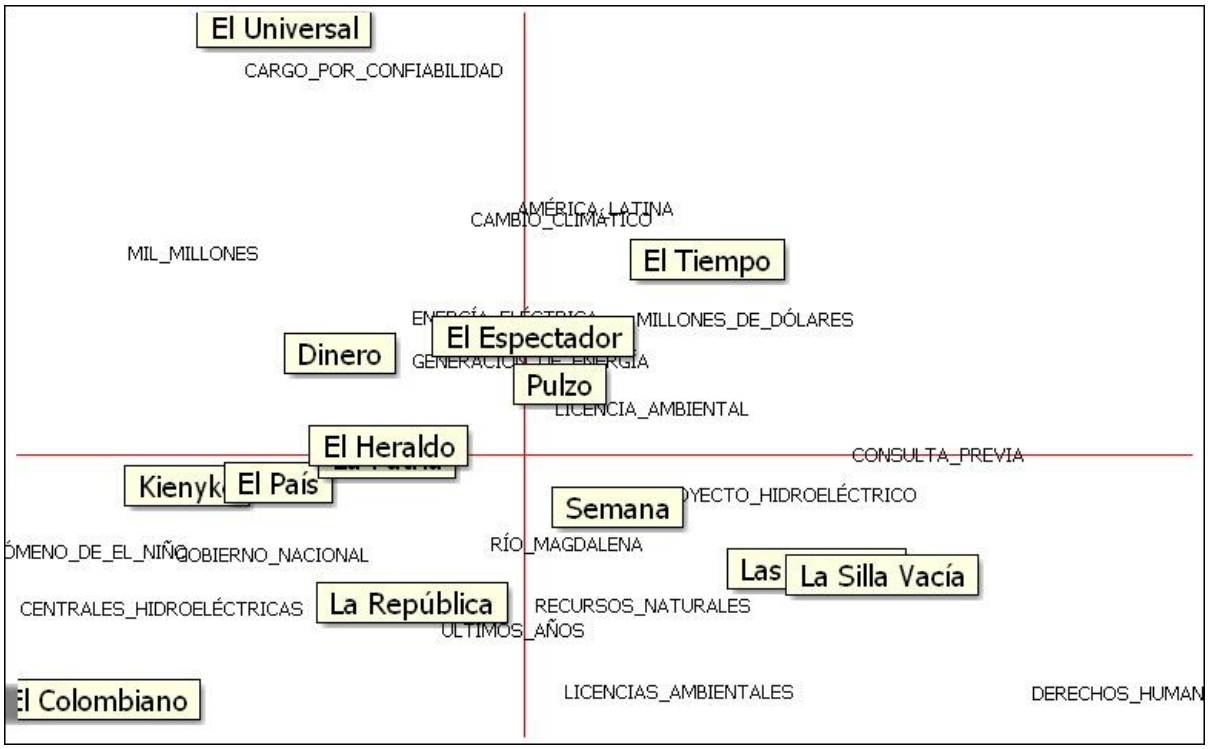

Figure 16. Correspondence analysis for the news media on the Guatemalan sub-corpus, using the phrases with frequency of 30 or higher. (Source: prepared by the author, with data from the corpus. Software: QDAMiner).

In the case of the Guatemalan sub-corpus, it was also run a correspondence analysis to the Top 150 single word-types in terms of case occurrence. Figure 17 shows the resulting graph. Notice how the newspaper *El Quetzalteco* stands out from the rest of the news media, positioned on the top right corner. It should be noted that there were no word-types in the vicinities of it. The result makes sense if it is recalled that *El Quetzalteco* is the only news medium not based in Guatemala City; moreover, previous results are consistent with this one, in particular, the fact that in the graphs presented in Figures 13 and 14, *El Quetzalteco* was already apart from the group of Guatemalan news media. It also should be noticed how the newspaper *Prensa Libre* was positioned almost exactly on the origin of the graph, which makes it the most "neutral" in terms of word-types. This is an interesting finding, due to the fact that *Prensa Libre* is

generally viewed in Guatemala as a traditional, conservative newspaper (Wotke, 2016); it would be reasonable, then, to expect that it will be associated with a specific set of word-types. This might indicate that its opinion section is open to a wide range of views, not only those subscribed by its Editorial Board. Regarding the other media, it can be seen that *Contrapoder* and *elPeriódico* are very close on the third quadrant (bottom-left); *La Hora* and *Plaza Pública* are located close in the second quadrant (top-left); *RepúblicaGT* is on the fourth quadrant (bottom right); and *La Nación* and *Siglo 21* are on the right almost on the horizontal axis.

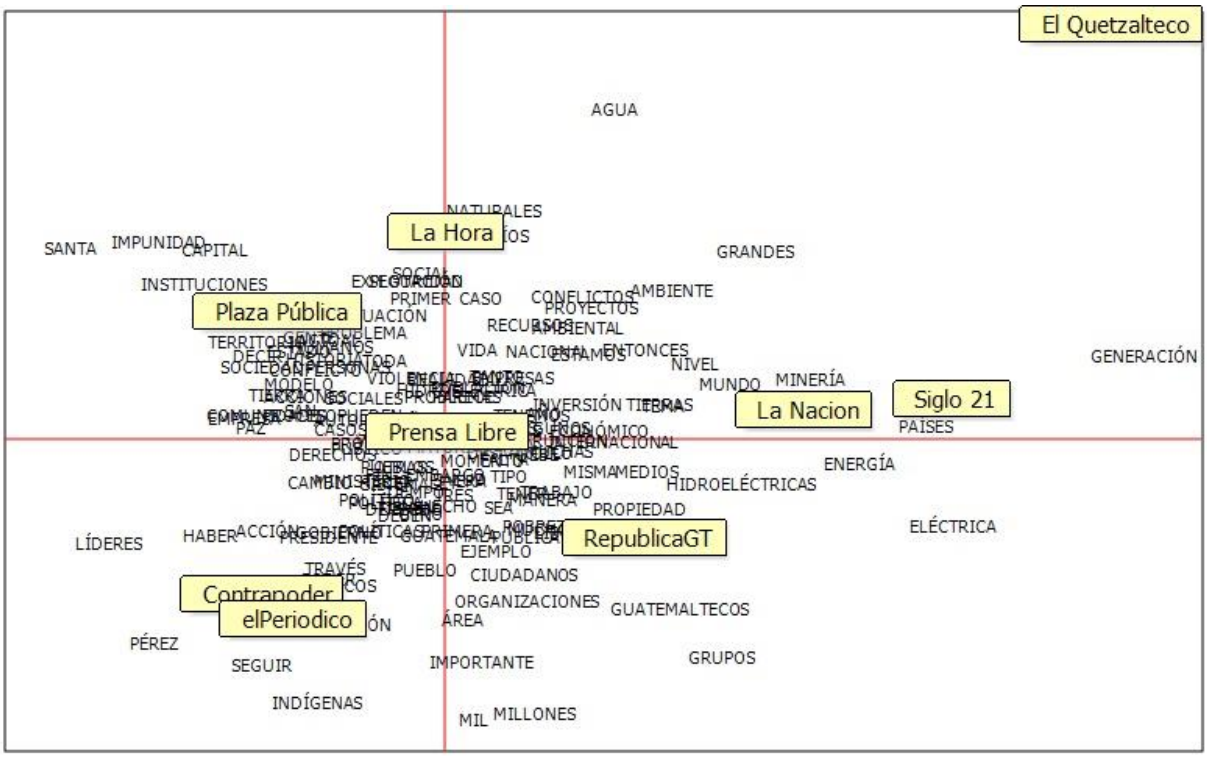

Figure 17. Correspondence analysis for the news media on the Guatemalan sub-corpus, using the 150 words with the highest term occurrence. (Source: prepared by the author, with data from the corpus. Software: QDAMiner).

As it was done with the Colombian sub-corpus, a correspondence analysis on phrases was also performed on the Guatemalan one. Figure 18 shows the resulting graph. It also had evident differences with the word-type correspondence analysis, as it was the case with the Colombian sub-corpus. Notice how *El Quetzalteco* was no longer the news medium that was the farthest from the others, and instead it was *Siglo 21* that took that place. Most of the news media ended up close to the origin, with *Prensa Libre* being again the closest one to the origin, and on the proximity to a group to its left that included *La Hora, RepúblicaGT, El Quetzalteco* and *La Nación*. The other media were somehow scattered on the graph: *Contrapoder* on the low-centre, *El Periódico* near to the origin but to the right, and *Plaza Pública* on the first quadrant. The medium with more closely associated phrases was *Contrapoder* which was near *sistema de justicia* (justice system), *partidos politicos* (political parties), *Banco Mundial* (World Bank) and *Otto Pérez*

Molina (President of Guatemala in 2010-2015). *Plaza Pública* seemed to be strongly associated with *Hidro Santa Cruz* (a hydroelectric project) and *Santa Cruz Barillas* (the town near the *Hidro Santa Cruz* plant), while *Siglo21* with *propiedad privada* (private property) and *construccion de hidroeléctricas* (construction of hydropower plants). The group on the centre-left could be associated with *conflictividad social* (social conflicts), *explotación minera* (mining exploitation), *derechos humanos* (human rights), *conflicto armado* (armed conflict), and *desarrollo rural* (rural development). As it was seen before, these are core terms for the representation of hydroelectricity as a source of conflict, and can be linked to a soft-path argumentative. The fact that the majority of news media in the Guatemalan sub-corpus could be linked with this argumentative line was consistent with previous results.

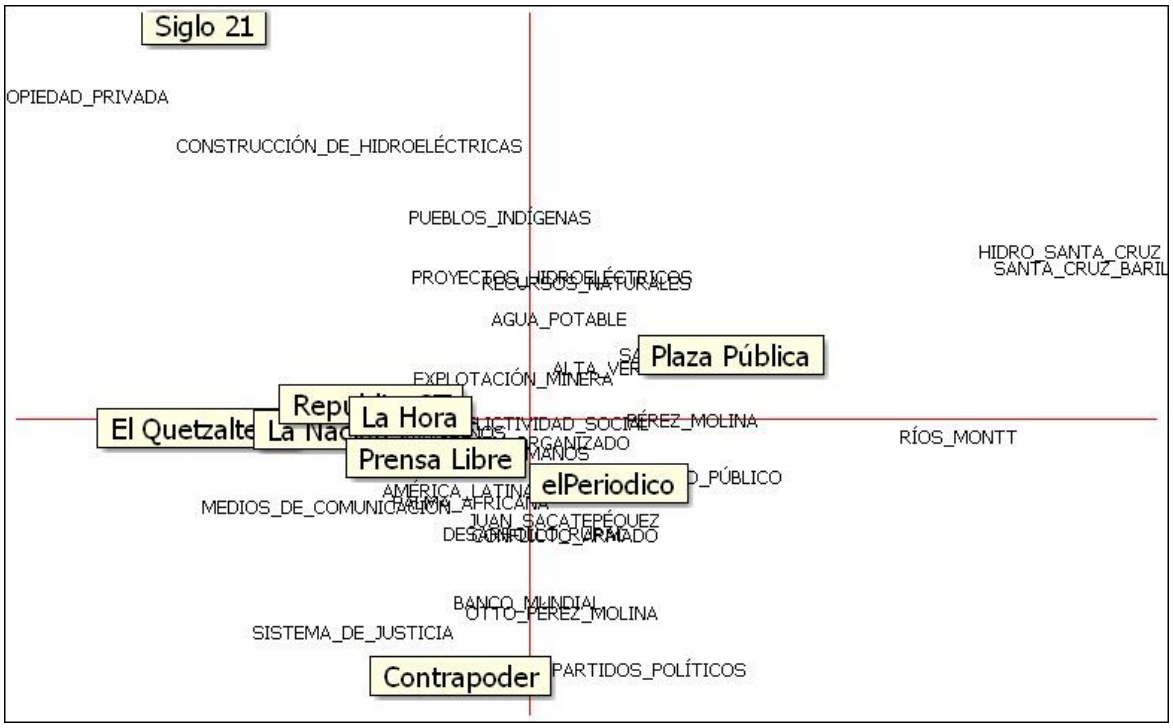

Figure 18. Correspondence analysis for the news media on the Guatemalan sub-corpus, using the phrases with frequency of 15 or higher. (Source: prepared by the author, with data from the corpus. Software: QDAMiner).

7.5.3 Analysis of the corpus by time period

In section 7.4, where a brief description of the corpus was provided, it was shown in Figure 7 that there was a significantly lower quantity of articles from the period of 2010-13 (four years) in comparison to the period of 2014-15 (two years). It was also stated that this difference, more than representing a spike in the national interest in each country on the subject of hydroelectricity, reflected the lack of a proper digital archive on news sites and the proliferation of digital news outlets of the last two years. For this reason, it was decided that the research strategy regarding the "date" variable, was going to be focused on the last two years. However, as a preliminary inquiry, correspondence analyses on each country's sub-corpora

were performed, contrasting the texts in each of them with the year of publication. It was decided that such an analysis on the general corpus was not going to be carried out, since it could be reasonably expected that news cycles in each country would be different enough to make a correspondence analysis not relevant for describing the corpus.

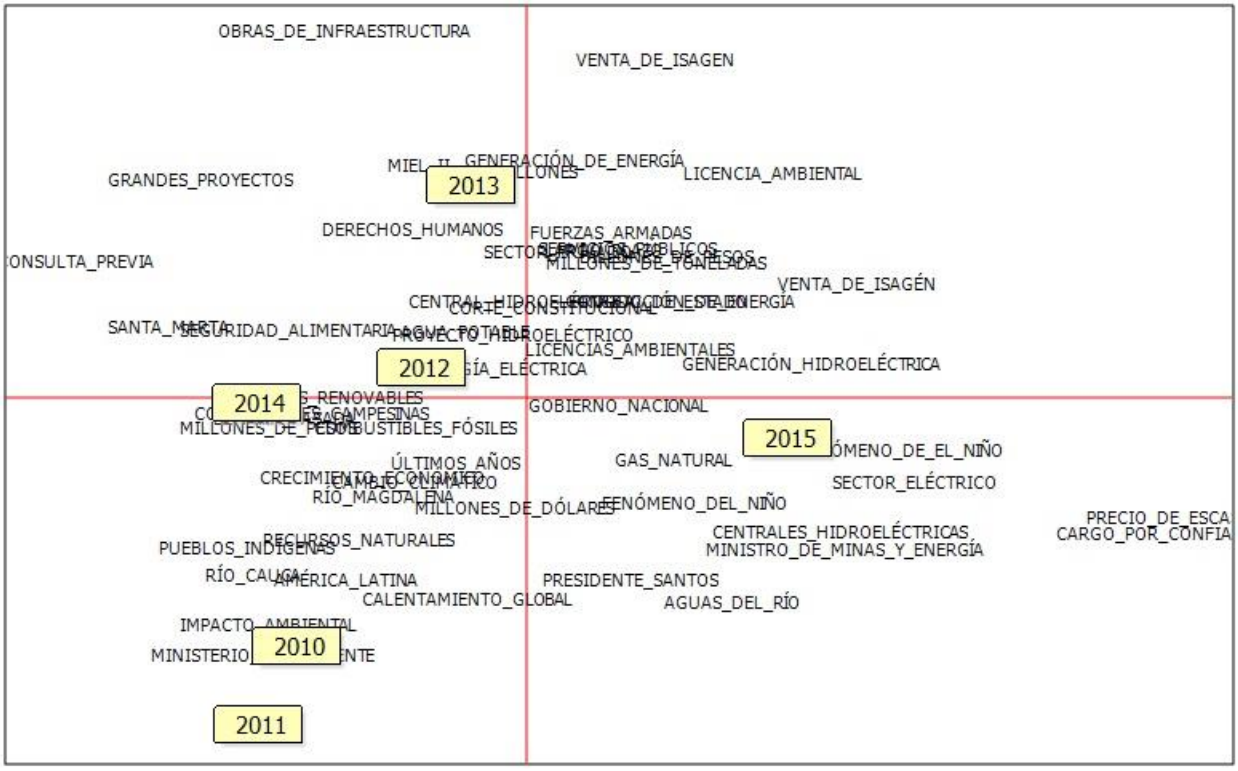

Figure 19. Correspondence analysis by year on the Colombian sub-corpus, using phrases with frequency of 25 or higher. (Source: prepared by the author, with data from the corpus. Software: QDAMiner).

The result of the correspondence analysis performed on the Colombian sub-corpus, comparing year against phrases, is shown on Figure 19. Notice how the year 2015 ended up on the right side of the graph, apart from the all the others. It can be seen also that spatially, there were three groups, placed in a way that could be compared to a time trajectory: going clockwise, it starts with, 2010 and 2011, at the bottom left; second, 2012, 2013 and 2014 from the centre-left to the top-left; and finally, 2015, taking the whole right side. This indicates first, that there can be traced a shift in topics and phrases on the spotlight through the years, according to each period; and second, that there was a clear divide on the phrases and topics associated with 2015 and the rest of the years. The last conclusion also partially justifies the focus on the latter years for more in-depth analysis.

Regarding the Guatemalan sub-corpus, Figure 20 shows the resulting correspondence analysis graph. It was performed to phrases (n-grams up to 4 terms) with frequency higher than 25, as it was done with the Colombian sub-corpus. The graph also shows a time trajectory, going clockwise from the top-centre with

the years 2010 and 2011; followed by the year 2012 to the right; then the year 2013 on the top-bottom; and finishing with the years 2014 and 2015 on the left-centre. It can also be seen that most of the phrases were closer to the years 2014 and 2015 than to other years, which also supports the idea of performing deeper analyses for that period. The year 2012 stood out from the rest as being the most distant from the origin. However, there were only two phrases that were associated with it: *estado de sitio* (state of emergency) and Santa Cruz Barillas, a rural town in Huehuetenango, Guatemala, in which, precisely in 2012 –as it was discussed in Chapter 5– a conflict exploded around the development of the Hidro Santa Cruz hydropower plant.

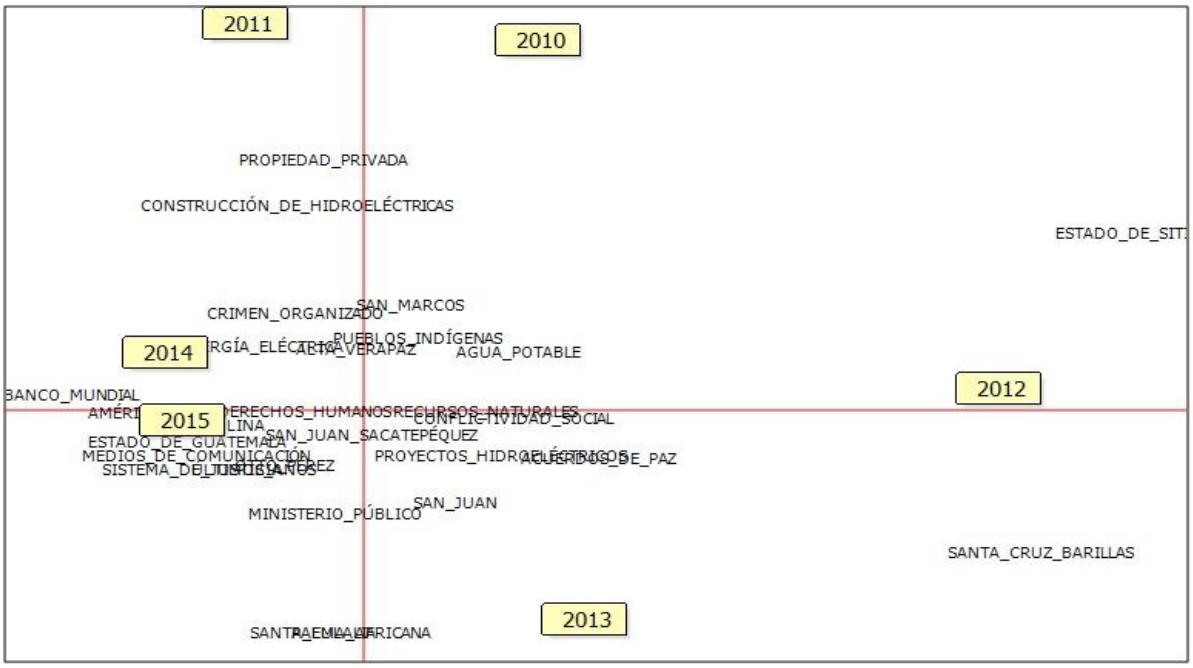

Figure 20. Correspondence analysis by year on the Guatemalan sub-corpus, using phrases with frequency of 25 or higher. (Source: prepared by the author, with data from the corpus. Software: QDAMiner).

To begin the analysis of the 2014-15 period, the first step was to plot the number of articles published by month during it, in order to discover trends in the corpus that with a simple year classification could be overlooked. A separate plot was made for each country. For each country, the mean number of articles by month was calculated, followed by the standard deviation of the group of data. The resulting plot was used to determine the extent and number of sub-periods in which each country's two-year sub-corpora could be divided.

Figure 21 shows the plot made for the Guatemalan 2014-15 sub-corpuses. The dotted line above (and below) the line of the mean was the result of adding (and subtracting) the standard deviation from it. This was made as a way to differentiate between periods of high media presence of the keywords and low

media presence. The trends in Figure 22 point to a division of the two-year period in four sub-periods (in parenthesis, the trend of the keywords during each sub-period):

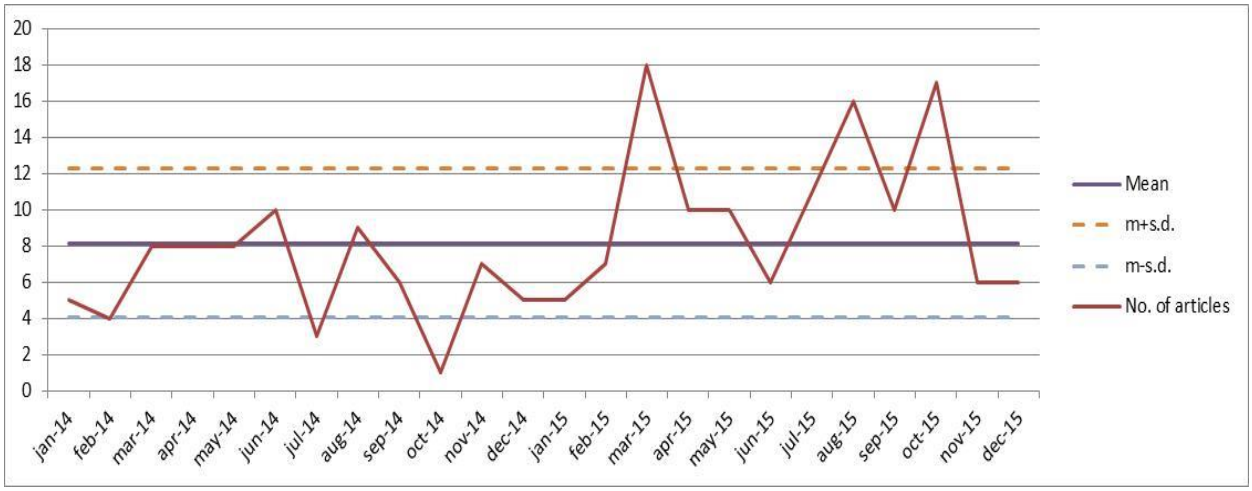

Figure 21. Number of articles per month in the Guatemalan 2014-15 sub-corpus. (Prepared by the author, with data from the corpus. Software: Microsoft Excel)

1. January - September 2014 (average presence; label: Jan-Sep14)
2. November 2014 - February 2015 (low presence; there were no articles from October, that is why this period starts on November; label: Nov14-Feb15)
3. March - October 2015 (high presence; label: Mar-Oct15)
4. November - December 2015 (average presence; label: Nov-Dec15)

After defining these sub-periods, the next step was to run a correspondence analysis between them (as a new variable) in the Guatemalan 2014-15 sub-corpus, in order to search for associations between them and word-types or phrases. Figure 22 shows the resulting graph for phrases with frequencies higher than 10.

This graph shows, as the previous, a clear time trajectory that starts, moving counter clockwise, on the bottom-right with the periods of Jan-Sep14 and Nov14-Feb15; then the period of Mar-Oct15 on the centre-left; and finally, Nov-Dic15 on the top-right. Notice that the third period, Mar-Oct15, was the only category that ended up on the left side of the graph, a fact that can be interpreted as a significant difference on the phrases associated with this period and the others. This separation makes perfect sense when the political events of the time are reviewed. Starting in early March, 2015, with an official visit of the United States Vice-President Joe Biden to pressure Central American governments into containing a child-migration emergency, a national crisis of large proportions unravelled (Bermúdez, 2015). The events that followed, including a major corruption scandal that involved a large amount of government officials, ended with the resignation in September, 2015, of President Otto Pérez Molina, a former Guatemalan Army General who

was finally accused of being the head of a corrupt criminal organization. Although this crisis seems to have little to do with hydroelectricity, political commentators and journalists connected the subsequent political unrest with the general state of conflict in the country, which included the protests against hydropower plants. That is the reason some of the phrases associated to this period were *Otto Pérez Molina*, *sistema de justicia* (justice system), *ministerio público* (prosecutorial office), *crimen organizado* (organized crime), and *líderes comunitarios* (community leaders).

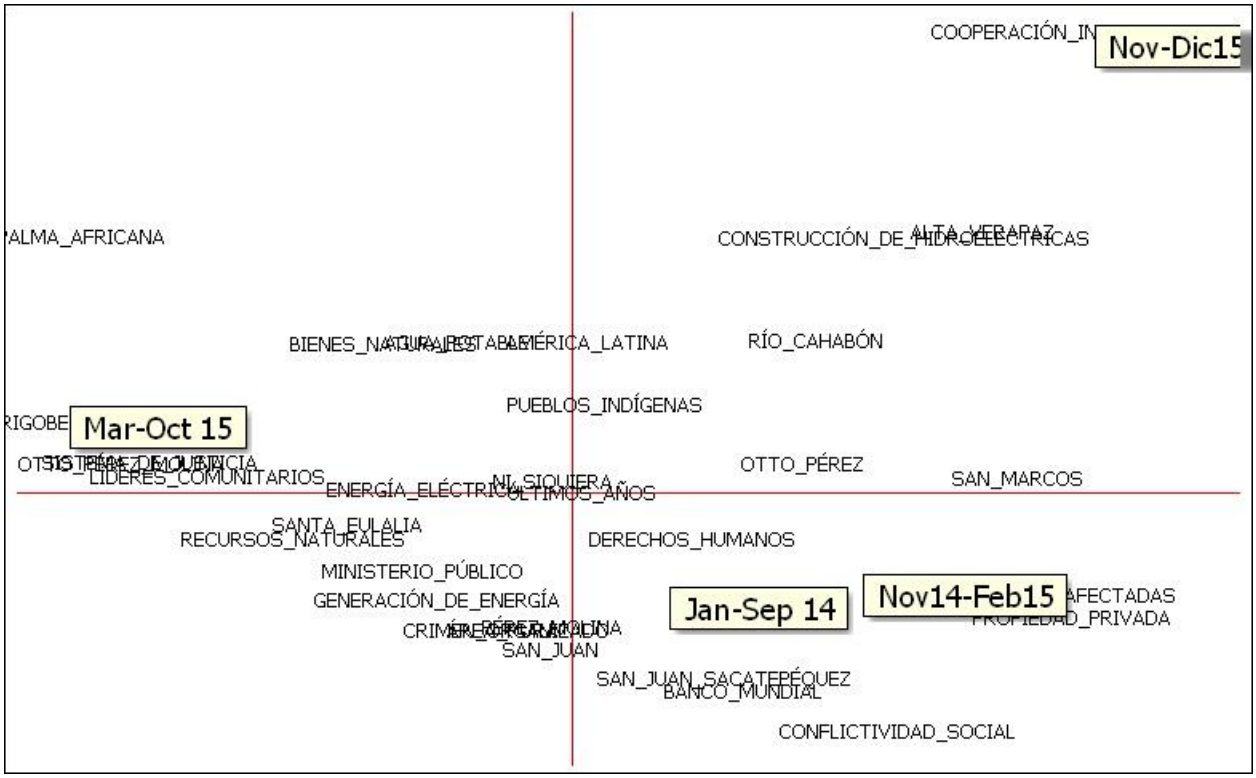

Figure 22. Correspondence analysis for sub-periods in the Guatemalan 2014-15 sub-corpus, using phrases with frequency of 10 or higher. (Source: prepared by the author, with data from the corpus. Software: QDAMiner).

Regarding the other periods on Figure 22, it can be seen that there were less phrases associated to them, and that their type fitted more with the environmental conflict argumentative –and the soft-path of energy transitions –, for example: *conflictividad social* (social conflict), *comunidades afectadas* (affected communities), *derechos humanos* (human rights), pueblos indígenas (indigenous peoples), *Río Cahabón* (a river where a large hydroelectric project is currently being developed) and *construcción de hidroeléctricas* (construction of hydropower plants).

Let us turn now our attention upon Colombia. The same procedure described for the Guatemalan 2014-15 sub-corpus was applied to the Colombian one. The resulting graph can be seen in Figure 23. The keyword presence in this sub-corpus manages to stay within the standard-deviation distance around the mean which indicates that for most of the period there was a steady flow of articles related to hydroelectricity.

However, it can be seen that before March 2015, the numbers stay below, whereas after that date there is slight increase in the number of articles. The only clear surge is seen in the last months of 2015. For this reason, in the case of Colombia it was decided to work with three sub-periods:

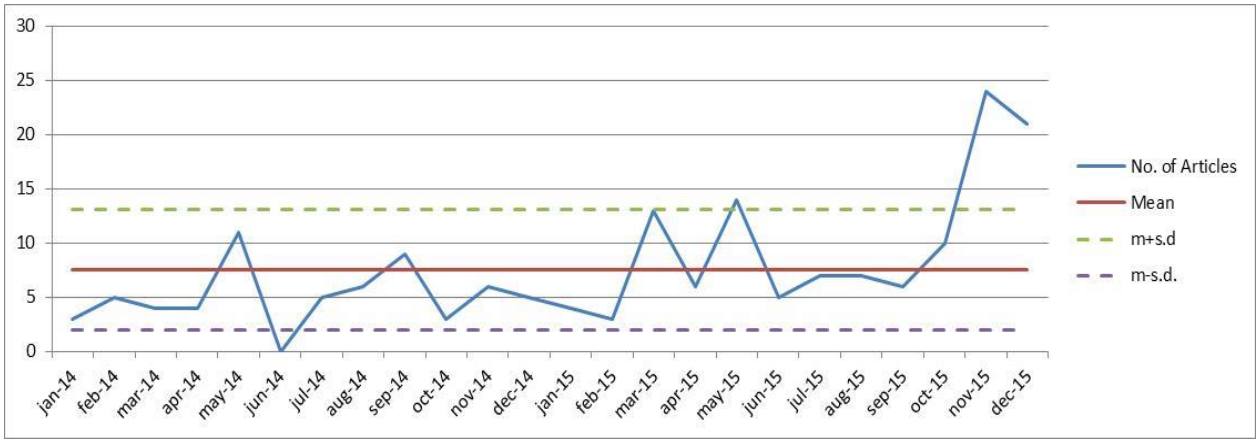

Figure 23. Number of articles per month in the Colombian 2014-15 sub-corpus. (Prepared by the author, with data from the corpus. Software: Microsoft Excel)

1. January 2014 – February 2015 (label: Jan14-Feb15)
2. March – September 2015 (label: Mar-Sep15)
3. October – December 2015 (label: Oct-Dec15)

After labelling each text with its corresponding sub-period, a correspondence analysis was run using the phrases with frequencies higher than 15 and contrasting them with the three periods described. The resulting graph is shown in Figure 24. Once again it could be traced a temporal trajectory, starting on the top-left and going counter clockwise: first, the period of Jan14-Feb15; second, on the bottom-left, the period of Mar-Sep15; and finally on the centre-right, the period of Oct-Dec15. The fact that stands out is that the shortest and last period was clearly separated in the graph from the other two. It is clear here that the surge in articles that occurred in that period was also thematically different from the other periods in those two years. In fact, there was a severe energy crisis in Colombia, whose first symptoms started manifesting in October 2015, and that was aggravated by a drought caused by El Niño Phenomenon (*Fenómeno del Niño*, one of the phrases associated with that period in Figure 24) that affected hydropower plants all over the country (Mateus Valencia, 2016). There were concerns that although there had been for the past years a surcharge in the price of electricity precisely to prevent this kind of crisis (*cargo por confiabilidad*, also one of the phrases), the government would not be able to face the emergency, and that power cuts and an increase in the maximum authorized price of electricity (*precio de escasez*) would be necessary. As in the Guatemalan case, the phrases associated with the other periods are less specific and

more conventional –for the Colombian context as it has been studied so far –regarding the role of hydroelectric energy.

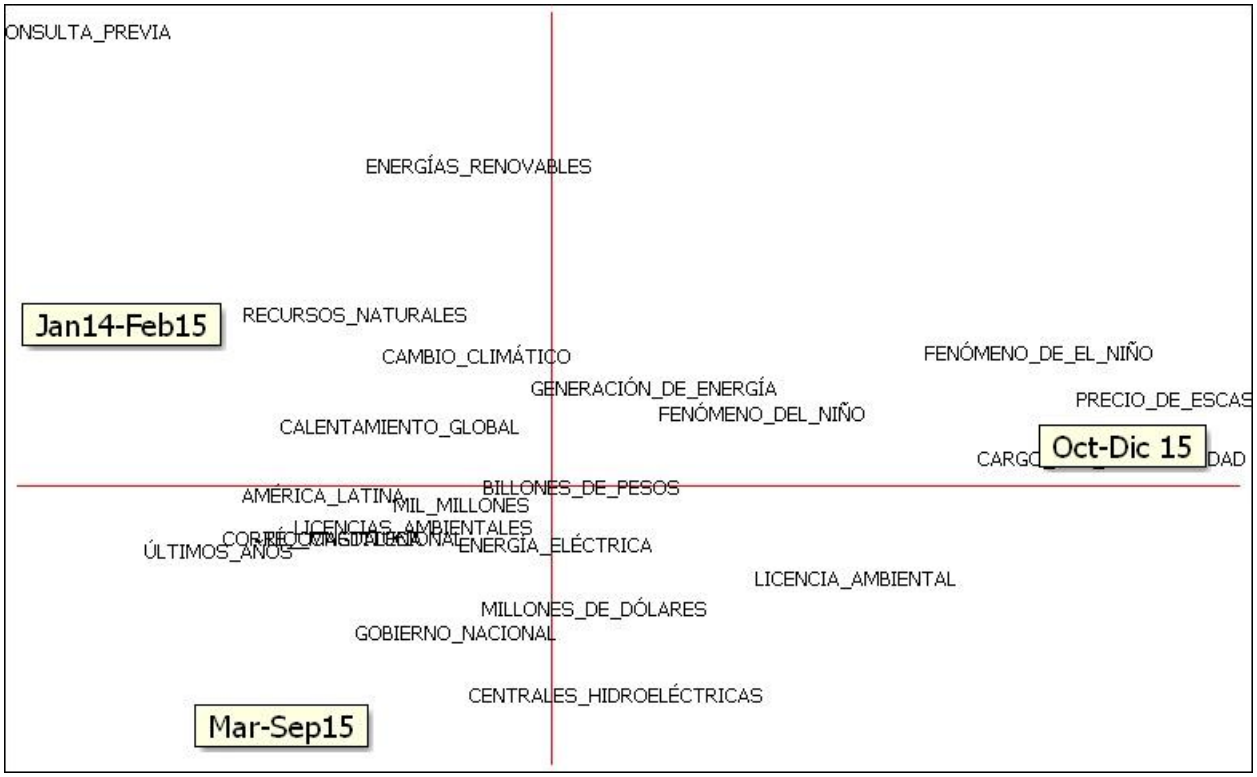

Figure 24. Correspondence analysis for sub-periods in the Colombian 2014-15 sub-corpus, using phrases with frequency of 15 or higher. (Source: prepared by the author, with data from the corpus. Software: QDAMiner).

7.6 Conclusion: Media representations as narratives of energy transitions

After having reviewed the corpus and analysed the texts in it by contrasting them with their ex-ante attributes, some conclusions can already be put forward. The first and most discussed so far is that there are clear differences between the Colombian and the Guatemalan sub-corpora. Every analysis performed in which the "country" variable has played some role has led to the conclusion that there are differences in the representations of hydroelectricity in each country's media. As a consequence, it can be said that the country comparison has successfully showed that there are elements in the media representations of hydroelectricity in Guatemala that are locally bound and that are not as significant in other country –in this case, Colombia – in which there are ongoing conflicts around hydroelectric and mining developments.

The most remarkable difference on the country level has been thoroughly discussed in the previous sections, but it is worth to recapitulate here. There have been various levels of analysis of the corpus, first in its entirety and then divided in two sub-corpora, one consisting of the Colombian texts, and other of the

Guatemalan. The analysis has also being carried out by contrasting different ex-ante attributes or variables assigned to each text, like country, date, and news medium. In addition, different methods have been used to perform the analysis, like correspondence analysis, term extraction, network mapping and text clustering. In almost all of these instances, strong evidence has been found for the association of the Colombian sub-corpus with the hard-path argumentative for energy transitions (Brondi, Armenti, Cottone, Mazzara, & Sarrica, 2014; Devine-Wright, 2007; Lovins, 1976). At the same time, the same analyses, carried on the Guatemalan sub-corpus, have produced also strong indications for its association with the soft-path argumentative. Let us review some texts from each sub-corpus as an example of how these associations were presented.

The first texts that are going to be presented are associated to the clusters on the upper part of the graph in Figure 11, the ones that were labelled "Human rights and extractive corporations" and "Public order and community authorities". Most of these texts are from the Guatemalan sub-corpus, but there are also some from the Colombian. The first example is this quote from an article published in Prensa Libre (Guatemala) by Kajkoj Máximo Ba Tiul[16]:

> "Everybody thinks that everything is going fine, just because the President arrives to the opening of a hydropower plant or a centre of production. But nobody notices the flagrant violation of the rights of the people –men and women – that the only thing they want is to live well. All of this is hidden when the talk is about hydroelectric projects" (Ba Tiul, 2014).

In this case it is clear that the author associated hydroelectric projects to concerns that the people's fundamental rights were being violated, and that it threatened their wellbeing. This is, evidently, a text that is in opposition of hydroelectricity in which the discourse is closer to a soft-path argument. And yet, this association can also be found in texts published in Guatemalan media that support hydroelectricity, although in terms that are critical of the protesters, as it is shown in the next text, from the right-leaning website República.Gt:

> [Developed countries] have realized that taking care of the environment is fundamental for the development of their population. Consequently, some of the solutions that they have proposed as viable and capable of guaranteeing supply for the communities are wind, thermal and hydroelectric energy sources. However, we see that in Guatemala, the conflicts, generated by the disinformation of interest groups, keeps development frozen. Because in this conflict, the actors that incite to invade and destruct hydropower plants are activists that claim that they are defending the rights of the population, while receiving international funding and shielding themselves on the protection of the environment and the territory (Gereda, 2014).

The author of this column, Sylvia Gereda, was clearly in favour of developing hydropower projects, and although her first phrases established a representation of them closer to a hard-path narrative

[16] All the quotes in this section are freetranslations from Spanish made by the autor.

("development of the population", "guaranteeing supply"); but then, as she discussed the conflicts, she stressed that activists claim that they are "defending the rights of the population" and "shielding themselves on the protection of the environment and the territory". This quote, although it does not see hydropower as the source of conflict, cannot totally separate the former from the latter, even as it questions the motivations of its critics. In another example, the Editorialist from the same website, in an article that discussed the current legal processes against the Guatemalan State for the Chixoy case, states that,

> It cannot be denied that it is good that there is a process of reparations since the [Guatemalan] State has committed a wrong, mostly in terms of Human Rights. At the time, and maybe to this day, Chixoy has been a place of dearth and suffering. It is undeniable that Guatemalans have to be solidary with those affected. But the compensation has to be on the same proportion of the damage, and it does not have to imply that the exceeding quantities have to be paid by this and future generations of Guatemalans (Editorial República, 2014).

This Editorialist went a step further than the previous, since he or she recognized that the development of Chixoy was the source of damages and suffering and that an adequate compensation is in place; however, he warned that awarding it in excess could have consequences for the finances of the Guatemalan State. It has to be noted that this article did not express a position regarding the current developments in the energy sector, but concentrated in analyzing the Chixoy case.

In the case of Colombia, there are also texts that can be associated with a soft-path narrative and the clusters mentioned above. One good example is this quote from the article by Juan Diego Restrepo in the Magazine *Semana*, which discussed the development of the large hydroelectric project Hidroituango:

> However, not everything is as ideal as it seems. The inhabitants of the area of influence of the project have expressed serious concerns and have stated in many ways to let know the country and the international community about the negative effects that the development of this projects have had; among them, the destruction of the social fabric as a consequence of the displacement that were forced into dozens of community members, loss of artisanal practices of mining and fishing in the Cauca River and, in consequence, a reduction of those families' incomes (Restrepo, 2014).

Although the article started by emphasizing the large size and importance of the projected hydropower plant, rapidly shifted to its main argument, clearly expressed in the above quote. The argument here also can be seen as an example of a soft-path narrative, since it put at the centre of the energy transition, the social and environmental concerns of the population that lives in the area of influence of the project, and the efforts of the community to interest the national and international public in their struggle.

In the case of hard-path narratives, the quantity of articles in the Colombian sub-corpus that show some association to that type of discourse is larger than in Guatemala. The next quotes come from articles that were in the cluster "Renewable energies and climate change" of Figure 11. The first is from an article in the

Colombian newspaper *El Espectador*, written by Mary Lou Higgins, and is a representative example of the type of rhetoric used in hard-path narratives:

> On the international level, Colombia has been recognized as a leading country among those that have promoted the negotiations around climate change. It is known by its clean electrical energy matrix, which depends, up to 70%, on renewable energies, especially hydropower. Moreover, Colombia is committed to reducing forest clearance, with the goal of arriving to a zero net deforestation rate on the Amazon region by the year 2020. (Higgins, 2014)

This article makes the case for not developing fracking facilities (a technology that obtains natural gas from deep-rock formations by pumping fluids into them) in Colombia, arguing that renewable energies are the correct way to follow in regard of energy investments. In the cited paragraph, the author stressed the importance of the renewable energy matrix, including hydropower, in the role of Colombia as an international leader in the issue of climate change. It is clearly a hard-path narrative that treats energy as a national strategic asset.

The next text, an article by Tatiana Dangond in the regional newspaper *El Heraldo*, is another example of a hard-path narrative, although in this case its depiction of hydropower is not totally positive:

> Although Colombia stands out as an emerging country in terms of economic development and environmental protection, it has an internal legal framework that, beyond the ratification of the [Paris Climate] Agreement, demands larger environmental care than the one that is currently being executed. While the world promotes wind or solar energy, in Colombia, the Government gets into fights over hydropower plants like El Quimbo, which, although it has been suspended by a ruling of the Constitutional Court, is expected to keep operating because of the threat of blackouts (Dangond, 2015)

This article discussed the actions that Colombia needed to take in the wake of the signing of the Paris Climate Agreement, and although it referred to hydroelectricity in a rather negative way, portraying it as part of an old paradigm in contrast to new technologies embraced in other countries like wind and solar, it still envisions energy policy as part of a national project, in the face of a global threat, man-made climate change. It is in this way that this article fits better a hard-path than a soft-path narrative.

There were fewer articles from Guatemalan news websites in the cluster “Renewable energies and climate change”, but their texts also fit into a hard-path discourse. The next quote is from an article by Juventino Gálvez, published in the news website Plaza Pública:

> Regarding energy, let us remember that 84% of the national energy needs are fulfilled with firewood. However, there are no noticeable actions to satisfy these needs in an organized and sustainable way, and even less actions directed at providing modern energy to the population that currently depends on firewood. To make the panorama even more complex, the needs in terms of electrical energy are far of being taken care of

> through an intelligent strategy by optimizing the current availability and diversifying with renewable sources, including small and medium hydropower plants (Gálvez, 2012).

This article discussed what to expect in regard of environmental policy from the newly-appointed (at the time) administration of Otto Pérez Molina. It is interesting that this quote in particular inserts well into the narrative developed in the first chapter of this dissertation, a fact that also shows that that particular discourse can also be associated with a hard-path narrative. In this case, like in the previous two examples, the discourse linked energy with a national project; however, in this case, the narrative was more connected to human development than to the influence of the country in the international arena or the threat of climate change, as it was the case of the two quotes from Colombian media.

Now that some excerpts have been reviewed, it can be concluded that, although there were examples in both sub-corpora of hard-path and soft-path narratives of energy transitions, the quantitative content analysis shows that the Guatemalan sub-corpus was more strongly associated with a soft-path narrative, while the Colombian with the hard-path. The analysis performed included correspondence analysis and network mapping, and it also showed that the Colombian media representations were more diverse (Figures 13, 14 and 15) in regard of the subjects and issues they discussed and analysed, while representations in the Guatemalan sub-corpus were more focused in a few issues, all revolving around soft-path narratives, like socioenvironmental conflicts, communities rights and public participation and negotiations. In the case of Colombia, just the examination of the two excerpts presented when discussing hard-path narratives in that sub-corpus showed that thematic diversity: the first article discussed the possibilities of changing the energy matrix of the country, and the second, the role of Colombian energy policies regarding the climate change threat, both internationally and domestically. In contrast, even the example presented from Guatemala that showed a hard-path narrative focused on human development and inserted itself in the very discourse of the promoters of the energy expansion. One small observation is necessary before moving on to the next topic: most of the conclusions presented in this section treat the research developed and discussed on this chapter as an independent inquiry, with no relation with that presented in Part Two; the analysis of how those two research phases complement, enrich or even put each other to the test, will be left for the final chapter of the dissertation.

In regard to the media representations that associated the mining and hydroelectric industries as part of a larger extractive complex, the quantitative analysis gave some evidence that they prevailed more in Guatemala, although in this case, the differences with the Colombian media were not so strong. One good example of this connection is this excerpt from an article by Ricardo Rosales Román in the newspaper *La Hora*:

> Based on the accounts collected, [the International Mission from the United Nations] could verify that "encouraging a development model based on extractive projects", precludes rural and indigenous communities from having "access and control" of the natural resources and in the case of mining and hydroelectricity, that [it allows] permits to be awarded "without a previous, free and informed consultation to the affected communities, or without respecting their results". The extractivist model of development, in a broad sense, encompasses the food and fuels agro-exporting monocultures, and the mining and hydroelectric projects (Rosales Román, 2014).

The author of this article is a former guerrilla commander who was one of the signatories of the Peace Accords of 1996. In this article he discussed the findings of an UN International Commission after its visit to six of the locations of environmental conflicts. The views expressed in this text summarized a representation[17] that is common among activists and popular organizations, the extractivist model of development. The association between mining and hydropower in this excerpt is clear, and in fact they are mentioned together not one, but two times. The most remarkable fact, however, is that the link with the two industries is also made in the case of the articles that are in favour of their development in Guatemala, with the difference that in this kind of articles the term "extractivist" is rarely used because of its negative connotations. The following excerpt from an article by Ramón Parellada in the Guatemalan newspaper *Siglo 21*, shows the type of association between mining and hydropower that is made in such kind of discourse:

> We are sitting in tonnes of silver, gold and other minerals, as well as thousands of barrels of oil. We have enough rivers to build hydropower plants and generate our own electricity. The sooner we exploit these resources, the sooner that we will reduce part of our large poverty. The fact that the companies that exploit these resources become richer does not make us poorer; that is a fallacy. In reality, they contribute to the improvement of our standard of living, direct or indirectly. But there are social and environmental organizations that look at this from a single point of view, demanding the total termination of the operations of exploitation of the non-renewable natural resources like mining and petroleum companies with the purpose of preserving the environment. I consider that these groups, which even oppose building hydropower plants, prefer that Guatemalans remain poor (Parellada, 2010).

It should be noticed that the only distinction the author makes between hydropower and the other industries is that the latter exploit non-renewable natural resources. There is no discussion about any difference between the potential environmental impacts of each industry, as if there were no costs or externalities associated with them, only profits to be made. As we learned in Chapter Two, there are degrees of impact even among the different types of hydropower plants, not to say between hydropower and mining; and even in the case of mining, environmental and social impacts vary drastically with the

[17] It should be stressed that the meaning of the word "representation" in this dissertation should be not taken as an "unreal" or "subjective" perception of an objective state of affairs. In this particular case, the findings of Chapter Five show that there is compelling evidence that in fact, an extractivist model of development was started with the laws sanctioned during the Arzú administration. This point will be discussed more thoroughly in the next chapter.

types of methods, minerals, technologies and facilities that are used. A necessary discussion that involved the technological dimension of this issue is non-existent in this text –and others from the corpus that develop the same argument. This type of association, which fails to consider technological and environmental differences among industries, turning them into one single large technological and economic system, is the kind of connection usually made by texts in the Guatemalan sub-corpus that depict positively hydropower. Moreover, that this association was made by columnists that favour hydroelectricity resonates with Itty Abraham's term "the excess of postcolonial technoscience", (Abraham, 2006, p. 213) that was discussed in Chapter Four, i.e. the fact that technoscience was so central in the colonial project that it permeated its political, social and human components and continued to play a key role in the postcolonial states. This connection with Postcolonial Theory will be further analysed in the next chapter.

In the case of the Colombian media, there are also texts that show representations of an association between mining and hydropower. The next excerpt is from an article in the magazine Semana:

> The case gains more interest at this moment, when the country is awaiting the results of other legal conflicts around large mining and energy projects; some are even halted, either because of the rejection of nearby communities or for lack of clarity of their environmental permits, as it is the case of the hydropower plant *Porce IV* in Antioquia, *El Quimbo* in Huila or gold mining in zones of [the natural park] *Páramo de Santurbán* in Santander. [The case of] *Anchicayá* is the first big case of environmental impact in which the justice system will pronounce, at least in these times in which the mining and energy "locomotive" is the protagonist (El caso del río Anchicayá, un fallo trascendente para el medio ambiente, 2012).

This article discussed the outcomes of a lawsuit that was filed on behalf of a community against a hydropower plant in the Colombian region of El Valle. Notice how it paired twice mining and energy (and especially the term "*locomotora minero energética*", the mining and energy locomotive) and how it clearly included hydroelectricity in that category. The adjectives *minero-energético* (mining and energy), hyphenated or just paired together, in fact appeared in several texts on the Colombian sub-corpus, while they did not appear in texts from the Guatemalan one. However, in most of the cases, the context of the terms indicated that, more than indicating an association between mining and hydropower, they referred to the industry of coal mining; a reference that sometimes extended to cover the coal-powered thermal power plants. In regard to the above-mentioned term, *locomotora minero-energética*, it appeared in another text, an article by Tatiana Roa in the newspaper *El Espectador*, and in this case, it also extended to the hydropower industry:

> [They] are starting to build hydropower plants that need large dams and flood the most productive lands, as it has happened with *El Quimbo*, *Sogamaso* and now *Ituango*, where hundreds of farmers and fishers started to mobilize since March 10th as they saw threatened their way of life by the construction of the *Hidroituango*

> power plant. The defence of water has become an important paradigm for the Colombian social movements. It evidences a profound critique to the extractivist development model that threatens to destroy the territories that guarantee the hydric cycle. For environmental defenders, the fight is clear: without water, there is no life. (…) And there is where, justly, the debate is centred. What will happen with the diverse existing vocations in the country as the mining and energy locomotive advances over rivers, valleys and forests that guarantee the water cycles? (Roa, 2013)

This text was written after a large demonstration in favour of preserving water sources took place in Colombia. It clearly put together hydropower with mining as it criticized the impact of the extractivist development model on water resources. When compared with the examples extracted from the Guatemalan sub-corpus, these texts show the same type of representations, starting from the notion of the extractivist development model, which also showed up in the Guatemalan texts. The most remarkable difference between the two sub-corpora is the fact that in the Colombian media, the texts that make the association between mining and hydropower are only the ones that have a position contrary to developing hydroelectric projects; while in Guatemala, as it was shown above, this association can be found in texts in favour and against hydropower. One explanation for such a finding is that in the Colombian case, large hydropower projects were developed in the span of 50 years, in a vast territory; while in Guatemala, the projects have been developed in a shorter period (15 to 20 years) and concentrated in a relatively small region of the country. This translates in a much more diluted presence in the media of the issue of hydroelectricity in the case of Colombia; while in the Guatemalan case, this temporal and geographical concentration –of both projects and conflicts – tends to make it the scope of more media attention, especially from columnists. In other words, in Colombia it cannot be said that there was an event similar as the "hydroelectric expansion" of Guatemala, or at least not during the period of the articles belonging to the corpus. These are the reasons that there are fewer texts in the Colombian sub-corpus that are occupied with advancing a pro-hydropower agenda; in fact, most articles in it are more focused on discussing punctual problems and events in the electrical energy sector.

These were some examples from the corpus of the results obtained using quantitative methods for content analysis; in this case, in regard to the media representations of mining and hydropower. Once again, some conclusions can be drawn and discussed. As it was discussed previously, the analysis showed that the association of mining and hydropower as part of a larger extractive complex does exist in both sub-corpora. Nevertheless, it is stronger in the texts in the Guatemalan sub-corpus. One explanation for this result can be inferred from the conclusion of the last paragraph. In the Guatemalan sub-corpus there is a larger quantity of articles that take upon themselves the task of advocating or defending hydropower than in the Colombian. This type of articles, instead of trying to demarcate hydropower from other industries by, for example, pointing out its advantages regarding carbon emissions or its technological versatility, grouped it

with the others as part of a large technological and economic complex that is the only way to national development. And since it is the only way, in this text, this type of all-encompassing complex can only be accepted or rejected as a whole, and in no way partially; it is as if the author of such a text were saying, "You either want development or you want to stay poor". This type of discourse is akin to technological determinism (Roe Smith & Marx, 1994), in the sense that, according to it, there is only one way to improve human development, which is a specific recipe of science, technology and industry, and that the public's only choices are accept it, reject it or escape from it (Bijker, 1997). The reasons for choosing this narrative to advance an agenda favourable to hydropower and not one that stresses the advantages it could have over other, more polluting industries, will be discussed in the next chapter, since some of them will be more evident once the two phases of research are confronted and discussed.

In general, there were a larger number of articles that associated extractivism and hydropower in the Guatemalan sub-corpus than in the Colombian. This was true also in the case of those articles that were written about hydropower plants conflicts and were critical of the industry and favourable to communities and activists. However, in this last case, it is worth noticing that the positions and discourse were similar in both sub-corpora, since both depicted hydropower as part of an extractivist development model, and for that reason not so different from the mining o petroleum industries.

It should be noticed however, that another purpose of showing excerpts of the articles was to make clear that the associations found by these quantitative methods do not imply that all the articles either in the Colombian or the Guatemalan sub-corpora conformed to the broad representations presented here. These excerpts showed that in both sub-corpora were articles that could be associated with each representation. Another way of making this point is to look at the other ex ante variables that were analysed.

In conclusion, the evidence gathered in this section suggests that there was a stronger association of mining and hydropower in the Guatemalan sub-corpus, because in its texts there were two clear positions in regard of the hydroelectric industry, and both these positions use the association of hydropower and mining as an argument to strengthen their stand on the matter. On the other hand, in the Colombian sub-corpus, while there were a group of texts critical of the hydroelectric industry that used similar arguments than in the Guatemalan sub-corpus, there were few articles that showed a position generally favourable to hydropower, making the mining-hydropower association less common in Colombian media.

At this point of the analysis, it is becoming evident that to draw more meaningful conclusions about the texts in the corpus, one cannot simply ignore everything discussed in the previous research phase. Some of the logic and arguments behind the media representations studied in this chapter can be traced back to

actors and events in the cartography developed in Chapter Five. And that is why this chapter should end here: it is time to confront what was learned from the two research phases and see how both of them can helps us understand the Guatemalan hydroelectric expansion.

Part IV

Conclusions

Chapter Eight

Conclusion:
On the possibility of an inclusive development

The opening statement in the introduction of this dissertation argued that this case was, at its core, about development. But this story was not about how to achieve it, how to boost it or its failure or success. It is about development as a concept in construction, as a narrative on the making, as a goal that, after a century or so as the guiding light of policy-making all over the world, became scrutinized and contested. As we have submerged in the deep waters of energy policy in Guatemala, we have found out, example after example, that there is no a one-size-fits-all representation of what development ought to be. We have found quite the contrary: an official story surrounded by multiple and divergent accounts that contradict it partially or totally, until it becomes a disputed tale. And finally, we have learned the social toll that comes from trying to advance one particular definition of development, while overlooking, or deliberately making invisible, others.

In the process, the terms "renewable energy" and "hydroelectricity" have been transformed too. From being, at the beginning of this dissertation, almost non-controversial terms, they transformed slowly in contested territories that could be associated equally to sustainability, climate change action and energy independence as to social conflict, environmental threat or extractivism. And this last fact was actually not a surprise at all. Previous studies (Brondi, Armenti, Cottone, Mazzara, & Sarrica, 2014; Castro, 2006) have shown that variable representations of environmental issues are common. These competing representations are at the heart of almost every socioenvironmental conflict around energy transitions, usually as a result of the imposition of a hegemonic representation of them onto less powerful groups that have only two ways of dealing with it: accepting or rejecting it. And after following the process of the energy transition in Guatemala, "renewable energy" has lost its halo of an essential means for a better society, and has ended up associated with massacres of the Maya people or corrupt governments.

It is not that suddenly we have uncovered the conspiracy behind the official story –and certainly, that was not the purpose of this research project. That would be an extremely easy solution for such a problem, to know that all this time the complexity of the world we live in was actually caused by a small group with vast power. It is more that we have come to realize that there are coexisting representations of these events that are also part of the struggle among the actors. Taking a cue from social representations theory, these competing representations are a good example of cognitive polyphasia (Jovchelovitch, 2002) in a social

group or collective. And although this dissertation has shown that Guatemalan media representations of hydroelectric energy are more cohesive and centred around fewer topics than in Colombian media, this fact does not mean that there is a settled debate in the country. On the contrary, there is a heated debate precisely because the discussion is focused on a few key issues. But before going deeper into this and other discussions, let us briefly review how we arrived here in the first place.

The purpose of this chapter is to bring together what has been learned from the two separate inquiries that were presented in Parts Two and Three of this dissertation; to look into them and see in which ways they overlap, complement, or contradict each other. But most of all, how they enrich each other mutually and contribute to a better understanding of the process and events that were called here, "the hydroelectric expansion" of the Guatemalan electrical network. To do so, the first step should be to summarize the results of each of these research phases.

In part two, the cartography of the hydroelectric expansion was presented, as both a historical process and a social controversy. The reconstruction of the events that gave way to it led to establishing the following stages:

- The assembling of a network of actors and actants in order to reform the legal frame of the electrical industry in Guatemala, with the purpose of increasing its efficiency and stability through the liberalization and deregulation of the electricity market, since natural phenomena and failing infrastructure had put it on the verge of collapse. Publicly, it was stated that the reforms were with the purpose of fostering human development by expanding electricity coverage. This resulted in the passing of the General Law of Electricity, GLE and other laws regulating the sector.
- The expansion of the electrical network, especially in the generation sector, which underwent two phases: the increase of the thermal generation plants, and following the approval of the Law of Incentives for the Development of Renewable Energy Projects, LIDREP, the hydroelectric expansion, which led to a growth of private hydroelectric generation of 6000 % in terms of installed capacity.
- Finally, the rise of the conflicts and protests against hydroelectric projects, which mostly took place in the regions of the country with the lowest human development scores. These growing social conflicts could be attributed at least partially to the composition of the network that originated the expansion, which excluded the communities that it was supposed to benefit, and instead generated a legal framework that promoted an extractivist approach to electricity generation.

The theoretical and methodological approaches selected to retell this story, namely Actor-Network Theory and the Cartography of Controversies, offered additional insights and findings to what previous studies on

these events had established. In particular, using ANT's approach of treating non-humans as actors, or actants, gave another perspective that helped explaining why the laws that reformed the electrical sector were passed with virtually no opposition; an explanation that before was almost entirely based on the influence of the international neoliberal wave in Guatemala. Instead, this cartography showed the role that the events related to the functioning of the Chixoy Dam and the repeated occurrence of droughts caused by "El Niño" Phenomenon helped shift the conversation from the ideological ground to a discussion centred around the stability and efficiency of the electrical grid; and from expanding the electricity coverage, to guaranteeing the electricity supply to those users already connected to the network. The ANT approach also showed that the legal framework, especially the GLE, did not produced the results that some of the actors –Government officials, industry associations, lobbyists – expected, behaving not as a disciplined intermediary, but as a mediator (Latour, 2005). In the efforts to produce a market the least distorted possible, the network created a law that fomented extractivist approaches to the electrical generation business, which in turned fuelled social conflict around it. Finally, the network was analysed from a postcolonial perspective, and it was discussed how a colonialist approach by the actors that promoted it was another key factor in excluding the energy-deprived communities that were supposed to benefit from the hydroelectric expansion.

The findings in Part Three allowed to outline current media representations of the hydroelectric generation sector in Guatemala, and by comparing them to representations from the same type of media in Colombia, they also contributed to show how the Guatemalan ones had elements that could be traced to the local and historical context in which they were developed. The data were collected from online news websites using data scraping and text mining techniques. Quantitative content analysis methods like correspondence analysis and in-text network mapping showed that Guatemalan media representations were more associated with a representation of energy as a matter of public concern and a subject of negotiations and conflicts, while the Colombian media representations associated hydroelectricity with a matter of national interest, an strategic asset to be understood in technical and economic terms. These cases fit reasonably with what is called the soft-path representation –in the Guatemalan case – and the hard-path representation –in the case of Colombia – of energy transitions (Devine-Wright, 2007; Brondi, Armenti, Cottone, Mazzara, & Sarrica, 2014). These quantitative methods also showed that Guatemalan media inclined to associate hydroelectricity more strongly with extractive industries, in particular, mining, than Colombian media. Other analyses were performed by comparing the texts in the corpus with other attributes such as date of publication and news source. These analyses confirmed the previous findings and added another layer of data to the media representations in the corpus.

In the conclusive sections of Chapters Five and Seven, some of the connections between the two research phases were already being made, as the answers of the research questions in each chapter pointed to directions that crossed into the territory explored by the other phase. This fact is actually not surprising, since it is to be reasonably expected, for example, that the current media representations of hydroelectricity in Guatemala have been shaped by its history, and by the actions and motives of the key actors involved in the hydroelectric expansion. However, discovering specific connections between some media representations and some particular actors or events actually can contribute to arrive to new descriptions that, although not completely rebuking or contradicting the existing literature on the matter, show previously unreported aspects of the research problem.

The first and most visible of these connections is the media representation of hydroelectricity as an extractive industry. As it may be recalled by the reader, one of the main concerns in the exposition of the research problem in Chapter One, had to do with the fact that preliminary research showed that some of the articles surveyed in Guatemalan media, grouped together hydropower with other, more polluting industrial activities that in some cases had larger environmental impacts, like the mining and petroleum industries. Then, as the theoretical framework and the literature review were developed, it was shown that this representation was also present in some of the scientific literature that addressed this problem, both in the national and regional level (Elías, 2009; Villafuerte Solís, 2014). In consequence, the task of determining if such a representation was prevalent in the Guatemalan online news media became part of the specific objective that gave way to the research phase of Part Three. What was not a part of the objectives of that phase was determining what causes led to this representation. The answer –or at least a part of it – came from the cartography of the controversy. In the next paragraphs, this first intersection of the two main parts of this research project will be discussed.

As we followed the actors and events that led to the approval of the GLE and later to the expansion of the Guatemalan electrical network, the picture that started to emerge was that this was an endeavour whose principal actors were members of the Guatemalan elites, which were changing the structure of the Guatemalan State, under the influence of the international neoliberal wave that started in the late Seventies and that gained traction after the fall of the Soviet Union and the Eastern bloc in the Eighties. This interpretation of the events is not in any way new; in fact, some of the studies reviewed in Chapter Two offered similar accounts (Paz Antolín, 2004; Orantes, et al., 2010; Villafuerte Solís, 2014). The cartography of Chapter Five showed that, even though the main promoters of the reform of the legal framework were in fact members of the Guatemalan elites, the network that was assembled was heterogeneous and succeeded not by being openly political about the subject, but because they shifted the

frame of reference from the ideological grounds to the technical, calling the legal reform "modernization" and emphasizing the great risk of collapse that the Guatemalan electrical network faced. The issue, at the time of the approval of the GLE was not development, it was efficiency and stability. It was only with this move that opposing political voices were silenced or turned in favour of the new laws. That was the reason why there were few voices in the academic and political left (Mejía, 1996; Morales M. R., 1998) that were critical of the process and saw the real shift in governance of the public utilities that these new laws implied. As it was discussed in Chapter Five, shifting the frame of reference from the ideological-political to the technical, from development to efficiency, helped avoiding the big questions: Whose development? With which purpose? At what cost?

At the same time, the heterogeneous network assembled was, in other aspect, remarkably homogeneous. Its promoters failed –knowingly or unknowingly – to recruit the very part of the Guatemalan population that the expansion of the electrical network was supposed to benefit, at least according to the initial developmental narrative in which they framed these reforms. With little or no input to the network from communities, environmental and political activists or other stakeholders from the civil society, the legal framework did not addressed any of their needs or concerns regarding this large transformation of the electrical network, and more importantly, its potential impacts. And this is how the GLE became a device for exclusion, just as the network it materialized also excluded in the first place its supposed beneficiaries.

As a consequence, the focus of the GLE was on making as efficient as possible the electricity market, instead of the stated purpose of expanding access to electricity. And the means it used for this purpose was its liberalization. Consequently, in order to keep the market the less distorted possible, restrictions on the role of each part of the business –generation, transmission and distribution– were put in place. These restrictions worked remarkably well in the task of keeping the market free, but together with the lack of proper regulation and compensation mechanisms for the use of public goods, either in the GLE or other related laws, they turned the generation business in a form of extractivism, taking away a resource from low-developed regions to fuel industry and growth in others. And it took away these resources because legally the generation industry was forbidden to provide the electricity access that could have been the most important negotiation asset with nearby communities. It should be noted that these mechanisms did not necessarily had to be included in the GLE; for example, an appropriate General Law of Water could have regulated the fair use of the hydric resources and complemented the GLE as a means of distributing costs and impacts among all the stakeholders.

In conclusion, the reason there is a representation of hydroelectricity as part of an extractive complex is because its legal framework was in fact shaped in a way that turned hydroelectricity into an extractivist

industry, as it was also the case of the mining and oil industries. This should not be interpreted as a general indictment of the hydroelectric industry, but as an assessment of its current position among the other actors of the hydroelectric expansion, like the Guatemalan State, the communities, market regulators, environmental activists and so on.

Before moving on to another conclusion that comes from the overlapping between the two research phases, let us look to the link between mining and hydroelectricity through the lens of ANT. The General Law of Electricity, from an ANT perspective, is a superb example of how an actant can in turn reshape the network that created it. This does not mean that there were some "unintended consequences" from the actors' actions, but that there is real agency in the GLE, if it is studied as an actant. The GLE was not a disciplined intermediary –as Latour would say –but a full-fledged mediator. It was not a disciplined intermediary because it failed to do what its network *intended*, i.e. give way to a smooth hydroelectric expansion that would guarantee the electrical energy supply. But it was a full-fledged mediator, since it was a perfect *embodiment* of the network that originated it; and that is the reason why it contributed to fuelling conflicts around hydroelectric projects.

The question of the agency of actants has been a subject of much debate among STS scholars and one of the major criticisms of ANT (Sismondo, 2010, p. 89). The case presented here can add some arguments to that debate, and also show some advantages of research performed using a mixed-methods approach. In the conclusion of Chapter Five it was argued that the reason that the Chixoy Dam and the El Niño Southern Oscillation (ENSO) were effective actants of the network that materialized in the GLE was not only a direct consequence of the events in which they were involved, but more importantly, of the social and media representations derived from those events. At this point, having already discussed social representations as a theoretical framework and used them to analyse the media representations in two countries in Part Three, the last point can be revisited. Considering them from the perspective of Social Representations Theory (STR), both Chixoy Dam and ENSO were already on the stage of objectification and their representations were already clearly associated with specific concepts by social groups. In the case of the Chixoy Dam, first, there was a solid association with inefficiency and corruption that was constantly reminded to the Guatemalan public through the national media as exemplified by the review of *Crónica* presented. On the other hand, by being the largest public project built in those times, the other strong association was with the Guatemalan State. And so Chixoy became the poster image of the inefficiency and corruption of public administration; a perfect mix for promoting a privatization and deregulation agenda. In the case of ENSO, its representation was associated with risk and vulnerability, but also with being a recurring event; and consequently, the reform of the legal framework of electricity became a preventive

measure against future catastrophic events that were almost certain to occur. Both representations were essential to facilitate the transition from a publicly-owned and much regulated electrical network to a market-driven, deregulated and privatised one.

The conclusion that can be drawn from the last paragraph is that the agency that was exerted by these actants, Chixoy and ENSO, was routed through their social representations. Theoretically, this argument is not completely new; Brey (2005), for example, presents the ways in which it has been developed or studied in realist, social constructivist and even ANT approaches. It could be even argued that this is an example of translation, as Latour describes it (2005), which even makes unnecessary the use of the term "social" representation". However, this conclusion serves also the purpose of pointing to intersections between SRT and ANT that could be methodologically and theoretically productive. In this case, the use of the categories and concepts of SRT to analyse the agency of actants, gives a clearer picture of how agency (or translation) is deployed along a network.

There is yet another point to be made from the comparison of the findings of the two research phases. As it was discussed above, the main conclusion from the analysis of the corpus in Chapter Seven was that in the Colombian sub-corpus hard-path narratives of energy transitions dominated thematically, while in the Guatemalan the association was stronger with soft-path narratives. It was also discussed that in Colombia, there were more diverse topics associated with hydropower, although most of them still fit with a discourse in which energy is a strategic national asset represented mostly in technical terms, which are two of the principal attributes of hard-path narratives. On the other hand, the topics in the Guatemalan sub-corpus were fewer and thematically closer, focusing on the representations of hydropower as an ecological resource that is subject to negotiations with an environmentally concerned and politically active public. There is a simple way in which these conclusions can be linked with the inquiry of Chapter Five, and that is by just asking if there is –as in the case of the mining-hydropower association – any insights in the map of the controversy that could explain these thematic differences in the sub-corpora.

In the case of this dissertation the answer can only be partial, since only the Guatemalan controversy was mapped, and therefore, any answer is inconclusive. As it was discussed in Chapter Seven, it was decided that only a brief background research of Colombia and its conflicts was to be made, since the main purpose of collecting the articles in the Colombian sub-corpus was to use it as a means of comparison of the media representations of hydropower in Guatemala. This does not mean that there was no research whatsoever performed on the social, political and environmental situation of Colombia, but rather that the analysis was not made in the same level and depth that the cartography of the controversy that was done for Guatemala. And yet, in Chapter Seven some inferences were made that, while not aspiring to be

definitive conclusions, could still have the role of starting-point hypotheses that could lead to new research directions. Some of these inferences will be discussed next.

The first and clearly outstanding fact is that the cartography of the Guatemalan hydroelectric sector led to the conclusion that there was an event, that here is called "the hydroelectric expansion", that started approximately in the early 2000s and it still is developing today. This event involved a boom in the development of private hydropower plants and was fostered by a change of both the legal framework and the Guatemalan State energy policies in the Nineties. Although most of Latin America went through the same type of shift in public policies around the same time, in the case of Colombia, documental research showed that most of their hydropower plants were built over a 50-year period and that there was no comparable expansion of their hydroelectric installed capacity in recent years (Palacios Sierra, 2013). This fact alone could explain some of the differences between media representations of Guatemala and Colombia in the period from which the corpus was extracted. It was argued in Chapter Seven that the number of articles in the Colombia sub-corpus that had a general favourable view of hydroelectricity or that openly promoted it was significantly smaller that in Guatemala, and that this fact explained partially the weaker association of mining and hydropower in Colombian media. One reason behind the smaller number of articles favourable to hydroelectricity in Colombia could be precisely that there was not such an event as the Guatemalan hydropower expansion. Therefore, the Colombian media were not as focused on the subject as the Guatemalan, or there was no media agenda in Colombia –or at least not as intense as in Guatemala – to promote hydropower.

Going back to the hard-path and soft-path representations, they can also be at least partially explained with the different historical contexts. Taking as reference the period of the corpus of articles, in Colombia the hydroelectric industry, private of public, already existed and was not under a large expansion. The issues that were so serious and relevant to require attention from the public arena were punctual, centred in specific situations or problems that surfaced in the wake of other events. Take as an example, some of the cases discussed in the conclusion of Chapter Seven: the crisis provoked by El Niño Southern Oscillation in 2015, the controversy over expanding coal mining and thermal power plants, or specific environmental conflicts around new hydroelectric projects, such as the *Anchicayá* lawsuit. All of these cases were mostly argued in a way that did not require to take a position against or in favour hydroelectricity a priori, but that needed, instead, to be contextualized within the national energy policy. And it was in this sense that a hard-path argumentative could be seen as a more effective way to get through a message.

On the other hand, in the Guatemalan case, the discussion around hydropower became a matter of public debate on the national level, not because of the isolated cases, but because there was a concerted effort to

expand the electrical network that involved mostly the private sector with the approval of the Guatemalan State. This effort included also the press, both for those who promoted it and those who opposed it. And in both cases it was necessary to create a great narrative, one that could put the conflicts into context, whether they were viewed positive or negatively. Consequently, most of the texts have a clear favourable or unfavourable position and most of them try to address the conflicts with arguments that fit the soft-path narrative.

8.1 Future directions

As it was stated before, the last arguments are not definitive, they are just inferences made from the analysis of both research phases. But this line of reasoning can lead to a much more interesting conclusion in regard of the methodological and theoretical approaches used for this research project. And that is that methods that were conceived within Actor-Network Theory, like the cartography of controversies, have the potential to be very useful to study Social Representations, especially for following the dual process of anchorage and objectification (Moscovici, 2000). Or, as it was discussed above, the other way around: using the concepts of anchorage and objectification as a way of understanding the process of translation (Latour, 2005). It was shown in the last examples that the mapping of the controversy provided plausible explanations for the media representations obtained from studying the corpus of articles. While the first one of the discussed examples, the Guatemalan media representation of hydroelectricity and mining as part of the same extractive complex, had stronger evidence in its favour due to the evident link between extractivism and hydropower that the network analysis brought up, the second example depended on a more in-depth analysis of the history of the Colombian electrical network and market. Nevertheless, both arguments are compelling enough to think of follow-up projects that could give more definitive answers. In conclusion, future studies that combine methodologies from ANT and social representations, not only in environmental studies, but in other fields of interest, could provide more complete descriptions of these increasingly complex problems.

The last phrase “increasingly complex problems” serves as a reminder of another promising direction in this field of study. It cannot be dismissed the role that software assisted content analysis played in the analysis of the research problem. The power displayed by the data scraping and text mining techniques to gather large amounts of structure information was outstanding. So it was the analytical capacity of the content analysis software QDA Miner and the network mapping platform CorTexT Manager, which could provide insightful information of the corpus and allowed to be manipulated in search of patterns and relations that previously could have been overlooked because of how time and effort consuming they were. These are powerful tools that still have more to offer to the social researcher. Referring in particular to the problem

of the socioenvironmental conflicts in Guatemala, this is one of the first projects that use these particular software tools. Taking into consideration the fact that most of these controversies currently take place in the public arena, and that in recent years social media have grown in importance as hybrid forums (Callon, Lascoumes, & Barthe, 2009), where an increasingly large proportion of the public debate takes place, future research on this and other conflicts should also increase its attention on the role of social media in these controversies. The software for gathering and analyzing data is powerful enough to go into Twitter, for example, and create weighed networks based on the number of retweets, answers, favourites and interactions of each single tweet on any subject. The metadata collected this way has the potential to create descriptions of controversies that are as wide as global networks and at the same type as deep as the most thorough content analysis.

The reference to the potential of these software-assisted methods points to another research direction in which this project inserts. This inquiry was divided in two phases with very distinctive methodologies: in the first part, an ANT-based cartography of the controversy was used to approach one aspect, mainly historical, of the research problem, while the second one consisted of an exploration of its current media representations, based on text mining and software-assisted quantitative content analysis. This can be considered a mixed-methods approach, which in itself is no novelty. However, the combination of those two specific methods has barely been used before, so a brief assessment of the research process and its outcomes is not out of place. As big data started streaming and then flooding every scientific discipline, social scientists looked at these methods with suspicion, sceptic to its promises of powerful analytic tools. Soon, the divide between "hypothesis-driven" and "data-driven" research appeared (Neresini, 2017). However, Neresini reminds us that:

> It is important to stress again the centrality of research questions, and not for abstract reasons related to a supposed supremacy of theory, but mainly because questions play a strategic role in generating data: they create the conditions for facing an uncertainty to be reduced, i.e. for triggering the process through which data are produced and utilized (Neresini, 2017, p. 13)

This statement has a necessary corollary, that there should be no divide, but rather symbiosis. This project is an experience in the latter, not the former. Both approaches tackle the research problem from different angles, and in the process contribute to its understanding by aiming at achieving "second-degree" objectivity (Venturini, 2012). Latour reminds us that, "rendering the production of objectivity more difficult is the name of the game" (Latour, 2005, p. 127). And I can confirm, at least from the viewpoint of the research experience, that this is true. As this dissertation comes to an end, the one thing that there is to complain about, is the constraints found along the way that reduced the resources available for facing the research problem. The research path chosen demanded a lot of resources, but the result is worth of them,

since both research phases reflect different yet complementary results. In conclusion, this type of research design can be an effective alternative for integrating data analysis into social research.

Finally, let us turn our attention one last time to development, the core of this story. It is clear by now that behind the hydroelectric expansion, that there was one and only one version of development supporting it. Whatever inputs other actors could give, was obscured by the giant shadow of the Guatemalan Elites' energy transition project. It is also clear that the type of development that prevailed was one that was deeply submerged in a thick coloniality layer, a development that was sustainable only when facing towards the international arena, one that was put into motion without actual input of those that it was supposed to benefit. It was shown that the "excess of postcolonial technoscience" (Abraham, 2006) was what drove the network that materialized in the GLE, which eventually ended up fuelling the conflicts. But this postcolonial technoscience excess was also to be found in the media representations studied in Part III; this is the reason that even a pragmatic discourse that singled out the versatility and environmental advantages of hydroelectricity, especially in comparison with the mining industry, is reject by the former's advocates and instead push the same narrative of a large technoindustrial extractive complex, as those who oppose them. And that is because it is the only version of development known to them; in this sense, they are more colonized by the development discourse as the people that they loudly call "ignorante peasants".

Nevertheless, no matter how stark this panorama may seem, it holds within itself the seeds of its transformation. It just needs the courage of those within it, to acknowledge that this thing, this humanity, this development is built together with the other, the others, those that are not "them", but have always been just "us". As the Zapatistas said (as cited by Mignolo, 2006): "Because we are all equal, we have all the right to be different". And that is the path to inclusive development.

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Appendixes

Appendix No.1
Brief overview of other renewable energies

Most of the information in this appendix –except when it is explicitly attributed to other sources- is taken from the International Energy Agency website (OECD / International Energy Agency, 2017).

A. Solar Energy

All energy used by life on Earth comes from the sun (Maczulak, 2010). Plants use it directly, while other living beings use it mostly indirectly. However, with the exception of solar drying, the direct use of solar energy for human activities and industrial processes is relatively recent. It was in the 19th century that the two main technologies for producing energy directly from the sun were introduced: thermal and photovoltaic.

Edmund Bequerel, in 1839, discovered that some materials had the capacity of converting light radiated on them into electric current, a phenomenon now called the photoelectric effect (Knier, 2008). This is the physical phenomenon in which the technology known as photovoltaic (PV) cells is based. The PV cell converts sunlight into direct current electricity, which can be then transported into an electricity grid (local or general). The most common PV technology is crystalline silicon-based systems. PV systems have the advantage that they can produce electricity even when not exposed to direct sunlight, i.e. on cloudy days. It is also a technology that can be produced at a large scale but that can be used in small local systems, even residential ones. Its disadvantages are that the electricity produced must be used instantly (so it depends on a battery system to be reliable or a network infrastructure) and has a relatively low efficiency (30%). PV systems were known to have high installation costs, but in the last years they have significantly declined (Fares, 2016), making its energy output one of the fastest growing in the world among renewables.

In thermal solar technology, as the word indicates, only the heat from the sun radiation is used. There are two types: concentrating solar power, in which all the solar energy is directed towards a point, reaching very high temperatures that evaporate a fuel –generally water– and turn into steam, which finally generates electricity. The second type is solar cooling and heating in which solar energy is used to heat water for residential heating and/or cooling purposes. Both thermal solar technologies have a great potential but are not as diffused and developed as PV cells.

B. Wind Energy

The electricity generated by transforming kinetic energy from the wind using turbines is called wind energy. As wind is a resource that is available practically everywhere, wind energy is a technology that has been growing steadily in the last decades, since it fosters energy independence. Just like solar energy, wind does not entail carbon emissions in its operation. The heart of the system is the wind turbine, which rotates with the wind and allows the transformation of kinetic energy into electricity.

Wind energy technology is classified mainly on the basis of the place it operates, being its two categories, onshore and offshore wind energy. Offshore takes advantage of faster and more reliable wind resources than its land-based counterpart. Although there are some disadvantages inherent to wind technology, like the extensive use of land (for example, it has been calculated that a wind farm that could produce the same amount of energy as a nuclear power plant would have to cover an area 2000 times larger) it has achieved substantial growth over the last years (Institute for Energy Research, n.d.), thanks to incentive policies in numerous countries.

C. Geothermal Energy

"Geothermal energy can provide low-carbon base-load power, heat (and cooling) from high-temperature hydrothermal resources, deep aquifer systems with low and medium temperatures, and hot rock resources." (OECD / International Energy Agency, 2017a). Geothermal resources were already used in antiquity. However, energy production for industrial use was first studied in Italy in the 19th century. By the early 20th century the first plants were already in operation in different parts of the world. One of the first, which still functions today, is the Lardarello Power Plant in Tuscany (Worldatlas.com, 2016).

There are three different types of geothermal power plants: flash steam plants, dry steam plants, and binary plants. In flash steam, high temperature and pressure water is released from the reservoir, transforming it into steam, which passes through a turbine and generates electricity. The dry steam plants use directly the steam in the reservoirs to generate electricity; and in the binary plants, the heat is transferred to another fluid (usually a volatile organic fluid like pentane) via heat exchangers, and this last fluid is the one that drives the turbines for electricity production (it can be recycled into the system a large number of times). The most common in the world is the first type, accounting for two-thirds of the current installed capacity; however, the fastest growing type is at the moment the binary plant.

Geothermal is a reliable source of power, since it depends on a constant stream of steam or hot water that is invariable regardless of season or weather conditions, so it can be used as a base load for the electrical grid (United States. Department of Energy, 2016). However, a disadvantage of this technology is that the exploration and development phases of a geothermal project are expensive, compared to fossil fuels and other renewables (National Renewable Energy Laboratory, 2012). Geothermal worldwide installed capacity was approximately 12 GW in 2014 and it is expected that it will rise to over 16 GW in 2020.

D. Biomass and Biofuel energy

The use of biomass for cooking and heating is as old as humanity itself; so old that –as discussed in the previous chapter– if a country today has a high percentage of households still using biomass for that purpose, it has become an indicator of poverty. This section focuses instead on modern biomass technologies for producing energy, including electricity generation from waste or by-products, biogas from animal or plants waste, and biofuels from crops. Consequently, biomass in this dissertation means any product or by-product of live organisms: wood, leaves, fruits, seeds, but also any kind of biological waste.

The main disadvantage of all types of energy generation systems that use biomass is that they produce carbon emissions. However, their impact is mitigated by the fact that since they come directly or indirectly from plants, most of the CO_2 produced is absorbed by the development of the next crop, if a sustainable replenishment is being undertaken.

There are numerous types of technologies for producing electricity from bio-waste or biological by-products, as they depend on the physical and chemical properties of the material to be used as a fuel. But the chemical reaction for most of them is the same, combustion. The heat generated by burning the materials is used to produce steam, and that steam is used to produce electricity using turbines. Another way of producing power (electricity) is by the conversion of organic waste in biogas (mostly methane) through a fermentation reaction, and then using gas for producing heat, then steam and finally electricity. This last technology is currently used in a minor fraction of operating plants, but it is seen as a promising technology for residential or small systems; research and commercial/residential applications in India are an example of its potential.

Biofuels, on the other hand, are organic fuels that are produced industrially from biological sources, which can be used in internal combustion engines with little or no modification. The biofuels that are currently produced on industrial scale (also called first generation biofuels) are bio-ethanol (mostly from sugarcane,

sugar beet, corn and wheat) and biodiesel (mostly from oil crops, like palm, rapeseed, soybean and in some cases used cooking oil and animal fat). The second and third generation biofuels are those that are still being tested on laboratory or pilot plant scales, like lignocellulosic ethanol or algae-based biofuels. There have been concerns on the pressure biofuels put on crops destined for human or animal consumption, for example, by driving up prices or competing with food crops for land use.

In the case of Guatemala, electricity produced with bio-waste has currently an important share in the energy market. Guatemala is the 5th exporter of sugar in the world (Workman, 2016), and the sugar industry uses the combustion of sugarcane bagasse to produce electricity, first for their own use and then to sell it to the electrical grid. In 2016, 24.1% of the electricity generated in Guatemala came from the sugar industry (Guatemala, Ministerio de Energía y Minas, 2017). Not all the energy generated by the industry came from biomass, since the supply of bagasse is also seasonal and there are periods when there is shortage. In these periods, bunker or coal, i.e. fossil fuels, are used, but the industry claims that their share in the total is minimal.

Appendix No. 2
Additional information on Guatemala's demography and economics

A. Demography

Guatemala's population is estimated to be approximately 15,190,000 as of July, 2016, with 51.6% of the people living in urban areas; more than 56% of the population is 24 years old or younger. The population growth rate is 1.79% as of 2016, with a median age of 21.7 years; Guatemala has the largest fertility rate in Latin America (Central Intelligence Agency, 2016).

Regarding ethnicity, in the last National Census, which took place in 2002, people that identified themselves as ladinos (from mixed indigenous and Spanish descent) and white were 59 % of the population; and people that identified themselves as indigenous (mostly of Mayan descent, but also from other non-Mayan ethnicities) were 39.5% (Georgetown University, 2006). However, other sources estimate a higher percentage of indigenous people, around 60% (Elías, Indigenous people in Guatemala, 2016). The indigenous peoples are divided into three groups: Mayan, Xinca and Garifuna. The Mayan are divided in 23 different ethnic groups (characterized by having different languages), of which the K'iché, Kaqchikel, Mam and Q'eqchi peoples are the most numerous (United Nations Development Programme, 2005); the regions of the country with the most Mayan population are the West Highlands and the North. The Xinca is an indigenous people from different descent than the Mayan and they are concentrated in a small territory in the Southeast of the country. Finally, there are the Garífuna, originating from three different ethnic groups: the Caribe people, African descendants and the Arahuaco people from South America; the region most densely populated by the Garifuna people is the Caribbean coast on the Northeast (Guatemala. Ministerio de Educación, 2009).

The International Organization for Migration (2016) estimates the current Net Migration Rate of Guatemala to be -1.1 migrants per 1,000 inhabitants, which means that it is a country with an outward net flow of people toward other countries. IOM also estimates that currently 5.86% of Guatemalan citizens lives abroad, with the United States of America (881,191 people) and Mexico (53,128 people) being the countries with the largest Guatemalan migrant populations. This large migration is seen as a consequence of social exclusion and also of the armed conflict (1962-1997, see Section 1.2.3, History). The country, in recent years "has seen a steady number of Guatemalans being forcibly returned from other countries" (International Organization for Migration, 2016), due to more aggressive immigration policies in the United States and Mexico.

B. Economy

Guatemala's economy is the largest in Central America if Purchasing Power Parity (PPP) is taken into account (Central Intelligence Agency, 2016). Its Gross Domestic Product (GDP) is estimated to be USD 63.91 billion (USD 126.2 billion at PPP), and its GDP per capita approximately USD 7,700. Its economy has been growing steady in the last few years, with 4% on average. However, this growth has failed to reach the lower-income strata of the population (Central Intelligence Agency, 2016). The largest sector of the economy is services, followed by industry and agriculture; although, in the case of exports, agriculture holds a larger share of the total. In 2016, the largest export was apparel with USD 1,063.9 million (12.3%), followed by: sugar with USD 673.1 million (7.8%); coffee with USD 611.4 million (7.1%); banana with USD 595.8 million (6.9%); and fats and edible oils with USD 353.1 million (4.1%). The four products after apparel are all agro-industrial, and together they represent 25.9% of the total exports; if apparel is taken into account the five largest exports represent 38.2% of the total (Banco de Guatemala, 2016). As electrical energy is a main issue for this study, it should be noted that it also figures as part of Guatemala's exports, mainly to Central America; in 2015 it was worth more than USD 58.5 million, or 0.7% of the total (Banco de Guatemala, 2017).

There are three other factors in the Guatemalan economy that are worth discussing here. The first is the impact of the remittances from the migrant population (mostly those in the U.S.). In 2016, they amounted to USD 6.285 billion, making them the largest source of income for the country (Banco de Guatemala, 2017b). The remittance income is larger than that from the first five export products combined and it amounted in 2015 to roughly 10% of the GDP. As it was discussed in the previous section, the large migration was a consequence of the social exclusion and inequality prevalent in Guatemala, so it seems ironic that now remittances from this group of people is the main source of income for the country.

The second factor is the impact of crime in the economy. A study (United Nations Development Program, 2009) estimated that the total value of criminal enterprises (kidnapping, extortion, domestic theft, and grand larceny) and illegal drug trade (including money laundering) in Guatemala was comparable to 10% of the GDP. The same study detailed its effects as: increase of consumption without a counterpart of production and employment, discouragement of the growth of the legal GDP, and forced fiscal disallowance as a result of uncollected taxes.

The third factor is the size of informal economy. The most recent National Employment Survey puts unemployment at a low rate, 2.4%, but it also registers that 69.3% (4.15 million persons) of the

economically active population works in the informal sector (Guatemala. Instituto Nacional de Estadística, 2014). This means that for every three employed persons, two do not have the benefits and safety that Guatemalan legislation provides for those with formal jobs. A report from the International Labour Organization (2013) estimated that in 2006 the contribution to Guatemala's economy of the informal sector is 34% of the Gross Value Added (GVA, which in the report is used instead of the GDP because not all countries listed had reliable tax information). This estimate shows that although a majority of the Guatemalan population works in the informal sector, the economic worth of their labour is pretty low in comparison with those in the formal sector.

These three factors influence the performance of the economy in general and of its macroeconomic indicators. As an example, the Guatemalan currency, the Quetzal (GTQ) has experimented in the last years a significant appreciation; it has gone from GTQ 8.35/USD in 2010 to GTQ 7.50/USD in 2016 (Banco de Guatemala, 2017). This phenomenon has had a negative impact in the country's exports (part of the formal sector of its economy), and it has been attributed to the increasing share of remittances in the economy, as well as the influx of dollars from smuggling and illegal drug trafficking (Luján, 2016), which, given the nature of these illegal activities, enters through the informal sector. This example also shows how these three factors influence each other: money from criminal activities is channelled into the economy initially via the informal sector or in other cases disguised as remittances so it can be later laundered.

Appendix No. 3

List of opinion articles collected for the corpus in Chapter Seven

A. Colombian websites

Title	Author	Date	Website	URL
Ecos de la reunión del BID en Cancún - Dinero.com	David Ramírez	13/04/2010	Dinero	http://www.dinero.com/opinion/opinion-on-line/articulo/ecos-reunion-del-bid-cancun/93858
Lecciones de las multinacionales paisas	María Alejandra González-Pérez.	24/05/2011	Dinero	http://www.dinero.com/opinion/opinion-on-line/articulo/lecciones-multinacionales-paisas/119889
Potencia en potencia	David Yanovich	11/04/2012	Dinero	http://www.dinero.com/opinion/articulo/potencia-potencia/148396
Diplomacia energética	David Yanovich	12/06/2013	Dinero	http://www.dinero.com/opinion/articulo/diplomacia-energetica/177599
Venta de Isagen no es rentable, ni estratégica	Camilo Díaz Urrea	16/09/2013	Dinero	http://www.dinero.com/opinion/columnistas/articulo/venta-isagen-no-rentable-ni-estrategica/184277
Chigüiros a pagar la luz	Andrés Felipe Fonseca	26/05/2014	Dinero	http://www.dinero.com/opinion/columnistas/articulo/danos-medio-ambiente/196604
Opinión sobre la venta de Isagen	Camilo Díaz Urrea	02/06/2015	Dinero	http://www.dinero.com/opinion/columnistas/articulo/columna-opinion-sobre-venta-isagen/209135?utm_source=dinero&utm_medium=correo&utm_campaign=2015_06_06?utm_source=dinero&utm_medium=correo&utm_campaign=2015_06_07
Opinión sobre la necesidad de explicar crisis en el sector	David Barguil	07/11/2015	Dinero	http://www.dinero.com/opinion/columnistas/articulo/opinion-sobre-necesidad-explicar-crisis-sector-energetico/215750
Sin mitos ni leyendas	Ricardo Lozano	08/11/2014	El Colombiano	www.elcolombiano.com/opinion/columnistas/sin-mitos-ni-leyendas-XB443572
Feliz cotidianidad	Óscar Domínguez	26/12/2014	El Colombiano	www.elcolombiano.com/opinion/columnistas/feliz-cotidianidad-IL973831
El Niño y El Patrón	Ricardo Lozano	25/01/2015	El Colombiano	www.elcolombiano.com/opinion/columnistas/el-nino-y-el-patron-CL1159352

Title	Author	Date	Website	URL
La calidad de las obras	Luis Guillermo Suárez	09/03/2015	El Colombiano	www.elcolombiano.com/opinion/columnistas/la-calidad-de-las-obras-KY1450419
SE DESTRUYÓ LO POCO QUE TENÍAMOS	Gabriel Harry Hinestroza	10/03/2015	El Colombiano	www.elcolombiano.com/opinion/columnistas/se-destruyo-lo-poco-que-teniamos-EX1462134
QUÉ DESPROPÓSITO LA VENTA DE ISAGÉN	Mauricio Restrepo Gutiérrez	13/04/2015	El Colombiano	www.elcolombiano.com/opinion/columnistas/que-desproposito-la-venta-de-isagen-DC1703630
La Tierra: Un Inmenso Depósito de Porquería	Ricardo Lozano	28/06/2015	El Colombiano	www.elcolombiano.com/opinion/columnistas/la-tierra-un-inmenso-deposito-de-porqueria-XA2211099
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Cuentos verdes	alberto-silva	05/11/2014	El País	http://www.elpais.com.co/elpais/opinion/columna/alberto-silva/cuentos-verdes
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Pacto por el ambiente	Manuel Guzmán Hennessey	27/07/2010	El Tiempo	http://www.eltiempo.com/archivo/documento/MAM-4037665
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Puente al futuro	ADRIANA LA ROTTA	12/05/2012	El Tiempo	http://www.eltiempo.com/archivo/documento/MAM-5416007
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Isagen	Guillermo Perry	26/04/2015	El Tiempo	http://www.eltiempo.com/opinion/columnistas/isagen-guillermo-perry-columnista-el-tiempo/15630660
El proyecto Tití	Heriberto Fiorillo	04/05/2015	El Tiempo	http://www.eltiempo.com/opinion/columnistas/el-proyecto-titi-heriberto-fiorillo-columnista-el-tiempo/15681041
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Elogio de la estupidez	Enrique Santos Molano	05/11/2015	El Tiempo	http://www.eltiempo.com/opinion/columnistas/elogio-de-la-estupidez-enrique-santos-molano-columna-el-tiempo/16422568
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Cómo no sentir envidia	MIGUEL YANCES PEÑA	17/06/2013	El Universal	http://www.eluniversal.com.co/opinion/columna/como-no-sentir-envidia
Isagen: el objeto del deseo	Amylkar Acosta	25/08/2013	El Universal	http://www.eluniversal.com.co/opinion/columna/isagen-el-objeto-del-deseo-5132
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Coyuntura energética	CARLOS ROMÁN C.	07/11/2015	El Universal	http://www.eluniversal.com.co/opinion/columna/coyuntura-energetica-9557
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Rigoberto Juárez	MAGALÍ REY ROSA	27/03/2015	Prensa Libre	http://www.prensalibre.com/opinion/rigoberto-juarez
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Amatitlán	Alfonso Yurrita	30/03/2015	Prensa Libre	http://www.prensalibre.com/opinion/amatitlan
La culpa es del pobre	Carolina Vásquez Araya	30/03/2015	Prensa Libre	http://www.prensalibre.com/opinion/la-culpa-es-del-pobre
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No nos extrañe nada	HUMBERTO PRETI	18/04/2015	Prensa Libre	http://www.prensalibre.com/opinion/no-nos-extrae-nada
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¿Y por qué no?	KAJKOJ MÁXIMO BA TIUL	25/04/2015	Prensa Libre	http://www.prensalibre.com/opinion/y-por-que-no-
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¡Y aún hay más!	MAGALÍ REY ROSA	08/05/2015	Prensa Libre	http://www.prensalibre.com/opinion/y-aun-hay-mas
Haciendo números	Carolina Vásquez Araya	09/05/2015	Prensa Libre	http://www.prensalibre.com/opinion/haciendo-numeros

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Renuncia y cárcel	KAJKOJ MÁXIMO BA TIUL	23/05/2015	Prensa Libre	http://www.prensalibre.com/opinion/renuncia-y-carcel
Reforma o revolución	KAJKOJ MÁXIMO BA TIUL	30/05/2015	Prensa Libre	http://www.prensalibre.com/opinion/reforma-o-revolucion
Los peces muertos	Carolina Vásquez Araya	13/06/2015	Prensa Libre	http://www.prensalibre.com/opinion/los-peces-muertos
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Estamos solos	MAGALÍ REY ROSA	10/07/2015	Prensa Libre	http://www.prensalibre.com/opinion/estamos-solos
Maya' Winaq	KAJKOJ MÁXIMO BA TIUL	11/07/2015	Prensa Libre	http://www.prensalibre.com/opinion/maya-winaq
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La Balanza de cuatro Platos	HUMBERTO PRETI	01/08/2015	Prensa Libre	http://www.prensalibre.com/opinion/la-balanza-de-cuatro-platos
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General, ¡renuncie!	KAJKOJ MÁXIMO BA TIUL	29/08/2015	Prensa Libre	http://www.prensalibre.com/opinion/general-renuncie
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Erradicar la impunidad	FRANCISCA GÓMEZ GRIJALVA	16/09/2015	Prensa Libre	http://www.prensalibre.com/opinion/erradicar-la-impunidad
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Libertinaje no es igual a libertad	Jaime Francisco Arimany	10/10/2015	Prensa Libre	http://www.prensalibre.com/opinion/libertinaje---libertad
Cambray II	KAJKOJ MÁXIMO BA TIUL	10/10/2015	Prensa Libre	http://www.prensalibre.com/opinion/cambray-ii

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Alto, piense	KAJKOJ MÁXIMO BA TIUL	17/10/2015	Prensa Libre	http://www.prensalibre.com/opinion/alto-piense
Todo va a la cloaca	HUMBERTO PRETI	21/11/2015	Prensa Libre	http://www.prensalibre.com/opinion/todo-va-a-la-cloaca
La agenda de Jimmy	Samuel Pérez Attias	27/11/2015	Prensa Libre	http://www.prensalibre.com/opinion/la-agenda-de-jimmy#comments
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