Socio-Environmental Conflicts Caused by Hydroelectric Projects on the Río Chiriquí Viejo

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1. Executive Summary

In the 1970s, Panama began constructing the first hydroelectric projects in order to promote the country's energy independence. In the mid-nineties, the government initiated the implementation of neoliberal policies by allowing private involvement in the generation of hydroelectricity. This created a context in which the private sector and their foreign investors became major players in the country's economic development (Perdomo, 2008). Though this move to clean energy is laudable, the manner in which the shift was accomplished and continues to be done deserves critique. According to Finley and Brook (2012), the current tendency is one of green authoritarianism which uses the carbon offset argument to prioritize hydro development while acting in oppressive ways towards affected populations. In Chiriqui province, the Rio Chiriqui Viejo (RCV) watershed contains 22 hydroelectric dams in operation, in construction or in the process of being approved. The cumulative impacts of such a quantity of dams are likely to be significant. This context has provoked strong resistance to hydroelectric development among the inhabitants of the RCV watershed. Our research aims to explore the perceived impacts of hydroelectricity and the problems with the participation process institutionalized within hydro projects' Environmental Impact Assessments. This was accomplished by answering three research questions: 1) *Are there socio-environmental conflicts caused by the hydroelectricity in the RCV watershed?* 2) *Where are these hydro projects located, and what are their perceived impacts?* and 3) *What is the approval process for hydro projects and how are affected communities included?*

We employed a mixed method of exploratory and descriptive research. For our first question, we conducted field interviews and observations to assess the general perceptions of people in the Rio Chiriqui Viejo (RCV) watershed towards hydroelectricity. Once we had gained an understanding of the situation, we conducted semi-structured, approximately one-hour long interviews with the political representatives of the sixteen *corregimientos* that border

the RCV in order to identify the perceived impacts of hydroelectric development. This data was used to build a map in ArcGIS that shows the locations of the dams and the impacts felt by each *corregimiento* under study. In order to describe the approval process of hydro dams in Panama, as well as its associated public participation process, we consulted government records and conducted semi-structured interviews with representatives of *la Autoridad Nacional de los Servicios Públicos* (ASEP), the *Ministerio de Ambiente (MiAmbiente),* and the Panamanian NGO *Alianza para el Desarrollo y la Conservación*.

Based on our interviews, we found that local political representatives have perceived a decrease in the river's discharge and the water's quality. These changes affect the human consumption of water, the agricultural and tourism sectors, and fishing activities along the river. In addition, according to our interviews, people's access to the river has decreased because the land surrounding parts of the river has become private property owned by hydroelectric companies, and because it has become too dangerous to be near the river as a sudden increase in discharge can occur at any time if a dam's sluice gates are opened to release pressure in the reservoir. Other important impacts include damage to local roads, the fracturing of aquifers, deforestation, and impacts on the watershed's fauna and flora. These impacts were perceived in *corregimientos* along the length of the RCV. Interviewees also mentioned the dishonest behaviour of hydro companies during the approval process.

Based on our research concerning the approval process of dams in Panama, we describe the multiple steps in this process as well as the relevant actors, while maintaining a focus on the inclusion of public participation. To begin, a hydroelectric company, known as "the promoter" makes an application to ASEP in a bidding process for a specific hydrological resource. Next, the promoter hires a private environmental consultant to conduct the project's EIA, which is of Category I, II or III depending on the scale of impacts. The EIA is then approved by *MiAmbiente,* and ASEP subsequently awards a contract for electricity production.

Finally, the promoter must receive a construction permit from the municipality in which the project is located. Several critiques of this process were identified. For example, there is the potentially problematic situation of indirect subordination between the consultant and the promoter. In addition, the participative process is inadequate because participative tools are not binding, and there is no enforcement or monitoring of the use of these tools. Therefore, there is the potential for hydroelectric companies to present empty promises to communities in order to gain construction permits. This situation can create a population that is apathetic towards the process because they do not trust that they are fairly included within it.

The exploratory research undertaken in this project has indicated that perceptions towards hydroelectricity in the Rio Chiriqui Viejo watershed are largely negative. The perceived impacts are numerous and felt throughout the river's length, while local political representatives feel the population is not adequately included in decision-making. Socio-environmental conflicts have arisen in Chiriqui because of the direct and cumulative impacts of hydroelectric development and because the participation process in place is inadequate to ensure sufficient public input in decision-making. These two issues are deeply interrelated and should not be addressed in isolation. Indeed, the complete acknowledgement of all potential impacts to affected communities and the environment can only be achieved in the context of a fair and competent public participation plan.

Resumen ejecutivo

En los años 1970, Panamá inició la construcción de los primeros proyectos hidroeléctricos para promover la independencia energética del país. Veinte años después, el gobierno inició la implementación de políticas neoliberales y permitió la participación privada en la generación de energía hidroeléctrica. Esto creó un contexto donde el sector privado y sus inversores extranjeros se convirtieron en actores principales en el desarrollo económico del

país (Perdomo, 2008). Aunque este movimiento a la energía limpia es encomiable, la manera en que se hizo este cambio y se sigue haciendo merece la crítica. Según Finley y Brook (2012), la tendencia actual es uno de "autoritarismo ambientalista" o "green authoritarianism" que utiliza el argumento de la reducción de emisiones de carbono para priorizar el desarrollo hidroeléctrico mientras actúa de manera opresiva hacia las poblaciones afectadas. En la provincia de Chiriquí, la cuenca del Río Chiriquí Viejo (RCV) contiene 22 presas hidroeléctricas en operación, en construcción o en trámite de aprobación. Los impactos acumulativos de tantas presas son propensos a ser significativos. Este contexto ha provocado una fuerte resistencia al desarrollo hidroeléctrico en los habitantes de la cuenca del RCV. Nuestra investigación tiene como objetivo estudiar los impactos percibidos de la energía hidroeléctrica y los problemas con el proceso de participación institucionalizada dentro de los estudios de impacto ambiental de los proyectos hidroeléctricos. Esto se logró responder a tres preguntas de investigación: 1) Existen conflictos socio-ambientales causados por la energía hidroeléctrica en la cuenca del RCV? 2) Cuáles son las ubicaciones de estos proyectos hidroeléctricos, y cuáles son sus impactos percibidos? y 3) Cuál es el proceso de aprobación de proyectos hidroeléctricos y cómo las comunidades afectadas se ven incluidas?

Empleamos un método mixto de investigación exploratoria y descriptiva. Para nuestra primera pregunta, realizamos entrevistas y observaciones de campo para evaluar las percepciones generales de las personas en la cuenca del RCV. Una vez que habíamos ganado una comprensión de la situación, hemos realizado entrevistas semi-estructuradas con los representantes políticos de los dieciséis corregimientos que bordean el RCV para identificar los impactos percibidos del desarrollo hidroeléctrico. Estos datos se utilizaron para construir un mapa en ArcGIS que muestra las ubicaciones de las presas y los impactos sentidas por cada corregimiento en nuestro estudio. Con el fin de describir el proceso de aprobación de las presas hidroeléctricas en Panamá, así como la participación pública asociada, consultamos a los

registros del gobierno y realizamos entrevistas semi-estructuradas con representantes de la Autoridad Nacional de los Servicios Públicos (ASEP), el Ministerio de Ambiente (MiAmbiente) y la ONG panameña Alianza para el Desarrollo y la Conservación (ACD). Según nuestras entrevistas, descubrimos que los representantes políticos locales han percibido una disminución en el caudal del río y en la calidad del agua. Estos cambios afectan el consumo humano del agua, los sectores de la agricultura y el turismo, y las actividades de pesca a lo largo del río. Además, el acceso de los habitantes al río ha disminuido porque algunos terrenos que bordean el río se han convertido en propiedad privada de las empresas hidroeléctricas. También, se ha vuelto peligroso bajar al río porque un aumento repentino de la descarga puede ocurrir en cualquier momento si se abren las compuertas de una presa para liberar la presión en el embalse. Otros impactos importantes incluyen daños a las carreteras locales, la fractura de acuíferos, la deforestación, y impactos sobre la fauna y la flora de la cuenca. Estos impactos se perciben en corregimientos lo largo de la longitud del RCV. Los entrevistados también mencionaron el comportamiento deshonesto de las empresas hidroeléctricas durante el proceso de aprobación de sus proyectos.

Como resultado de nuestra segunda pregunta de investigación, describimos los múltiples pasos del proceso de aprobación de las hidroeléctricas, así como los actores pertinentes, manteniendo al mismo tiempo un enfoque en la inclusión de la participación pública. Para empezar, una empresa hidroeléctrica, conocido como “el promotor”, hace una solicitud a la ASEP en un proceso de libre concurrencia para un recurso hidrológico. Luego, el promotor contrata a un consultor ambiental privada para hacer el EIA del proyecto, que es de Categoría I, II o III dependiendo de la magnitud de los impactos. El EIA es aprobado por MiAmbiente y después ASEP adjudica un contrato de producción energética. Por último, el promotor debe recibir un permiso de construcción de la municipalidad en la que se ubica el proyecto. Identificamos varios problemas al dentro este proceso. Por ejemplo, hay la situación

potencialmente problemática de subordinación indirecta entre el consultor ambiental y el promotor. Además, el proceso participativo es inadecuado porque las herramientas de participación no son vinculantes y no hay supervisión sobre la utilización de estas herramientas. Por lo tanto, existe la posibilidad que las empresas hidroeléctricas presentan promesas vacías a las comunidades con el fin de obtener los permisos de construcción. Esta situación puede crear una población que es apática hacia el proceso, ya que no confían en que están bastante incluidas en la toma de decisiones.

La investigación exploratoria realizada en este proyecto ha indicado que las percepciones hacia la energía hidroeléctrica en la cuenca del río Chiriquí Viejo son en gran parte negativa. Los impactos percibidos son numerosos y se sienten en toda la longitud del río. Además, los representantes locales sienten que la población no está incluida adecuadamente en la toma de decisiones. Conflictos socio-ambientales han surgido en Chiriquí a causa de los impactos directos y acumulativos del desarrollo hidroeléctrico y debido a que el proceso de participación es inadecuado para asegurar un aporte suficiente del público en la toma de decisiones. Estos dos problemas están profundamente interrelacionados y no deben ser tratados separados. De hecho, el reconocimiento completo de todos los posibles impactos sobre las comunidades afectadas y el medio ambiente sólo puede lograrse en el contexto de un plan de participación pública justa y competente.

2. Introduction

2.1. Context

Low and middle income countries have rushed towards hydropower for a variety of reasons, including growing populations, international pressure to replace carbon-intensive energy infrastructure with renewable energy projects, and a need to close the electricity gap. In the 1970s, the Panamanian government began constructing the first hydroelectric projects in

order to minimize the country's dependence on oil and thus lower the volatility of domestic electricity prices. In the mid-nineties, the government began implementing neoliberal policies, and allowed private involvement in the generation of hydroelectricity, making the latter a major player in the country's economic development (Perdomo, 2008). The motivation to encourage hydroelectric projects, according to Felix Wing, the General Secretary of Panama's *Ministerio del Ambient*e, was to attract foreign investment. Hydropower is now Panama's main source of electricity, accounting for 53% of installed electrical capacity: 24% from large dams and 29% from smaller run-of-the-river turbines. The rest is primarily generated by thermal power plants, while wind and solar energy together account for 9% of the national electricity supply (ASEP, 2016).

Another factor contributing to Panama's rush toward hydropower could have been the incentives created by the Clean Development Mechanism of the Kyoto Protocol. This mechanism allowed companies in industrialized countries, who found cutting emissions too expensive, to earn certified emissions reduction credits if they financed low-carbon projects in developing countries (Finley-Brook et al., 2011). As a result, in order to gain foreign investment, the Panamanian government had the incentive to encourage hydroelectric projects. This was done by cutting taxes that hydroelectric companies would need to pay and facilitating permit acquisition for hydro projects.

In this context of government enthusiasm for the exploitation of rivers, Panama has a history of conflict surrounding hydroelectric projects. Human rights are recognized to have been violated in some cases involving hydroelectric infrastructure on indigenous land, as companies did not comply with the international norms of free, prior and informed consent. In addition, authorities used physical violence in several instances, for example, during the construction of Chan 75 and Bonyic dams in order to repress opposing communities (Finley-Brook et al., 2011). According to Finley and Brook (2012), the current tendency is one of green

authoritarianism which uses the carbon offset argument to prioritize hydro development while acting in oppressive ways towards affected populations, especially marginalized peoples. Public opposition to hydroelectricity reached such an intensity that, in October 2015, the current government of Juan Carlos Varela decided to cancel the permits of sixteen hydro projects in the provinces of Chiriqui and Veraguas (Rivera, 2015).

Chiriquí province has specifically experienced conflict due to hydroelectric development. It is a mountainous region with elevated precipitation levels, and thus has a high potential for hydropower. The Rio Chiriquí Viejo (RCV) is the province's principal river, and its watershed, also known as *Cuenca 102*, has the greatest potential for hydroelectricity (Vega, 2012). The Rio Chiriquí Viejo is 162 km long, and flows through the districts of Bugaba, Baru, Renacimiento and Alanje, which together have nearly sixty thousand inhabitants (*Ministerio de Ambiente*, 2016). The river itself is currently dammed by five hydroelectric projects of varying sizes, and five more projects are under construction or have been granted construction permits. The tributaries of the RCV, which are included in the *Cuenca 102*, contain an additional twelve hydroelectric dams (ASEP, 2016).

Under Panamanian law, hydroelectric companies are allowed to use up to ninety percent of the natural flow of a river, potentially leaving ten percent of the water in the river's natural channel. This minimum ecological flow does not take into account the volume of water required for specific ecosystem functioning, or the other uses of the river required by nearby communities (CIAM et al., 2014). In addition, there is no cumulative Environmental Impact Assessment of the multiple dams constructed and approved to be built in the watershed, only individual Environmental Impact Assessments (EIA), which frequently contain errors and inconsistencies (Bigda-Peyton, 2012). The excess of hydroelectric projects in Chiriquí is also eliciting concerns from Panama's *Ministerio de Desarrollo Agropecuario*, which has noted that the dams are threatening the agricultural industry's access to water (Arcia, 2015).

2.2. Host Institution

The *Fundación para el Desarrollo Integral, Comunitario y Conservación de los Ecosistemas en Panamá* (FUNDICCEP), is a non-governmental organization founded in 1996. FUNDICCEP leads environmental programs related to the conservation of protected areas, promotes sustainable development within communities in Chiriquí, and actively supports the province's civil society (FUNDICCEP, 2017). Among many other things, this organization spreads awareness about the negative impacts of hydroelectric dams in Panama, and has met with government representatives to encourage a moratorium on the approval of hydro projects. In fact, in partnership with the *Centro de Incidencia Ambiental* (CIAM) and other NGOs, FUNDICCEP succeeded in pressuring the government to cancel the Resolution AG-0091-2012 of the formerly named *Autoridad Nacional del Ambiente* (ANAM) at the beginning of 2017 (CIAM, 2017). This victory at the *Corte Suprema de Justicia* dismantles the rule of the minimum ecological flow of 10%, and pressures the *Ministerio de Ambiente* to redefine how river discharge should be allocated to different users (Jaramillo, 2017).

2.3. Research Questions and Objectives

First Question: *Are there current or anticipated socio-environmental conflicts caused by the ten hydroelectric projects planned or in operation on the Rio Chiriqui Viejo?*

Second Question: *Where are the hydroelectric projects on the Rio Chiriqui Viejo located, and what are their perceived impacts in the corregimientos bordering the river?*

Third Question: *What is the approval process for hydroelectric projects in Panama and how are affected communities included in this process?*

Our primary research objective was to explore the socio-environmental conflicts caused by the ten hydroelectric projects on the RCV. These conflicts were examined by collecting data on the dams' impacts as perceived by local political authorities, civil society, and affected

individuals. Our aim was to record the perceived impacts, since documenting the "real" impacts would have required multiple scientific studies and surveys which would have been impossible within our time frame. However, our results can potentially be useful as a baseline from which more specific research questions are studied in the future. We collected exploratory data with the aim of illustrating the geographical distribution of the perceived impacts of hydropower on the RCV. In addition, we investigated the approval process for the construction of hydro dams in Panama as well as the associated community consultations.

An environmental conflict is defined as a conflict resulting from the scarcity of a natural resource or the overstrain of an ecosystem's sink capacity, that is its ability to absorb pollution (Libiszewski, 1992). Usually, conflicts arise when a resource is scarce and the costs and benefits of its use are unequally distributed (Sanchez-Vasquez, 2016). In the case of a hydroelectric project, the costs are the negative impacts that affect human livelihoods and the environment in addition to the financial costs of the projects absorbed by the hydro company and the state. The benefits of this use of a natural resource are the profits made by the company and the state, the effect on the Panamanian economy, and finally the local jobs and compensations given to the communities directly affected by the project.

A *socio*-environmental conflict includes a social dimension, and is triggered when there is a power imbalance between agents who have opposing worldviews (Ortiz, 2011). In this case, the conflict itself is not only about the distribution of resource property rights, but also includes the cultural perception of the resource and the value communities attribute to it. According to Ortiz (2011), there is no clear link between environmental factors and conflicts. Rather, conflicts are shaped by a social and institutional framework. This is why our third research question has such importance: the conflicts are not caused only by the negative impacts created by the hydroelectric projects on the Chiriquí Viejo River, but arise in a

particular institutional framework where opposing worldviews weight differently in the power balance.

For our host institution, we also created deliverable products for them to use in their work raising awareness about hydropower development in the Chiriquí Viejo watershed. First, we created a map to show the locations of the watershed's 22 hydro projects, and the geographical distribution of their perceived impacts. The map shows the area's districts and *corregimientos*, the rivers of the Chiriquí Viejo watershed, and the locations of the dams. Rather than place permanent symbols printed in the map, we created small removable stickers to symbolize the impacts perceived by each *corregimiento*. This decision was taken in order to create a more effective tool that could be adapted in case more research is done to identify and analyze other impacts and other *corregimientos*. Second, we drafted a flow diagram to illustrate the numerous steps in the approval process of hydroelectric projects in Panama. Both the map and the flow chart are accompanied by extensive explanatory documents in Spanish to clarify their content.

3. Methodology

To answer the three research questions stated above, we used a multi-method research design. This term refers to the "mixing of methods by combining two or more qualitative methods in a single research study'' (Nagy Hesse-Biber, 2010). Specifically, our research combines exploratory research for our first and second questions with descriptive research for our third question. We chose this research method because it creates a synergistic effect, where the results from each question inform the direction of the other parts of the project. Our second and third questions complement each other by bringing out multiple angles on the conflicts, which is another attribute of the multi-method research design. Our central study populations

are the sixteen *corregimientos* that border the RCV, although during our exploratory research, we also attended a community meeting in Paraiso, which is outside of our study area.

3.1. First Research Question: Exploration of the Situation

The intention of our first research question was to provide a general idea of the situation around hydroelectricity in Chiriqui. It aimed to identify whether there are any socio-environmental conflicts caused by the hydroelectric dams on the Rio Chiriqui Viejo. Because no previous research has outlined specific conflicts occurring on this river, we used an exploratory approach to gain familiarity with the local issues surrounding hydroelectricity. This phase took place in the first week of our internship and was the foundation on which we based the rest of our research. We began our exploratory research by reading newspaper articles on hydroelectricity in the area and documents related to specific hydroelectric companies. To answer this question having no local connections, we conducted multiple informal unstructured interviews with contacts from our host supervisor's professional network. We must note that this is a biased sample because these individuals are expected to hold the same opinions as our host.

For this portion of the project, we interviewed members of two activist organizations opposed to the hydroelectric projects in Chiriquí: the *Red Nacional en Defensa del Agua* and the *Coordinadora Bugabeña Contra las Hidroeléctricas*. In addition, we spoke to an attorney who has been a legal adviser for Fundiccep in the past and to three individuals directly affected by the proposed dams in Volcan. The informal, unstructured interviews we conducted contained exclusively open ended questions, and we mainly let the interviewee lead the discussion. The set of questions in each interview was tailored to the person we were speaking with. For example, the affected citizens we interviewed were asked about their personal

experience related to the hydroelectric projects, while members of civil society organizations were asked about their activist role within Chiriquí.

In addition, we attended a community meeting in the *corregimiento* of Paraiso in the Boqueron district of Chiriquí. This meeting had been organized so that members of the community could share their concerns and ask questions to a representative of the hydroelectric company that is building the Chuspa dam in their *corregimiento*. We were invited to attend and collect exploratory information, which was very useful as a general source of insight, even though Paraiso is outside of our study area and does not use the Rio Chiriquí Viejo. We took field notes to record our observations of the participatory process and the dynamics between the different actors.

In order to conduct our interviews according to academic norms, we completed the Tri-Council Policy Statement tutorial on the Ethical Conduct for Research Involving Humans. Our certificates of completion are presented in the Appendix (See Fig. 3). For all interviews in this study, we followed the McGill Code of Ethics and provided consent forms or asked for verbal consent within our recordings.

3.2. Second Research Question: Perceived Impacts by Corregimiento

Based on the results from our exploratory research for our first question, which found that there are significant perceived socio-environmental conflicts surrounding the dams in the Rio Chiriqui Viejo (RCV), we adopted an exploratory approach to answer our second research question. This second question is aimed at uncovering the precise impacts felt by affected communities and how these impacts are geographically distributed across the river's length. We conducted semi-structured interviews with the deputies or mayors of each of the four districts that border the RCV: Renacimiento, Bugaba, Baru, and Alanje. In addition, we interviewed local political representatives of affected *corregimientos* along the river. In any

political hierarchy, it is always important to consider to what extent local representatives truly represent their electorate. Thus, we must acknowledge that our sources of information may be biased and sometimes not fully representative of the population under study. Although all corregimientos in the area are affected by hydroelectricity, because of limited time, we had to focus on those that directly border the RCV: Cerro Punta, Volcán, Santa Clara, Plaza Caisán, Monte Lirio, Río Sereno, Cañas Gordas, Dominical, Breñón, Santa Cruz, Gomez, Aserrio de Gariche, Progreso, Baco, Nuevo Mexico, and Divalá.

For twelve of these sixteen *corregimientos*, we spoke with the *representantes de corregimiento* or their *suplentes* (substitutes). For the four remaining *corregimientos* of Dominical, Cerro Punta, Cañas Gordas, and Divalá, we were unable to meet with a local political representative and therefore found other individuals to interview. For Dominical, we spoke with a local high school teacher who is the president of the *Fundación Amigos de Renacimiento*, a local nonprofit that works towards the sustainable development of the district of Renacimiento. She was well informed on the hydroelectric projects in her *corregimiento*. For Cerro Punta, we spoke with a member of our host institution, whose offices are located in Cerro Punta. For Cañas Gordas, we were able to receive detailed information from the *representante de corregimiento* of Santa Clara. Finally, for Divalá, we spoke with the *representante* on the telephone and he told us that his *corregimiento* is unaffected by hydropower on the RCV. These replacements for the actual political representatives of Dominical, Cerro Punta, and Cañas Gordas are likely to have provided information similar to what we would have received from a *representante*. However, this is an inconsistency in our methodology that may have impacted the quality of our results.

We did not have the time or resources to conduct surveys with members of communities, since our goal was to cover the vastest geographical area possible. This goal originates from the fact that our host institution specifically asked for a geographical illustration

of how the dams on the RCV affect everyone along the river. *Corregimiento* representatives seemed to be the best local actors to provide us with an idea of the main conflicts because they are well positioned to gather information on problems the *corregimiento* suffers. We began with very few contacts, and at each interview we would ask the interviewee to identify *corregimientos* that are affected by the hydroelectric projects on the RCV. This created a situation in which our growing numbers of interviews provided us with more contacts for affected *corregimientos*. Our interview questions were centred on the impacts perceived by the interviewees, as well as the general perspective of their *corregimientos* in relation to hydroelectric companies. The data collected in these interviews was used to create the aforementioned map in ArcGIS using the maps available in the Smithsonian Tropical Research Institute's database.

3.3. Third Research Question

To answer our third research question, which concerns the approval process for hydroelectric projects in Panama, we used government documents, laws, decrees, and the websites of the *Ministerio de Ambiente* and the *Autoridad Nacional de los Servicios Públicos* (ASEP) as our as our main sources of information. In Panama City, we also interviewed two legal advisers of the NGO *Alianza para la Conservación y el Desarrollo* (ACD) whose contact information was given to us by our host institution supervisor. In addition, we interviewed Felix Wing, the General Secretary of *MiAmbiente*, and el Ing. Fernando Vargas, the person responsible for the *Unidad de Gestión Ambiental de ASEP*. We also used our interviews with local representatives in the Chiriqui Viejo watershed in order to explore the perceptions of local authorities on the participative process in Panama. Using the information collected we created a flowchart to illustrate the steps involved in the complex approval process of hydroelectric dams and the roles of the various actors involved. We used the web-based application

Lucidchart to create this flowchart. Since our goals were to study the participative mechanism within the approval process of dams and give a general idea of the institutional framework of this process, we focused the main components of the flowchart on mechanisms that are meant to promote participation or are used by affected populations to influence the approval process.

4. Results

4.1. First Research Question: Exploration of the Situation

Based on our exploratory research at the beginning of this project, we concluded that there are significant socio-environmental conflicts surrounding the hydroelectric dams on the Rio Chiriqui Viejo. In the *corregimiento* of Paraíso of Boqueron district, which is outside of our area of study, we attended a public meeting between community members and a representative of the hydro company Navitas International, which is building a hydro project called Chuspa. This meeting revealed that there are profound conflicts between communities and the different actors involved in hydroelectric projects being built in Chiriqui. We witnessed concerns about the truthfulness of the project's EIAs, due to the fact that it underestimated the area's biodiversity, which would be affected by deforestation for the project. One point that locals were especially worried about was the potential loss of hummingbird biodiversity in the area, which was understated in the project's EIA (C. McIntyre, personal communication, January 30, 2017). In addition, concerns were raised about the lack of proper public consultations before the approval of the Chuspa dam. Specifically, dam construction began without the required municipal permit. These issues are more deeply analysed in the results section associated with our third research question. We later discovered that after this community meeting, a group of people went to protest the project by blocking the road to the construction site. According to a member of our host institution, they have remained there continuously for the past three months (M. Knorsch, personal communication, April 24, 2017).

During our informal meetings with locals from Cerro Punta, which is inside our area of study, we learned that there is significant tension between hydroelectric companies and the area's agricultural industry. Adaias Gonzalez, a member of Cerro Punta's agriculture committee, told us that they had made requests to the government to build an irrigation system of 270 litres per second. *MiAmbiente*, conceded only 100 L/s to their project while approving a hydroelectric project proposed by the locally influential Eleta family, which required 800 L/s. The Eleta hydro project did not end up being built and the government eventually gave permission to the irrigation project to use 200 L/s. However, the process was challenging and costly for local farmers, and there is the remaining threat of other hydro dams being proposed and impacting the access to water of the area's agricultural sector.

In the *corregimiento* of Volcan, we met with Laura Pedreschi, a real estate businesswoman and a central member of the civil society group *La Coordinadora Bugabeña Contra las Hidroeléctricas*. What we learned from her concerned the lack of accessible information in relation to the multiple hydro dams being proposed and built in the province of Chiriqui. Indeed, she explained that many of the existing proposals for dams were not included in public records and one of her colleagues had to dig through other documents at the offices of ASEP to build a comprehensive list of existing projects, which included their sizes in megawatts, their geographic locations, and their statuses. Ms. Pedreschi also cited Article 16 of *El Decreto Ley No. 35 de 1966*, which regulates water use. Specifically, the article lists the potential uses for water in the following order: "*usos para fines domésticos y de salud pública, agropecuarios, industriales, minas y energía*" (Ley 35, 1966). Ms. Pedreschi interpreted this article as giving the priority of water use to local users and not to hydroelectric companies, a priority she feels is not respected in her area.

Based on this data collection, we concluded that there are important socio-environmental conflicts associated with hydroelectricity in Chiriqui. The inhabitants of

Chiriqui mistrust the process with which environmental impacts are evaluated, they feel they are not adequately consulted, and basic information about the area's hydro projects is ostensibly very difficult to find. These conditions justify further investigation into the perceived impacts of hydropower in the Rio Chiriqui Viejo watershed. For this reason, we conducted interviews with representatives of the sixteen *corregimientos* that border the Rio Chiriqui Viejo in order to collect more detailed information and map out the perceived impacts of hydroelectricity in the area.

4.2. Second Research Question: Map of Perceived Impacts

The map of perceived impacts shows the rivers of the Chiriqui Viejo watershed and the *corregimientos* that belong to the four districts bordering the RCV. The map also contains the ten hydro projects on the RCV and the twelve projects on its tributaries. All projects are composed of a dam and a *casa de máquinas* (power plant), where the kinetic energy from the turbines is transformed into electricity. For the four projects with a distance of more than 5 km between the dam and the power plant (Pando, Monte Lirio, Baitun and Burica), the map presents these as two separate geographic points. Connecting them is the underground tunnel which transports up to 90% of the river's flow. These underground tunnels are symbolized by a dotted red line. For the length of the river where these tunnels are present, the river's natural channel is supposed to contain a minimum of 10% of its original flow. The hydroelectric company associated with each project, the river in which it is located, along with the status, EIA category and size in megawatts of each hydro project is shown in a table beside the map.

There are four possible statuses for a project: in commercial operation, in construction, *en diseño final*, and *en trámite*. When a project is *en diseño final*, it has been fully authorized by ASEP but construction has not yet begun because the company is finalizing their plans and securing financial support. When a project is *en trámite*, it is undergoing the planification phase

and getting all necessary approvals from ASEP and ANAM (F. Vargas, personal communication, April 19, 2017). The EIA of each hydro project designates it as either Category II or III. As an aside, Category I projects are judged to have no environmental impact. The difference between Category II and III projects is in the scale of the impact. Specifically, Category II projects are expected to produce partial effects on the environment and no serious indirect or cumulative effects, unlike Category III projects (Panama Tramita, 2016). The sixteen *corregimientos* that border the RCV cover a large territory because the river itself has a length of over 160 km. Thus, the impacts felt by different *corregimientos* vary because of geographical differences. The following are the specific impacts of hydroelectricity perceived along the river. For the complete set of impacts felt by each *corregimiento*, see Table 1 in the Appendix.

The primary and most general impact we heard about from our interviewees is the lowered discharge of the RCV. Indeed, it was an impact mentioned as being important in thirteen *corregimientos*, roughly 80% of those under study. The lower quantity of water in the river can be experienced through three different mechanisms. First, it is something that occurs if there is a hydroelectric project within the *corregimiento*. Most hydro projects are composed of a reservoir formed using a dam, an underground tunnel that can transport up to 90% of the river's flow, and a *casa de máquinas* (F. Vargas, personal communication, April 19, 2017). The underground tunnels can range from 1 to 25 km in length according to the maps in the projects' EIAs we consulted at the *MiAmbiente* library. While the vast majority of the river's volume passes through this tunnel, the river's natural channel can contain only 10% of its original flow. Some interviewees mentioned that hydro companies sometimes take a greater percentage of the flow than they are legally allowed to (D. Samudio, personal communication, February 1, 2017).

Second, a lower flow can occur in the river downstream of multiple hydroelectric projects, even after they return all the water back to the river. This phenomenon occurs due to increased water evaporation in the artificial lakes created by the dams because of the greater surface area of the body of water. A cumulative impact of multiple hydro dams on a single river is therefore a lower downstream volume of water (Kohli and Frenken, 2015). Though this mechanism was not something explained to us by our interviewees, we can hypothesize that it is the reason communities downstream of hydro dams have been noticing a decreased volume of water in the RCV. Third, a lower flow in the river can occur when a hydro company retains water in the reservoir in order to stock up potential energy during periods of low electricity demand (F. Vargas, personal communication, April 19, 2017). These last two cumulative mechanisms can explain why the representatives of Monte Lirio, Progreso, and Gomez went so far as to say that the RCV's flow has decreased by more than 50% (Q. Piti, personal communication, March 14, 2017).

The *corregimientos* that have felt a decrease in the river's flow are distributed from the beginning to the end of the RCV. Therefore, we can conclude that they are experiencing a lower water quantity for different reasons. Specifically, those downstream likely have a lower flow due to the cumulative impacts of evaporation and water storage caused by the multiple dams present upstream. The *corregimientos* located closer to the beginning of the RCV on the other hand likely perceive a lower flow because there is a hydroelectric project directly in their territory taking up to 90% of the flow. In this case, the river's natural channel would contain a fraction of its original flow because the rest is being transported in the project's underground tunnel. The decreased volume of water, whether it is caused by underground tunnels, increased evaporation or water storage in reservoirs, has important implications for the human consumption of water, the agricultural industry, local fishing activities, and the tourism sector.

Though not a widespread impact, the lack of water for human consumption due to hydro dams is a serious issue. The RCV is used for drinking water in only three of the *corregimientos* along the river: Dominical, Progreso and Nuevo México. In Dominical, inhabitants used to drink the water of the RCV, but according to Siannah Yadira Yanguez, the president of the *Fundación Amigos de Renacimiento*, this is no longer possible because the water is contaminated by the chemicals present in the hydro projects' underground tunnels. She explained that this has caused skin diseases in fish (S. Y. Yanguez, personal communication, March 14, 2017). Lower water quality was also perceived in Aserrio de Gariche and Nuevo México. Throughout our literature review of the potential impacts of hydroelectric projects in general, we found some evidence that water contamination can occur. When a hydroelectric reservoir is constructed, the initial flooding of terrestrial forests results in methyl-mercury contamination which temporarily poisons the watershed, soil, and food supply (Rosenberg et al., 1995). Methyl-mercury is easily assimilated into living organisms, which may explain the fish diseases witnessed by Sra. Yanguez. A second effect that reservoirs have on water quality is through eutrophication. When a contained volume of water becomes enriched in nutrients like phosphorous and nitrogen, algal blooms occur, and after the death and decomposition of the algae, the water becomes depleted in oxygen. Specific health risks appear when fresh water, extracted from eutrophic areas, is used for the production of drinking water (European Commission, 2002).

The *corregimiento* of Progreso has an even greater dependence on the RCV than Dominical: their *toma de agua*, where they take water for human consumption, is only one kilometer away from the Burica hydro project. In this context, a lowered volume of water or a reduced water quality would have serious impacts on the health of people in Progreso. The community of Frontera, within Progreso, does not have a water treatment plant, which poses additional health risks (O. Mendoza, personal communication, March 9, 2017). The

corregimiento of Nuevo Mexico in Alanje also depends on the RCV as a source of drinking water although it is perceived as "insalubre" and the community lacks a *potabilizadora* (A. Suira, personal communication, April 7, 2017). The presence of hydroelectric dams and their potential impact on water quality is especially worrying because 48.9% of the population of Nuevo Mexico lacks adequate access to clean drinking water (*El Instituto de Estadística y Censo*, 2010).

Another specific impact of the RCV's reduced flow is on the agricultural sector. According to our interviews, half of the *corregimientos* along the RCV have felt this impact. Furthermore, in these eight *corregimientos*, the group of people perceived to be most affected by the impacts of hydropower in general are farmers. This impact affected the livelihoods of communities: one representative stated that "las cosechas [de los agricultores] han bajado de 40 a 50%" (Q. Piti, personal communication, March 14, 2017). Because the population of Chiriqui is largely composed of rural agricultural workers, the fact that farms are lacking water may have an important effect on the province's economy. In many *corregimientos*, there is no irrigation system, rather farmers use rural aqueducts from streams. However, farms focused on cattle raising often depend on the RCV (A. Espinoza, personal communication, April 6, 2017).

Though none of the *corregimientos* we studied were said to have a commercial fishing industry, 75% of our interviewees stated that people who used to fish in the RCV for personal consumption are affected by the hydro dams. The reduced quantity of water in the river is one mechanism that could have played a role in the decreased fish populations. Another explanation could be the change in water quality mentioned earlier and the physical presence of the dams, which cause fragmentation in the river's ecosystem. The latter is a common impact of hydropower in general: dams have negative effects on the reproductive strategies of migratory amphidromous fish which require the saline conditions of the ocean for their eggs to develop to the juvenile state (Holmquist, 1998). Losses or decreases in fish and shrimp populations

compromise livelihoods as well as have cascading effects on the food web – affecting birds, and micro-aquatic organisms (Kennedy, 2014). The RCV contains a Liza population, a migratory fish which has been disappearing due to the presence of dams (D. Samudio, personal communication, February 1, 2017).

A third explanation for hydropower's impact on local fishing activities is the fact that, in some cases, the area near dams and along the river where an underground tunnel is present, the river's banks have become private property and are no longer accessible to local fishermen (O. Mendoza, personal communication, March 9, 2017). In seven *corregimientos*, people have told us that the banks of the RCV are now private property owned by hydroelectric companies. In Breñón, Plaza Caisan, and Gomez, we heard that people were obliged to sell their lands that bordered the river to hydro companies (M. Martinez, personal communication, March 10, 2017). This situation has reduced local communities' access to the river, which is important not only for fishing but also for washing, bathing, recreational activities, and tourism.

A separate reason why people living along the RCV have not been able to access the river is related to safety. According to our interviewees in seven *corregimientos*, there is a risk to those who go to the river. When there is too much water in the reservoir of a hydro project, the company will open the dam's *compuertas* (sluice gates) to relieve water pressure. This creates a sudden and drastic increase in the river's discharge. Though there is an alarm system for when this occurs, it is not possible for everyone along the river to hear it (Q. Piti, personal communication, March 14, 2017). For this reason, even when there are public paths to access the river, it is sometimes too dangerous to do so (S. Y. Yanguez, personal communication, March 14, 2017). Though we did not hear of any specific accidents that occurred because of opened sluice gates, there was sufficient concern about the possibility of it that people have reduced the time they spend by the river.

Hydroelectricity is perceived to affect the small but significant tourism industry along the RCV. Both the reduced flow of the river and the reduced public access to it make touristic activities like whitewater rafting very difficult. About a third of the *corregimientos* we studied have stated that this impact occurred. The representative of Volcan explained that there used to be rafting organized on the RCV, but now the river is too dry for these activities to continue (N. Hernandez, personal communication, March 14, 2017). Panamanian news outlets released articles on this topic about a decade ago, writing that "la generación de energía hidráulica podría poner en riesgo el turismo que genera el rafting panameño" (Fonseca, 2004).

One impact we were not expecting is related to damaged infrastructure. When hydroelectric companies begin construction, heavy equipment is transported in large trucks on rural roads that sometimes cannot support the weight. In a quarter of the *corregimientos* we studied, roads were damaged or even completely destroyed by the passage of construction vehicles. Sra. Yanguez of Dominical explained, "Este daño fue causada por el paso de los equipos pesados [de las hidroeléctricas]" (personal communication, March 14, 2017). In the *corregimiento* of Santa Cruz, 26 km of their main road was destroyed, and the hydroelectric companies building the Baitun and Bajo Mina projects denied it was their fault (J. Famania, personal communication, March 13, 2017). In Plaza Caisan, the roads are also in a poor state due to hydro construction. The companies responsible have offered to patch the damaged roads, but have not yet done so (F. Gonzalez, personal communication, March 14, 2017). This impact of hydroelectric infrastructure has been documented by the Panamanian *Ministerio de Obras Públicas*. In a description of the impact, Dominical, San Andres, Santa Cruz and Plaza Caisán are mentioned as being affected: "el colapso de la carretera se da producto del exceso de peso de los camiones propiedad de las empresas hidroeléctricas que realizan trabajos en las márgenes del río Chiriquí Viejo" (*Ministerio de Obras Públicas*, 2013).

During our interviews, we also asked about the perceived benefits of hydroelectricity. The hydroelectric company Hydro Caisan S.A. was said to provide annual financial assistance to communities, giving 150 000 USD every year to be divided among the *corregimientos* affected by their hydro project called El Alto (F. Gonzalez, personal communication, March 14, 2017). Such payments are used for public projects in communities such as school renovations, road construction, soccer fields, etc. The other benefit of hydropower mentioned by our interviewees is the employment opportunities it brings. However, these are temporary jobs that sometimes create socioeconomic disruptions in the sense that former construction workers refuse to work in the agricultural sector because they are used to higher wages (D. Samudio, personal communication, February 1, 2017). According to the *diputado* of Baru, the influx of higher paying jobs also caused social problems related to drugs and prostitution (C. Motta, personal communication, February 21, 2017). In addition, according to our interviewee in Dominical, Sra. Yanguez, hydro companies promised to give half of construction jobs to locals, but in the end only gave them about 3% of available jobs (S. Y. Yanguez, personal communication, March 14, 2017).

When asked if communities affected by hydroelectric companies received the benefit of cheaper electricity, all of our interviewees responded that they did not. We were told that the electricity produced by the hydro dams in the RCV is sold to foreign countries in Central America and that locally affected communities are not sold electricity at a discount (F. Gonzalez, personal communication, March 14, 2017). Monte Lirio even suffers from regular blackouts despite having multiple hydroelectric projects within its territory (Q. Piti, personal communication, March 14, 2017). Indeed, despite the development of hydropower generation in the province, more than a tenth of the population of Chiriqui lives without electricity (*El Instituto de Estadística y Censo*, 2010).

During the exploratory portion of our research, we heard about an aquifer on the border between Volcán and Plaza Caisan that was fractured by the construction of the underground tunnel of the Pando hydro project. According to a member of our host institution, the fracturing of the aquifer released millions of litres of water toward the ocean which lowered the supply of water of the area's farmers who had been using wells for their agriculture (D. Samudio, personal communication, February 1, 2017). This story was also told to us by the representative of Rio Sereno, though he was not able to confirm in which *corregimiento* it occurred (E. Fuentes, personal communication, February 2, 2017). The representative of Volcán seemed unsure about the story, but said that there was only a single farm affected by groundwater disruption. He added that the hydro company responsible for it, Electron Investment S.A., took care of the farm's water supply for two years until the problem disappeared (N. Hernandez, personal communication, March 14, 2017). It is unclear what exactly happened during the construction of the Pando tunnel; it would therefore be important to conduct further research into this potential impact.

The final and most general impact of hydropower perceived in our study area is environmental damage. Though there were serious social and economic impacts mentioned in our interviews, nearly all interviewees felt the most drastic impacts were on the environment. It seems that the disrespect for nature shown by hydro companies was one of the biggest reasons why communities opposed them. In addition to the impacts on aquatic wildlife mentioned earlier, the deforestation associated with the construction of hydro dams has negative effects on riparian flora and fauna. The representative of Gomez stated that "los animales silvestres desaparecen en muchas áreas" (A. Espinoza, personal communication, April 6, 2017). The same observation was made by the representative of Monte Lirio, who said "toda la fauna migró" (Q. Piti, personal communication, March 14, 2017). In Monte Lirio and Breñón, representatives stated that hydroelectric companies have not honoured their commitments to

reforestation, something they are required to do according the projects' Environmental Impacts Assessments (Q. Piti, personal communication, March 14, 2017).

4.3. Third Research Question

Democracy is a recent form of government in Panama, and some political dynamics are problematic (Guevara Mann, 2016). The military dictatorship of Manuel Antonio Noriega Moreno from 1983 to 1989 left a legacy of corruption that persist to this day, even as Panama has become a democracy (Gilboa, 1995). The perception of local politicians, NGO representatives and the General Secretary of Miambiente is that the previous government's tendency to allocate so many water concessions to hydroelectric companies was in part due to the underlying corruption present in Panama's government institutions.

The local representatives we interviewed almost unanimously perceived the participatory process, specifically the institutional mechanisms currently in place, negatively. Of the thirteen *representantes de corregimiento* interviewed, twelve had a negative perception of the participatory process integrated in the Environmental Impact Assessments of the hydro projects. Of these twelve, six described the consultations as "amañadas". Only one, the representative of Plaza Caizan, did not clearly state his opinion of the participative process itself, and instead blamed the citizens for not participating sufficiently.

The dissatisfaction of these local representatives is in itself an issue to be investigated properly, but in our goal of creating a general picture of the conflicts we focused on their democratic access to the decision-making process. Conflicts may arise from the lack of local input, leading to national-level decisions that do not consider the real social cost endured by affected communities. All political representatives, including the *representantes de corregimiento* and the district deputies, were unanimous in saying that they would not accept any new hydroelectric projects on the Rio Chiriqui Viejo under any conditions. This statement

was often accompanied by a reference to the already staggering number of projects currently in place. Looking at the map and the table of perceived impacts, one can grasp the amplitude of the conflicts across the *corregimientos* under study (See Appendix, Fig. 1 and Table 1). According to Ing. Fernando Vargas (2017), the person responsible for the *unidad de gestión ambiental de ASEP*, the number of projects in a river is determined by its flow. However, the fixed 10% of the flow allocated for the ecological flow has been declared inaccurate by the Supreme Court of Panama and is to be revised for each of the country's watersheds (Jaramillo, 2017).

One approach taken for the making of the EIA is to see public participation as a way to provide enough information for authorities to make informed decisions, without giving an actual role to the public in the decision making process (Morrison-Saunders and Early, 2008). This approach does not guarantee that the information collected will actually be taken into account, especially if the population affected is marginalized or if there is no real political pressure to count local resistance as a significant social cost. The extreme opposite approach would be to use the public participation process documented in the EIA to shift the balance of power.

Most researchers agree that the purpose of public involvement is to improve the decision-making process, not to let the public shape the final decision. However, even if there is a risk of policy paralysis caused by a straightforward capacity of the communities to shape the decision-making process, if they are given no power at all, the public can become cynical and withdraw from any participatory process (O'Faircheallaigh, 2010). This kind of cynicism has been observed in the affected communities along the Rio Chiriquí Viejo by the *corregimiento* representatives of Volcan and Plaza de Caisan, in addition to the deputy of the district of Bugaba. These local representatives expressed their concern that the population seemed apathetic because they knew they would not have any impact on the decision making

process regardless of their implication in the participative mechanisms in place (N. Hernandez, Personal communication, March 14, 2017), (F. Gonzalez, Personal communication, March 14, 2017), (J. Castillo, Personal communication, February 21, 2017).

4.3.1 Institutional mechanisms in the approval process of a hydroelectric project

To understand the problematic institutional mechanisms that lead to these conflicts, we can look at the approval process of hydroelectric projects in Panama and at how concessions of water use are given to hydroelectric companies. We present here a summary of the approval process of hydroelectric projects and a description of the key stakeholders. Accompanying this description is a flowchart, which uses numbers to represent the chronological order of the different stages of the approval process. We could not create a visually obvious flowchart in terms of chronology because many mechanisms happen simultaneously, or the same actors play different roles at different stages of the process (See Appendix, Fig. 2). Because the participative tools present in this process were central to our research question, the technical studies related to the EIA are not illustrated in the flowchart.

First, one or more promoters send a hydroelectric project application to the *Autoridad de los Servicios Públicos* (ASEP) (step 1 in flowchart). The application of the chosen promoter is then transferred to the *Ministerio de Ambiente* (*MiAmbiente*), which will evaluate whether the project complies with environmental norms, and whether the resource is available for the type of project proposed. If the resource is approved by *MiAmbiente* to be used for the intended project, the application goes through a competitive process of free concurrence, which is a bidding process. The *Autoridad Reguladora*, a body of ASEP, first determines if the promoters comply with the relevant norms and will then establish a reference price. The promoter offering the highest bid for the resource concession will be awarded the concession, but only if the price

offered is no less than 80% of the reference price established by the *Autoridad Reguladora* (ASEP, 2012).

The concession contract is then transferred to *MiAmbiente*. The promoter must hire an environmental consultant certified by *MiAmbiente* to produce an Environmental Impact Assessment (EIA) which is required by the *Ley 41 General del Ambiente de 1998* (Mendez, 2002). This law was the first to fully describe and require EIAs, and was not put in place until the *Decreto Ejecutivo No.59 de 2000* was in force. This decree was derogated (partially repealed) by the *Decreto Ejecutivo No.209 de 2006,* which was then derogated by the current active decree, the *Decreto Ejecutivo No.123 de 2009* (F. Wing, personal communication, April 17, 2017). An EIA can be of category I, II or III, which is determined by the extent of the potential socio-environmental impacts. The requirements that must be fulfilled by a promoter vary depending on the category of their project. Hydroelectric projects are generally categorized as II or III. Our analysis is focused on the requirements of a hydro company related to citizen participation in the EIA. These requirements vary according to the category of the project, as depicted in the following table. The most important difference is that, unlike a Category II project, a Category III project, which involves more severe impacts, is required to hold a public forum (*Decreto ejecutivo 123 de 2009*, 2009).

Table 1: Requirements of the *Decreto ejecutivo 123 de 2009* concerning public participation depending on the category and stage of an EIA

	Stage	
Category	Preparation	Revision
I	**Informative meeting** **Interviews or surveys**	None
II	**Citizen participation plan** a. Surveys, interviews, workshops, assemblies, working meetings, etc. b. Information dissemination c. Responses to information requests from community	**Formal consultation** on the EIA with the community. The document will be kept at the disposal of the community for them to formulate their observations, during fifteen active days
III	**Citizen participation plan** a. Surveys, interviews, workshops, assemblies, working meetings, etc. b. Information dissemination c. Responses to information requests from community	**Formal consultation** on the EIA with the community. The document will be kept at the disposal of the community for them to formulate their observations, during twenty active days **Public forum** The promoter invite the population affected where the project is localised with a aim of 2% attendance rate. The forum is base on an expose of the corresponding EIA.

Note: *MiAmbiente* can require a public forum for an EIA of Category II if it judges it necessary or if the community or civil society living in the area influenced by the project request it.

The EIA produced by the private consultant is then sent to *MiAmbiente* (step 2 in the flowchart) who will evaluate and approve the project with the insight of all involved institutions, such as ASEP and the *Ministerio de Obras Publicas*. The approved EIA and concession contract will then be transferred to ASEP who will then award the concession to the promoter (step 3 in the flowchart). The contract formulated by ASEP will provide a date by which construction of the project must begin, as well as a time frame in which construction must be completed (F. Vargas, personal communication, April 19, 2017). In addition, the promoter must obtain a construction permit from the municipality (step 4 in the flowchart) in order to physically build the project (step 5 in the flow chart) (CAO, 2010).

4.3.2. Critical assessment of the decision-making process

The following are the critiques of the approval process that emerged throughout our interviews. First, the environmental consultant is hired directly by the promoter (A. Chang, personal communication, February 20, 2017). This consultant must be certified by *MiAmbiente* according to certain criteria ensuring that they are competent (*MiAmbiente*, 2015). However, there were multiple testimonies in our interviews stating that some EIAs contain false information, and even plagiarize content from the EIAs of other hydroelectric projects (F. Wing, personal communication, April 10, 2017). Important information is claimed to sometimes go unreported in the EIA, which minimizes the assessment of possible impacts caused by the project (R. Benjamin, personal communication, January 27, 2017). This could, in part, be explained by the context of the consultant's subordination: they may want to please their employer by making the environmental and social costs of the project appear less severe than they are in reality (A. Chang, personal communication, February 20, 2017).

According to Felix Wing (2017), the law has not been properly applied in cases where a consultant commits such errors because no process was initiated to take their name out of the certified consultant registry. Even if a consultant is deemed competent, without a monitoring system in place to ensure the validity of the EIA and resources available to enforce the law, there is the possibility of falsification. Two reforms are under discussion at the national level and would be possible solutions to this problem. The first would be to have environmental consultants hired by the state. The second would be to create a third-party institution where the company could deposit funds to pay the consultant indirectly (O. Jordan, personal communication, February 20, 2017).

A second critique of the approval process is that there are some cases where Category III projects were reported as being fragmented into different projects so that they would have to comply with the lower standards of a Category II EIA (O. Jordan, personal communication,

February 20, 2017). We examined the documents at the *MiAmbiente* library related to our 22 hydroelectric projects under study to investigate if this was the case for any of them. We found that, in the cases of Pando, Monte Lirio, El Alto, Bajo Mina, Baitún, and Bajo Frio, many EIAs were done for a single project (See Appendix, Table 2). However, all of these were Category III projects and therefore have not been subcategorize from the fragmentation of their EIA into multiple impact assessments. All of the projects had one document for the main EIA called *Hidroelectrica [Name of the project]*, while the other EIAs associated with the same project were about related infrastructure such as transmission lines, the landfill site, access roads to the power plant, bridge construction and concrete supply area.

To ensure the adequate categorization of hydroelectric projects, a company could be restricted to creating only one document for all its components to prevent the possibility of the project being subcategorized. However, the rationale for allowing companies to fragment their EIAs is that it can take years to complete an EIA and promoters may not have sufficient funds to incorporate all the components of their EIA at the same time (F. Wing, personal communication, April 10, 2017). Because they have a limited time to provide a valid EIA to *MiAmbiente*, companies are allowed to fragment their projects into components.

Based on our research, the citizen participation process in place in Panama cannot be defined as fair or competent, according to the definitions of Webler and Tuler (2000). Fairness refers to the level of involvement of the public and what they are "permitted to do in a deliberative policy-making process". For a policy-making process be fair, individuals of the public must have the opportunity to attend participative meetings, state their opinions, participate in the discussion, and have a certain weight in the decision making (Webler & Tuler, 2000). The following are some example where a participative process would not be considered fair.

The case of the Chang-75 hydroelectric dam in Bocas del Toro province is well documented: the public forum for the project took place in a remote area, which was inaccessible to the affected Ngobe communities due to economic constraints (Barber, 2008). We learned of a similarly inadequate participation process at the community meeting in the *corregimiento* of Paraiso, where people told us that the hydroelectric company Navitas International started the construction of a road without a construction permit from the municipality. Moreover, they shared their concerns about not having been properly consulted. A representative of Paraiso told us that the community was not aware of the project until its construction began. The inhabitants of Paraiso that we interviewed said that the hydroelectric company did not organize a consultation with the community, or if they did, our interviewees never heard of it (Anonymous, personal communication, January 30, 2017).

Another example of an inadequate participative process was given by Jacobo Famania, the *corregimiento* representative of Santa Cruz. He said that in 2005, during the formal consultations for the Baitun project, the hydro company put a sheet at the door saying that those who signed it would get employment related to the project's construction. According to Sr. Famania, the company used these signatures to prove support for the project within the EIA. These examples reflect the lack of fairness in the participative process within Panama's development projects because potentially affected populations had a decreased access to the participatory process.

Competence refers to the pursuit of a full understanding between actors before an agreement is made (Webler & Tuler, 2000). According, to Osvaldo Jordan, the participation mechanism associated with hydro development is not binding (O. Jordan, personal communication, February 20, 2017). Therefore, if a company promises something in a public forum, they are not legally obliged to respect the oral promise. The *representante* of Breñón told us that the promoter of the Baitun and Bajo de Mina projects, which was Ideal Panama

S.A. at the time but has since changed to Cilsa S.A., committed to provide compensation to the community by improving local schools, churches, and roads (M. Martinez, personal communication, March 10, 2017). However, Breñón has not received any of the compensations promised during the public forum that took place more than ten years ago. This demonstrates the process' lack of competence, since a complete understanding was not struck between the company and the community before the projects were approved. Because oral promises are not binding, even if the participative process follows national norms, there is no way for affected communities to base their decision on the actual benefits that a hydroelectric project could bring. These deficiencies in the participative process and the lack of community autonomy in relation to resource management can explain the public apathy that some local representatives have expressed.

Because the institutionalized participative mechanism within EIAs does not satisfy local representatives, some have used the requirement of a municipal construction permit as a leverage point (step 4 in the flowchart). In 2011, the district of Renacimiento passed a moratorium that prevents any construction permits from being provided to hydroelectric companies (Vásquez, 2011). Since then, no new hydroelectric projects have been constructed in the district (D. Rodriguez, personal communication, February 2, 2017). According to Antonio Chang, a hydroelectric company could accuse this moratorium of being anti-constitutional, making it a temporary solution to the excess of dams in the RCV watershed (A. Chang, personal communication, February 20, 2017). As a second tool to oppose hydroelectric development, Jose Luis Castillo, the deputy of the district of Bugaba, is currently working to pass a moratorium on the approval of hydro projects at the national level. Unlike the municipal moratorium passed in Renacimiento, his project is to pass a national law, the *Ley No. 206,* which could not be easily overturned by hydro companies. This project also aims to organize an audit of all concessions already given or *en tramite* to ensure their compliance with the law.

Finally, since the decision of the *Corte Suprema de Justicia* cancel the Resolution AG-0091-2012 and asked for improved participative process (Jaramillo, 2017), Miambiente has published on their website a process for the modernization of the environmental impact assessment system. At the time we are writing this paper, Miambiente is conducting a public consultation at the national level on the modification proposal of the Decreto Ejecutivo 123 de 2009 (Miambiente, 2017).

5. Conclusion

In conclusion, we have found two main sources for socio-environmental conflicts in the Chiriqui Viejo watershed: multiple direct and cumulative impacts perceived by our interviewees, and a flawed public participation process. We found that local political representatives have perceived a decrease in the river's discharge and the water's quality. These changes affect the human consumption of water, the agricultural and tourism sectors, and fishing activities along the river. In addition, according to our interviews, people's access to the river has decreased because the land surrounding parts of the river has become private property owned by hydroelectric companies, and because it has become too dangerous to be near the river as a sudden increase in discharge can occur at any time if a dam's sluice gates are opened to release pressure in the reservoir. Other important impacts include damage to local roads, the fracturing of aquifers, deforestation, and impacts on the watershed's fauna and flora. These impacts were perceived in *corregimientos* throughout the length of the RCV. Interviewees also mentioned the dishonest behaviour of hydro companies during the approval process. This set of impacts may not be considered in its entirety when the Panamanian government approves a hydroelectric project. These results are significant because they

illustrate why there is a profound opposition to hydroelectricity in this region. Understanding the sources of this opposition is key to solving the government's dual roles of promoting clean energy and protecting affected communities and the environment.

Based on our research concerning the approval process of dams in Panama, we describe the multiple steps in this process as well as the relevant actors, while maintaining a focus on the inclusion of public participation. To begin, a hydroelectric company, known as "the promoter" makes an application to ASEP in a bidding process for a specific hydrological resource. Next, the promoter hires a private environmental consultant to conduct the project's EIA, which is of Category I, II or III depending on the scale of impacts. The EIA is then approved by *MiAmbiente*, and ASEP subsequently awards a contract for electricity production. Finally, the promoter must receive a construction permit from the municipality in which the project is located. Several critiques of this process were identified as it seems there are problematic institutional mechanisms which affect the reliability of EIAs. For example, there is the potentially problematic situation of indirect subordination between the consultant and the promoter. Also, EIAs may be fragmented to understate environmental impacts. In addition, the participative process is inadequate because participative tools are not binding, and there is no enforcement or monitoring of the use of these tools. Therefore, there is the potential for hydroelectric companies to present empty promises to communities in order to gain construction permits. This situation can create a population that is apathetic towards the process because they do not trust that they are fairly included within it.

Panama's government has been recognized as having an interpretation of public participation that is focused on consultation and education, rather than being an inclusive process where all concerned actors can shape management (Gardner, 1999). According to Reed (2008), public participation should be institutionalized and not left as an informal procedure. In the case of the EIAs of hydro project in Panama, the participative process is institutionalized

since hydroelectric companies are required to create a citizen participation plan, a formal consultation, and a public forum, depending on the scale of their impact. This is required by the *Ministerio de Ambiente*, but as we heard from the actors interviewed, these institutional mechanisms are not reliable, and allocate permits to companies after only an ornamental participative process. The results of our research on this approval process are significant because they highlight a deficiency in the extent to which affected communities are included in decision-making related to clean energy development.

The creation of our map of perceived impacts has the potential to help our host institution in its activist mission and in its work spreading awareness and building civil society involvement in this issue. Also, FUNDICCEP will now have a preliminary description outlining which *corregimientos* feel which impacts; this is information that can help them organize their campaigns and identify issues that particularly affect certain communities. Our flowchart of the approval process can help provide a basic understanding of the institutional mechanisms in place. Our work vulgarizing this complex process can empower those who oppose the excessive hydro development taking place in Chiriqui. Our critical assessment of this process can be used by FUNDICCEP and other local NGOs and civil society groups to develop policy suggestions and request specific governmental reforms. This tool has value especially in Chiriqui's context of resistance and long-term protests.

In the wider context of the global academic community, our work also has relevent contributions. Our map and its content helps to set a foundation for future study because it gives a geographical approximation of the impacts perceived by people in this particular watershed, something we could not find in the existing literature. The descriptive research we conducted on the approval process of hydro dams in Panama can help to guide future research on policy. Very little research has been done on the framework for development projects and their EIAs in Panama. According to our review of the literature, the only academic research to

cover this topic is Mendez (2002). However, his summary of the approval process was based on an older version of the *Decreto Ejecutivo No.59 de 2000* (Mendez, 2002). Our work therefore provides an update on the way that development projects are approved in Panama.

The exploratory research undertaken in this project has indicated that perceptions towards hydroelectricity in the Rio Chiriqui Viejo watershed are largely negative. The perceived impacts are numerous and felt throughout the river's length, while local political representatives feel the population is not adequately included in decision-making. Socio-environmental conflicts have arisen in Chiriqui because of the direct and cumulative impacts of hydroelectric development and because the participation process in place is inadequate to ensure sufficient public input in decision-making. These two issues are deeply interrelated and should not be addressed in isolation. Indeed, the complete acknowledgement of all potential impacts to affected communities and the environment can only be achieved in the context of a fair and competent public participation plan.

Appendix

Figure 1: Map of Perceived Impacts in the Corregimientos Along the Río Chiriquí Viejo

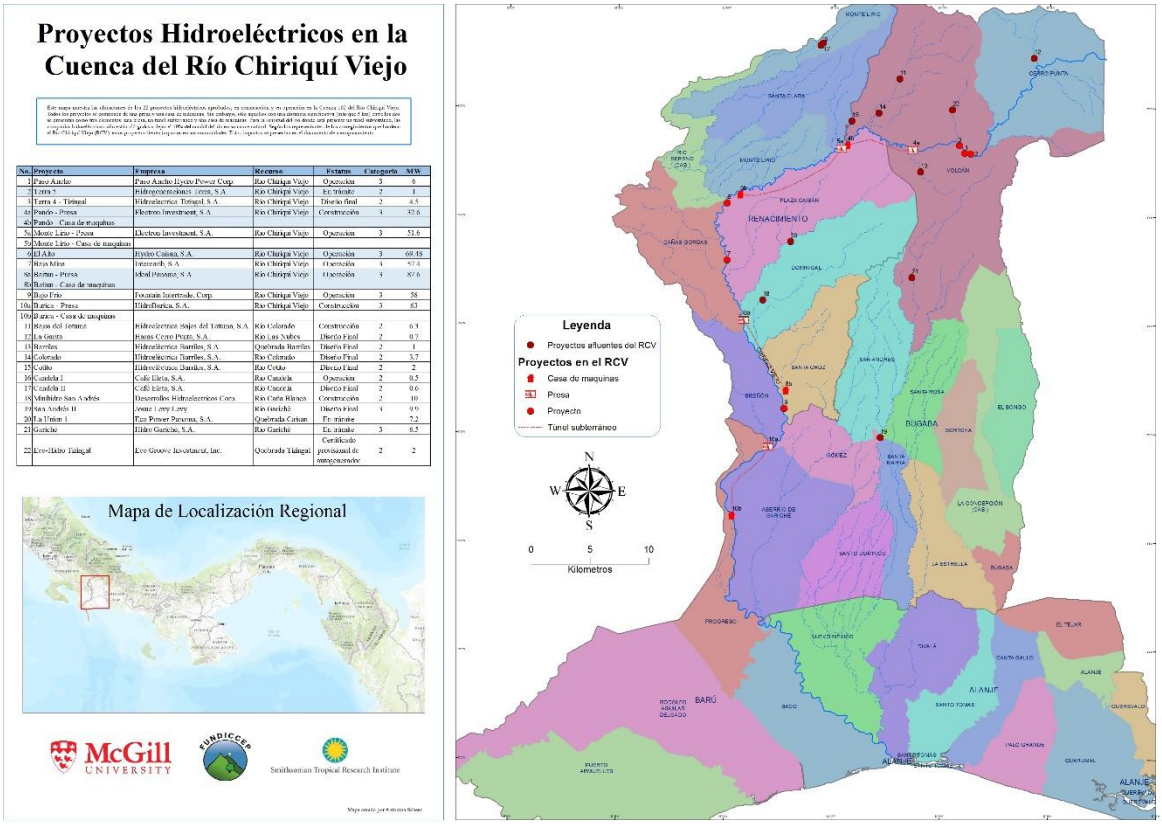

Figure 2: Flowchart of Approval Process for Hydroelectric Projects in Panama

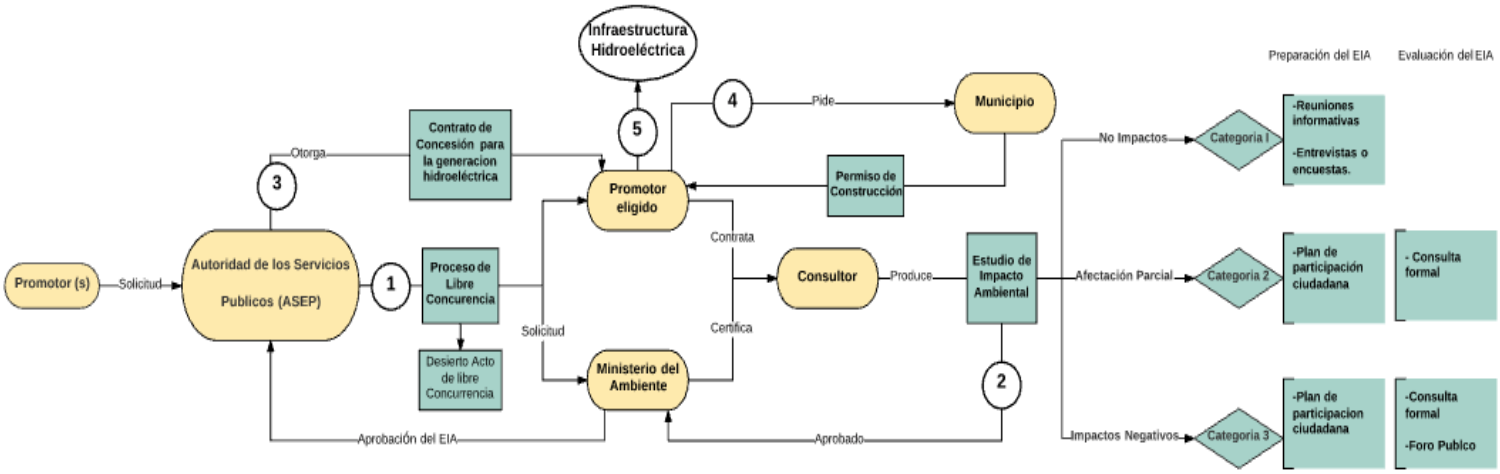

Table 1: Impacts felt by each *corregimiento* under study

Distrito	Corregimiento	Menos caudal	Menos calidad	Consumo humano	Sector agropecuario	Pesca	Calles dañadas	Rio privado	Rio peligroso	Acuifero fracturado	No reforestan	Impactos ambientales	Turismo (rafting)
Bugaba	Cerro Punta	-	-	-	Si	Si	-	-	-	-	-	-	-
Bugaba	Volcan	Si (50%)	-	-	Si	Si	Si	-	-	Si	-	Si	Si
Renacimiento	Santa Clara	Si	-	-	-	Si	-	-	-	-	-	-	-
Renacimiento	Plaza Caisan	Si			Si	-	Si	Si		-	-	Si	-
Renacimiento	Monte Lirio	Si (50%)	-	-	Si	Si		-	Si	-	Si	Si	Si
Renacimiento	Rio Sereno	Si	-	-	-	-	-	-	-	-	-	-	-
Renacimiento	Canas Gordas	Si	-	-	Si	Si	-	Si	-	-	-	-	Si
Renacimiento	Dominical	Si	Si	Si	-	Si	-	Si	Si	-	-	Si	Si
Renacimiento	Brenon	Si	-	-	-	Si	-	Si	-	-	Si	-	-
Renacimiento	Santa Cruz	-	-	-	-	Si	Si	Si				Si	-
Renacimiento	Asserio de Gariche	Si	Si	-	Si	Si	-	-	Si	-	-	-	Si
Renacimiento	Gomez	Si (50%)	-	-	-	Si	Si	Si	Si			Si	-
Baru	Progreso	Si (60%)	-	Si	Si	Si	-	Si (futuro)	Si	-	-	-	-
Baru	Baco	Si (poco)	-	-	-	-	-	-	Si	-	-	-	-
Alanje	Nuevo Mexico	Si	Si	Si	Si	Si		-	Si				-
Alanje	Divala	-	-	-	-	-	-	-	-	-	-	-	-
	TOTAL	13	3	3	8	12	4	7	7	1	2	6	5
	Porcentaje	81.25%	18.75%	18.75%	50%	75%	25%	43.75%	43.75%	6.25%	12.50%	37.50%	31.25%

Table 2: Information on the hydroelectric dams in the Rio Chiriqui Viejo watershed

No.	Proyecto	Empresa	Recurso	Estatus	Categoria	Numero de EIAs	MW
1	Paso Ancho	Paso Ancho Hydro Power Corp.	Río Chiriquí Viejo	Operación	3	1	6
2	Terra 5	Hidrogeneraciones Terra, S.A.	Río Chiriquí Viejo	En trámite	2	1	1
3	Terra 4 - Tizingal	Hidroelectrica Tizingal, S.A.	Río Chiriquí Viejo	Diseño final	2	1	4.5
4a	Pando - Presa	Electron Investment, S.A.	Río Chiriquí Viejo	Construcción	3	4	32.6
4b	Pando - Casa de maquinas						
5a	Monte Lirio - Presa	Electron Investment, S.A.	Río Chiriquí Viejo	Operación	3	3	51.6
5b	Monte Lirio - Casa de maquinas						
6	El Alto	Hydro Caisan, S.A.	Río Chiriquí Viejo	Operación	3	3	69.48
7	Bajo Mina	Intercarib, S.A.	Río Chiriquí Viejo	Operación	3	3	57.4
8a	Baitun - Presa	Ideal Panama, S.A. CILSA S.A.	Río Chiriquí Viejo	Operación	3	3	87.6
8b	Baitun - Casa de maquinas						
9	Bajo Frio	Fountain Intertrade, Corp.	Río Chiriquí Viejo	Operación	3	3	58
10a	Burica - Presa	HidroBurica, S.A.	Río Chiriquí Viejo	Construcción	3	3	63
10b	Burica - Casa de maquinas						
11	Bajos del Totuma	Hidroelectrica Bajos del Totuma, S.A.	Río Colorado	Construcción	2	-	6.3
12	La Garita	Haras Cerro Punta, S.A.	Río Las Nubes	Diseño Final	2	-	0.7
13	Barriles	Hidroeléctrica Barriles, S.A.	Quebrada Barriles	Diseño Final	2	-	1
14	Colorado	Hidroeléctrica Barriles, S.A.	Río Colorado	Diseño Final	2	-	3.7
15	Cotito	Hidroeléctrica Barriles, S.A.	Río Cotito	Diseño Final	2	-	2
16	Candela I	Café Eleta, S.A.	Río Candela	Operación	2	-	0.5
17	Candela II	Café Eleta, S.A.	Río Candela	Diseño Final	2	-	0.6
18	Minihidro San Andrés	Desarrollos Hidroelectricos Corp.	Río Caña Blanca	Construcción	2	-	10
19	San Andrés II	Josue Levy Levy	Río Gariché	Diseño Final	3	-	9.9
20	La Union 1	Eco Power Panama, S.A.	Quebrada Caisan	En trámite		-	7.2
21	Gariché	Hidro Gariché, S.A.	Río Gariché	En trámite	3	-	6.5
22	Eco-Hidro Tizingal	Eco Groove Investment, Inc.	Quebrada Tizingal	Certificado provisional de autogenerador	2	-	2

Table 3: Interview Questions for the *Representantes de Corregimiento*

1.	Cual es la posición y la perspectiva de su distrito y su corregimiento relacionada a los proyectos hidroeléctricas que se realizan en el río Chiriquí Viejo?
2.	La población de su corregimiento usa el agua del Río Chiriquí Viejo para consumo humano? Agricultura? Pesca? Actividades turísticas?
3.	Tiene una hidroeléctrica al dentro de su corregimiento? Como se llama? Sino cuál es la hidroeléctrica más cerca?
4.	Por cuáles proyectos hidroeléctricas su corregimientos está afectado y cuál proyecto causa los más impactos positivos y negativos?
5.	Cuáles son los beneficios de estos proyectos sobre las comunidades que viven cerca de ellos?
6.	Cuáles son los impactos negativos de estos proyectos sobre las comunidades que viven cerca de ellos?
7.	Cuales otros corregimientos que conoce son afectados por las hidroeléctricas?
8.	Cuántas personas viven en su corregimiento? Son todos campesinos y agricultores? O hay otro industrias aquí?
9.	Las empresas hidroeléctricas los dan compensaciones? Ejemplo: escuelas, carreteras, obras comunitarias.
10.	Las empresas hidroeléctricas tienen que hacer la reforestación en las áreas donde se construyen sus presas. Lo hacen?
11.	Cual grupo de la población piensa que esta el mas afectado?
12.	Tiene alianza con otras organizaciones, ONG, sociedad civil o institución gubernamental sobre el tema del abastecimiento de agua?
13.	Cómo funciona el proceso de los estudios de impactos ambientales que se hacen para los proyectos hidroeléctricos en Panamá? Cual es su opinión sobre este proceso?
14.	Cual es su opinión sobre la manera que las empresas hidroeléctricas y el gobierno hacen las consultaciones ciudadanas para estos proyectos?
15.	La población de su corregimiento se moviliza contra las hidroeléctricas? De cual manera?
16.	Cuales son los recursos legales que tiene la población que se opone a las hidroeléctricas?
17.	¿Cuáles son las condiciones bajo las cuales usted apoyaría un proyecto hidroeléctrico en la cuenca Chiriquí Viejo?

Figure 3: Certificates of Completion of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans Course on Research Ethics (TCPS 2: CORE)

PANEL ON RESEARCH ETHICS
Navigating the ethics of human research

TCPS 2: CORE

Certificate of Completion

This document certifies that

Antonina Scheer

has completed the Tri-Council Policy Statement:
Ethical Conduct for Research Involving Humans
Course on Research Ethics (TCPS 2: CORE)

Date of Issue: **15 January, 2017**

PANEL ON RESEARCH ETHICS
Navigating the ethics of human research

TCPS 2: CORE

Certificate of Completion

This document certifies that

Constance Lambert Tremblay

has completed the Tri-Council Policy Statement:
Ethical Conduct for Research Involving Humans
Course on Research Ethics (TCPS 2: CORE)

Date of Issue: **13 January, 2017**

Table 3: Schedule of Activities

Date	Activities
January 11-15	● Skype meeting with internship host institution, Damaris Sanchez of FUNDICCEP ● Begin literature review on the topic of hydroelectricity in Panama and Chiriquí
January 27	● Interview Ramon Benjamin, past legal counsellor of FUNDICCEP ● Meet Ariel Espino to clarify project's direction
January 28-29	● Contact organizations in Chiriquí to invite them to interviews ● Continue literature review ● Begin drafting research proposal
January 30 to February 2	● Travel to the offices of FUNDICCEP in Cerro Punta, Chiriquí ● Attend community meeting in Paraiso where questions were asked to a representative of a company that is building a nearby hydroelectric project called Chuspa ● Interview representatives of organizations in Chiriquí, and other relevant contacts of our host institution ● Visit the site of the Pando hydroelectric dam
February 3	● Finish and submit research proposal
February 4-5	● Establish a new set of tasks and priorities for the coming internship weeks ● Draft detailed questions to ask in upcoming interviews with government officials, and NGO representatives
February 6	● Deliver interview invitations to the six government ministries in Panama City
February 20-24	● Meet and interview deputies from the districts of Baru and Bugaba ● Meet and interview two representatives of ACD (environmental NGO) ● Transcribe and analyze the interviews collected thus far ● Begin learning to use ArcGIS and creating a preliminary map ● Contact *corregimiento* representatives for interviews in March
March 9-12	● Travel to Chiriquí and rent a car to interview organizations and *corregimiento* representatives in Baru, Alanje, and Renacimiento ● Spend weekend processing interviews and preparing the interim presentation ● Begin to synthesize our results so far and identify information needed to draw a more accurate picture of the conflicts
March 13-14	● Travel to Cerro Punta and do interviews with *corregimiento* representatives in Renacimiento and Bugaba

March 15-17	● Prepare interim presentation ● Process the information we've collected in the past days ● Interim presentation
March 19 & 21	● Begin drafting the final paper
April 6-7	● Travel to Chiriqui for the last time and finish all the remaining interviews in the region
April 13-16	● Organize, transcribe and analyze ALL interviews ● Visit ASEP and MiAmbiente to redeliver interview invitations ● Consult the EIAs held as public documents at the MiAmbiente offices ● Synthesize findings ● Finish the map of the Chiriquí Viejo watershed
April 17-23	● Interview government representative of ASEP ● Draft and edit final paper ● Prepare final presentation
April 24	● Submit final report ● Present findings of research project at the internship symposium in Panama City

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