

Failure of Energy Mega-Projects in Chile: A Critical Review from Environmental Policy-Making Perspectives

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Abstract:

A number of successive energy crises over the last decade due to the lack of a balanced investment planning in the energy sector in Chile has led to a strong dependence on external sources and also doubled energy prices in the country, posing a significant challenge to the economy. With the purpose of reaching long-term goals while simultaneously addressing short-term urgencies, Chile seeks to build a consistent and integrated energy policy in order to attract investment in the sector. Despite an overall attractive investment climate and encouraging market conditions in the country, the energy sector has been adversely affected, in particular, by mega-project rejections due to their environmental and social expected impacts. This article presents a critical analysis of the Environmental Policymaking in Chile and explores its implications with respect to the Environmental Impact Assessment (EIA) as a national decision making instrument in assessing potential impacts of activities to the environment. It highlights recent experiences of the energy generation mega-projects in addressing environmental issues and the main challenges ahead, recommending then public policies to effectively address these challenges.

Keywords: Energy Mega-Projects; Chile; EIA

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1. Introduction:

Chile, over the last 26 years, has rapidly progressed on the basis of economic freedom, democracy, and rule of law. As a result, it joined the OECD in 2010, as the second Latin American country accepted after Mexico in 1994. In this context, Chile's energy sector went through dramatic changes in the 1980s when the state owned companies in the electric sector were privatized. The focus was on a private-sector-led growth strategy, which was actually very successful in terms of increasing capacity and improving the efficiency of the firms (Fischer, Gutierrez and Serra, 2002; Serra, 2002). However, Chile's pioneering experience with the power sector privatization and liberalization created competition problems due to insufficient regulation, especially in transmission and vertical integration (Bitrán y Saavedra, 1993; Serra, 2002, Bauer, 2009).

The adoption of free market economic policies and several institutional reforms allowed the country to achieve an exceptional economic performance with high growth rates, low inflation, and a significant poverty reduction. The significant improvement in the welfare of the population has led to a double boost in electricity demand, positioning Chile as the country with the highest energy consumption per capita in Latin America. However, despite the economic achievements, supply in the power sector lagged to keep pace with economic growth. As a consequence, the country experienced several energy crises, some of them as a result of a critical lack of diversified investments in the sector. For a fast developing economy, which also has a strong dependence on external sources to supply its primary energy needs, the lack of investment in generation capacity became a critical issue in terms of securing power supply.

In the country there exist historical unsolved problems related to social, indigenous, and environmental fragilities (Newbold, 2004; Susskind et al., 2014), which combined with the marginalization of the communities where energy projects are located has been a potentially significant threat for the development of energy projects. This became particularly true when environmental evaluations of mega-projects started to play a role in the approval or rejection of them. In practice, over the past years, environmental evaluations of large energy projects have been a constant source of conflict among communities, investors, and the government (Barton et al., 2012; Schaeffer and Smits, 2015). As a result, many energy projects using different technologies and located in different regions of the country have suffered a long delay in their approval processes, and most ended up either rejected or challenged in court due to a weak and flawed environmental review system.¹ In fact, this is true for all of the mega energy projects, such as the Ralco and Pangué dams in the Bio-Bio river (720MW and 450MW respectively) in the 1990s, the Barrancones coal plant (540MW) in 2010, and, more recently, the HidroAysen mega-dam complex (2,750MW) in the Patagonia in 2013.²

One of the key issues to consider, is that Chile's high economic growth mostly depended on the exploitation of natural resources, which accounted for 75% of overall exports. Therefore, policy decisions on the exploitation of natural resources have given high priority to facilitate investment and promote economic growth, while environmental and social concerns were perceived mainly as a restraining factor (Lostarnau et al., 2011). Furthermore, Energy was

¹ For example, in the case of HidroAysen, the House of Representatives established a Special Inquiry Commission after the approval of the dam complex, which concluded that the environmental assessment system suffered from failures and weaknesses (HRC Report, 2012).

² The case of Barrancones is probably the most dramatic one, as the project was approved but to the strong opposition existing in the local community the President of the country called the owners of the project to request them to cancel it anyway and so they did.

an issue in which citizens had no say, as it was related to technical decisions that should be made only by experts (Schaeffer and Smits, 2015). The evidence shows that, as a consequence, Chile's economic policies caused high social and ecological costs affecting dramatically the biodiversity in its territory. As a result, increasing environmental concerns and more ambitious social objectives have questioned the long-term sustainability of this pattern of economic development and have increasingly turned energy into an issue that raises debate or leads to conflict. This article analyses environmental policy making in Chile, focusing on the observed challenges in the case of mega energy projects. It also gives important policy recommendations for effectively addressing these challenges. The remainder of the article is organized as follows. Section 2 presents an overview of the main controversial energy megaprojects in the recent history of Chile. Then, the main existing development trends of Environmental policymaking in Chile are highlighted in Section 3. Section 4 examines the key environmental policy related challenges large energy projects in Chile, and finally Section 5 discusses policy recommendations.

2. Controversial Mega-Energy Projects in Chile

For the last couple of decades, Chile has faced the challenge of balancing its increasing need of securing sources of energy supply to fuel its booming economy, with the also increasing environmental concerns in the country. In addition, between mid-2000s and 2015, electricity prices remained high. This may be explained, among other things, by the lack of investment in new energy projects caused by difficulties experienced in obtaining the necessary authorizations to develop and build them, which is mainly explained by environmental and

public opposition in spite of less interest in investing (Gaete, Gallego, Stamford and Azapagic, 2015).

In this context, large energy projects have been controversial and provoked not only heated debates but also large-scale protests. Table 1 summarizes the relevant information for the four (Ralco and Pangué are part of the same project) energy mega-projects that have been the most controversial, generating a highly visible public debate and large community demonstrations.

Table 1: Energy Mega-Projects in Chile

Project	Technology	Capacity (MW)	Flooded Area (ha)	EIA Presented	EIA Approved
HidroAysen	Hydropower	2750	5910	August 2008	May 2011
Pangué	Hydropower	450	500		
Ralco	Hydropower	692	3500	March 1996	June 1997
Castilla	Coal	2100		- December 2008	-
Barrancones	Coal	540		- December 2007	September 2010

The first mega-project that faced a large public opposition in Chile and was involved in controversy was the Ralco and Pangué dams in the Bio-Bio river. In 1965, ENDESA announced a plan to develop six large dams on the Bio-Bio river and there were no criticism or comments from the media or the public in general at that time. Then, in 1990 it was announced the plan to build the Pangué Dam (467 MW⁹, the first one of the six identified in 1965). For that purpose, ENDESA requested funding support from the International Finance Corporation (IFC), an agency of the World Bank. The EIA of the project formed part of IFC's appraisal and was contracted to a US consulting firm. The study addressed not only environmental impacts but also the issues of resettlement of indigenous Pehuenche people

and others affected by the 500 ha reservoir. The loan agreement explicitly considered environmental protection and some mitigation measures, including the acquisition of land for the relocation of indigenous people displaced. In 1995, due to the strong opposition to the project by indigenous communities, the IFC contracted a study to review their implementation. Once the report was submitted, ENDESA did not grant permission for its release, which generated the view that its conclusions were negative and that it could be even put at risk Ralco, the next project to be implemented in the area. As a consequence, the IFC threatened to declare ENDESA in violation of the environmental conditions of the loan agreement, ENDESA threatened to sue the IFC if the report was released and, finally, decided to buy out the IFC loan (Orellana, 2005; Nelson, 2013). The involvement of the IFC had been very relevant, as the Pangué project was implemented before Chile enacted environmental laws and, therefore, the IFC provided some minimum international standard for the environmental evaluation of the project (Orellana, 2005). This turned out not to be the case and, in a period of time in which Chile faced the risk of energy rationing, the project was approved without significant objections. In the case of Ralco, the mandated EIA was legally in place at the time of its implementation. However, because the environmental legislation was quite new and the institutions implementing it somehow weak, the project was approved without requesting the relevant and necessary environmental studies and with few mitigation measures and ex-post monitoring of its impacts (Goodwin, 2006). In both cases, despite strong opposition, the project was approved and implemented with strong government support (Orellana, 2005; Susskind et al, 2014). Pangué started operating in 1996 and Ralco in 2004. In terms of compensation for the affected communities, it might be relevant to mention that in 2002 five Pehuenche women brought the Ralco case to the Inter-American

Commission on Human Rights. This resulted in an agreement with the Chilean Government under which individual compensation was granted to the petitioners.

Among the controversial mega projects, HidroAysén has probably been the most notorious megaproject, which intended to build five hydroelectric power plants on rivers of Aysén Region in the Patagonia. The plants were planned for an installed capacity of 2,750 megawatts, corresponding to 13% of the country's total installed capacity as of 2016. The project required flooding a total of 5,910 hectares of land, some fraction of them has agricultural use and a large fraction correspond to protected areas of environmental significance and large eco-friendly touristic potential. In addition, a transmission line of more than 2,000 kilometers long is needed to carry the electricity produced in the Patagonia to the main consumption centers. The line would have to pass through several natural reserves, ancient forests and the natural habitat of protected species. It would also cross several cities and many small towns, including some indigenous communities. In 2008 the project developers (the largest electricity generation companies in the country, ENDESA and Colbun) presented the EIA study for the 5 power plants before the National Environmental Commission (CONAMA), the institution handling the environmental evaluation before the SEA was put in place. A first controversial issue had to do with the fact that the EIA study did not include the transmission line³. After a long process of evaluation, new studies that were required and several changes to the original project to mitigate its environmental

³ It might seem obvious that the generation and transmission components would have been considered one project for EIA purposes given that one would not be built without the other. However, it was argued that Transelec was a separate entity from ENDESA, and therefore should have to present its own EIA for the transmission line project. CONAMA accepted the idea of a separate EIA to be presented by each entity (Nelson, 2013).

impact, the project was approved in 2011.⁴ The approval was legally challenged by several environmental NGOs, Senators and House representatives, but the Supreme Court rejected all the legal complaints ratifying the approval of the project in 2012. However, the owners of the project decided not to pursue the environmental evaluation of the transmission lines claiming that the lack of a national energy policy prevents the development of large and complex projects like HidroAysén. Finally, in 2014, a Committee of Ministers presided by the Minister of Environment changed the previous environmental approval of the project to rejection, claiming for this purpose new evidence of its negative impacts presented by environmental organizations and also the lack of enough mitigation measures, especially towards the relocation of people living in the areas to be flooded. In that way Chile's government officially cancelled the controversial HidroAysén project.

A third good example of controversies related to an energy mega-project is the one experienced by the project called “Barrancones”. In December 2007, the consortium GDF Suez presented for environmental evaluation a project for a thermal power plant in Barrancones. The project location was 25km from a marine reserve where 80% of the world’s Humbolt penguins live. In August 2010, the Environmental Regional Commission (ERC) approved the project. As a result, thousands of people protested in front of the Presidential Palace. Two days later, the President announced that the project will not be built after a conversation he had with the owners of GDF Suez.⁵ Indeed, one day after the presidential announcement, GDF Suez announced that they will not go forward with the project. Then,

⁴ After the Regional Environmental Commission approved the project, more than 80,000 people took to the streets in Santiago, while thousands flooded the streets of various cities across the country in subsequent rallies.

⁵ The president did not have any institutional power to stop the project. Therefore, what he did to solve the conflict between the official environmental approval and the rejection of the community is something that puts at risk the role of participation (Spoerer, 2013).

in November 2010 they officially withdrew the project, which had been approved by the ERC.

Finally, a mega-project worth mentioning is the largest coal firing plant project in Chile: the Castilla Complex near Copiapo City. In 2009 the Brazilian company MPX presented the project Castilla to the National Environmental Commission, to be known as the largest coal-firing plant in all South America, with six 350-MW pulverized coal units. The project also included a 125-Ha cinder disposal site and a port to get the coal from overseas. In 2009, the first objection to the project came up from a very close scrutiny of the environmental filing from various groups. This resulted in the first rounds of protests. In 2010, the Regional Commission qualified the project as “polluting industry”. MPX tried to reverse this qualification and the final decision went to the National Environmental Commission (CONAMA), but given all the difficulties CONAMA decided to stop the evaluation process. In the Atacama Region, the project added new opponents and people started getting uneasy regarding how decisions are made in Chile’s Capital Santiago, without considering the region’s will. During 2010, the number of groups within the region that expressed their rejection to the project grew consistently to include the Environmental Commission of the Atacama Region, Municipalities, the farmers from Totoral (neighbor to the project), and most regional council members. In July 2010, a complaint was presented before the Court of Appeal to change the nature of the project to polluting. In September 2010 the Court of Appeal issued a sentence siding with the opposition groups, and upholding the polluting nature of the project. In November 2010, the Supreme Court of Chile ratified the sentence from the Court of Appeal, making the approval of the project almost impossible. The company finally desisted of the project.

3. Development of Environmental Policymaking in Chile

Since the early 1970s, there has been a worldwide expansion of environmental protection standards through legal frameworks and procedures directly concerned with environmental protection and management. As a result of the globalization processes, environmental governance practices have also been undergoing major transformations (Harvey, 2005 and Pierre, 2000) and the effect of environmental measures on market access negotiations for international agreements has become particularly important. Therefore, in order to participate in international arrangements and obtain benefits of free trade and investment liberalization, the environmental protection standards required to be well integrated into national and international policy frameworks. In the rapidly growing globalization process and growing internal problems such as social polarization and environmental concerns, Latin American countries faced increased pressures from internal and external forces to adopt environmental protection standards. However, environmental policy making in most of the region has been constrained by institutional and political arrangements and, in practice, environmental legislation only progressed when the internal demand has been strongly allied with global forces (Techlin et al, 2011). As other countries in the region, Chile also faced a serious challenge of environmental stewardship under conditions of rapidly increasing investment in natural resource industries. Through many decades, although environmental and its associated public health concerns within the civil society was evident, environmental policy planning and regulation in Chile were considered as a detrimental factor to economic growth. Environmental rights in the 1980s Constitution were ambiguous and very limited, especially when compared to private property and economic rights. By early 1990s with the return to

democracy, many internal factors- including an accumulation of severe environmental problems and the emergence of environmental non-governmental organizations (NGOs) put enough pressure on the government to undertake environmental reforms. However, according to many scholars, a policy window for the environment in Chile was not open until these internal factors were linked with foreign pressures (Tecklin 2011 and Lostarnau et al, 2010), including the country's accession to the OECD in 2010. In Chile, environmental protection policies were first implemented in 1994, when the Environment Law (No. 19,300) was enacted. The law aimed to establish a single environmental liability system and incorporated a series of procedures for assessing environmental impacts giving priority to the Environmental Impact Assessment System (SEIA) as the principal tool for environmental impact evaluation. In 2010, Congress approved a new law (Law No.20.417) that made several amendments to the Environmental Law. The changes introduced implied a significant progress towards establishing a modern environmental institutional system. An increasing role of the local community in the EIA process, establishing a new strategic environmental assessment, introducing alternative and faster proceedings, and implementing an innovative sanction system to encourage compliance were among the substantial changes in the new Law (Urritia and Aviles, 2015).

3.1 Institutional Framework

Under the previous Law (No. 19.300), the National Environmental Commission (CONAMA) was a coordinating body of all the environmental policies of the state and, as such, was in charge of the SEIA process in Chile. The role of CONAMA comprised proposing policies and environmental regulations, managing the Environmental Impact Assessment System (SEIA), and to impose penalties when noncompliance with established requirements

occurred. Compared to the supervisory bodies existing in most countries of the region, this was the environmental regulatory institution with the lowest hierarchical status responsible for leading environmental policies. CONAMA's environmental objectives were often opposed by productive and development goals promoted by other ministries within the government. This was not only because CONAMA lacked political weight, but also because it did not have an adequate division among its environmental regulation, enforcement, and productive development functions. As a result, CONAMA was never able to implement an effective inter-sectorial coordination.

The 2010 Environmental Law abolished CONAMA and introduced three main regulatory institutions and some less substantive institutional amendments. These institutions are the Ministry of Environment (MMA), the Environmental Assessment Service (SEA) agency and the Environmental Superintendence (SMA) (Table 2). The MMA is a key responsible body for designing and applying environmental policy, plans and programs in Chile. Compared to CONAMA, the MMA has a broader and larger scope and it co-operates with the President of the Republic. The SEA is another key institution established under Law (No.20.417) and is in charge of managing the SEIA process, evaluating the impact of all development and infrastructure projects in the country, and also has the role of promoting and facilitate public participation within the project evaluation process. The SMA is an independent and autonomous tribunal, responsible for executing, organizing, and coordinating the compliance and enforcement with respect to project activities. The 2010 Environmental Law also instituted the Council of Ministers for Sustainability, which is chaired by the Minister of Environment and its responsibility is to advise the President in the areas of environmental

protection, protection of natural resources, and the evaluation of the environmental impact of economic activities.

In 2012, a new Law (No.20.600) was enacted to create the Environmental Courts with the role of conducting judicial reviews of the decisions of the Environmental Superintendent and to resolve administrative controversies and demands for environmental damages.

Table 2: Current Environmental Institutional Framework in Chile

Institution	Main Responsibilities
The Environmental Ministry	Setting the policies, plans and programs related to environmental issues, promoting sustainable development, the integrity of the environmental policy and its regulations.
Service of Environmental Assessment	Administering the Environmental Impact Evaluation System
Superintendence of the Environment	Running environmental inspection and penalizing in cases of environmental non-compliance
Council of Ministers for Sustainability	Chaired by the Minister of Environment, advises the president on sectorial policies, including draft laws and regulations about the environment
Environmental Courts	Specialized jurisdictional bodies whose function is to solve environmental controversies under their competence and ruling on other topics mandated by law.

3.2 Environmental Impact Assessment (EIA) in Chile

The Environmental impact assessment (EIA) has increasingly become a routine decision making technique on environmental evaluations implemented extensively in the world. As it is well known, the EIA is an effective planning and management tool for identifying the

impact of a specific activity, project or even policy, regarding its magnitude and potential effects on the environment. The EIA was first adopted in 1969 by the United States government as part of the National Environmental Policy Act (UN, 1972). Since 1980s, its application has expanded worldwide, initially in the European Union and OECD countries and then, under the pressure of the leading countries, toward international organizations that expanded its environmental capacities (Wade, 1997). The Rio Conference in 1992 recommended EIAs, which had a strong influence in many –until then- reluctant developing countries (Hochstetler & Keck, 2007; Kolhoff et al., 2013). Today, most South American countries have incorporated some type of EIA system in their environmental legal and regulatory framework.

In Chile, as described before, the Environmental impact assessment System (SEIA) was introduced in 1994 as the principal tool for environmental impact evaluation. The Environment Law establishes that the projects or activities that are likely to produce environmental impact, in any of their stages, are subject to a mandatory assessment of their environmental impact. In the case of energy projects, the SEIA process is mandatory if a project's installed capacity is larger than 3MW, regardless of the type of resource to be exploited and whether the project requires or not the construction of high-voltage electric transmission lines and substations. Even though the main goal of the process is to guarantee that a project neither produces damage nor does it represent a hazard to the environment, the SEIA also considers and evaluates its social impacts. For projects and activities that are not subject to the SEIA, a relevant sector specific state entity is responsible for enforcing environmental legislation. If a project is subject to the SEIA, environmental evaluation must follow one of the two-submission routes to start the process. The first route is to file an

Environmental Impact Declaration (DIA), which is a simplified procedure applicable to those projects that do not generate any of the environmental impacts indicated in the Environmental Law. The second route, considered for projects generating the environmental impact criteria stated in the law, requires filing an Environmental Impact Study (EIA), which is more complex and demanding. The law lays down six environmental criteria for deciding which route to take. The criteria are 1) risk to public health, 2) significant adverse effects on quantity and quality of renewable natural resources, 3) impacts on human communities, 4) proximity to the population, protected resources and areas, 5) alteration of cultural heritage, and 6) alteration of the landscape. If any aspects of the project are likely to generate one of the impacts above, an EIA must be presented. Among other things, the EIA requires a baseline development assessment, impact analyses, and potential mitigation and compensation measures. Once the DIA or EIA is submitted to the SEIA for review, it is evaluated and then the project receives approval, objections to be amended or rejection. The final decision - called environmental qualification resolution (Resolución de Calificación Ambiental, RCA) - is taken by a committee that includes the Regional Governor, the Regional Director of the SEA, and regional representatives of several ministries. In addition, the Law mandates that the State must ensure minimum mechanisms for citizen participation in matters dealing with the EIA procedure. The minimum mechanisms indicate that the applicant must publish a summary of the study in the local newspaper containing the project's essential data and must transmit it by local radio broadcasts at its own expense. The public whether directly affected by project or not, can review the project and submit comments and observations to the relevant agency within 60 days of publication.

Table 3: Summary of EIA process in Chile

EIA process	
Decision-making authorities	ME: Ministry of Environment; Environmental Assessment Service (SEA); Environmental Superintendency (SMA)
Screening	The lists of project types are determined by Law. It is related to those projects with the potential for significant risks to human health or cause significant impact on natural resources, resettlement, or communities' livelihoods; otherwise, only a DIA is needed.
Scoping	No formal provision. Minimum scope, specified in legislation, is based on six criteria which includes analysis of potential impacts on human health, natural resources, social conditions, protected areas, and landscapes; and on cultural, archaeological, and historical heritage
Public participation	Environmental Law mandates citizen participation. Citizens can submit comments on EIA within 60 days of period
Monitoring	EIA should include Environmental Monitoring Indicator Plan accordance with the general instructions issued by the Environmental Superintendence (SMA). It should include the period and frequency of delivery of reports evaluating the results.
Reporting	The SMA control ongoing compliance with the conditions, rules, and measures set out in the Environmental Qualification Resolution (RCA)

4. Observing Challenges in Practice

During the last decade, Chile has achieved a remarkable progress in terms of environmental regulation through consolidating its environmental institutions and designing a comprehensive environmental policy framework. As a result, now environmental and social impact evaluation of each project are explicitly required by National Law. However, the benefits of environmental reforms are lagging behind since there exists a lack of effective policy implementation and law enforcement. Today, implementation of the existing environmental framework in Chile still does not provide adequate opportunities to address the tradeoffs associated with a sustainable use of natural resources (Goodwin, 2006). The environmental impact assessment (EIA) ultimately failed to truly justify that many large projects do not generate serious environmental impacts, even though some of them were initially approved by the environmental authorities. For instance, in the case of the largest hydro energy project-HydroAysen, there was significant evidence that many components of the environmental impact assessment were incorrect or failed to fully assess the impact of the dam. In addition, the role of scientific evidence and knowledge was marginalized as the environmental authorities made an autonomous decision in the case of the HydroAysen project (Barandiaran, 2015). The case of Pangué and Ralco was not significantly different, Nelson (2013) states that "The inertia and the reactive, rather than proactive, stance shown by the government on energy (specially in hydroelectricity, as is evident from the foregoing discussion) must be attributed to a combination of politics, reticence of bureaucrats to be held accountable or to become involved with anything potentially conflictive, and the very real power wielded by ENDESA."

As a result, large energy projects have caused intense public debate reflecting a significant clash between the necessary energy generation investments and the protection, preservation and sustainability of natural resources and the quality of the environment (Bauer, 2009; Susskind et al., 2014). Thus, public protests became quite common causing a significant delay or even the halt of large investments projects.

Based on the data and information collected from agency reports, press releases, and academic publications, we determined the key challenges of environmental policymaking in Chile that adversely affected the completion of large energy projects. The challenges are classified under three broad headings that includes deficiencies in the national policymaking, deficiencies associated with scientific assessment in EIA process, deficiencies for adequate timing for the EIA process and deficiencies in the public participation procedure.

Deficiencies in national policymaking

The underlying conflict between environmental protection and economic development has been very real and became more explicit in the case of energy mega-projects (Lostarnau et al., 2011). There exists a generalized perception, and some evidence to back it up, that EIAs in Chile have been dominated by economic and political interests, operating more as an instrument of several interest groups influence and rent seeking than as an effective tool to prevent environment damage from investment projects (Sabatini et al., 2000, Barandiaran, 2015)). This is particularly true for large energy projects that represent a significant investment for its developers, which in are large corporations exercising significant influence in the Chilean market. Ruthenberg (2001), for example, argued that many of the problems

arising from mega-projects are mostly the result of significant deficiencies in the existing regulatory framework related to its limited environmental and sustainability perspectives. In particular, Chile lacks a clear and comprehensive sustainable development policy for regions which host all mega energy projects. Chile is one of the most centralized countries in South America and the decision-making and implementation for most public policies are taken at the national level and regional and local interests are extensively ignored. This fact, together with poor regional development strategies, prevents a balanced assessment of social, environmental and economic regional aspects for each project. As a matter fact, in the EIA process, there is no requirement for the proposed project to be compatible with local/regional development policies or plans. The practical application of EIA to territorial development plans and the implementation of relevant mitigation measures is very limited. The Minister for the Environment is responsible for recommending national environmental standards, however, it is difficult to ensure that these national standards are met at the regional or local level. Moreover, municipalities in Chile are not empowered to go beyond national environmental standards to take into account more severe local environmental conditions, a standard practice that exists in many developed countries.

- Deficiencies associated with scientific assessment in EIA

One of the serious deficiencies of EIA is related to the lack of depth in its analysis of scientific evaluations. The experience above mentioned of large energy projects showed that science in Chilean environmental politics plays a marginal role in the decision-making and scientific expertise is replaced by ‘rules’. In the Hydro Aysen case, the EIA failed to adequately address significant scientific concerns on measuring the ecosystem. Therefore, the scope of the hydrologic data was incomplete and the methods of data gathering and extrapolation are

extensively questionable. The lack of consideration of some of the basic issues presented in the EIA does not provide confidence in the results, which generates public concerns and even lead to protests.

In the handling of large energy projects, due to the lack of technical capacity in the governmental institutions, Chile is reported to have an overreliance on consultants instead of academic scientists (Espinoza & Alzina, 2001). It is generally believed, especially in Latin American countries, that consultants are usually beholden to the companies hiring them and will not generate studies with results and conclusions that are against their interest. The objective in those cases is not to evaluate the projects, but instead justify them to obtain the EIA approval. Thus the accountability between consultant results and possible environmental damages was weak in the HydroAyen project (Bagdarian, 2012). Furthermore, In Chile consultants used to have important political connections. In fact, several consulting companies were established by politically influential individuals who were previously involved in designing or implementing the environmental politics of the country (E. Silva, 1996).

- *Lack of adequate timing for the EIA process*

One of most widely perceived problems in the EIA process that affects the realization of energy projects is its timing. More specifically, in terms of timing, there are two challenges that need to be faced in Chile. The first one is that the EIA takes place too late (De La Maza, 2001), which potentially causes additional costs to the project that would have been avoidable at an earlier stage. At the same time, it does not give a legal authority to the government to force deeper environmental improvements. In fact, several times, when project developers submit proposals for evaluation, substantial investments decisions about design and

mitigation measures have already been made and cannot always be changed. Ideally, the EIA process should be able to screen out environmentally unfriendly projects before irreversible or costly decisions are made (Goodwin, 2006). The second challenge related to timing is that the whole EIA process might take a long period of time, which causes uncertainty and some additional costs, at least financially. Some delays are every now and then just for political reasons, for example, because it is unpopular for the government to approved a project that - even if it is technically and environmentally sound- has faced public protests. The option then might be to leave the decision to the next government. As mentioned by Spoerer (2013), there is no correlation between technical reports and the decision of approving or rejecting a project. The decision is a political one and, therefore, government officials might sign a technical report questioning a project and then voting in favor of approving it, as it was shown in the case of Barrancones.

- *Deficiencies in the public participation procedure*

According to Fitzpatrick and Sinclair (2003), public participation “accentuates the effectiveness of the environmental assessment, actualizes the principles of democracy, ensures that the project meets the needs of the public, assigns legitimacy to a project, provides awareness for conflict resolution for stakeholders, provides a forum for the submission and inclusion of local knowledge in the EA decision, and provides for a more comprehensive consideration of factors on which decisions are made”. Over a decade of experience with EIA in Chile shows that several of these statements are far from being achieved. Therefore, the existing provisions for public participation in the Chilean EIA do not guarantee adequate consideration of project alternatives or minimization of potential environmental impacts, which led to environmental and social conflicts in the large energy projects.

One of the main challenges in terms of public participation, is to generate legitimacy with respect to the decisions made under the EIA process. As stated by Berdegue (2015), the lack of legitimacy of the evaluation process does not provide an effective space for discussion; additionally, the distribution of costs and benefits for affected communities is inadequate. Currently, the role for the affected communities is quite limited as it is only in terms of helping to identify impacts that were not considered by the project developer (Costa, 2012). In practice, citizens received information and they have 60 days to send written observations, which are then considered by the environmental authority but are not a reason to reject the project. For example, in the case of Barrancones there were 650 observations, but they were barely mentioned in the resolution approving the project. In that sense, the participation of the community seems to be just a formality to legitimize the environmental approval of the project, but it is not a real mechanism of participation and decision allowing to incorporate the observations of the community into the project (Spoerer, 2013).

In most cases, several other factors such as lack of education, effective citizens' interest in environmental matters, and their difficulty in understanding the scientific-technical language of the projects became a major impediment for effective public involvement. Almost all mega energy projects are situated in isolated rural areas, where the population of these zones have a little knowledge and no training at all in technical, scientific or legal issues and they do not receive any legal and technical counseling by the authorities. In fact, under the current Environmental Law (No.20.417), citizens' observations within the public participation process should be submitted through Internet only. Certainly this situation is detrimental to populations of isolated rural areas where there is no infrastructure, resources and/or knowledge to use such technology (Lostarnau, 2011).

5. Conclusions and Recommendations

Chile is at a crucial historical moment regarding its energy development, as it urgently requires dealing with large energy needs for its growing economy in a continuous and secure manner while also taking into consideration increasing environmental concerns. The country faces particularly enormous challenges in the case of large energy projects that have been controversial and provoked heated debates and large-scale protests. It is commonly recognized that a strong and transparent institutional EIA system should play a key role as an instrument for balancing the needs of new energy projects in Chile and the goal of reaching a sustainable economic development. However, to be able to play such a role –and prevent social conflicts- the EIA system requires not only technical capacity and independency, but also legitimacy among the citizens and to be able to consider a sufficient degree of participation of the communities affected by the projects under evaluation. In the case of energy megaprojects some of these issues are particularly important and up to now the EIA system in Chile has not been able to deal with them successfully. In terms of recommendations, there are two dimensions in which significant changes could be made; one related to the improvement of EIA evaluation process itself and the other to the institutional capacity of the EIA system.

5.1 The improvement on EIA evaluation process

Regarding the evaluation process, a first step to improve it would be the generation of baseline information on ecological and socioeconomic conditions that can help future project evaluations and also allow monitoring them once they have been approved and later on implemented. A second step would be to consider a more comprehensive environmental evaluation, which includes policies, plans, and programs (Alshuwaikhat, 2005). Project level

EIA react to development proposals rather than anticipate them, which prevents to steer development towards environmentally robust areas or at least away from environmentally sensitive areas. Environmental conflicts are related to the location of new projects and also to their potential impact. Even though the SEIA system might help in terms of reducing or preventing these conflicts, the lack of territorial planning limits its role and exacerbates the conflicts (Costa (2012)). Additionally, the cumulative impacts caused by several projects should be properly considered and, more specifically, different parts of a project should never be evaluated separately (like an energy plant and its transmission line or several dams next to each other that are part of the same project development). Finally, a third necessary step is to significantly improve the role of citizen participation. Currently, the public participation period of an EIA is just for 60 business days. However, opportunities for citizens' opinions in the development of a project are very limited, which prevents at an early stage of the project the evaluation of alternatives that would reduce environmental or social negative impacts. Therefore, it is fundamental to develop clear and effective mechanisms for public participation in the EIA processes. The SEIA system should ideally provide social acceptability to complex choices (Bronfman et al., 2012). For this purpose, public participation must start earlier such that the affected communities are able to provide meaningful feedback and even exercise some real influence over the project's design or implementation. It would also be important to consider not only environmental and social concerns, but also a project's impacts on the demographic mix, community and institutional structures, and threats to cultural practices.

Transparent procedures should be put in place so that impacted individuals and communities are appropriately consulted and receive the appropriate compensation for the damages

imposed. Mitigation measures are mandatory when a SEIA or EIA is presented, however, there is no regulation about their type, quantification, relationship with the negative externalities caused, and their approval. Additionally, the compensation measures do not require an economic and social analysis. As a result, both are completely arbitrary and the incentives for the project developer are to propose the cheapest measures possible regardless if they fulfill the goals of mitigating or compensating the impacts of the project (Costa, 2012). It is important to highlight that obtaining effective mitigation measures, instead of just monetary compensations, which has been usually the case, is the best way to obtain legitimacy among communities and a sustainable development in the long run. Additionally, it would be relevant to incorporate requirements for closure plans into EIAs. For example, in South America, Peru has made significant progress in this respect by incorporating it to mitigate long-term environmental impacts that have typically challenged the sustainability of mega energy projects.

Given that several of the conflicts related to large energy projects have occurred in poor areas of the country, it might be necessary to provide a cost-free, neutral and technically sound advice to the communities affected (Lostarnau et al, 2011). In such a way, the communities would be able to actively participate in an informed way and reach a reasonable agreement – in terms of environmental and social impacts and also mitigation measures- for the development and implementation of a large energy megaproject.

5.2 Improvements on the institutional capacity

Regarding the institutional dimension, Chile has made some progress toward improving the transparency of the EIA system and also diminishing the possibility of political influence. However, it still necessary to increase the regulatory capacity of state authorities to

implement the new environmental legislation and process the increasing numbers of EIAs in the system, especially in the cases of large projects that present higher level of complexity for their evaluation. For this purpose, it is necessary to significantly increase the budget of the EIA system, allowing it to hire more and better personnel and increase its technical capacities. In such a way it would possible to improve the formulation of predictive techniques and methods to better evaluate the EIAs and then also monitoring the environmental impacts and enforcing the mitigation measures. The main goal for the Chilean government should be to strengthen the legitimacy and technical capacity of the EAI system, such that the EIAs are closely regulated by the government but independently evaluated.

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