

# ENERGY TRANSITION IN SOUTH AMERICA: ELITE'S VIEWS IN THE MINING SECTOR, FOUR CASES UNDER STUDY<sup>1</sup>

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## 1. Introduction

In South America, most countries face significant energy challenges due to increased demand, deficits in infrastructure and energy policies, increased CO<sub>2</sub> emissions, urban pollution, poverty, and increased socio-environmental conflicts (Larraín and Aedo 2008, Walter and Martínez-Alier 2010, OLADE-UNASUR 2012). There have been efforts to advance energy efficiency and sustainable patterns of energy consumption, but these as yet have had insufficient results (Vergara *et al.* 201, ECLAC, 2015).

The number of publications on sustainability transition studies has grown fast in the last decade (Geels 2013), especially in developed, Northern and Anglo-Saxon countries. Many of these studies have focused on critical problems of energy transition (Smith 2012, Verbong and Loorbach 2012), mostly from the science, technology and society perspectives and in the engineering fields, with a system-based approach. Here we emphasise a sociological perspective for developing countries in South America.

In the context of this transitional perspective, we address the following questions: are South American elites' social representations favourable to energy transition and energy-sustainable industrial consumption in the extractive sector? How is the narrative production of meaning affecting these favourable opinions? Our study is focused on four countries: Argentina, Chile, Colombia and Ecuador. It is understood here that sustainable energy consumption in large-scale mining refers to energy consumption in all phases of the mining cycle, and involves achieving energy efficiency and energy consumption with lower carbon emissions. Energy transition is focused on the introduction of renewable energies (RE).

The world is advancing, in a paradigm shift, towards clean industrial production and concomitant sustainable and equitable energy consumption. The extent to which elites of developing countries are aware of this necessary paradigm shift is a key issue of environmental governance, which involves private and government actors. 'Storylines codifying visions and expectations are important for the enrolment of different actors into coalitions for change' (Smith, *et al.* 2005, p. 1507).

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## 2. Scope and Objectives

There are strong inter-relations between energy and environment (Cubillos and Estenssoro 2011, Omer 2011), and the energy sector has been recognised as a key contributor to the climate change (CC) crisis (IEA 2013). Recent global energy market transformations (with the decisive incorporation of unconventional oils) are not yet able to reduce the threat of declining conventional energy sources. These transformations trigger concerns on a planetary level since they still rely on a very high percentage of energy sources from fossil fuels that increase greenhouse gases (GHG) and contribute to CC (IEA 2013). In this context, new technologies and investments related to renewable sources are being promoted by special policies and tariffs in many regions, and particularly in developed countries (Harmelink *et al.* 2006, Omer 2011). Efforts on investments in RE (excluded large hydro) in emerging economies committed to \$156 billion, up 19% on 2014, while developed countries invested \$130 billion, down 8%. (Frankfurt School 2016).

The general objective of our research is to improve the understanding of South American elites' views regarding sustainable energy industrial consumption and energy transition in the context of development alternatives. We focus on elites related to economic sectors that have a higher impact in strategic development processes in South America: energy and the energy-mining complex.

Analyses and experts agree that energy is one of the main issues for the four South American economies we have chosen to study (ECLAC 2015). For more than a decade, investments in the extractive sector have become a relevant lever of growth of the new model of development. Growth projections of mining investments indicate that this sector will be one of the key factors of growth in the near future. According to Metals Economic Group (2013), Latin America has remained the most popular non-ferrous exploration destination in the world, attracting 25% of global spending in 2012. Five countries—Chile, Peru, Brazil, Argentina, and Colombia—accounted for the lion's share of the South American total. Three countries selected for our research were among those with the highest amounts of non-ferrous explorations worldwide: Chile 5%, Argentina 3%, and Colombia 2%.

The investment boom in the mining and energy sectors constitutes the main challenge for elites related to the activity and public agenda on those issues. Thus, policies that promote energy efficiency and RE could become key alternative factors of change (ECLAC 2015). In this context, the specific objective of our research was to observe and analyse how open are key elites connected to the energy and mining sectors to considering a paradigmatic shift that must be introduced to promote cleaner mining production, energy efficiency and especially RE.

Our main hypothesis is that elites will have a generally favourable view of energy transition to RE sources, but that there will be different specific discourses and social representations with regard to sustainable energy consumption in the large-scale mining sector. This asymmetry in the discourse will result in reduced performative and real combined support for energy transition.

In other words the way in which discourses are created and rhetoric is used in the 'sustainable energy consumption in the mining industry' narrative affects the priorities given to energy efficiency, and especially to non-conventional renewable energies ([NCRE] sources: solar, wind and geothermal). These linguistic and semantic variations are mainly due to the socio-structural positions of the major participants in the discourse, in this case the respective members of the elite concerned. The national variable will not be influential given a narrative structure that crosses national borders.

Here, we analyze social representations of energy consumption in the large-scale extractive sector, based on an analysis of the discourse advanced by social agent members of elites in four South American countries. We have chosen Argentina, Chile, Colombia and Ecuador because, as said, their mining and energy sectors have become increasingly challenging since investment is growing considerably, and they are being resisted by local communities for socio-environmental reasons.

In comparative terms we have chosen two pairs of countries that occupy opposing positions with regard to the energy sector and mining development. This is because our information is based on small-N samples; therefore we have to stress comparative similar/different criteria. On the one side are Argentina and Chile, on the other Colombia and Ecuador. From the point of view of the energy matrix Argentina (71.3%) and Chile (62.5%) depend heavily on fossil fuels to feed their thermoelectric power plants. Argentina is the only one of the four countries that has nuclear power plants (4.6%) and Chile has an important contribution of biomass (9%). In contrast, Colombia (79.6%) and Ecuador (58%) rely mostly on hydropower (Observ'ER and Fondation Energies for Le Monde 2016).

However, in all of the countries studied, NCRE are marginal in their global energy matrix (OLADE-UNASUR 2012). The percentages of wind power in total energy provision in the four countries were: Chile, 0.5%; Argentina, 0.2%; Colombia, 0.1%; and Ecuador, nil. The percentages of solar power were: Argentina 0.01% and Chile, 0.009%; and nil for Colombia and Ecuador. No geothermal plants are mentioned. Nevertheless all four countries have high potential for NCRE (Vergara *et al.* 2013, Newell 2014).

In the mining sector there is a gradient in the countries' evolutions and relative weight: Chile has most mining of the four: in 2014 the mining contributed 11.2% of gross domestic product (GDP); mining exports represented 60.7% of all exports. In 2014 the mining sector contributed 2.4% of Colombian GDP, although its importance is growing; 1.3% of Ecuador's GDP; and 1.1% of Argentina's GDP. Nevertheless, in terms of development, the Argentinian mining sector, after Chile's, has a longer history and weighs more in the commercial balance, contributing 6.4% of the country's exports.

The energy policies in these countries are diverse. The main official measures address strategic goals led by the requirement to increase electric power for development needs, and to ensure energy security and autonomy. The goal of reducing carbon emissions has been secondary, although recently there have been new efforts to promote RE.

### 3. Approach and concepts: social representations, elites and sustainable energy in the mining sector

In social dynamics and interaction, social actors make decisions based on information, expectations and projects (Smith *et al.* 2005). Social representations of environmental issues are fundamental to understanding social and institutional practices towards sustainable consumption and energy (Spaargaren 2003). Such representations are linguistically mediated constructions based on encoding and decoding processes that are reflected in respective discourses. Therefore discourses and rhetorical strategies are crucial elements for understanding environmental governance (Dryzek 2005).

Furthermore, energy consumption patterns can be conceived as social construction patterns. Countries that seek to promote energy transition have encouraged studies of the social constitution of energy technology from an interdisciplinary perspective (Château and Rossetti 2011). At first sociology focused on presenting the social impacts of energy technologies. New approaches to the relation technology and society are now at work. Now the focus is on the expectations, stages, practices and social representations, which are supposed to constitute energy technology itself (Rohracher 2008).

There have been abundant studies in South America—especially by institutional organisations related to the energy sector—about industrial energy consumption, and particularly energy and the mining sector. However, almost no academic sociological literature exists about elites' views of sustainable industrial consumption and energy transition.

In the early 2000s a report on energy efficiency and RE in Latin America noted that there were few policies and institutions developing sustainable energy, due to a lack of political will to place the issue on the political agenda. The report called for the identification of the cultural and institutional reasons for the 'relative failure' of sustainable energy development in the region (Altomonte *et al.* 2003). Recently, studies of elites with an impact on the political agenda have been scarce in regard to sustainable development, energy efficiency, and sustainable energy, with the exception of those we have conducted in recent years (Parker 2011, Parker *et al.* 2013). Clean Development Mechanism studies of the Argentine case refers only marginally to energy transition (Newell 2014). We have not identified other studies in these countries that focus on these actors and the energy transition. Brasil is a separate case for its high development of RE. In Europe, political-institutional, socioeconomic, and country specific factors have been studied showing complex interactions involving various actors (Chateau and Rossetti 2011, Marques *et al.* 2010).

Social patterns of energy consumption (residential or large-scale industrial or mining) are a product of complex linguistic, semantic and social construction processes performed by actors whose place as emitters has concrete coordinates and is socio-technically conditioned. Studies of energy and water consumption in mining (Northey *et al.* 2013), based on sustainability reports of mining companies, confirm the clear relevance of these resources for mining processes. More accurate information about energy consumption, GHG emissions and the water footprint of mining production (Norgate and Haque 2010) suggest transnational mining has been increasing energy efficiency, including NCRE and the use of fuel cells. This has been replicated in several of these

countries; the Chilean experience stands out, although it is only beginning to introduce alternative energy sources in large-scale mining.

#### 4. Methodology

The strategic design of our investigation is qualitative and comparative (Yin 2011), seeking to reveal the specific distinctiveness of elites as actors in relation to energy resources involved in the mining and energy sectors in four countries. We used mainly Millian comparison methods with a small-N statistical comparison, complemented with a narrative comparison method employing typological procedures.

A previous study of the social representations of elites in Chile has shown that socio-occupational function and social position (Parker *et al.* 2013) were key to understanding differentiation in discourses about CC and views about the environment. For this reason, the qualitative sample drawn for this study was theoretical and stratified (Trochim 2006).

Our main results come from a main sample of 65 elite members (see Table 1) of the selected cases in the four countries (2012-2013). For comparative reasons we have carried out two other samples of interviewees in Chile, Sample I: 26 elite members (2011) and Sample II: 28 elite members (2013). The comparative samples come from Chile, which is a paradigmatic case because it is the main mining country in Latin America, and third in global mining after China and Australia, with 7.3% of world production.

With the comparative samples we wanted to test if the main patterns and tendencies found in the principal sample were reproduced for the Chilean samples. A different result would be indicative of a strong national influence demonstrating that the last part of our hypothesis was invalid.

**Table 1: Sample of interviewed members of elites**

Samples	MAIN SAMPLE	Comparative sample I	Comparative sample II
	Argentina, Chile Colombia, Ecuador	Chile	Chile
Year	2012-13	2011	2013
Business person	19	12	7
High official	11	0	5
Politician	12	10	6
Expert	12	0	5
Ecologist	11	4	5
Male	48	22	20
Female	17	4	8
N	65	26	28
<b>Source:</b> Research carried out by the author and his team. ENGOV Project FP7 266710 and Fondecyt Project 1150607			

With the aid of a panel of experts in each country, we chose elite members from a very select list of names of representatives of groups at a national level with extensive influence on business, politics, government bureaucracy, and civic environmental organisations. All of the members were involved, directly or indirectly, in paradigmatic cases of large-scale mining and some with energy corporations. The list consisted of business people, chief executive officers (CEOs) or high executives, high officials from the mining or environmental ministries, members of parliament (of mining, energy or environment commissions), experts (mostly consultants) involved with the cases, and national environmental leaders.

For triangulation reasons, we used a double instrument method. Following a face-to-face semi-structured consented interview (Harvey 2011), interviewees had to answer a structured closed questionnaire.

We subjected the discourses objectified in texts to semantic discourse analysis focused on the semiotic square (Barthes 1966, Greimas 1976). We decoded the texts following the analytical linguistic and semantic procedure based on syntagmatic (grammar) and paradigmatic (conceptual network) structures. This involved reconstructing the main semantic structure of the texts and building on the models of social representations.

## 5. Main Findings

### 5.1 Sustainable energy industrial consumption and RE in the questionnaire

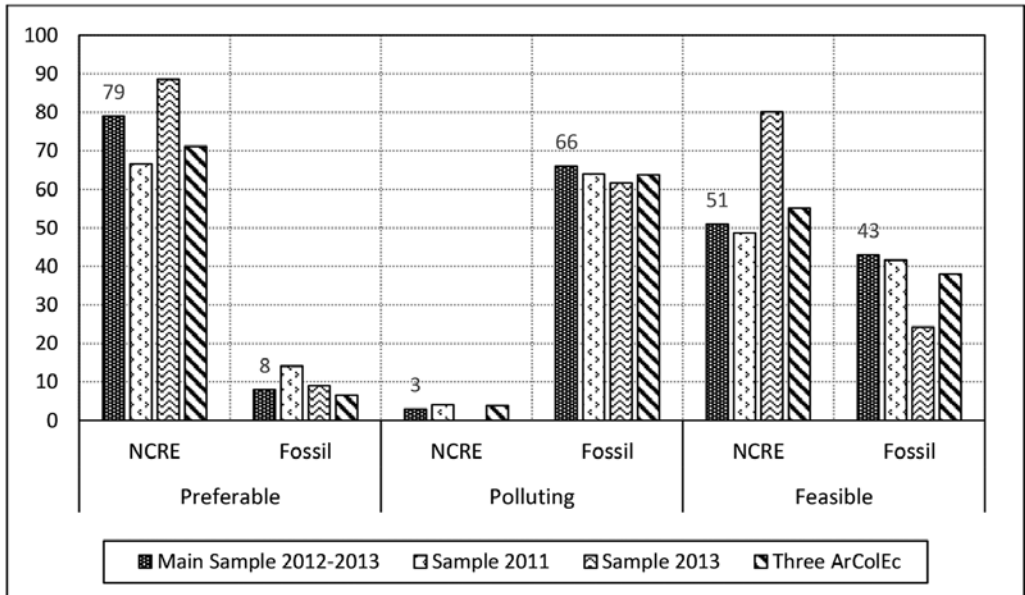
Descriptive statistical analysis of responses to the questionnaire suggests that the discourse of the interviewees is built around a consensual code of social representations regarding the environment and energy. This is consistent with the fact that, in the open-ended interviews, there is a level of *environmental awareness* – at least in terms of rhetoric.

Because the best way to face CC, along with energy efficiency, is the transition to renewable and cleaner energy sources (Omer 2011, Cubillos and Estenssoro 2011), we asked questions about these alternatives. In the main sample, a majority said that dissemination and promotion of RE sources in the public sphere should be made “very often” (75%) or “often” (17%). Most of the interviewees in our main sample mentioned and supported RE. A preference toward RE, such as solar (92%), wind (81%) and hydropower (76%), is noticeable. RE is favoured because it is considered to be cleaner and feasible: RE technologies are non-polluting and there are technological and economical ways to implement them. Hydro is considered feasible by 92%, solar by 67%, and wind by 53%. Of energy sources considered to be most polluting, coal-fired thermal power (90%), thermal power oil (83%) and atomic energy (59%) top the list, in that order.

We recoded all the alternatives in two overarching categories: the main pollutant energies with a fossil fuel origin (carbon, oil and gas) as well as the classical NCRE (solar, wind and geothermal) (see figure 1). We analyzed the different samples: the main sample was compared to the comparative samples I and II. We have also disaggregated the main sample in another sample with only the interviewees from Argentina, Colombia and Ecuador (n=46), so as to compare them with the samples of Chile (2011 and 2013).

The variations between the samples are relatively slight. Their implicit logic validates our handling of the main sample in the context of conducting small N methods.

**Figure 1. Energy Choices: Polluting or Non-Conventional Renewables  
Sample Comparison (Relative frequencies)**



Source: Research carried out by the author and his team.

ENGOV Project FP7 266710 and Fondecyt Project 1150607

Respondents widely preferred RE (and particularly NCRE, 79% in main sample), and identified fossil fuels as pollutants (66%). Notwithstanding NCRE are viewed as more feasible (52% in the main sample) fossil fuels are considered feasible by a high proportion (43%).

As Table 2 demonstrates, the samples correspond to different countries. The behaviour of the domestic variable must be analyzed in greater detail. Preference and feasibility were analyzed in the main sample.

**Table 2: Energy preferences (Main Sample, 2012–2013)  
(Only relative frequencies in terms of source of energy)**

	Argentina	Chile	Colombia	Ecuador
Gas	16.7	38.5	22.2	13.3
Carbon	0.0	0.0	11.1	0.0
Oil	0.0	0.0	0.0	0.0
Hydro	50.0	92.3	55.6	93.3
Solar	91.7	100.0	77.8	93.3
Tidal	83.3	58.3	66.7	42.9
Wind	90.9	76.9	77.8	80.0
Geothermic	54.5	92.3	44.4	60.0
Atomic	9.1	0.0	0.0	7.1
Biomass	41.7	69.2	33.3	46.7

Source: Research carried out by the author and his team.

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Taking Argentina first, Table 2 indicates a preference mainly for solar and wind, probably because the Pampas and Patagonia are vast resources of wind and solar energy. Nuclear is mentioned as well, probably because Argentina is the only country studied that already has nuclear energy. In Chile, preferences are for solar, hydro, geothermal and wind. Chile, with a great solar resource, the Atacama Desert, and plenty of water and geothermal resources in the Andes, also possesses large wind resources in the central valleys. The Chilean energy matrix already has an important percentage of biomass. Colombian respondents prefer solar, wind, tidal, and hydro. Colombia currently makes extensive use of hydropower from the vast basins of the Colombian Andes. Already central to the country's electricity mix it is supposed to grow because of its great potential to replace fossil sources. Research to identify the energy potential of the sea has been developed in recent years. In Ecuador, interviewees prefer hydro, solar, wind and geothermal. Ecuador currently has abundant hydropower resources and a government that aims to increase their use. Similarly, geothermal resources exist in the Andes, as well as solar and wind.

Having analysed preferences, we now move to assessing energy source feasibility where there are significant differences between interviewees.

For Argentina, there are abundant hydro (83%) resources in the Andes, with solar (75%) and wind (72%) in the Pampas, and abundant gas reserves (67%); nuclear energy is mentioned because there are three reactors currently operating.

In the Colombian case, hydro (89%) is frequently cited as feasible because Colombia has abundant water resources; gas (62%) and coal (62%) are cited because Colombia has large reserves and coal mines which are important in the world market.



Ecuadorean sources cite hydro feasibility (100%) because the country has abundant hydro sources and energy policies that prioritise them, and solar (93%) and wind (60%) because there is significant potential to harvest them.

For Chile, in this main sample the energies privileged as feasible are: hydro (62%), coal (62%), and oil (58%). This might be an expression of the particular energy and mining situation of the country: the country needs a great amount of energy for mining and does not have any hydrocarbon reserves, coal for thermo plants being the best priced energy alternative.

All these choices reveal the influence of the national particularities on the discourse about the feasibility of energy sources. We can perceive that the country variable shapes energy preferences and the evaluation of energy feasibility; however, it is not the main independent variable. In fact another independent variable with more explanatory capacity is related to the social position of the interviewees. (See Table 3).

**Table 3: Preferred and feasible types of energy by socio-institutional position of interviewee (Relative frequencies in terms of socio-institutional position)**

	Preferable		Feasible	
	NCRE	Fossil	NCRE	Fossil
Business person	70.6	6.0	45.8	55.1
High official	88.9	10.0	45.2	60.0
Politician	85.2	14.8	55.6	24.7
Expert	79.2	4.2	55.4	33.3
Ecologist	80,0	6.7	60.0	20.0
TOTAL	79.2	8.2	50.6	43.3

Source: Research carried out by the author and his team.  
ENGOV Project FP7 266710 and Fondecyt Project 1150607

We synthesized the data to analyze how main sample respondents answer. The analysis of the data relating to a large preference for NCRE and views about fossil fuels indicates that the different socio-institutional positions are influential.

Business persons manifest least preference for NCRE (71% vs the mean 79%) and in relative terms consider fossil fuels more feasible than renewables (55% vs 43%). High government officials tend to prefer NCRE a little more (89% vs the mean 79%) but consider fossil fuels more feasible than renewables (60% vs 45%). Politicians are slightly more likely to prefer fossil fuels (15%) (mainly gas) and simultaneously tend to consider these types of fuels less feasible (25%). Experts tend to consider fossil fuels less feasible (33% vs the mean 43%) and are least likely to prefer them (4%). Ecologists consider NCRE most preferable (80%) and fossil fuels least feasible (20%).

Nevertheless, the differences are not deep, except as regards the feasibility of fossil fuels. Business persons and high government officials tend to highlight their feasibility; by contrast, experts – together with politicians and ecologists – tend to stress the difficulties for the concrete implementation of them.

In short, renewable sources receive a high level of preference and important support in relation to feasibility. This means that RE have a broad and general level of support from the elites in the four countries. However, as we have seen in the analysis, the particularities of each country influence how feasible the energies are considered to be. Socio-institutional positions clearly tend to influence preferences and views of NCRE.

As we observe above, there is a basic rhetorical consensus on the RE preference. Beyond this consensus, the in-depth semantic analysis of the discourses will reveal greater differences that the statistical description on its own leaves unacknowledged.

## 5.2 Sustainable energy industrial consumption narratives: types of discursive models

Beyond the basic rhetorical consensus that is friendly to the environment, a semantic qualitative analysis allows us to configure discursive models: they might be configured as a typology of elites' views of energy consumption and RE.

The semantic discourse analysis of our corpus follows a systematic procedure which moves from the superficial narrative to the deep structure of meaning. The emphasis of the analysis is on discovering semiotic structures followed by an extra-textual interpretation. For presenting results in this paper the analysis will be simplified and the semiotic structure will be omitted. By these procedures, a typology was established. This typology involved four models of social representations of sustainable consumption of energy in the large-scale extractive sector; and are the following:

### *Model one: responsible consumption and maximum energy efficiency to ensure competitiveness*

The main perspective here is the development of a competitive energy market. The main idea is the reference to **energy consumption**, with the implication that the factor which can regulate consumption is the market value of energy. Energy consumption in mining depends on a competitive energy market to operate at the best possible level of competitiveness and profitability (with low prices).

‘So (mining) demand of energy is high and one of the major costs affecting the competitiveness of the mining industry in Colombia is the cost of energy’ (Colombian, interview n° 5).

The other principal main idea of this discourse is **adequate energy policy** that involves permissive legislation to encourage private initiatives.

The metal mining industry is viewed as ‘dependent’ on the energy sector. The energy alternatives emphasised by the discourse model analysed are improving technology for better efficiency and a search for diversified energy sources, fostering independence and security. The incorporation of RE is only instrumental to that goal. Assuming that mining demands considerable energy for its productive processes (electricity or fuel for the extractive processes, or for facilities or transportation), this discursive model recognises that the main energy comes from fossil sources.

‘I believe that non-conventional renewable energy cannot supply the total demand. I believe that thermo-electric power plants are necessary’ (Chilean, interview n°13).

The main semantic axis of the semiotic square on energy industrial consumption is s1- *Contaminating* versus s2- *Clean*. The counter axis implies *polluting energy* with the word *necessary*. Polluting energy is a necessary evil.

This discursive model conceives water and energy as essential supplies of a very important economic activity for the development of *extractive* countries, a business which seeks to be competitive and profitable in the international market economy. For this reason water consumption must be minimised and energy efficiency and technology must be optimised. Therefore, this model proposes *rational use of resources*, *responsible energy consumption* and *responsible growth*, not stressing (and even showing scepticism regarding) RE.

#### *Model two: efficient management, regulation and responsible consumption*

Energy consumption is understood around the semantic axis: efficiency/inefficiency where the first lexeme s1 is associated by implication to -s2 *efficient practices* and contradicts -s1 *inefficient consumption*. The opposite topic, *deregulated management*, is semantically connoted by the text due to the insistence on requests for energy and mining activity *regulations*, and particularly with regard to water and energy consumption.

The word – s2 *efficient practices* is deduced by its conceptual network: ‘recycling’, ‘efficiency’, ‘evaluation process’, ‘energy efficiency’, ‘defined energy matrix’, ‘efficient thermo power plants’ etc.

‘Then it is the *responsibility of both companies and authorities*, how to develop, *how to manage*, how to make the implementation of projects’ (Argentinian, interview n°13).

This discursive model proposes to improve management and a ‘clear policy’ on energy, but does not point to a transition toward a new country’s energy matrix. Responsible energy consumption in large-scale mining, based on integral, comprehensive and efficient management, should aim toward ‘growth in a sustainable manner.’

‘Well, from the point of view of an electrical system, renewable energy can cover a portion of the load dispatch, but usually you need basic

energy: coal, hydro, etc., that are, say, basic seeds' (Member of International Organisation based in Chile, interview n°1.).

In short, this discursive model generates a clear meaning around energy consumption with the core concepts of *efficient management*, *integrated management*, *regulations* and *responsible consumption*.

### *Model three: comprehensive policy, RE and sustainable development*

This model provides statements about the energy and water consumption in mining, with its significant core based on a *political* approach to sustainable development.

The main word here (s1) is *problematic consumption* that is opposed to (s2) *efficiency and recycling* linked to *sustainable mining*.

The problematic use of water and energy/ volume decrease and pollution, is related to 'non-existent environmental control' (no institutional supervision) where environmental control is associated with the words 'law' and 'politics'. Policy must consider the best use of water and energy resources.

'... I believe that government intervention in these sectors, water and energy, should be much higher than it currently is today in Chile' (Chilean, interview n° 9).

'... the political system must integrate the difficulty of managing mining, there is a lack of an institutional framework' (Ecuadorian, interview n°15.)

RE (conventional or non-conventional) is decisively opted for to reduce GHG emissions. This means the energy/ carbon relation is clearly considered in this discourse.

In relation to energy policies, the fundamental semantic axis lies in the key word *carbonised energy* s1 (contaminant energy), a term denotatively associated with GHG emissions: that is, with the energy derived from burning fossil fuels.

'Our Constitution is more environmental, more protective of the rights of nature. That is why the President has decided to change the energy matrix, going from thermoelectric to hydropower' (Ecuadorian, interview n° 7).

In short, this model proposes sustainable development, which subjects the industrial and mining economy to strict fiscal and governmental controls, rules and regulations. It seeks sustainable consumption of water and energy, promoting efficiency, recycling and the move toward RE, including energy transition by the extractive sector itself.

*Model four: Other development based on alternative energy matrices*

This discursive model triggers meanings on energy from a critique of the environmental impacts of mega-projects. In this context, the topic of water and energy industrial consumption is discussed.

Specifically this discourse states that mining is becoming ‘incompatible with life’, questioning the ‘over-consumption’ of water and energy and their *inequitable* consumption. This discursive model proposes an alternative development that respects the balance of the ecosystem.

‘I think that we can live without the mining that is imposed on us today ... but we cannot live without water, we cannot live without land’ (Colombian, interview n°14.)

As for energy consumption this discursive model clearly favours the transition to RE, leaning toward NCRE, but mainly insists on conceiving the whole energy system differently.

‘We are the country of the sun, of the water. Here we have a chance and the potential to generate types of energy other than in terms of oil.’ (Ecuadorian, interview n° 13).

The meaning articulating axis of this semiotic square is not *renewable energy*, as in the previous discourse model three, but rather the design of the entire energy system and its socio-technical form. As the discourse makes clear, hydropower and /or solar energy projects must be developed with local communities and local governments.

The relationship between energy consumption by large-scale mining and the potential increase of GHG emissions resulting from an increase in demand for fossil fuels (coal, gas) is very present in this discourse. This reveals an explicit perception of the long term inter-generational environmental justice.

Finally, relating to one of our main questions about this discourse production, from the point of view of the socio-institutional position of the emitter we have the following distribution:

**Table 4: Discursive models according to the socio-institutional position of the emitter**

	Discursive models				Total
	One	Two	Three	Four	
	Absolute frequencies				
Business person	17	1	1	0	19
High official	4	4	2	1	11
Politician	1	2	5	4	12
Expert	1	5	5	1	12
Ecologist	0	0	2	9	11
	23	12	15	15	65
	Relative frequencies				
Business person	89	5	5	0	100
High official	36	36	18	9	100
Politician	8	17	42	33	100
Expert	8	42	42	8	100
Ecologist	0	0	18	82	100
	35	18	23	23	100

Source: Research carried out by the author and his team.

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As seen here, distribution differences are significant ( $\chi^2 = 40.84$ ; sig. 000) and revealing: model one is clearly affirmed by business persons, and not by respondents who are politicians, experts and environmentalists. Model two is stated first by experts and senior officials; it is not evident in texts of entrepreneurs and ecologists. Model three is affirmed by politicians and experts. The model is slightly more significant in the case of politicians. It is clearly less manifest in business persons. Model four is clearly evident in the texts of the environmentalists interviewed, and to a lesser extent between politicians. Clearly model four is not affirmed by the discursive text of business persons, and is slightly present among experts.

## 6. Discussion and Conclusions

Elites are usually relevant in terms of patterns of industrial energy consumption since they intervene, often decisively, in investment decisions and policymaking. The evidence shown by our qualitative analysis highlights the different discourses of such elites, and that their lack of agreement may affect the political viability of an energy transition.

Regarding energy and the environment, elites are faced with the major dilemma of a developing country: development requires economic growth, but this effort also requires

consideration of environmental factors and sustainable and equitable patterns of energy production and consumption. Therefore, agency and power in the governance of an energy transition must be analysed. As Smith, *et al.* (2005) have asserted, power to effect change depends on regime membership and the distribution of resources for change, and expectations. Recent research has demonstrated how sustainable technologies become entangled with cultural practices and thus co-evolve, influencing energy consumption (Ozaki and Shaw 2014).

Giving support to our hypothesis, our research has provided evidence that technological factors are not the main arguments within the discourses: rather these factors are often mixed with the social, economic and environmental considerations, values and interests of the emitter. The emphasis on the competitiveness of the first model might reveal that technical and economic factors are being privileged. The instrumental assessment of RE indicates that interest in utilitarian corporate profitability seems to be the ultimate goal of sustainability considerations. In model two, insistence on regulations can conceal a rather economic (within the managerial) perspective. In models three and four, establishing development policies (sustainable in one case, alternative in the last one), means that the political factor becomes preponderant. In all four models the extent to which NCREs are accepted tends to be semantically associated with the extent to which conditions of acceptance of development models are established. These development models are framing the discursive options.

We have found that the emitter's social position has real influence in discursive production. In the first model, we predominantly find business people (executives and managers); in the second, experts and high officials; in the third, politicians and experts; and in the fourth, some politicians and nearly all the environmental leaders. However, discourses are not mechanical reflections of socio-occupational functions. Clear analysed trends favour our hypothesis that the position regarding energy transition and sustainable patterns of energy consumption are conditioned by social-political-cultural macro-variables: the relative position in the socio-institutional structure (in this case, the role as actors linked to corporations, government agencies or civil society).

Our understanding of these positions can be enhanced by considering the implications of unequal distributions of power and agency on the part of different actors. Our analysis has suggested that, in the social representations rationale, the actors on the side of socio-technological forms of hegemonic large-scale energy and mining production forms linked to dominant power in society (business people and high government officials) are more likely to focus on energy efficiency in the context of mega-projects. Actors linked to localities or communities, linked to subaltern groups who are resistant to mega-projects (politicians and especially non-governmental organisation (NGO) leaders), will tend to have a view that is supportive of NCRE sources in the context of a decentralised socio-technological system, on a human scale and including the participation of local communities.

In contrast, what appears clearly is that the last part of our hypothesis is not valid. The national variable, the fact of emitting the discourse from a determined country within its energy and mining landscape, and the recent history of development, is indeed deter-

minant, for energy preferences, and mainly for the evaluation of the feasibility of energy alternatives. Local particularities tend to affect a general positive rhetoric favouring RE and energy transition. Nevertheless, the cultural models (framing the different types of discursive models) are more powerful in shaping the direction in which the seminal ideas support (or not) sustainable transition.

Both macro variables, semantic structure and country context are independent. But which of them is more powerful in socially constructing the discourses: structure or context?

The semantic discourse analysis revealed that, leaving aside contextual references, there was a common semantic structure for each model. Surprisingly, core meanings in the speeches and main arguments found in the main sample (even comparing the extreme polar cases of Argentina, Chile vs. Colombia, Ecuador) are very similar, and this is why the within-case analysis was feasible. In addition, the comparative samples, in their turn, are very similar, coming from discourses found in two different Chilean samples separated by time and space. It is this semantic similarity which enabled both the within-case method and the inter-case comparative method.

However, the typology of models we have presented above should not be reduced to a schematic analysis. Social dynamics affect the way discourses are enunciated, modified, and negotiated, and finally implemented. The political dimension of controversies influence the different options of the actors involved, within the context of energy regimes and conflicts (Hysing 2013).

Our interest has been centred on the framework of the energy transition processes worldwide and how they are manifested in a specific region (in South America). A predominant subjacent concern of a majority – beyond an ideal rhetoric – in the analysed elites' discourses on the energy issue, is more focused on the interest of maintaining economic growth and energy independence and security than ensuring cleaner energy consumption (observed in models one and two). Nevertheless, the potential of turning the rhetoric about energy transition into a real process of change should not be discounted, as our analysis suggests (see models three and four).

The discourses supporting RE argue against scepticism regarding energy transition. The views of the elites studied are varied but they clearly show less reluctance regarding RE than existed a decade ago (Altomonte *et al.* 2003). Now, elites seem open, in principle, to cleaner forms of energy and participatory ways to implement them (Seebach 2016)—but only some of them are truthfully open to accepting the post-hydrocarbon energy paradigm.

The energy transition cannot be reduced to the strict relationship and dynamics that exist between technologies and engineering systems: it certainly involves social actors that can promote or hinder the process of change given their different cultural and value-oriented frameworks between which, with a relevant role their environment concerns.

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## References

- Altomonte, H., Coveillo, M., Lutz, W. F. *Energías renovables y eficiencia energética en América Latina y el Caribe, Restricciones y perspectivas*. Santiago de Chile: CEPAL, División de Recursos Naturales e Infraestructura; 2003.
- Barthes, R. Introduction à l'analyse structurale des récits, *Communications*. 1996; 8 (8), 1–27.
- Château, B. and Rossetti di Valdalbero, D. (eds.). *World and European Energy and Environment Transition Outlook WETO-T*. Brussels: Directorate-General for Research and Innovation, Socio-economic Sciences and Humanities, European Commission; 2011.
- Cubillos, A., Estenssoro F. (eds.). *Energía y medio ambiente, una ecuación difícil para América Latina*. Santiago de Chile: Colección IDEA USACH; 2011.
- Dryzek, John S. *The Politics of the Earth, Environmental Discourses*. New York: Oxford University Press; 2005.
- ECLAC. *The Future of Energy: Latin America's Path to Sustainability, International Conference - Santiago de Chile: August 18 -19, ECLAC*; 2015. Accessed 01.11.2016. Available from: [http://conferencias.cepal.org/futuro\\_energias/](http://conferencias.cepal.org/futuro_energias/)
- Frankfurt School. *Global Trends in Renewable Energy Investment 2016*, Frankfurt am Main: Frankfurt School, UNEP. 2016. Accessed 04.16.2016. Available from: [http://fs-unep-centre.org/sites/default/files/publications/globaltrendsinrenewableenergyinvestment-2016lowres\\_0.pdf](http://fs-unep-centre.org/sites/default/files/publications/globaltrendsinrenewableenergyinvestment-2016lowres_0.pdf)
- Geels, F. References relevant for STRN [online], 8 July, 2013. Accessed 10.14.2014. Available from: <http://www.transitionsnetwork.org/files/Reference%20list%20to%20transition%20publications.pdf>
- Greimas, A.J. *Sémiotique et Sciences Sociales*, Paris : Du Seuil; 1976.
- Harmelink, M., Voogt, M., Cremer, C. Analysing the effectiveness of renewable energy supporting policies in the European Union. *Energy Policy*. 2006; 34, 343–351.
- Harvey, W.S. Strategies for conducting elite interviews. *Qualitative Research*. 2011; 11 (4), 431–441.
- Hysing, E. Representative democracy, empowered experts, and citizen participation: Visions of green governing. *Environmental Politics* . 2013; 22 (6), 955–974.
- International Energy Agency (IEA). *Redrawing the Energy-Climate Map*, Paris: OEDC/IEA, International Energy Agency. 2013.
- Larraín, S., and Aedo, M. P. *Política Energética en América Latina, Presente y Futuro*. Santiago de Chile: IFG, IPS; 2008.

- Marques, A., Fuinhas, J.A. and Pires Manso J.R. Motivations driving renewable energy in European countries: A panel data approach. *Energy Policy*. 2010; 38, 6877–6885.
- Metals Economics Group. *Worldwide Explorations Trends 2013*; 2013.
- Accessed 12.17.2014. Available from: [http://www.metalseconomics.com/sites/default/files/uploads/PDFs/meg\\_wetbrochure2013.pdf](http://www.metalseconomics.com/sites/default/files/uploads/PDFs/meg_wetbrochure2013.pdf)
- Newell, P. The politics and political economy of the Clean Development Mechanism in Argentina. *Environmental Politics*. 2014; 23 (2), 321–338.
- Norgate, T. and Haque, N. Energy and greenhouse gas impacts of mining and mineral processing operations. *Journal of Cleaner Production*. 2010; 18, 266–274.
- Northey, S, Haque, N., and Mudd, G. Using sustainability reporting to assess the environmental footprint of copper mining. *Journal of Cleaner Production*. 2013; 40,118-128.
- Observ'ER and Fondation Energies pour le Monde. *Worldwide electricity production from renewable energy sources*. Paris. Accessed 04.27.2016. Available from: [http://www.energies-renouvelables.org/electricite\\_renouvelable.asp](http://www.energies-renouvelables.org/electricite_renouvelable.asp)
- OLADE, UNASUR. *UNASUR: un espacio que consolida la integración energética*. Quito: Organización Latinoamericana de Energía; 2012.
- Omer, A. M.. Energy and Environment: Applications and Sustainable Development. *British Journal of Environment & Climate Change*. 2011; 1(4), 118–158,
- Ozaki, R. and Shaw, I. Entangled Practices: Governance, Sustainable Technologies, and Energy Consumption. *Sociology*. 2014; 48(3), 590–605.
- Parker, C. Global Warming, Elites and Energy in Latin America: The Chilean Case. *Journal of Environmental Science and Engineering*. 2011; 5 (12), 1702–1714.
- Parker, C., Letelier, M, Muñoz, J. .Elites, Climate Change and Agency in a Developing Society: the Chilean Case. *Environment, Development and Sustainability*. 2013; 15(5), 1337–1363.
- Rohracher, H. Energy systems in transitions: contributions from social sciences. *International Journal of Environmental Technology and Management*. 2008; 9 (2/3), 144–161.
- Seebach, C. *Desafío energético, confianza, participación y diálogo*, in 1er Seminario de Energía, diálogos de energía para un desarrollo sustentable en y con los pueblos indígenas, Asociación de Generadoras de Chile, IACCTIS, Santiago de Chile: Hotel San Francisco, April 14<sup>th</sup>, 2016.
- Smith, A. Civil society in sustainable energy transitions, in Verbong, G. and Loorbach, D. (eds.). *Governing the Energy Transition: Reality, Illusion, or Necessity?*, New York: Routledge;2012. 180–202.
- Smith, A. Stirling, A., Berkhout, F. The governance of sustainable socio-technical transitions. *Research Policy*. 2005; 34, 1491–1510.

Spaargaren, G. Sustainable Consumption: A Theoretical and Environmental Policy Perspective. *Society & Natural Resources*. 2003; 16 (8), 687–701.

Trochim, W.M.K. Nonprobability Sampling, *Social Research Methods*. 2006. Accessed 01.20.2013. Available from: <http://www.socialresearchmethods.net/kb/samprnon.php>

Verbong, G and Loorbach, D. (eds). *Governing the Energy Transition. Reality, Illusion or Necessity?* New York: Routledge; 2012.

Vergara, W., Alatorre, C., Alves, L. *Rethinking Our Energy Future. A White Paper on Renewable Energy for the 3GFLAC Regional Forum*. Washington DC: Inter-American Development Bank, Discussion Paper, No. IDB-DP-292; 2013.

Walter, M., Martinez-Alier, J. How to be heard when nobody wants to listen. Community action against mining in Argentina. *Canadian Journal of Development Studies*. 2010; 30 (1–2), 281–303.

Yin, R. K. *Qualitative Research from Start to Finish*. New York: The Guilford Press; 2011.



# ENERGY TRANSITION IN SOUTH AMERICA: ELITE'S VIEWS IN THE MINING SECTOR, FOUR CASES UNDER STUDY

**Abstract:** Implementing a transition towards sustainable patterns of energy consumption in the extractive sector, including energy efficiency and renewable energy sources, is an ongoing, but incipient, process in South America. The focus here is on social representations of elites on 'sustainable energy consumption' in the large-scale mining sector in Argentina, Chile, Colombia and Ecuador. The concepts of efficiency and non-conventional renewable energy are widely accepted. The main question is: are elite views in these countries favourable to energy transition and energy-sustainable industrial consumption in the extractive sector? Notwithstanding a basic consensus, different views exist on renewable and efficient energy, regulations and policies. In the semantic core of the discourses, the different and contradictory interpretations of elite groups are evident. A qualitative discourse analysis and a descriptive statistics comparison of these differences reveal shifts in meaning, in social positions, and the influence of each country context in the production of these discourses.

**Keywords:** energy transition; renewable energy; energy in Latin America; elites and energy; elites in mining and energy.

**Resumo:** A transição para padrões sustentáveis de energia no sector extrativo, incluindo eficiência energética e fontes de energia renováveis, é um processo contínuo, mas incipiente, na América do Sul. O foco aqui é sobre as representações sociais das elites sobre "consumo de energia sustentável" no setor de mineração em larga escala na Argentina, Chile, Colômbia e Equador. Os conceitos de eficiência e energia renovável não convencional são amplamente aceitos. A principal questão é: são as opiniões das elites desses países favoráveis à transição energética no sector extrativo? Apesar do consenso básico, existem diferentes discursos sobre regulamentos e políticas de energia renováveis e eficientes. No núcleo semântico dos discursos, as interpretações diferentes e contraditórias dos grupos de elite são evidentes. Uma análise qualitativa do discurso e uma comparação estatística descritiva dessas diferenças revelam mudanças no sentido, nas posições sociais e na influência do contexto de cada país na produção desses discursos.

**Palavras-chave:** transição energética; energia renovável; Energia na América Latina; Elites e energia; Elites em mineração e energia.

**Resumen:** La transición hacia patrones sustentables de energía en el sector extractivo es un proceso incipiente en América del Sur. Se analizan aquí las representaciones sociales

de las élites en el “consumo de energía sustentable”, en el sector minero a gran escala en Argentina, Chile, Colombia y Ecuador. Los conceptos de eficiencia y energía renovable no convencional son ampliamente aceptados. La pregunta principal es: ¿son las opiniones de las élites en estos países favorables a la transición energética en el sector extractivo? A pesar del básico consenso, existen diferentes discursos sobre regulaciones y políticas energéticas renovables y eficientes. En el núcleo semántico de sus discursos, emergen visiones diferentes y contradictorias. Un análisis del discurso y una estadística descriptiva de esas diferencias revelan cambios en el significado, en las posiciones sociales, y de la influencia del contexto de cada país en la producción de esos discursos.

**Palabras clave:** transición energética; energía renovable; energía en América Latina; élites y energía; élites en la minería y la energía.

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