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Socio-environmental liabilities of coal mining in Colombia: a political ecology approach to the global coal chain

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Ph.D. Thesis Andrea Cardoso Diaz

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A POLITICAL ECOLOGY APPROACH TO THE GLOBAL COAL CHAIN

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Amarte es Alegría

Amo danzar cerebralmente contigo

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Abstract

The expansion of coal mining in the Caribbean region of Colombia not only creates environmental and health problems locally but is also a matter of global concern. Colombia, with almost 85 million tons exported, makes a large contribution to greenhouse gas emissions when the exported coal is burnt in coal-fired power plants (CFPPs) in importing countries, such as The Netherlands and Turkey. This is ever more relevant as the commitments from COP21 in Paris imply that four-fifths of carbon resources (from coal, oil, and gas) must remain under the ground.

This thesis uses ecological economics and political ecology approaches to analyze the coal supply chain from its extraction in the open-pit coal mines in Cesar and La Guajira (Colombia) to the final consumption in CFPPs in The Netherlands and Turkey. It also employs the socio-environmental liability approach as an improvement over the standard externalities framework, since it allows for an explicit incorporation of responsibilities for uncompensated damages along the coal chain.

The coal chain is analyzed in depth through different layers (market, physical, socio-environmental liabilities, social actors and the plurality of valuation languages) and different scales (local, national and global).

In order to identify the coal chain socio-environmental liabilities and ecological distribution conflicts, 84 interviews were conducted in Colombia, The Netherlands and Turkey. Different economic valuation methods were used to estimate the value of the socio-environmental liabilities, and discourse analysis methodologies were used to analyze the plurality of valuation languages deployed along the coal chain.

Results show that the socio-environmental liabilities of the coal extraction and its transport to export ports exceeds the market price of coal. The analysis of the ecological distribution conflicts reveals that the geographies of coal are anchored in environmental injustices and democratic deficits associated with both coal mining and CFPPs, and irreconcilable tensions between public health, economic gain and the political power in these three countries. The analysis of the valuation languages shows that in The Netherlands there are two main views regarding coal imports from Colombia, respectively the “Blood coal” and “Better coal” positions. The first one is concerned about human rights violations and the second one frames the question in the context of ecological modernization. In Turkey, the main debate is between the use of highly

polluting domestic lignite or the import of better quality coal (anthracite from Colombia). Both in The Netherlands and in Turkey there are different degrees of concern about climate change and "unburnable fuels" which appear still to be absent in Colombia where the debate is focused on the local and national socio-environmental liabilities. This thesis concludes that the success of environmental justice actions taken along the coal chain depends on the political power of social actors and their willingness to give up, negotiate or impose their own valuation languages.

Keywords: coal mining, coal-fired power plants, commodity chains, energy policy, ecological distribution conflict, environmental liabilities, economic valuation, valuation languages, environmental/climate justice.

Resumen

La expansión de la minería de carbón en la región Caribe de Colombia no sólo crea problemas ambientales y de salud a nivel local, sino que también es una cuestión de preocupación global. Colombia, con casi 85 millones de toneladas exportadas, contribuye considerablemente a las emisiones de gases de efecto invernadero cuando se quema el carbón exportado en las centrales eléctricas de carbón (CEC) en los países importadores, como los Países Bajos y Turquía. Esto es cada vez más relevante ya que los compromisos de la COP21en París implican que cuatro-quintas partes de los recursos de carbono (provenientes del carbón, petróleo y gas) deben permanecer en el suelo.

Esta tesis utiliza los enfoques de economía ecológica y ecología política para analizar la cadena de suministro de carbón desde su extracción en las minas de carbón a cielo abierto en Cesar y La Guajira hasta el consumo final en CEC en Holanda y Turquía. También emplea el enfoque de pasivos socio-ambientales como una mejora con respecto al marco conceptual estándar de externalidades, ya que permite una incorporación explícita de responsabilidades por daños no compensados a lo largo de la cadena del carbón.

La cadena de carbón se analiza en profundidad a través de diferentes capas (mercado, proceso físico, pasivos socio-ambientales, actores sociales y su pluralidad de lenguajes de valoración) y diferentes escalas (local, nacional y global).

Con el fin de identificar los pasivos socio-ambientales de la cadena del carbón y los conflictos ecológicos distributivos, se realizaron 84 entrevistas en Colombia, Holanda y Turquía. Se utilizaron diferentes métodos de valoración económica para estimar el valor de los pasivos socio-ambientales y se utilizaron metodologías de análisis de discurso para analizar la pluralidad de los lenguajes de valoración empleados a lo largo de la cadena de carbón.

Los resultados muestran que los pasivos socio-ambientales de extracción de carbón y su transporte a los puertos para su exportación superan el precio de mercado del carbón. El análisis de los conflictos ecológicos distributivos revela que las geografías del carbón están ancladas en injusticias ambientales y déficits democráticos asociados tanto a la minería del carbón como a las CEC, y tensiones irreconciliables entre la salud pública, las ganancias económicas y el poder político en estos tres países. El análisis de los lenguajes de valoración muestra que en los Países Bajos hay dos puntos de vista principales sobre las importaciones de carbón de Colombia, las posiciones de "Carbón

ensangrentado" y "El mejor Carbón". El primero está preocupado por las violaciones de los derechos humanos y el segundo enmarca la cuestión en el contexto de la modernización ecológica. En Turquía, el principal debate es entre el uso de lignito doméstico altamente contaminante o la importación de carbón de mejor calidad (antracita de Colombia). Tanto en los Países Bajos como en Turquía hay diferentes grados de preocupación por el cambio climático y los "combustibles no quemables" que parecen estar ausentes en Colombia, donde el debate se centra en los pasivos socio-ambientales locales y nacionales. Esta tesis concluye que el éxito de las acciones de justicia ambiental a lo largo de la cadena del carbón depende del poder político de los actores sociales y de su disposición a renunciar, negociar o imponer sus propios lenguajes de valoración.

Palabras claves: minería de carbón, centrales eléctricas de carbón, cadenas de producción y suministro, política energética, conflictos ecológicos distributivos, pasivos ambientales, valoración económica, lenguajes de valoración, justicia ambiental/climática.

Preface

Before presenting the content of the thesis, I would like to explain the motivation of this research topic and some work experiences that have shaped the analytical approach presented in the chapters.

In 2009, I moved to Santa Marta to work at the Universidad del Magdalena which is a public University located in the Caribbean region of Colombia. There where the bright colors, the music, and the people all together make this place a magical place. Actually, Magdalena was Gabriel García Márquez inspiration to create "Macondo." There the train that was used to transport banana workers, now it is used to transport millions of tons of coal, spreading coal dust along the way.

At the Universidad del Magdalena, I taught environmental economics and environmental accounting. I discussed the local environmental problems with the students, which all were related to coal. The livelihood of most of the student's families are fishing and tourism; then they were very concerned about the impacts from coal transport and shipping. During one of the lessons, I took the students to the port of Drummond. The students were interested visiting the port. However they complained about the coal dust and the noise of the train to the representative of Drummond. For example, Arregocés, an indigenous student from Sierra Nevada de Santa Marta, claimed to the representative: "Leave the bones of the mother earth in the place."

In 2011, stirred by personal and professional interests, I applied to the Colombian Government Ph.D. Scholarship "Colciencias." The Universidad del Magdalena supported me as well and gave me a study commission to conduct the Ph.D. with the compromise to return. In 2012, I moved to Barcelona to start my Ph.D. studies at ICTA-UAB under the supervision of Professor Joan Martinez-Alier. During my stay at the ICTA-UAB, I was fortunate to be able to cooperate with the EJOLT project (2011-2015), and during the last ten months with the new ENVJUSTICE project (2016-21). Both projects have been directed by Joan Martinez-Alier. Under the EJOLT projected, I have collaborated with colleagues in the publication of two reports: "Economic tools for evaluating liabilities in environmental justice struggles" and "Refocusing resistance for climate

justice. COPing in, COPing out and beyond Paris". Both publications are discussed in Chapter 2 and in its Appendix.

My interest in study and value the socio-environmental liabilities from coal mining arises from the consultancy made with Joan Martinez-Alier for the Colombian General Audit Office (CGR) in 2013-2014. The CGR conducted an audit of the mining companies in Cesar. Within the audit process, a topic of particular interest to the CGR was the monetary quantification of the uncompensated damage. From this need, I started the research on the identification and the economic valuation of such damages. I presented the results of this research at the 2015 Conference of the European Society of Ecological Economics at the University of Leeds, where I won the prize of the "Best Student Paper." The latter paper was published in Ecological Economics in December 2015 and will be discussed in Chapter 2.

My Stay at ICTA-UAB has provided me the opportunity to create new research projects based on collaboration with colleagues from other universities. Chapter 3 of this thesis was raised from eco-eco e-mail discussion list and eco-eco seminars where Dr. Ethemcan Turhan and I exchanged information about coal mining in Colombia and coal burning in Turkey. We found an interesting South-South relationship between both countries through coal supply chain. Afterward, we have worked together in the design of the research, and we both conducted fieldwork in Turkey in November 2015. The result of this work is presented in Chapter 3, and it will be submitted in Antipode. The third paper (Chapter 4) has been conducted during my research stay for three months (April-June 2016) at the International Institute of Social Studies, in The Hague. This paper has been submitted to Ecological Economics in November 2016.

During the Ph.D. I have participated in several conferences on Ecological Economics and Political Ecology: The Political Ecology DOPE conference at Kentucky University in 2014, The Latin-American Conference in Political Ecology at Universidad de Chile in 2014 and The Latin-American Conference in Environmental Conflicts at Universidad Sarmiento, Buenos Aires, Argentina in 2014. I have also attended the 2014 Spring course with the title "Achieving sustainable development on Samothraki Island: Social Ecology concepts and methods in real-world context" organized by the Institute of Social Ecology,

Alphen-Adria-Universität Klagenfurt, Austria. Lastly, in 2015 I attended the summer school “Degrowth an Environmental Justice” organized by ICTA.

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I. General Introduction

The body of this doctoral thesis consists of three main chapters which can also be read as separate papers. In this Introduction,I present an overview of the three Chapters.
Chapter 2 considers the growth of open-pit coal mining in Cesar, Colombia which increased in volume by 288% between 2000 and 2012, generating environmental and social damage unacknowledged by both companies and the state. This chapter aims to identify and value socio-environmental liabilities from coal mining at different stages of the coal chain. It shows that environmental liabilities can be operationalized under three types of responsibilities: moral, legal, and economic. The identification of environmental liabilities allocates moral responsibility; legal responsibility is needed for effective reparation; and economic valuation provides arguments for claiming compensation, as well as seeking remediation and mitigation of damages. In order to identify socio-environmental liabilities, interviews were conducted, and environmental mining conflicts were analyzed. To estimate monetary values, data was linked to existing literature on costs associated with damages. Results show that the economic values of socio-environmental liabilities per ton of extracted and exported coal are higher than the market price of coal. The main socio-environmental liabilities arise from pollution, local health deterioration, water table depletion, land and ecosystem services losses, damages from transportation and shipping, and coal reserve loss. A comparison with studies in China and the United States indicates that values increase when other health impacts and climate change on a global scale are included.

From Colombian coal mining in Chapter 2, I move on in Chapter 3 to the overseas markets for Colombian coal. Energy geographies are changing, as coal production and consumption is declining or being phased out in the Global North. Consequently, the future of coal will be decided in the Global South. This chapter explores the new geographies of coal and questions the reproduction of multiple landscapes of environmental injustice related to the extraction and consumption of coal. The political ecology of the coal chain is analyzed with a focus on two developing economies, Colombia and Turkey, which lie at the source and destination of new geographies of coal. The extraction and consumption of coal are linked by socio-ecological interactions and

conflicts occurring on multiple scales. I thereby examine the changing landscapes of coal extraction and consumption operating at different layers (market, physical, and socio-environmental) and multiple scales (bi-local, bi-national and global) with a focus on ecological distribution conflicts and environmental justice. The analysis reveals that these new geographies are anchored in environmental injustices and democratic deficits associated with both coal mining and coal-fired power plants, as well as irreconcilable tensions between public health, economic gain and the political power in these two countries. While the global market-led drivers contribute to entrench coal as a valuable source of cheap energy, communities' struggles at the coal extraction and consumption sites increase. They are facing repression influenced not only by powerful national actors but also by global power structures. The challenge for the global environmental justice movements, therefore is to link the claims and actions of the local environmental movements at both ends of the coal chain.

Chapter 4 shows again, with new materials, how environmental goods and damages are accumulated and unequally distributed along the coal supply chain, producing multiple landscapes of environmental injustices where actors sustain different values and representations of coal to either resist or legitimize its extraction and consumption. This chapter seeks to incorporate such valuation languages, as it analyzes the ways in which the valuation languages (and particular coal "meanings") of the social actors involved in the coal chain are contested and deployed according to their position in the chain and their relationship with the territory where coal is extracted and burned. More specifically, Chapter 4 examines and compares the coal chains between Colombia-Netherlands and Colombia-Turkey, assessing their valuation languages to understand the various dimensions of the ecological distribution conflicts. I analyze the coal chains again through different layers (market, physical, socio-environmental liabilities) and scales, adding a new country and additional layers (the actors and their valuation languages). To identify the valuation languages along both coal chains, semi-structured interviews, and secondary data analysis were conducted. Discourse analysis methodologies were used to identify the frequency and relevance of the valuation languages. Results show that the multiple valuation languages appearing in the ecological distribution conflicts. They are to some extent peculiar to each country and to the economic and political context in which the different stages of the coal chain are embedded. The environmental justice actions taken along the coal chain with the focus of reconciling these multiple valuation

languages are also discussed. I conclude in Chapter 4 that the success of these actions depends on the willingness and political power of social actors to give up or negotiate or impose their own valuation languages.

1. General conceptual framework

To understand the economics and politics of coal mining in Colombia, I decided initially to focus on the department of Cesar in the Caribbean region which is a major world coal exporting area. I also soon realized that I had to understand the important role of overseas coal import markets, such as The Netherlands and Turkey, and their very different energy policies. Conceptually I place myself at the connection point or the confluence between political ecology and ecological economics. The thesis starts however with an applied study of environmental economics giving plausible economic valuation of the environmental liabilities from coal mining and transport in Colombia. I use various and appropriate methods of economic valuation. One striking finding is that such liabilities exceed the market price of coal. I know however that this neoclassical environmental economics framing is only one approach among many, which in this thesis is seen as a possible instrument to achieve environmental justice, for instance in a court case (see Chapter 2 section 2 & 3).

The thesis adopts a wider framework as it develops through the chapters. It acknowledges and discovers the plurality of values, elicited through discourse analysis, that social actors deploy along the coal supply and demand chain from extraction through transport to final consumption in coal-fired power plants. Here a crucial concept is that of "commodity chain" which I use throughout the thesis and which I analyze thoroughly in Chapter 4 Section 2. Commodity chain is a concept that comes from world systems theory and it is very pertinent to the study of the international political economy of coal. In this thesis, I look not only at the political economy but also, in detail, at the political ecology of coal (as the study of the ecological distribution conflicts that take place at each stage in the coal chain). Such conflicts relate to different scales (e.g. loss of health in mining areas but also climate injustices). The conflicts develop at different "layers": there is a physical layer in tons of coal and kWh produced, there is a market layer of prices, socio-environmental liabilities; there is another layer of social actors and their own distinct

valuation languages. All this provides a novel analysis of political ecology of the coal chain (See Chapter 3 Section 2).

2. Aims and research questions

The core of this thesis is the coal mining expansion on a large scale in Colombia, mainly in La Guajira and Cesar. In the latter, coal production increased 288% from 2000 to 2012 generating significant environmental and social impacts. This thesis undertakes the assessment of environmental and social liabilities produced by coal mining activities in Cesar, as an exercise to assess the ecological distribution conflicts generated by extractive activities of multinational companies in developing countries. Thus, the central research questions which arise in Chapter 2 are: How to identify socio-environmental liabilities of coal mining in Cesar, Colombia? and How to give an economic value to those socio-environmental liabilities?

In Chapter 3, I start to question the environmental injustices along the entire coal chain. These injustices are not just happening where the coal is mined in Colombia but also where coal is burned for energy production. Therefore, I explore an often-unnoticed relationship between coal mined in Colombia and coal consumption in Turkey. This chapter studies the new geographies of coal between these two emerging economies. The aim is to link the ecological distribution conflicts produced by coal-fired power plants in Turkey with those generated by coal mining extraction in Colombia. Consequently, the research question is: How do new geographies of coal produce multiple landscapes of environmental injustices and democratic deficits in exporting and importing countries?

I realized that in the ecological distribution conflicts along the coal chain social actors deployed different valuation languages. Thus a range of "voices" to resist or to support coal must be included. Chapter 4 aims to incorporate these valuation languages that are used along the coal chain. An approach that is able to analyze these multiple languages is indeed an advance in ecological economics and political ecology, and that is the goal to which this Chapter is aspiring. The research questions which arise in this chapter are: How different are the valuation languages along the Colombia-Netherlands coal chain to those expressed in the Colombia-Turkey coal chain? How do we reconcile those multiple valuation languages?

3. Methodologies

The three central chapters use different but overlapping methodologies. I have chosen to bring to the introduction all the methodological sections so as to avoid repetitions.

In Chapter 2, to identify environmental liabilities, I conducted 23 semi-structured interviews in the Cesar coal mining area, Valledupar and Bogota in June 2013. I interviewed leaders of the representative organizations and governmental institutions working in the coal mining sector including miners with work-related illnesses; union representatives from the multinational companies Drummond and CNR; community leaders from the villages of El Hatillo, Plan Bonito and Boquerón; Non-Governmental Organizations; the Secretary of Agriculture of Cesar; and a panel of experts in different areas working in the coal mining sector (a medical doctor, a toxicologist, a geologist, two engineers, and two lawyers).

The interviews explored many themes related to perceptions of environmental and social damages, of the ways in which traditional community life has been affected by mining, of existing relationships with companies, and their own perception of compensation or remediation of damages. The duration of the interviews ranged from 2-3 hours. The respondents provided in-depth detailed answers rather than short quantitative ones.

Next, I compared the qualitative findings from interviews with the analysis of the coal chain environmental mining conflicts, through secondary data including press releases from trade unions and various organizations related to coal mining; court sentences and legal documents; and news reports. Finally, I linked the qualitative findings with secondary quantitative data from national and local organizations including reports from the governmental institution.

To list the socio-environmental liabilities I examined the stages of the coal chain, using the framework proposed by Epstein et al. (2011), which tabulated and derived monetary values for a wide range of coal mining environmental damages. They monetized those that are monetizable, quantified those that are quantifiable but difficult to monetize, and described the qualitative damages. I replicated this classification. The monetizable data were linked according to the specific mining conditions in Cesar with existing literature

on the costs associated with these types of environmental damages using market prices, remediation treatment, and mitigation costs. The estimates are presented in minimum and maximum ranges to address uncertainty regarding environmental damages accumulated over time. All the values in Chapter 2 are presented in US dollars based on 2012 prices. In order to derive monetary values, a previous step is to describe the social and biophysical damages or losses. Not all such losses are monetized. Therefore, the chapter incorporates different valuation languages (ecological, social) and the communities' own perception about damages. Its main aim, however, it to reach plausible monetary valuation.

Chapter 3 uses a "Double case study methodology." There are a number of studies that use double case study approaches on environmental justice related to mining. Some of these focus on ecological distribution conflicts (Urkidi & Walter, 2011), while others focus on the comparison of similarities and differences of the cases (Avcı, 2015). This Chapter focus on the extraction of coal in Colombia and the consumption of coal in Turkey. The Colombia case is based on Chapter 2 and new fieldwork undertaken in January-March 2014 in Cesar and La Guajira. Thirty semi-structured interviews were conducted with leaders of the representative organizations and governmental institutions working in the coal-mining sector including miners, union representatives, community leaders, NGOs, and a panel of experts (medical doctors, geologists and engineers). In June 2016, additional interviews by phone were conducted with representatives of social movements. To connect the coal chain between these two countries, I conducted together with Dr. Ethemcan Turhan eighteen semi-structured interviews in Istanbul, Ankara, Zonguldak and Çatalağzı (Turkey) in November 2015. We interviewed energy company representatives, trade missions, anti-coal activists, NGO representatives, local journalists, energy ministry officials, environmental agency officials, the Colombian embassy chief of mission, and experts working on projects related to the effects of the CFPPs (medical doctors, nurses and lawyers). Use of semi-structured interviews allowed us to achieve multiple narratives on the CFPPs conflicts by the respondents and to increase explanatory power.

After the compilation of fieldwork data, we compared the qualitative findings from the semi-structured interviews with the analysis of ecological distribution conflicts at the extraction (mines) and consumption (CFPPs) sites by triangulating the data with multiple

sources of evidence (court decisions, legal documents, national and international reports and newspapers). This helped us understand how coal extraction and consumption reproduce environmental injustices and democratic deficits in both cases. In an attempt to create a coherent analysis, we included not only the socio-environmental and health impacts of coal extraction in Colombia and coal burning in Turkey but also the adverse effects of climate policies. This approach allowed us to identify the emergent actors, strategies and the directions of coal in the post-Paris era, therefore producing findings that are relevant beyond the single cases of Colombia and Turkey.

Chapter 4 focuses on valuation languages deployed by different social actors along the coal commodity chains**.** The methodology used in this Chapter is based on Avci et al., (2010) that includes quantitative and qualitative methods to analyze valuation languages which are employed by different actors in a resource extraction conflict. The current study focused on the qualitative methods to analyze the valuation languages along coal chains from Colombia to The Netherlands and to Turkey. This comparative analysis identified differences between political and social contexts in the coal chain, and the distribution of environmental goods and bads, which determine the valuation languages used at every stage and scale of the coal chain.

I used here again the data on coal extraction in Colombia from fieldwork in Cesar and La Guajira from January to March 2014 and for Turkey case I use the eighteen semi-structured interviews as in the previous chapter.

To collect data on the imports and consumption of coal in the Netherlands a fieldwork study was undertaken from April to June 2016. Thirteen semi-structured interviews were conducted in Amsterdam, The Hague, Den Bosch and Utrecht with representatives of energy companies, NGOs, climate grassroots groups, international research centers, , officials of the Ministry of Foreign Affairs and officials of the Colombia embassy in The Hague, as well as a representative of the trade union confederation. Moreover, two "Blood coal" campaign meetings were attended.

The semi-structured interview format allowed the eliciting of multiple valuation languages related to the coal conflicts from the respondents. To increase explanatory power, I also used secondary data such as court decisions, legal documents, national as

well as international reports, and newspapers. For the data analysis, I use Atlas-ti to identify the valuation languages categories along both coal chains. Two types of analysis for identifying the valuation languages were used. These included the content analysis (Grbich, 2013) which was used to identify the frequency and relevance of those valuation languages, and to examine coal meanings along the chain; and the framing analysis (Entman, 1993) used to explore how actors define the problems and solutions in their valuation languages.

4. A wider context

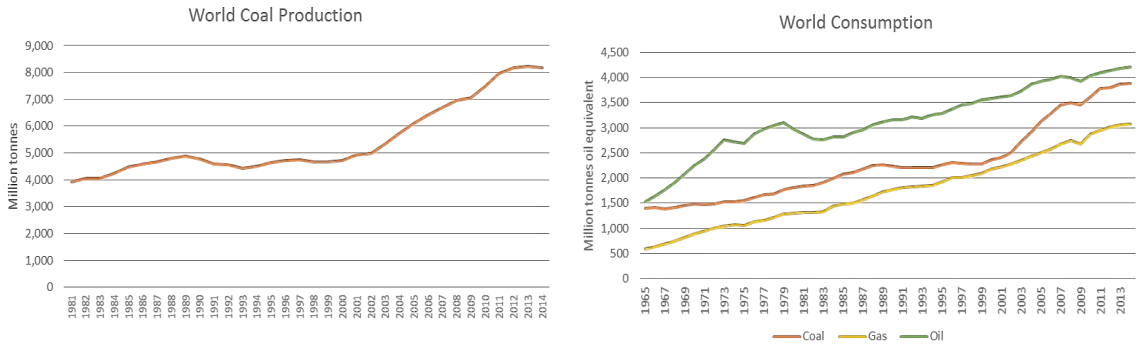
In this section, I touch on very relevant issues about the coal market and trade which are not considered in the detail that they deserve in the body of the thesis. If climate change policies advance, then a lot of the coal reserves will become "unburnable fuels." Coal reserves of different quality are very abundant in the planet, and more than a peak production of coal what seems to be relevant is a peak consumption of coal. However, India is far from reaching this point although China is perhaps approaching it. The levels of coal production and consumption in the world economy are so high compared to the past that even after the peak, new mining frontiers will open with new ecological distribution conflicts and CFPPs which will still produce local damage to health in the importing countries. Finally, a developing trend is the increase in South-South trade in coal (as between Colombia and Turkey but also between Colombia and India) which brings to the fore new geopolitical issues.

4.1 Coal in the 21st century

Coal production increased sevenfold in the 20th century, as explained by McNeill, (2001) in *Something new under the sun, an environmental history*. Coal fueled the industrial revolution although in the 20th-century oil and gas gained relevance in the energy mix. However, at present, even in the era of low-carbon innovation with solar and wind energy expanding rapidly, coal, which is the most carbon-intensive source of energy, has resurged since 1999 (Steckel et al., 2015; Tyfield, 2014). Fourteen consecutive years of growth in coal production occurred until 2013 (see Figure 1). The increasing dependence on coal was not only happening in China and India but also across different developing countries, especially other developing, fast-growing countries mainly in Asia, that use a higher proportion of coal in the energy mix to satisfy their growing energy demand

(Steckel et al., 2015). The coal resurgence has been driven by the low coal prices, the possibility of importing coal from countries with low extraction costs and the relatively low capital costs of coal-fired power plants (Edenhofer, 2015; Steckel et al., 2015). Moreover, coal receives about 60% of the total post-tax energy subsidies (Coady et al., 2015).

Figure 1. Global coal trends



Source: BP Statistical Review of World Energy, (2015)

4.2 Coal and climate change

The profits of coal resurgence were achieved through the externalization of the domestic mining social costs and also the costs of climate change (Richards & Boom, 2015). Coal combustion generates the largest share of CO_2 emissions due to its heavy carbon content per unit of energy release (IEA, 2015a), and also the extraction, transportation and processing of coal generate CO_2 emissions and pollution (Heinrich-Böll-Stiftung & FoE, 2015). In 2013, coal accounted for 46% of the global CO_2 emissions, even though coal represented 29% of the global total primary energy supply and oil represents 31% with 33% of CO_2 emission share (IEA, 2015b). Despite this, coal was still used to generate 41 % of global electricity in 2013 (IEA: DGEE, 2015b). Coal power plants generated 31 % of all CO_2 emitted from burning fossil fuels, more than the emissions from the entire oil demand for global transport (IEA:DGEE, 2015a; Jones & Gutmann, 2015). Consequently, the coal rush has had serious implications for climate change mitigation strategies. McGlade and Ekins (2015) have warned than the world *can only burn about 12% of current global coal reserves, two-thirds of the oil and about 50% of the natural gas reserves* to meet the target temperature of plus 2°C. If *four-fifths of the reserves are "unburnable carbon,"* then one can estimate that about 88% of known coal reserves must stay in the ground (McGlade & Ekins, 2015).

4.3 A possible peak consumption of coal

In 2014, global coal consumption decreased by 0.9% (-71.4 Mt to reach 7,923.2 Mt), compared to growth of 5.1% in 2013 and 2.6% in 2012 (IEA, 2015a), bringing an end to the 14 years of coal resurgence with a peak in 2013. According to the International Energy Agency (2015a), the decline occurred in both the OECD (-46.9 Mt, -2.2%) and non-OECD countries (-24.5 Mt, -0.4%). If we review the trend of the top 10 coal consumers that accounted for 86.8% of global consumption 8 of them had a decline in consumption in 2014 compared with 2013, those are Poland (-5.8%), Australia (-4.7%), Russia (-4.5%), Germany (-4.2%), Japan (-4.1%), China (-2.9%), South Africa (-2.6%) and the United States (-0.4%) (IEA, 2015a). While in Indian and Korea the coal consumption grew by 13.8% and 4.0% respectively (IEA, 2015a).

However, the idea of the peak consumption of coal should be viewed cautiously. Two countries are fundamental to the future of coal: China and India. China is the world's largest coal consumer, producer and importer (IEA, 2015c). It drove most of the over 50% growth in global coal demands in the coal resurgence (Renssen, 2015) and now it is driving the decline in coal consumption. In 2014 coal consumption in China dropped for the first time since 1999. At the same time, the economy grew 7.3% (Shearer et al., 2015) and the CO_2 emissions in China declined around 130 Mt (1.5%) (IEA, 2015a). The increase in electricity consumption has been entirely covered by growth in power generation from renewable sources (Greenpeace, 2015). In 2014, hydropower generation rose by 22%, power generation from wind and solar increased by 34% and demand for natural gas grew by 9% (IEA, 2015a). This energy mix transformation was driven by the China National Energy Strategy for 2014–2020, which establishes the target of phasing out 10 gigawatts (GW) of small thermal power plants by 2020 (IEA, 2015d). Meanwhile, in India, new coal-fired plants represent nearly half of the net coal capacity added worldwide. A significant expansion of coal output makes India the second-largest coal producer in the world, but rising energy demand also means that India may become, before 2020, the world's largest coal importer, overtaking China (IEA: DGEE, 2015b).

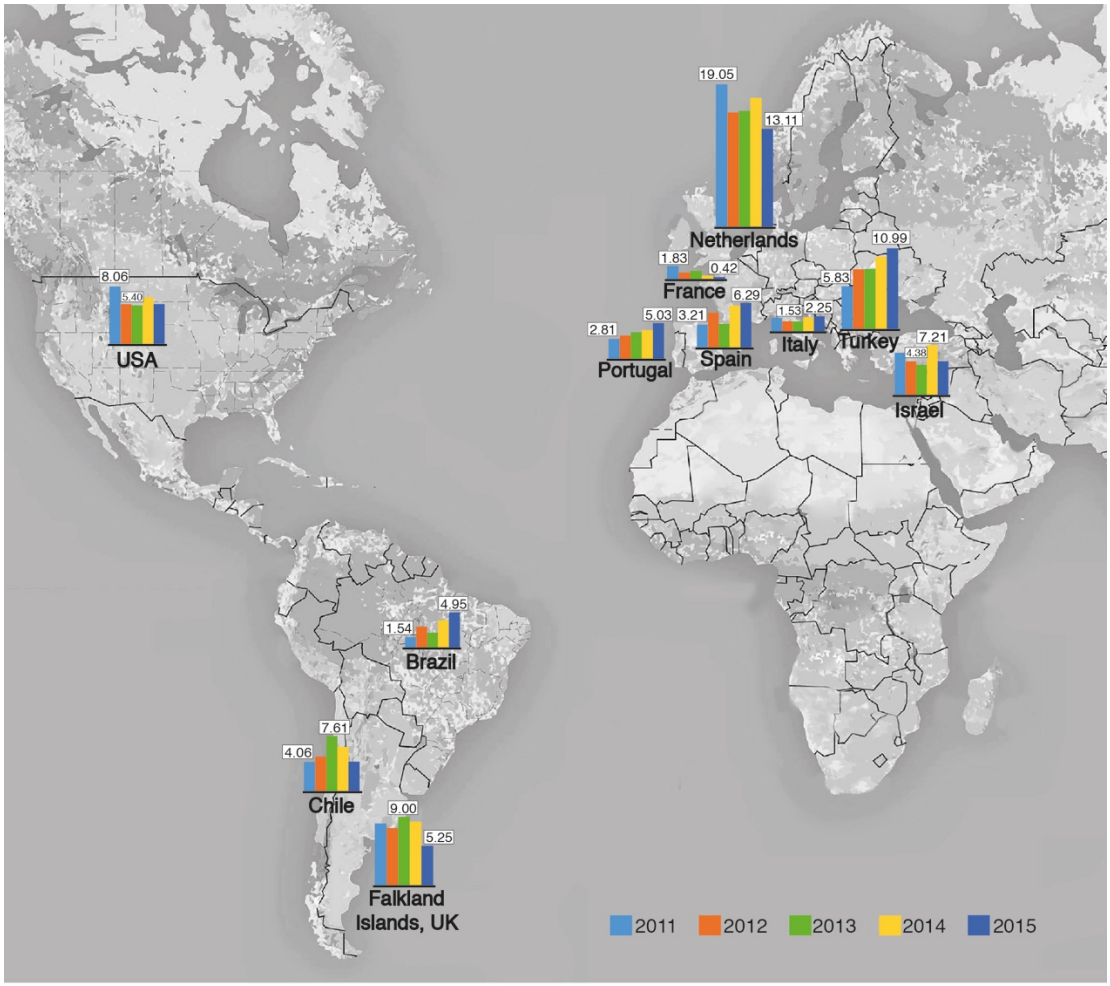
In 2015, global coal consumption continued to fall significantly between 2.3% - 4.6% in January-September 2015, compared to the same period in 2014 (Greenpeace, 2015). In China, coal use in the power sector was down more than 4%, and its coal imports dropped by an astonishing 31% in the same period (Greenpeace, 2015). The declining share of

coal in electricity generation is a global trend. Coal-fired power generation in China reached 79% in 2011, and since then declined to 69% in 2015. The U.S is retiring coal-fired power plants (IEEFA, 2015). Moreover, the U.K. is committed to phasing out coal-fired power plants within the next 10-15 years (Greenpeace, 2015). In the E.U., coal consumption has been falling since 2012, the decline of coal is being accelerated by the success of the renewables sector in Europe (Greenpeace, 2015).

4.4 Coal trade

There is a connection between world coal consumption and Colombian coal exports. In 2015 Colombia was the fourth largest net exporter of hard coal after Indonesia, Australia, and Russia (IEA, 2016). During the last five years most of Colombian coal was exported to the Netherlands, the U.S. Turkey and the UK (through the Falklands Islands):

Figure 2. Colombian coal exports by country of destination (2011-2015)



Source: Author based on SIMCO (2016)

A substantial change in the energy sector from 2014 to 2015 was the rapid drop in world oil prices, from over $100 per barrel in mid-2014 to below $50 in 2015, with consequences for natural gas and coal prices (IEA, 2015d). Coal suppliers have struggled since 2011 with an oversupplied market (Renssen, 2015). Coal prices in northwest Europe declined from $73 per ton in mid-2014 to around $60/t at the start of 2015 due to persistent oversupply (IEA, 2015d). Australia's Newcastle and South Africa's Richards Bay benchmarks have dropped to between $51 and $58/t, or about 60% off their last peak in 2011(Gloystein, 2015). Despite this, export trade of all types of coal[1] in the world rose slightly by 0.7% in 2014, to reach a record level of 1,383.6 Mt. This is an increase of 28.5% from 2010, and total exports have more than doubled (121.6%) over 2000 levels (IEA, 2015a).

Similarly, in 2014 Colombia reached its highest level of coal exports, an increase of 16.62% (from 73.4 Mt to 85.6Mt) compared to 2013. However, in 2015 the Colombian coal exports decreased by 20% to 71.3Mt (SIMCO, 2016). In Colombia, the coal-mining sector is in a critical situation similar to the oil sector, due to the drastic decrease in coal prices in 2015 by 28%, a decline that adds to the consecutive losses of the last five years, from $124 to $42/t, a total decrease of 66%(Revista Semana, 5 March 2016).

Nevertheless, in the Global South, the lower coal prices are likely to act as a form of economic stimulus to use a higher proportion of coal to satisfy the growing energy demand. In 2014, the total world coal imports increased by 2.3%, to reach 1,423.6 Mt.[2]The 31.9 Mt of additional trade was spread out, with most areas reporting moderate increases, with exceptions in India which increased imports by 50.6 Mt; and China decreased imports by 35.6 Mt. This decline was for coal from Indonesia (-19.4 Mt), South Africa (-7.0 Mt), Viet Nam (-6.3 Mt) and the U.S. (-5.2 Mt) (IEA, 2015a). In Turkey, coal imports reached their highest levels of 29.8Mt in 2014, an increase of 11% from 2013 levels.

According to the IEEFA-Institute for Energy Economics and Financial Analysis (2015), the international coal trade is likely to have peaked in 2014. They forecast a further 30%

[1]Included steam coal and coking coal exports

[2]The difference between total coal imports and total coal exports is primarily due to the different coal classification methodologies used by the importing and exporting countries. It also occurs because of coal in-transit, coal that is unaccounted for, and reporting discrepancies by importing and exporting countries (IEA, 2015b)

decline by 2021, to 762t. Currently, the coal companies are in deep financial distress due to low prices, oversupply, the impact of pollution-control regulation and investment capital which is rapidly moving from coal to renewables (IEEFA, 2015).

The recent increase in China's coal imports (from March to September 2016) after two years of decrease is generating an increase in coal market prices which has motivated optimism among coal exporters (Reuters, 2016). These changes have been driven by a Chinese policy that aims to control domestic coal prices and keep the industry afloat by limiting operations at all coal mines to 276 days instead of the earlier 330 (a 16% cut)(Goodwill, 2016). According to the Energy Desk of Greenpeace(2016), this is only a short-term measure which aims to prevent insolvencies while the government implements the overcapacity cuts. Therefore it is premature to predict a resurgence of coal consumption in China (Goodwill, 2016).

The Colombian coal price also experienced an increase from US$43.84/t in March 2016 to US$60.95 in September 2016 (Index Mundi, 2016). It is worth noting that this thesis has been developed under the 2015 scenario when prices dropped. Chapter 2 was written based on 2012 prices that fluctuated between 90 and 100 US$, being sensitive to declines in demand. In my view, coal prices will decline but even at 40 or 50US$ it is profitable for the companies to mine coal in Cesar and La Guajira in Colombia. Given the low royalties and taxes paid, and the noninclusion of course of the local socio-environmental liabilities which I calculate in Chapter 2, and the global damage from climate change.

II. Behind the coal chain: Socio-environmental liabilities of coal mining in Cesar, Colombia

This Chapter is based on the publication:
Cardoso, A., 2015. Behind the life cycle of coal: Socio-environmental liabilities of coal mining in Cesar, Colombia. Ecological Economics 120, 71–82.

This paper won the prize "Best Student Paper" at the European Society for Ecological Economics Conference, Leeds, July 2015.

1. Introduction

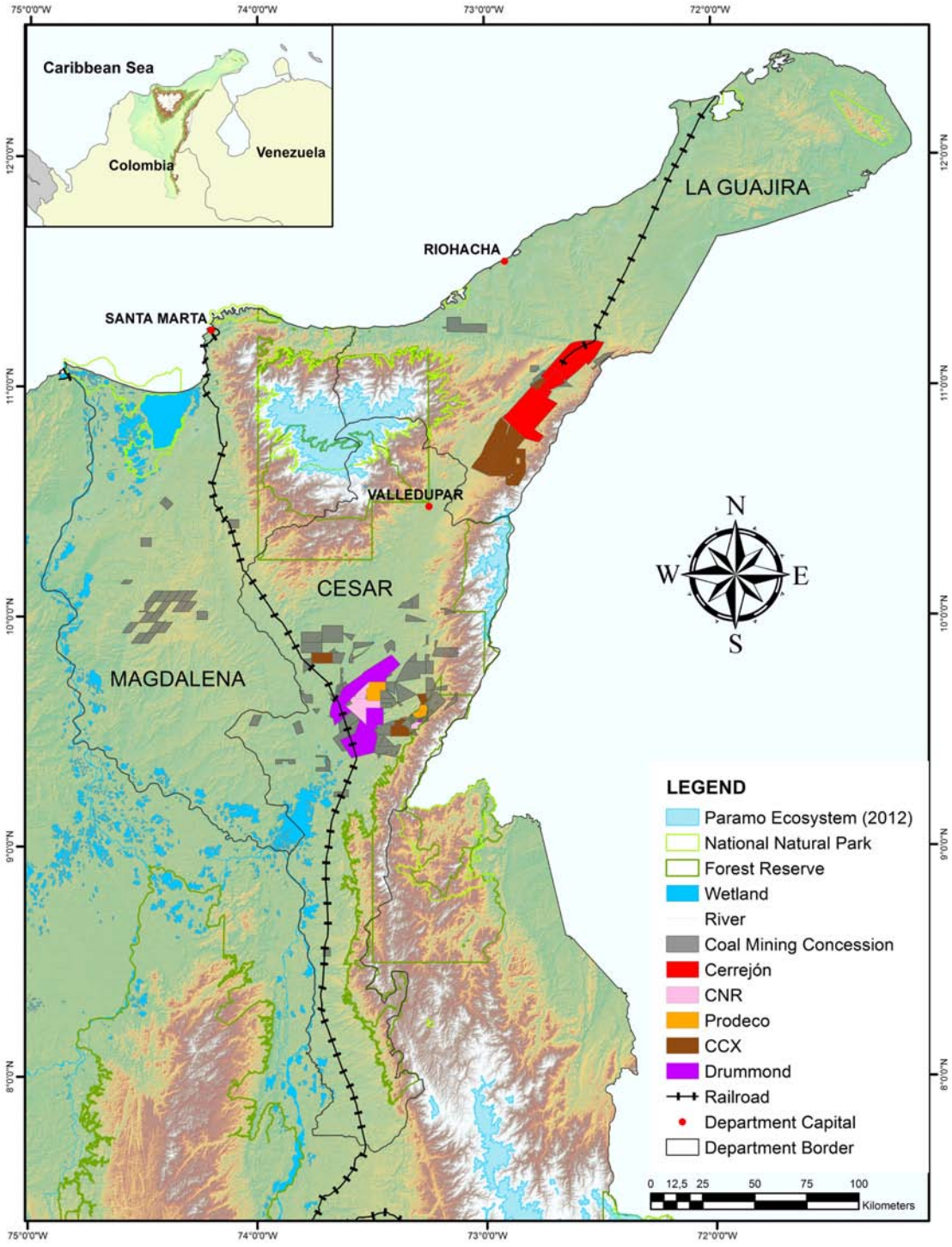
Emerging economies are causing growth in global social metabolism (Fischer-Kowalski and Haberl, 2015; Schaffartzik et al., 2014)[3]. There is an accelerated demand for primary resources generating pressure to exploit areas that were initially outside the scope of the market, such as indigenous territories and pristine ecosystems (Muradian, et al. 2012). In Latin America, Gudynas (2013) describes this new economic and political order as "extractivism". Svampa (2013) names it as the "Commodity Consensus", including both post-neoliberal and neoliberal governments, substituting the "Washington Consensus" (imposed by the World Bank and International Monetary Fund). Svampa describes two processes: first, reprimarization of economies through the expansion of large-scale extractive processes with limited added value; second, the deepening of "accumulation by dispossession" (Harvey, 2003). These processes put pressure on the environment and local communities, causing strong social resistance (Latorre at al., 2015; Martinez-Alier et al., 2010). In Colombia, Pérez-Rincón (2014) has reported a relationship between the quantity and intensity of environmental conflicts and growing extractive industries where 42% of reported environmental conflicts in Colombia are related to mining activities and 19% to the exploration and extraction of fossil fuels. In particular, coal mining accounts for 15% of environmental conflicts.

Coal is one of the three main energy sources in the world and is used to generate 40.4% of the world's electricity, while coal, peat and oil shale were responsible for 43.9% of

[3] To see the economy as a "metabolic flow" goes back at least to Georgescu-Roegen (1971)

global CO_2 emissions (IEA, 2014). Coal mining has a negative impact on the environment, human health, and climate change throughout the coal chain (Bell & York, 2012; Epstein et al., 2011; Morrice & Colagiuri, 2013; Palmer et al., 2010; Yushi, Hong, & Fuqiang, 2008).

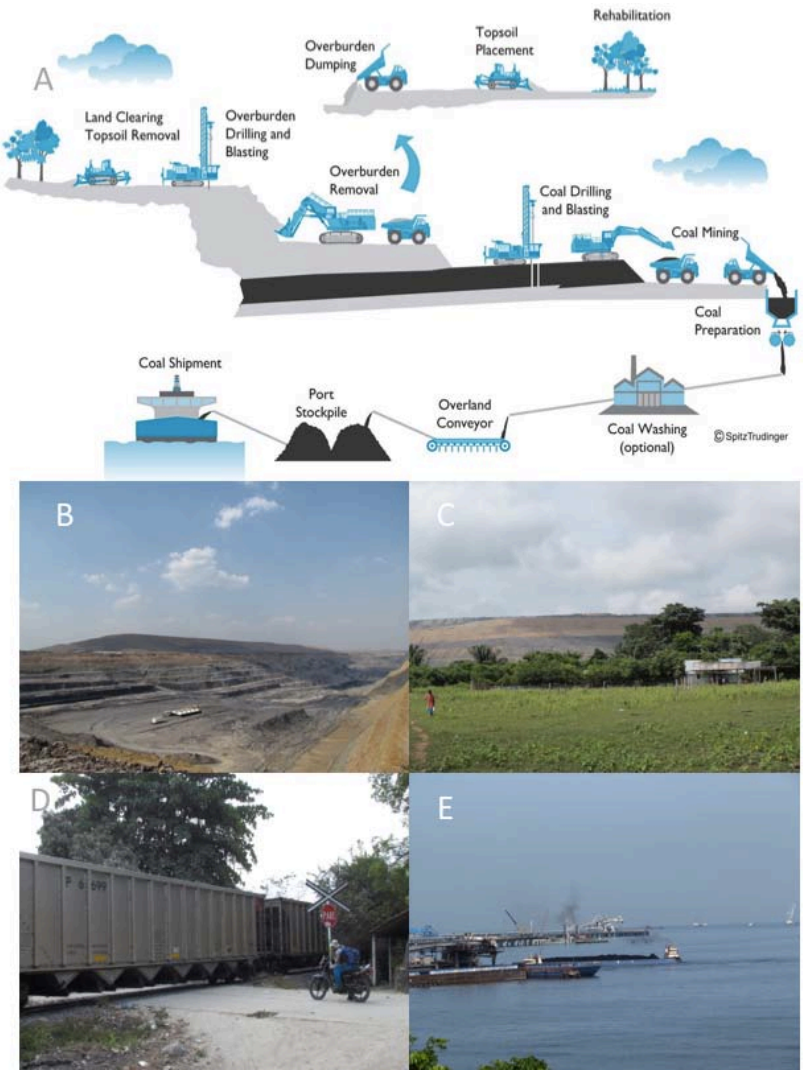
Figure 3. Coal mining concessions in Cesar and La Guajira



Source: Colombian Mining registry (July 2014).

A precise connection between the world's social metabolism and Colombian coal exports exists. In 2013, Colombia was the fifth largest net exporter of coal, after Indonesia, Australia, Russia and the U.S. (IEA, 2014). The coal exported by Colombia comes mainly from La Guajira and Cesar states (Figure 3). Coal production in Colombia increased by 133% from 38.24 million tons (Mt) in 2000 to 89.2 Mt in 2012. Cesar´s coal production increased by 288%, from 12 Mt in 2000, to 46.6 Mt in 2012, overtaking the production in La Guajira, traditionally the largest exporter, which in the same period increased its production by 58.3%, producing 35 Mt in 2012. All coal extracted in La Guajira and Cesar goes to export. In 2012, most of Colombian coal was exported to Europe (50.5%), in particular to the Netherlands (19.7%), while 24.6% was exported to Asia, 7.2% to the U.S. and 16% to the rest of Latin America (SIMCO, 2016).

Box 1. A) Open-pit coal mining process. B) Hatillo open-pit coal mine in Cesar. C) El Hatillo town. D) Coal train. E) Coal port in Santa Marta



Source: A. www.miningandtheenvironment.com. B,C,D&E: Author

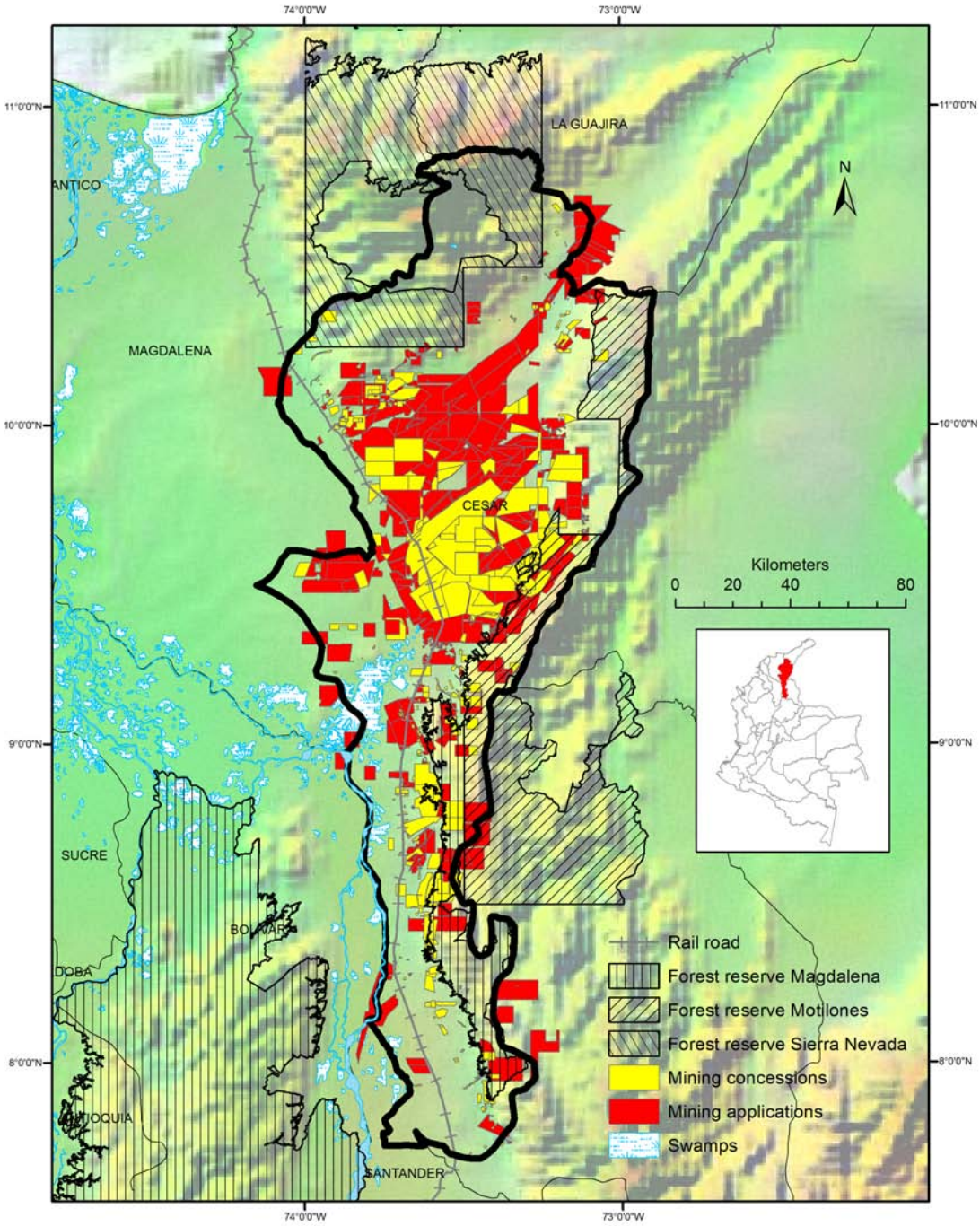
The expansion of large-scale open-pit coal mining in Colombia has been driven by the metabolic change in the world economy, and a combination of favorable commodity prices and the governments' neoliberal policies. Through the Mining Code (Law 685 of 2001), governments promote mining as an activity of public utility and social interest, arguing that it advances industrialization, generates national and local development, increases exports, creates jobs, and produces royalties for the state. The Mining Code limits government participation to a regulatory role and leaves mining operations in the hands of the private sector (Fierro, 2012; Pardo, 2013). Indeed, foreign direct investment in the 1990s ranged from US$2-3 billion a year, increasing to more than US$10 billion in 2005, and topping more than US$16 billion in 2012 (Rudas & Espitia, 2013a). Consequently, rights granted to Afro-descendant and Indigenous communities and policies to protect ecosystems and biodiversity are violated by permits for exploration and mining (ABColombia 2012; Vargas 2013).

In Cesar, several multinational companies have been given open-pit mining permits to extract and export coal (see Figure 3). The three main companies are Drummond (U.S.-based), which exported 54% of the total coal production in Cesar in 2011; Prodeco (subsidiary of the Switzerland-based Glencore-Xstrata), which exported 16% in 2011; and Colombian Natural Resources (CNR; controlled by Goldman Sachs) responsible for 8% of exports (SIMCO, 2016).

Open-pit coal mining in Cesar takes place in tropical dry forests. Coal deposits are located within valuable ecosystems including: Santa Marta Sierra Nevada in the northwest; Perijá mountains in the east; and the Zapatosa wetland in the south. These ecosystems are essential for regional agriculture. Figure 4 depicts the overlap between forest reserve areas, mining concessions and applications for July 2013.

As in other regions of Colombia, mining areas in Cesar are historically affected by guerrilla and paramilitary violence (PAX, 2014). Moreover, coal mining operates under weak environmental institutional frameworks reflected in inadequate control instruments and sometimes co-opted authorities (Fierro, 2014). The livelihoods of local communities are negatively affected. They face significant social, environmental and human rights damages (ABColombia, 2012; Ardila et al., 2011; CGR , 2014; PAX, 2014; Silva, 2010). Under these conditions, two critical points stand out. First, the coal mining multinationals do not take moral and legal responsibility for environmental damages nor for the health problems of the local population. Second, the communities do not have decision-making rights regarding distribution of mining revenues.

Figure 4. Forest reserves, mining concessions and applications in Cesar, Colombia



Source: Colombian Mining registry (July 2013).

The objective of this Chapter is to identify, and value in economic terms (making all assumptions explicit) the socio-environmental liabilities of mining in Cesar. A major finding is that unpaid damages are larger than the price of coal. This study relies on information on social and biophysical damages from various sources, and also on interviews with local and national stakeholders. This study is framed in a way that it could

be relevant for a court case (perhaps under ATCA, the Alien Tort Claims Act) claiming repayment of damages from coal companies or as a contribution to a report from the Colombian General Audit office. This economic-valuation framing does not mean that the author is unaware that environmental liabilities and the achievement of environmental justice goes far beyond economic compensation. There are many other valuation languages. Monetary valuation is only appropriate is some contexts (Kallis, Gómez-Baggethun, & Zografos, 2013; Rodríguez-Labajos & Martínez-Alier, 2013; Spangenberg & Settele, 2010; Zografos et al., 2014).

Section 2 will explore the meaning of environmental liability. Section 3 explains why economic valuation is sometimes appropriate to assess such socio-environmental liabilities. Section 4 identifies several socio-environmental liabilities from coal mining in Cesar expressed in social and biophysical information and gives their economic values. Section 5 compares the results with studies conducted in China and the U.S. Section 6 draws the conclusions of the study.

2. Environmental liability

Liabilities and assets are the two main items on a balance sheet in accounting terminology. Liability accounts include the current debts of the company; i.e. the monetary value of all debts to banks and suppliers, among others. In double-entry accounting, liabilities are claims on assets. Normally, all monetary debts are included in the balance sheet but environmental and social debts are not. They are considered by mainstream economists as negative externalities and a product of market failure. However, according to Centemeri (2009), this approach oversimplifies the nature of environmental problems, because it does not consider the specific moral and political problems raised by environmental issues. Centemeri argues that we have to consider two types of uncertainty. The epistemic uncertainty surrounding environmental damages, due to the complexity of the social and ecological interdependencies to identify the causes and effects of the damages. And the moral uncertainty because the different ways to value the environment. Then, the evaluation of such damages is a political process (Centemeri, 2009), in which the community affected is constituted and collectively define and address the injustices of these liabilities.

The EJOLT (Environmental Justice Organisation, Liabilities and Trade) project[4] through a conjoint reflection between Environmental Justice Organizations (EJOs) and academics, defined environmental liabilities as any situation of damages or 'harms' (risks of such damages) that are imposed on third parties producing an injustice and claims for compensate, remediation and to stop further damage (Zografos et al., 2014)

Environmental liabilities have been operationalized under three different responsibilities: moral, legal and economic (Zografos et al., 2014). Identifying "uncompensated damage" allocates moral responsibility due to unfair distribution of the damage. EJOs acknowledge that moral responsibility generates an obligation to stop or repair damage, and to compensate them in monetary and non-monetary terms (Zografos et al., 2014). However, moral responsibility is not sufficient for reparations. Legal responsibility is needed for the effective reparation of environmental damage and compensation to the victims (Fierro & López, 2014).

The degree of the legal responsibility depends on each countries´ legislative system, and the strategies to compensate for remediating damages. In Europe, the Environmental Liability Directive (OJEU, 2004) regulates payment for remediating damage once it is possible to prove a causal link between the activity of a company and a damage. In the U.S., the CERCLA (Comprehensive Environmental Response, Compensation and Liability Act of 1980) determines liabilities as retrospective obligations to pay for clean-up costs of pollution. CERCLA and that European Directive provide two further socially relevant contexts for exercises in money valuation.

Some EJOs and activists have claimed that the environmental liabilities of exporting extractive industries are part of an ecological debt from the global North to the South, that would also include "climate debt" caused by "loss and damages" (in the vocabulary of the international negotiations). Conceptualizing environmental damage as environmental liabilities and ecological debt is a language deployed not only for claiming compensation but more importantly to stop and prevent further damages (Martinez-Alier et al., 2014; Meynen & Sébastien, 2013).

2.1 Environmental Liabilities from Mining

In the case of mining activities in Latin America, the concept of environmental liability ("pasivo ambiental") has been used in the public sector for the management of abandoned

[4] http://www.ejolt.org/

mines (Yupari, 2004). In Peru, the term is used not as a concept of obligation or debt, but to name the elements present in abandoned mining infrastructure and effluents, such as acid drainage.[5] In Chile, the National Commission for the Environment (CONAMA) acknowledges pasivo ambiental as "abandoned mining workplaces which constitute a significant risk to human health and the environment." In contrast, Bolivia´s Environmental Law 1333 adopts a more general definition of pasivo ambiental: "A group of negative impacts dangerous to health and/or the environment, caused by activities which existed for a determined period of time and generated unresolved environmental problems."

In 2010, the firm Econometría undertook a study for the Colombian Ministry of Mines and Energy, which established a characterization, prioritization and valuation methodology for environmental liabilities in order to formulate policy guidelines.[6] They defined two types: those derived from uncompensated damage of inactive or abandoned mines; and those resulting from damage caused by current mining activities. The study suggested that liability should not be limited to impacts associated with inactive mining because active mining also generates environmental damage that requires management, for instance toxic water spills or accidental tailing dam failure. The responsible agent is the mining company, but there are also co-responsibilities of the environmental authorities who have allowed (by acting or by omitting any action) the "configuration of environmental liabilities" (Econometría, 2010).

This Chapter concurs with this view, and it approaches environmental liabilities in Cesar as the uncompensated damages caused by companies that currently mine coal.

3. Is economic valuation (EV) appropriate for environmental liability accounting?

In an ecological context, EV is a process that assigns monetary value to natural resources or environmental services. The methodology includes both the estimated monetary value of goods and services provided by environmental resources and the quantification, in economic terms, of environmental damages. There is a dilemma within ecological economists whether or not to use monetary valuation (Kallis et al., 2013) from Costanza et al. (1997) to Spash (2008).

[5] This definition was included in the Law 28271 of 2004, Perú.

[6] The methodology proposed has not been adopted by Colombian regulations.

The issues of incommensurability and the plurality of values (Martinez-Alier et al., 1998) put into question the capacity of EV to address environmental concerns (Centemeri, 2015). The environmental conflicts are fought out in many languages, and the EV of damages is only one of such languages (Martinez-Alier, 2001). Non-economic languages such as ecological values, the attachment to place, and the sacred values of Indigenous and Afro-descendant communities are perhaps becoming stronger on a global scale, and they have a considerable meaning in megabiodiverse and multicultural countries (Rodriguez Labajos & Martinez-Alier, 2013). Therefore, the inclusion of plural values is not only an ethical but also a political issue to ensure that all relevant viewpoints are taken into account (Kallis et al., 2013).

Kallis et al. (2013) understand that the monetary valuation process is a part of a broader process of institutional and power changes. They provided four criteria to engage or not in economic valuation. The purpose of valuation must embrace environmental improvement criteria; distribution measures (environmental justice); the acknowledgment of a plurality of values; and precluding the commodification or privatization of the environment. According to these criteria, an EV would be appropriate in legal cases related to environmental and human health damages (Kallis et al., 2013). Since the definition of environmental liability emphasizes the social and biophysical values lost, the injustice and the imminent risk to human and ecosystem health, the mentioned criteria are suitable for an EV of the socio-environmental liabilities generated by coal mining in Cesar (Colombia). Assume that Drummond and other companies would compensate for the damages in monetary terms (which is unlikely, not least because the damages are larger than the price of coal). This would not entitle them to "do it again". Therefore, the environment and human lives are not commodified by such payments.

An EV of coal mining environmental liabilities in Cesar can be framed hypothetically as expert advice for a court case or a series of court cases (either in Colombia or perhaps in the U.S. under the ATCA) asking the mining companies to compensate for damages caused in Colombian territory. The frame is international civil law, the means is a calculation of the damages in money terms (as Chevron-Texaco case in Ecuador). This study (with its calculations) could become a practical input to such court cases where the liability of companies would be determined and compensation would be established. This study could also be use in administrative proceedings, to establish grounds to fine the companies. This exercise in EV becomes one of the criteria in a multi-criteria matrix,

where the final outcome would certainly not depend only on economic values but also on other values expressed in their own units.

4. Valuing socio-environmental liabilities of coal mining

Table 1 shows the socio-environmental liabilities identified on local, national, and global scales. Sections 4.1 to 4.9 explain the values given in Table 1.

4.1 Air Pollution

Several gases and pollutants are released when explosives strip rock covering the coal, and when mining wastes are exposed to air and water. Morales and Carmona (2007) indicate that the trace elements presented in Cesar open-pit coal mines are arsenic, mercury, selenium, cadmium, and lead.[7]

Along with coal extraction, storage and transport, dust is released. The coal dust causes: visibility reduction; material damages to buildings due to corrosive properties; alteration of local climate; and harm to respiratory systems. Total Suspended Particles (TSP), with the mass concentration of PM10 and PM2.5 have easy access to lung alveoli, which can cause severe respiratory diseases and irritation of mucus membranes (CorpoCesar, 2013).[8]

[7] Morales and Carmona (2007) investigated the coal from Cesar, particularly in the area La Jagua de Ibirico. They observed that coal has "(…) relative low percentages of ashes and high sulfur percentages," in comparison to those of La Guajira (Cerrejón area). The analysis of trace elements in the samples of Cesar reveals the following concentrations: mercury, 0.017 ppm – 0.336 ppm; arsenic, 0.32 ppm – 11.67 ppm; selenium, 0.92 ppm – 6.63 ppm; cadmium, 0.13 ppm – 0.91 ppm; and lead, 0.56 ppm – 1.97 ppm.

[8] It includes all the aerodynamic diameter particles of 100μm or less. The breathable particles PM10 which have an aerodynamic diameter of 10μm or less; and PM2.5, which measures particulate material and has an aerodynamic diameter of 2.5μm.

Table 1. Economic valuation of socio-environmental liabilities of coal mining in Cesar

	Environmental and social liabilities		Social and biophysical losses	US$ 2012/t		Economic Valuation Method used in the literature	Limitations of the economic valuation
			Quantitative and qualitative	Min.	Max.		
Local	**Pollution**						
	Air	Gas emissions and coal dust	Reported levels of TSP and PM10 surpassed permitted limits	0.23	7.31	Hedonic prices and contingent valuation method (Mendieta et al., 2010). Treatment cost (Li et al., 2011)	overestimated
	Soil	Mining waste	Ratio coal/mining waste = 1/18	39.78	59.61	Avoided treatment cost	underestimated
	Water	Water quality loss	Risk of water quality index > 35%. unfit for human consumption	0.38	0.50	Avoided treatment cost	underestimated
	Territory loss by open pit mining						
	Water resources committed: diversions of rivers and groundwater affected		10-14 m level of abatement				Irreversible non-monetized loss
	Loss of agricultural land and livestock		36% decrease in temporary crops	1.82	6.50	Share of Cesar´s agricultural production within the national agricultural	overestimated
	Relocation: El Hatillo, Plan Bonito y Boquerón		912 families should be relocated.	0.58	1.02	Compensation agreement in Plan Bonito	underestimated
	Ecosystem services loss - Protected Areas		10% of protected areas have mining titles and 11% have mining requests pending				Non-monetizable
	Public health loss		Extra mortality and morbidity	42.72	52.13	Occupational diseases cost (MPS-Ministerio de la Protección Social, 2007); value of statistical life - VSL (Miller, 2000; Viscusi, 2008; Viscusi & Aldy, 2003); dose-response method (T. Morales et al., 2012)	underestimated
National	**Loss by transportation and shipment of coal**		Noise and air pollution (coal dust). The distance traveled by the coal train is 240 km. It passes through 10 municipalities. It operates every 20 min	18.84	18.84	Hedonic prices, travel cost and contingent valuation (Coronado & Jaime, 2010), External cost rail freight (Forkenbrock, 2001)	underestimated
	Lives lost in coal transportation accidents		In 2008-2011 there has been 25 deaths and 280 injured	0.30	2.01	Value of statistical life-VSL (Miller, 2000; Viscusi & Aldy, 2003; Viscusi, 2008); cost of railroad injury (Miller et al., 1994); Colombian statutory accident insurance (SOAT)	underestimated
	Coal reserve loss (non-renewable resource)		About 1,933 Mt of coal reserve	5.44	13.09	"User cost" method (El Serafy, 1989)	It depends on the duration of the reserves and interest rate
Total - coal extraction and transportation within Colombia				**110.10**	**161.01**		
Global	**Pollutant emissions from power plants and Climate damage from combustions emissions**		1t of coal would produce 2.5t of CO2 and others pollutants (methane, oxides of nitrogen, oxides of sulfur, mercury and others)	376.99	1,900.73	(Epstein, et al. 2011)	underestimated

Source: Author

In 2007, strong protests arose in La Jagua de Ibirico provoked by high levels of air pollution and the presence of respiratory disease in the community. As a result, the government declared Cesar´s mining district as a "pollution site" and imposed a remediation program on the mining companies. Nevertheless, the 2012 air quality monitoring system reported levels of TSP and PM10 that surpassed permitted limits.[9] In Plan Bonito, the TSP level was reported at 162.43μg/m^3, while the maximum allowed level is 100μg/m along the road that leads to La Jagua, pollution levels reached 122.71μg/m^3. PM10 levels in Plan Bonito and La Jagua were 74.05μg/m^3 and 61.52μg/m^3 respectively, while the maximum limit should be no more than 50μg/m^3 (CorpoCesar, 2013).

Mendieta et al. (2010) estimated the cost of the externalities caused by the reported PM10 levels at US$7.31/ton of coal using hedonic price and contingent valuation method. This estimate can be considered the value of the environmental liability or debt since coal companies are not paying an environmental tax. We estimated US$0.23/ton for the minimum losses caused by the coal dust treatment based on the estimation in Li et al. (2011).[10] Therefore, the socio-environmental liability caused by air pollution is estimated in the range between US$0.23/ton - US$7.31/ton. This range is overestimated because it may involve double counting over other estimated liabilities, such as health effects.

4.2 Soil – Mining waste

Mining waste is a by-product of open-pit coal mining. Fierro and López (2014) calculated a ratio of coal to waste (stripping ratio) in the Colombian Caribbean region of 1:18 based on reports made by Drummond and Cerrejón. Coal production from Cesar reached 420.7 million tons in the period of 1990-2012 resulting in 7.57 billion tons of mining waste.

The mining companies are responsible for the treatment of mining waste dumps. However, the Colombian General Audit office - CGR (2014), found irregularities regarding the treatment, soil remediation and stability of the dumps with further evidence that the mining companies have only performed 42% of the rehabilitation.

The rehabilitation process involves covering the ground with an organic material of at least 15 cm; reforestation with manually planted, native species with a density of 1,111

[9] Online system and monitoring: http://sevca-zcc.dyndns.info/ambiensQ/ambiensqamt/corpocesar/

[10] Li et al (2011) estimated the loss of US$31.6 million caused by the treatment costs of the coal dust from 1949 to 1959, in Mentougou District of Beijing, China, with extraction of 150 million tons.

trees per hectare; and maintenance for three years following the year of planting. According to the interviews conducted with three engineers working in the mining sector, the treatment costs range between US$3.81 - US$5.71 per ton of mining waste, resulting in US$68.58 - US$102.78 per ton of coal (based on the ratio of coal:waste, 1:18). Since mining companies must still complete 58% of the rehabilitation of the dumps, the liability is estimated between US$39.78/ton – US$59.61/ton.

4.3 Loss of water quality

In November 2013, the CGR (2014) conducted a multidisciplinary audit of the coal mining companies in Cesar, including a water quality analysis in the mining zone. The results of the audit show alterations caused by sulfur lixiviation and oxidation due to high levels of sulfate, manganese, and iron, increasing water acidity. The concentration of the chemical pollutants exceeds Colombian and international standards for drinking water.

In 2011, the Ombudsman office (*Defensoría del Pueblo)* had requested Cesar´s Health Office to analyze the drinking water in El Haltillo due to complaints. Samples from underground water and the El Haltillo´s community aqueduct were analyzed. The laboratory results revealed a risk index for water quality (IRCA) of 37.5%, whereby values over 35% are classified as high risk and undrinkable. Likewise, reports from the Health Office of El Paso municipality, showed an IRCA of 36% in 2011 and for La Jagua de Ibirico, an IRCA of 47.33% in 2009.[11]

One of the reasons for low water quality is the deficient wastewater treatment in the mines despite licensing requirements. The mining companies do not report their water usage. Prodeco, was obliged to report their water use due to plans to deviate the Calenturitas River.[12] The MAVDT (2009) reported that the total water consumption of the Predeco mine was 85.36 liters (L) per ton of extracted coal. This data is comparable to the figures reported by Cerrejón (2011) in a planned expansion project in La Guajira (55-60 million

[11] Municipal Sanitary Certifícate. http://elpaso-cesar.gov.co/apc-aa-files/61363630303634363836663362383761/certificacion-sanitaria-municipal.pdf
Accountability report. La Jagua de Ibirico town hall, 2010. http://www.lajaguadeibirico-cesar.gov.co/apc-aa-files/38376161323464353562383639616133/Revista_pags_9_a_12_rendicion.pdf

[12] Water use at this particular mine was used for the following activities (MAVDT 2009): Water-pumping from mining pits used to control coal dust; Water-pumping from wells used for fabricating explosive elements, washing vehicles and moistening coal. The excess is pumped into the Calenturitas River without treatment; Water run-off from treated mining waste dumps is directly pumped into Calenturitas River; Water run-off from untreated mining waste dumps with high levels of chloride, sulfur, calcium, sodium and other metals is pumped into sedimentation ponds.

tons per year), which would demand 17,000 m^3 of water per day or 103.4 -112.8 L/ton. In comparison, the water consumption in rural areas in Colombia accounts from 83 to 120 L/day per person (Ojeda, 2000). In La Guajira and Cesar during dry seasons or "El Niño", consumption levels can drop to 7 L/day (Cabrera & Fierro, 2013).

To calculate the environmental liability of water pollution, we consider the lack of water treatment as a debt, with an avoided treatment cost of US$4.44/$m^3$.[13] This value is multiplied by the minimum and maximum values of the mines' water consumption. This value ranges from US$0.38/ton to US$0.50/ton. This range is underestimated because the water treatment is not sufficient to remediate the damages in flora, fauna, and humans by water pollution.

4.4 Loss of territory due to open-pit mining

Environmental liabilities include territorial loss at large mining sites. This includes the local population´s lost livelihoods due to loss of land and ecosystem services, given the fact that open-pit mining does not share land-use with any other activity.

4.4.1 Water resources loss: river deviation and groundwater damage

Large quantities of groundwater deposits are pumped from coal mines and several rivers of high importance to the local populations´ food security have been deviated. For example, the extension of the Calenturitas mine (Prodeco) altered the course of the Calenturitas River for 5.1km; Maracas River for 1.41km; and Tucuy River for 1.39km (MAVDT, 2009). These alterations changed the geography, the riverbeds, the availability and diversity of aquatic species.

Prodeco and SIG Ltda (2008) made a hydro-geological model to predict how mining will affect the points where drinkable water is captured. For instance, the lowering of the water table in Plan Bonito would reach 14.8m by 2020, probably caused by mining operations by the three companies. The model also evidences that Calenturitas River will face a flow reduction of 0,86 L/s. This study concludes that, given the limited availability of water in the coal zone, a deficit is foreseen, increasing the need for imported water from other distant sources such as the Perijá mountain range and the Magdalena River.

[13] I calculated the treatment cost based on personal interviews with engineers from Cerrejón and Coquecol SA, August 2013.

The mining sector audit in Cesar conducted by CGR (2014) included water level measurements in wells close to those reported in the study by Brown (1983). The CGR compared the data and found a minimum of a 10m reduction to the water table. In addition, they found that Drummond deviated a stream without authorization, consequently there is a pending law suit.

The environmental authorities and the mining companies only estimate the lowering of water tables in meters. There is not data about the total volume of water loss and the topographic abatement map is not updated. In addition, the complexity of the water system and consequences on ecosystems and local livelihoods make the depletion of the water tables an irreversible and non-monetized loss.

4.4.2 Loss of agricultural and grazing land

> *"Cesar is an agricultural and cattle department, but we have been overwhelmed by the mining sector, which is growing at an impressive rate. Currently, several agricultural and cattle lands have been acquired by mining companies. The cattle breeder and the farmer are being displaced"*
>
> Cesar´s Agriculture Secretary (2013) [14]

Cesar was a model in Colombia for its cattle, rice, and cotton farming. Between 1990 to 2010, temporary crops decreased by 36% from 531,890 to 338,585 tons, while for all of Colombia the decline was 7% from 8,770,590 to 8,190,616 tons (URPA, 2010).[15] Between 1990 and 2012, the municipalities of Codazzi and El Paso lost approximately 9,300 ha of arable land. However, other towns such as Becerril, Chiriguana, and La Jagua reported increases in arable land by 14.161 ha, despite the constant and growing presence of mining in the last five years (Poveda, 2012). This could be explained by the presence of new monocultures of oil palm. In economic terms, between 2000 and 2011 the minimum loss in the share of Cesar´s agricultural production within the national agricultural sector was 3.5% and the maximum 11.13%.[16] This loss is assumed to be a liability from coal mining and is estimated between US$1.82/ton – US6.05$/ton. This

[14] Interview, June 2013.
[15] Crops that mature within one or more rain seasons and are destroyed after harvesting, e.g. rice, maize and cotton
[16] Estimation based of the Colombia National Statistical System. We estimate the losses as the negative perceptual change between each year and the previous one
http://www.dane.gov.co/index.php/estadisticas-por-tema/agropecuario

value is possibly overestimated because the agricultural sector could be affected by other impacts such as "El Niño" and agricultural national policies, among others.

4.4.3 Population relocation

"If it wasn´t for the pollution, it would be very nice to live in Plan Bonito. Everything is easy for us here. We very much enjoy living in Plan Bonito because we have all the public services, school for our kids…and we can live from our lands and breed pigs and other animals" Resident of Plan Bonito[17] *Interview, June 2013*

In 2010, El Hatillo, Boquerón and Plan Bonito were given relocation orders by the Ministry of Environment to avoid further damage from air pollution that exceeded allowed limits. This was the first time in Colombian history that the environmental authority ordered a relocation. The Ministry imposed responsibility on Drummond, Glencore-Prodeco, and CNR, for the resettlement of 912 families.[18] Plan Bonito was given one year to relocate, and El Haltillo and Boquerón were given two years. However, they are all pending resettlement.

Plan Bonito residents have been negotiating monetary and non-monetary compensation since 2007 for damage and loss. Table 2 lists the compensations according to agreements made in monthly meetings between November 2012 and December 2013. This process will be finalized when the companies give the families the agreed compensation.

The relocation process of El Haltillo and Boquerón has advanced at different stages. In El Hatillo the mining companies are constructing a "transition plan" to overcome the food crisis decreed in February 2013 due to general unemployment and lack of cultivatable land. The plan includes food subsidies and creation of productive projects.

In Boquerón, more than half of the population is Afro-descendant and they are demanding the recognition of their ethnic rights as a palenque. However, the government does not acknowledge this and the relocation agreement is pending.[19]

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[17] *Interview, June 2013*

[18] According to the census made by the operator RE PLAN, Plan Bonito has 176 families; El Haltillo, 279; and Boquerón, 457.

[19] Ministry of Interior Certification 957 of May 30th 2012

Table 2. Monetary and non-monetary compensation for Plan Bonito relocation

Items to compensate	Compensation
House Replacement	105 m^2
Home furniture	Living room, TV, bed
Terrain	180m^2 of productive gardens
Crops	Loss trees (mangoes for fruit and shade) and loss crops.
Profits loss - commercial establishments	Earnings Loss during the last 6 years
Profits loss – Farmers	Minimum wage for the last 6 years
Emerging damage	The cost of moving and the rising cost of living
Dismantling the housing	Mining companies compensate to remove reusable material
Bonus for damages	Depends on the time lived in the town
Livelihood restoration program	Psychological support during and after the relocation. Youth education fund. Micro-enterprises fund. Grant to elderly.
Health	Medical examination and residents will be affiliated to private health care

Source: Personal Interview with lawyer representing Plan Bonito community

The liability derived from not relocating these populations (in the period of time stipulated by the law 2011-2012) is valued based on the assumption that the monetary compensation negotiated by Plan Bonito would be replicated for the families in Haltillo and Boquerón. In Table 3, the liability due to non-relocation is estimated between US$0.58/ton to US$1.02/ton. This value is underestimated because the compensation plan in Plan Bonito (Table 2) does not include damages from air pollution and low water quality.

Table 3. Socio-environmental liability for not relocating El Hatillo, Plan Bonito and Boquerón

Relocation cost by family	Families	Minimum	Maximum
Families with commercial establishments (5%)	46	6,754,471.91	13,899,166.48
Farmers	866	45,444,046.71	78,250,341.10
Total	912	52,198,518.61	92,149,507.59
Coal production in Cesar (tons) 2011-2012	90,366,460		
Social liability per extracted ton of coal (US$/ton)		0.58	1.02

Source: Author, based on data provided in the interview with the lawyer of Plan Bonito residents (June 2013)

4.4.4 Loss of forests and ecosystem

Nearly 27% of Cesar consists of national and regional protected areas while 10% of these protected areas have mining titles and 11.4% have mining requests pending. There is an overlap between mining development and protected zones. The land use change of forestry reserves and other protected areas has been regulated as 1:1 environmental

compensation.[20] However, the loss of ecosystem and compensation for environmental impacts, are not considered.

Nature Serve (2010) conducted an ecosystems evaluation for 1,278,600 ha, which corresponds to 56% of the Cesar area. Only 30% of this area is covered by natural ecosystems and secondary vegetation. The remaining dry and riparian forests are in critical danger. The recommendation is to protect from 76% to 100% of these forests although they are located in areas with mining titles. The projections made by this study argued that coal mining causes loss of water, biodiversity, and ecosystems. Even when there is a 1:1 compensation for deforestation, the biodiversity loss is non-compensable.

The coal mining activities affect the health of ecosystems. Cabarcas-Montalvo et al., (2012), Coronado-Posada et al., (2013) and Guerrero-Castilla et al. (2014) showed that the flora and fauna living around the Cesar coal mining areas have a greater chance of DNA damage and metal toxicity having implication on ecosystem services and human health.

The liability from loss of forest could be considered equal to the cost of "reforestation". However, ecosystem loss is considered as non-monetizable. Future investigations should approach an integral valuation that includes other valuation language such as ecological and cultural values.

4.5 Loss of public health

Section 4.1, 4.2 and 4.3 estimates how much money companies save by not complying with environmental quality norms. These savings appear as extra profits. Here we give monetary estimates for the increased morbidity from coal mining. Failure to compensate for such damages also increases profits.

There is widespread frustration among the local community and miners due to the lack of government and mining corporations' responsibility to address community health, and this has a powerful influence on the overall well-being of the locals.

[20] 1 ha of subtraction of forest reserves: 1 ha of reforestation. The species type for the reforestation is not regulated.

4.5.1 Occupational diseases and work accidents

According to the Association of Sick and Injured Workers of Drummond (Asotred, 2012), 133 associates have had work accidents; 347 present several pathologies of whom 53% present disc herniation and spinal diseases, 30% have musculoskeletal diseases, 12% have lost hearing, 1% have been diagnosed with mining pneumoconiosis. After experiencing negative health effects and receiving the above mentioned diagnoses, mining workers began a legal procedure to pressure the Professional Risks Insurance (PRI) company to acknowledge their sicknesses as "professional" and allow them to be relocated, indemnified, or to retire. According to Asotred (2012), the PRI have catalogued 229 cases as "professional sickness" and 118 as "common disease". However, union members and sick workers reported that mining companies manipulated the PRI with the intention of cataloguing their pathologies as "common diseases" and thus, denying any right to compensation. Then, these 118 sick miners are considered as being also entitle compensation. They present similar diseases to those catalogued as "professional". They have spinal diseases (54%), loss hearing (12%), musculoskeletal diseases (20%), mental illnesses (5%), respiratory diseases (6%) and dermatitis (1%). The economic value is based on the healthcare cost of the occupational diseases given by Colombia Social Protection Ministry (MPS, 2007), which estimated the cost of the most frequent occupational diseases in 2003 and 2004. Mental illness cost are not included. These "common diseases" has a healthcare cost that range between US$1,166.74 to US$933,789.81 in 2012. Drummond produced 26,005,144 tons of coal in the same year. As a result, the liabilities due to uncompensated occupational disease are estimated at a maximum US$0.04/ton. This value is underestimated because it does not include mental illnesses and loss of quality of life.

Asotred (2012) reported that during the period 2000 to 2011, 21 miners have died. 16 in work accidents, two have died from respiratory diseases and three union leaders have been killed. There is a lawsuit against Drummond for collaborating with paramilitaries responsible for murdering these union leaders (PAX, 2014).

Hendryx & Ahern (2009) estimated the economic value of the mortality in Appalachian coal mining regions trough the Value of Statistical Life (VSL) Lost. The VSL concept is based on the amount that a group of people is willing to pay for fatal risk reduction (Miller, 2000; Viscusi, 2008; Viscusi & Aldy, 2003). The VSL have increasingly used in environmental analysis to value the benefits of pollution control policies or other public

benefit programs (Miller, 2000), or to value the lost lives due to pollution (Hendryx & Ahern, 2009). Miller (2000) showed that VSL may vary between countries due to differences in cultural norms or income levels. He estimated that for developing countries (Peru and Venezuela) the VSL is about 120 – 300 times the annual GDP per capita. Table 4 shows the liability for miners lost lives.

Table 4. Liability estimation due to miners' deaths

Liability – miners deaths	Min	Max
VSL Miller (2000)* Colombia GDP per capita 2012 (US$7,763)	931,560	2,328,900
21 miners´ deaths (Drummond)	19,562,760	48,906,900
Drummond production (ton) 2000-2011		172,487,454
$VSL loss /ton	**0.11**	**0.28**

Source: Author, based on data provided by Asotred (2012)

4.5.2 Locals health problems

The Department of Health (Secretaria de Salud de la Gobernación del Cesar 2011) reported that 51.3% of the El Haltillo population presented diseases related to environmental pollution such as respiratory disease (30.08%), skin rashes (11.59%), and eye disease (1%). In La Jagua de Ibirico in 2012, 7,575 cases of illnesses related to environmental pollution were reported, out of which 68% corresponded to respiratory damages. Children are most affected. Agudelo, et. al, (2012) evaluated 1627 children from the Cesar coal mining zone and found that the frequency of respiratory diseases is higher in the population living in towns near mining waste deposits and with heavy coal traffic.

To economically value damages to locals health we used results proposed by Morales et al., (2012). The authors applied the dose-response method and concluded that for each 1μg/m^3 of annual exposure to MP10, 1,974 cases of Acute Respiratory Infection (ARI) are produced per year. They also estimated that in Colombia the average cost for ARI treatment is US$2,258 per person, including consultation, hospitalization, and treatment. Liability due to ARI generation in the entire coal production area is calculated based on the annual concentration of PM10 between the years 2007 and 2012 which range between 382.70 μg/m^3 – 464.81μg/m^3 with an average annual coal production of 40Mtons.[21] The value estimated ranged between US$42.61/ton to US$51.81/ton.

[21] In 2007, the environmental authority in Cesar began air pollution measurements in response to the social movements in La Jagua.

The total liability due to loss of public health (miners and locals' health) ranged between US$42.72/ton to US$52.13/ton. This is underestimated because it does not include mental health of the population and miners and others diseases caused by environmental pollution.

4.6 Losses due to coal transportation and loading

Mining companies transport extracted coal by train and trucks. The Atlantic railway is 240 km and in 1999 the private enterprise Fenoco received an authorization for its use. Two mining multinationals are the main owners of Fenoco: Drummond and Glencore-Prodeco. The train operates 24 hours a day with a 20 minutes frequency and goes through 10 municipalities of Cesar and Magdalena (Figure 3).

Coal dust is dispersed from the mine to the port of Santa Marta. Coronado and Haider (2010) used three EV methods (hedonic prices, travel cost, and contingent valuation) to calculate a total annual loss of US$30.52 million in the real estate market in Santa Marta, a port city in the northwest of Colombia. The houses next to the coal transportation systems are impacted by noise and coal dust, deteriorating their value. This study also estimated a loss of US$67.3 million per year related to diminished travel frequency of national and foreign tourists (because of damage to landscapes, beaches, water and mobility). Consequently, there is less income related to lodging, restaurants, and leisure. The sum of these losses is considered to be the liability due to coal transportation in the area of Santa Marta, which is estimated to be US$2.44/ton.

To estimate the liability in other towns where coal is transported and shipped we consider external costs from train freight transportation (air pollution and noise) estimated by Forkenbrock (2001) as US$0.11 ton/mile (converted to 2012 prices). The Liability due to regional coal transportation of 240km (149.13 miles) is estimated to be US$16.40/ton. The total liability due to coal transportation and leading is estimated to be 18.84 (including the liability in Santa Marta above). This value is underestimated because it does not include the regional effects due to coal transportation by truck freight.

4.7 Loss of human life due to accidents related to coal transportation

Coal transportation by train results in frequent accidents. Between 2008 and 2011 there were 25 deaths and 280 injuries reported. Fenoco denies responsibility, whereas the families of the victims argue that those situations could have been avoided if the coal

mining companies had prevention mechanisms such as safety signs, alarms, and traffic lights that announce the train arrival.[22]

To economically value the liability due to loss of human life we used the VSL lost (Miller, 2000; Viscusi & Aldy, 2003; Viscusi, 2008) used in section 4.5. To estimate the liability for those injured in coal transportation accidents. The Colombian statutory accident insurance (SOAT), establishes a maximum of 500 times the legal minimum wage per day (SMDLV) for medical expenses (US$5,252.39) and 180 times the SMDLV for permanent disability compensation (US$1,890.86).[23] Additionally, permanently disabled persons can access disability pensions through social security. If all injured end with permanent disabilities, each injured could receive a minimum annual pension of US$3,781.7 for at least 30 years. The present value of this would be US$69,175.32[24]. With these costs we estimate the minimum liability at US$ 76,318.57 per injured.

Table 5. Estimation of the Liability due to coal Transport Accidents

Social Liability -deaths in coal transport accidents		
	Minimum	Maximum
VSL US$	931,560	2,328,900
Total Value (25 victims) US$	23,289,000	58,222,500
Coal production in Cesar (tons) 2008-2011	147,429,380	
US$/ton	0.158	0.39
Social Liability -injured in coal transport accidents		
	Minimum	Maximum
Cost per injured in train accident	76,318.57	851,836.21
Total Value (280 injured)	21,369,199.78	238,514,139.13
US$/ton	0.145	1.62
Total Social Liability -Coal Transport Accidents US$/ton	0.30	2.01

Source: Author, based on Value of statistical life-VSL (Miller, 2000; Viscusi & Aldy, 2003; Viscusi, 2008); cost of railroad injury (Miller, 1994); Colombian statutory accident insurance (SOAT)

To estimate the maximum I used the cost of railroad injury estimated by Miller, et al. (1994). They estimated a comprehensive injury cost of US$46,568.70 per person per year

[22] This documentary informs about the accidents occurring in the railway: http://www.noticiascaracol.com/informativos/septimodia/video-301528-nadie-responde-victimas-del-tren-de-la-muerte

[23] The legal minimum daily wage –SMDLV- in 2012 was US$10.5 and the legal minimum monthly wage-SMMLV was US$315.14

[24] 4% discount rate

(converted to 2012 prices). This includes medical cost (US$1,584.94), ambulance services (US$12.96), vocational rehabilitation (US$5.55), lost wages (US$9,922.53), lost household production (US$1,864.53) legal defense cost (US$ 733.22) and lost quality of life (US$32,444.97). I assumed that these costs should be compensate for at least 30 years. The present value would be US$851,836.21 per injured. Table 5 shows the total liability due to coal transport accidents is US$0.30/ton-US$2.02/ton. This value is underestimated because there are no reports of accidents before 2008 (the train began to operate in 1999).

4.8 The "user cost" – loss valuation of the coal reserve in Cesar

The "user cost" method (El Serafy, 1989) refers to the disinvestment made when consuming a nation´s non-renewable resources, since the country would be spending its potential of generating future income. In the case of coal extraction, Colombia is losing non-renewable resources and decapitalizing. According to El Serafy (1989) the irreversible loss of natural resources should be deducted from the generated income. For instance, the coal reserves in Cesar are 1,933Mton, if the annual coal extraction is 48Mton, the duration of the coal reserves will be 40 years. At an interest rate of 5%, the companies should deduct a 14% user cost from the revenue produced by coal extraction and deposit it in an account that will compensate for the depletion. In Colombia coal mining companies must pay 10% royalty (different from tax on profits) for a production larger than 3Mton per year. If the annual coal extraction increases to 65Mton (as predicted), El Serafy´s rule (always at 5% interest rate) would indicate a 22% "user cost". Thus, they could be obliged to put this quantity into a fund that would be managed by the state on a concept of depreciation of this "natural capital". The state should be able to receive the interests of this fund once the coal is depleted. If the mentioned fund had started in 2012 (year 0) and assuming that the revenue of this sector corresponds to the whole market price of coal per ton, the mining companies would have to contribute US$13.04/ton if the annual coal extraction is 48Mton, or US$21.02/ton if 65Mton. In fact, in Colombia coal royalties of 10% is applied over the coal price without transport cost (US$79.35/ton) regardless of extracted tons and the length of reservations, the royalty is US$7.94/ ton.[25] Based on the values of the "user cost" (estimated above), the liability for the loss of coal reserves is US$5.44/ton - US$13.09/ton.

[25] price average of Ministry of Mines and Energy´s Resolutions (0141 March 29 of 2012, 0309 June 27 of 2012, 0429 September 27 of 2012, 0577 December 31 of 2012)

4.9 Global cost of coal combustion

Epstein et al. (2011), estimated the full cost accounting for the Appalachian coal life cycle ranged between $US818.7/ton to US$2,352.1/ton.[26] To estimate the cost associated to coal combustion in electric power stations they considered the local loss of public health, pollution, and damage to climate change. This loss could reach $US376.99/ton to US$1,900.73/ton and according to them, this values still undervalues the total effects. This estimation is used to value the socio-environmental liability due to Cesar coal combustion outside Colombia.

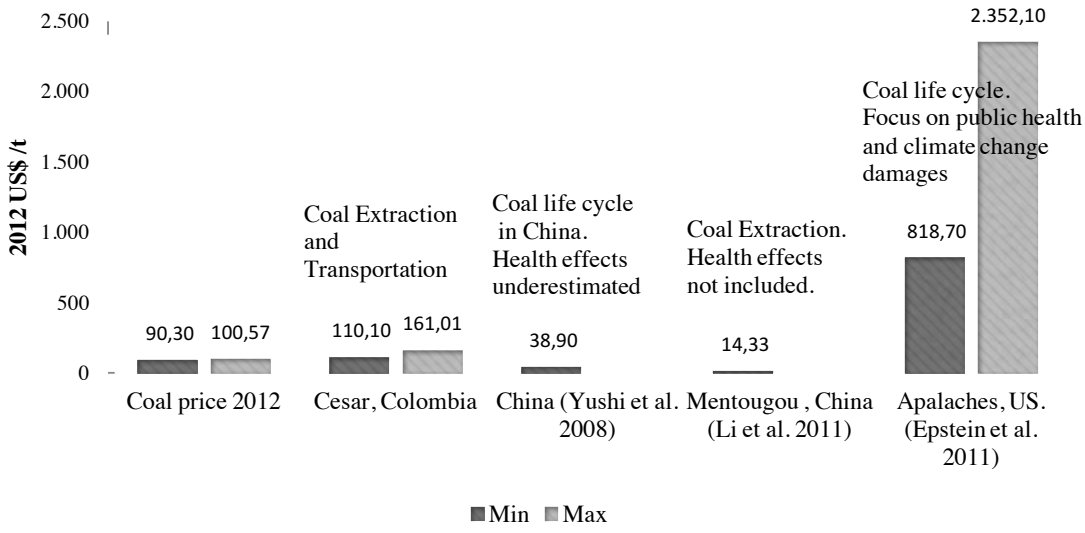
5. Comparison: Socio-environmental liabilities of coal mining in Cesar and other studies

The aggregation of estimated values determines that each ton of extracted coal in Cesar produces socio-environmental liabilities valued between US$110.10/ton – US$161.01/ton during the extraction and transportation process. These results exceed the market price of one ton of coal, which in 2012 fluctuated between US$90.3/ton - US$100.57/ton.

In comparing the estimated values in Cesar with similar studies conducted in China and the U.S., the results show that values increase greatly when public health and climate change caused by combustion of coal on a global scale are included (Figure 5). For instance, Epstein et al. (2011), reported the largest socio-environmental cost associated to the coal chain at the national and global scales; and Li et al. (2011) reported the lower values because they only included damage estimations of coal extraction in a small district in Beijing, China. In turn, Yushi et al. (2008) estimated the value of the damages for the whole coal chain but only at the national scale in China.

[26] Epstein et al. (2011) presents the costs in terms of ¢/kWh. A conversion to tons of coal equivalent was made: 1 ton coal equivalent = 8141 kWh.

Figure 5. Socio-environmental liabilities of coal mining in Cesar vs. other studies



Source: Author

6. Discussion and conclusions

Liabilities are identified through social and biophysical indicators involving different aspects. For instance, railway accidents and air pollution, families displaced and public health loss. However, the methodology for appraising environmental liabilities in terms of monetary estimates reduces such aspects to a common unit. This framing is relevant in some contexts (as explained in section 3). Nevertheless, the methodology is debatable because of the risk of commodification of nature and human life. Also, among other challenges, the difficulty in quantifying environmental liabilities in monetary terms arises from the uncertainty of long-term pollution consequences. Beside this, I have included data from different studies in this field, which have their own assumptions and uncertainties.

EV implies a sacrifice of the different valuation languages of the actors and the various social and ecological values. However, EV can generate useful information about damages expected to be paid particularly in court cases or through administrative proceedings. It can also inspire other communities beyond those directly affected. The recent cases of Chevron in Ecuador or BP in the Gulf of Mexico provide contexts where monetary valuations are relevant.[27]

The EV of socio-environmental liabilities per ton of coal depends on the phases in the coal chain that are being assessed, the scale, and the environmental damages included.

[27] See http://chevrontoxico.com/, http://www.theguardian.com/environment/bp-oil-spill for more details.

Calculations of environmental liabilities in Cesar are based on the best available data produced and used by a wide range of institutions. This EV is limited by the difficulty to quantify the loss of water resources and damage to ecosystems. In addition, the study does not include other socio-environmental damages, such as mental health of the population and miners, and other diseases. Environmental liabilities for transportation from the Colombian coast to the importing countries are not included.

This study leaves the general discussions on externality vs. cost shifting; weak sustainability vs strong sustainability; economic commensuration against incommensurability of values; and focuses on EV in frames that could become demonstrably pertinent for concrete struggles for environmental justice.

Regardless of the precise economic value, each ton of extracted coal in Cesar produces socio-environmental liabilities at each stage of the coal chain at the local, national, and global scales. When a ton of coal from Cesar is exported to Europe, the U.S., or Asia, it carries uncompensated socio-environmental liabilities value estimated here at between US$110/ton – US$161/ton, which are considerably higher than the market price of coal. It also carries indeed (in other valuation language) displacement of local communities, infringement of territorial rights, health problems, frustration in the communities, irreversible depletion to the water table, biodiversity and ecosystem loss, and human lives, among others.

In terms of EV, the relocation plan for Plan Bonito, El Hatillo and Boquerón, environmental liabilities such as cultural loss of territory should be included. The monetary compensation is an end-point intervention that does not resolve the distribution of benefits-damages. Further, these compensations may increase inequalities inside the communities, and can generate new conflicts and corruption.[28]

Throughout the entire coal chain those who bear the social and environmental cost of coal extraction are the local communities at all scales: the most impoverished communities and Afro-Colombian communities in Cesar but also Colombia is losing coal reserves, water tables, forests and biodiversity. Outside Colombia, the combustion of coal from

[28] Norwich declaration on environmental justice: “Money can´t buy justice”. Available at: http://www.uea.ac.uk/documents/439774/0/Norwich+Declaration/ea31d880-ca9d-4176-9289-35e017a58350

Cesar affects the fenceline communities near the power plants, and also contributes to the global climate change.

The most appealing feature of the liabilities framework is that it allows for an explicit incorporation of moral and legal responsibilities. The identification of environmental liabilities should start from a collective reflection that allocates moral responsibility of the damages, where the people can express their own concepts of reparation and compensation of damage. It should then proceed to enumeration of the environmental and social damages in the appropriate technical languages. The EV of damages is not merely an academic exercise. It provides arguments to claim compensations and a framework for the communities to explore different legal mechanisms for effective reparation. Government Audit Offices and national macroeconomic accounts ought to include environmental liabilities, and the inclusion of the socio-environmental liabilities in the mining companies´ balance sheet as requirement for granting mining concessions beyond bland "corporate social responsibility" statements.

Ecological economics must incorporate the study of environmental liabilities beyond economic accounting. Linking environmental liabilities with the field of Environmental Justice it could analyze the process of identifying and attaching a plurality of values (including, when pertinent, economic values) to environmental damages; and the tools used by the communities affected to address such environmental liabilities.

Appendix. "Leave the bones of Mother Earth in place": A further discussions of the economic valuation of coal mining environmental liabilities

The Indigenous Peoples in the Colombian Caribbean
see coal deposits as the bones of Mother Earth
(Arregocés, a Kogui student at Universidad del Magdalena
Santa Marta, 2012)

This Appendix of Chapter II is based on the publications:
Cardoso, A., 2016. Pasivos ambientales de la minería de carbón en Colombia: una aproximación desde la ecología política. Revista Ecología Política. Especial: Ecología Política en América Latina 51, 94–98.

Cardoso, A., 2015. Leave the bones of Mother Earth in place: the liabilities left behind from Colombian coal exports, in: Temper, L., Gilbertson, T. (Eds.), Refocusing Resistance to Climate Justice: COPing In, COPing out and beyond Paris, EJOLT Report No. 23. pp. 98–103.

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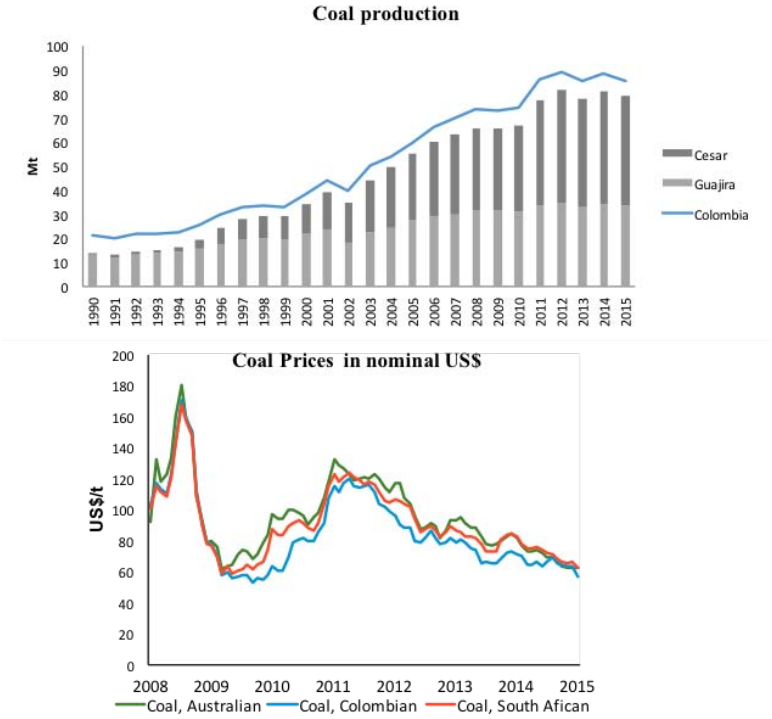
1. Introduction

In Colombia, the expansion of large-scale mining has been promoted by neoliberal policies of recent governments that consider mining as a development locomotive; this clashes with the rising protests and environmental conflicts across the country[29]. Coal production has increased by 124% from 38.2 Mt in 2000 to85.5 Mt in 2015. In 2012 Colombia reached its highest level of coal production with 89.9 Mt (SIMCO, 2016). The Colombian Government expectation was to reach 160 Mt in 2020 (Directorio Minero, 2012).That expectation may be not achieved, since 2014 the coal market has been in a critical situation similar to the oil sector. This is because oversupply has caused a drastic decrease in coal prices from US$124/t in 2011 to US$42/t in 2015, a decrease of 66% (Revista Semana, 2016) (See Figure 6). By late 2016, the Colombian coal price was US$60.

[29]EJatlashttps://ejatlas.org/ reports 122 environmental conflicts 80% due to mining

Figure 6. Colombia Coal Production vs. Coal Prices



Source: SIMCO- Colombian Mining Information System 2016, World Development Indicators (The World Bank, 2015)

The Colombian coal production of 2 t per person per year, more than five kilograms per day, in energy equivalence[30]represents almost 40,000 kcal[31] nearly twenty times the energy needed by each person daily in their diet (Martinez-Alier, 2013). Although coal cannot be eaten, this energy and material flow deficit are remarkable. Almost 95% of the extracted coal is exported, and what remains are environmental and social impacts that contribute to the accumulation of socio-environmental liabilities (Cardoso, 2015a). However, 8% of the Colombian GDP is based on mining and oil extraction (UPME, 2014) and in La Guajira and Cesar coal production represents 42% and 52% of their GDP respectively (Bayona, 2016). Those figures are misleading because if the corporate accounting is incorrect because it does not subtract the environmental liabilities, then the macroeconomic accounting is also wrong (Martinez-Alier, 2013). In addition, in part due to cheap coal exports there are both a trade balance deficit (higher imports than exports in monetary terms) and a physical deficit (a huge discrepancy between the tonnage exported, which is depleting or degrading natural resources, and the tonnage imported).

[30] One approach to analyze growth is through the relationship of exosomatic/endosomatic energy.
[31] 1 kg equivalent coal = 7,000 kcal. 1 kg of coal equivalent would be the amount of energy for the combustion of 1 kg of coal with a calorific value of 7,000 kcal/kg.

Thus, Colombia needs overall to export 5t in order to import 1t at the level of 2014 prices(Samaniego et al., 2015; Vallejo et al., 2011).Therefore, the relevant question is: What are the socio-environmental costs of such a transfer?

Furthermore, export-led exploitation is not benefiting the local population, as the resistance of local and Indigenous communities shows (see Section 3). This appendix compares the political economy of coal mining with its socio-environmental liabilities to show that the option of leaving coal in the ground increasingly becomes more relevant. The trade balance deficit and domestic socio-environmental liabilities larger than the market price of coal seem to point towards a reconsideration of coal policy, even more so when taking into account global climate change.

2. Coal mining revenue

Colombia´s government promotes mining arguing that it generates great revenues (taxes, royalties, and surface canon - annual license fee for exploration and exploitation) that contribute to national and local development (Torres et al., 2015; UPME, 2012). Nonetheless, Rudas & Espitia (2013b) studied the participation of the State and society in mining income, comparing these numbers with the tax exemptions for the coal-mining sector. He found that mining tax exemptions ranged from 68% to 103% of the total mining royalties in the period 2007-2009. Therefore, the Colombian government has given away the coal revenues (ABColombia, 2012). Rudas & Espitia (2013b) estimated that multinational mining companies paid income tax for about 880 billion pesos in the period 2005-2010. However, in the same period, they were able to save 1.78 trillion Colombian pesos due to deductions, discounts, and tax exemptions. That means that for every 100 Colombian pesos paid by these mining companies, they obtained discounts that represented losses of more than 200 Colombian pesos to the state.

The information above reveals the lack of robust and accountable governance mechanisms, along with the lack of transparency of information that in the end benefits multinationals (ABColombia, 2012). Moreover, Christian-Aid (2009) reported that in Colombia, coal mining companies underprice their exports, ensuring a transfer of revenue out of the country to reduce their final tax bill. That is supported by the statement given by the head of the Direction of Taxes and National Customs of Colombia (DIAN for its

initials in Spanish): "Mining is sold in fiscal paradises, the generous subsidies can cause the firms to declare losses in their accounting effects when they are receiving significant profits."[32]Therefore, the evidence shows that the massive coal extraction for export is in practice a physical and monetary wealth transfer from Colombia to the importers.

3. The coal mining boom in Colombia and its conflicts

Article 332 of the Colombia National Constitution declares that the subsoil is owned by the state. Under the Mining Code, however, the mining authority may authorize the exploitation of minerals through mining concessions. Consequently, landowners are forced to sell their lands, generating displacement and violating fundamental rights. Chomsky et al., (2007) demonstrate how coal mining companies in La Guajira and Cesar are the agents behind the dispossession and displacement of Indigenous Wayuu and Afro-descendant communities. While some communities were relocated because of mining expansion, other communities located close to the mines have been brutally displaced due to dire environmental pollution and social conditions. Many communities have lost their traditional territories and cultural heritages.

Garay (2013) considered the multinational mining permits as a fragmentation of the territory, which generates spaces with lack of governability due to the absence of a sovereign national State. There is no strict control by State mining, environmental and territorial authorities, and in addition the rights of the mining companies prevail over the fundamental rights of communities due to Article13 of the Mining Code which states that this activity has public utility and social interest. Thus, the hierarchy of rights in the legal system is ignored (Negrete, 2013). Moreover, conflicts are worsening because of inadequate prior consultation with the indigenous and Afro-descendants, which should be carried out before the mining projects start and the fact that the consultation is not obligatory reduces its veto power (Vargas, 2013a). As a consequence, the mining activity contradicts policies oriented to the protection of areas with significant ecological importance; the rights of rural populations, Indigenous and Afro-descendant communities (Law 70 of 1993 and ILO Convention 169); land restitution; protection of lands for

[32] Juan Ricardo Ortega, statement in *Portafolio* newspaper. "La minería se vende en Paraísos fiscales: DIAN". May 7th 2010.

agricultural uses; and biodiversity management (ABColombia, 2012). These contradictions generate three types of conflicts (Vargas, 2013b):

a) Conflicts between mining activities, and regulations or decisions concerning environmental and land use planning.
b) Conflicts between the interests of mining extraction, and the use, enjoyment and conservation of ancestral territories by ethnic communities.
c) The overlapping of mining activities with agricultural activities, and water and land rights of rural populations.

Pérez-Rincón (2014) identified the dialectics of socio-environmental conflict "resolution" in Colombia: first, the use of institutional and legal mechanisms that combine negotiation and claims in court, second persistent violence. On the one hand, community complaints are taken to court and may succeed. For example, in July 2013 the Colombian Constitutional Court ordered Drummond to take measures to decrease the noise and air pollution at its Pribbenow mine near La Loma. The court decision came after the complaint of a community member due to 'unbearable' levels of noise, dust and particulate matter dispersed in the air (produced by coal extraction works), worsening health conditions of the neighboring residents and the contamination of the water sources used for consumption and farming. Moreover, in 2014 the Colombia's national audit office denounced the inaction of the mining authority and Drummond to meet the requirements of the court. On the other hand, social movements are increasing protests as a means to negotiate with the government. For example, in 2007, riots emerged in La Jagua de Ibirico, a key coal-mining town in Cesar. The whole community (entire families including women, teenagers and miners) decided to block the main road used to transport coal (see Box 2). They denounced the high levels of air pollution, respiratory diseases, and the unemployment and poverty in the area (OCMAL, 2007). To stop the riots, the Colombian president visited the region and declared Cesar´s mining district as a "source of pollution." He then opened negotiations for labor, health, environmental, housing, agriculture, and infrastructure issues with the mining companies and the community (Ecoregional, 2007).

Box 2. Traditional vallenato song about the Jagua Ibirico protest in 2007

La protesta
Compositor: Alberto Bolaño López

"*vámonos vámonos para la trinchera*
a bloquear la carretera porque el paro ya estalló,
se compone o se putea
más está friega ya esto no hay quien lo detenga
porque el pueblo se cansó,
sucedieron tantas cosas en esa fecha
recordar tanta violencia a mi más tristeza me da,
de ver al pueblo metido en la reyerta
esta es la historia completa y aquí la vengo a contar,
de ver al pueblo metido en la reyerta
esta es la historia completa y aquí la vengo a contar,
que los dientes le dañaron a una niña,
que la vida le segaron a un señor,
que al tanque le rociaron gasolina,
pero que el bendito carro no prendió,
que la culpa la tienen la de las minas
que nos dejan solo contaminación,
que de poco al servidor la regalía
y por eso fue que el pueblo se exaltó,
vamos a ponerle las quejas al presidente,
vamos a decirle lo que hizo la policía,
los antimotines ofendieron a la gente,
porque ellos creyeron que aquí´ suave la tenían,
dispararon gases sin medir las consecuencias,
sin tener en cuenta que a los niños agredían
y así fue que al pueblo se le acabo la paciencia,
y una lluvia de piedras con justicia le caigan,
este era un pueblo que había aguantado con prudencia
pero despertaron al león que en paz dormía,
este era un pueblo que había aguantado con prudencia
pero despertaron al león que en paz dormía.
La esperanza se adueñó de nuestra gente
al escuchar del presidente
mañana yo estaré allá,
media Jagua madrugó para el colegio
nos fuimos a coger puesto para poder protestarle al presidente"

Nevertheless, in Cesar, social movements continue to denounce high levels of air pollution, resulting in respiratory disease, and river diversions – critical for local food security. Eusebio Garcia, coordinator of the environmental negotiation with mining companies in La Jagua de Ibirico:

[...] "Coal has brought us nothing good…. coal has only brought misery, poverty, famine… we want things to be like they were before when we were a rice farming village. We were farmers and lived happily, we had a healthy environment, but

today the irrational situation of coal mining worries us. Coal mining is destroying the environment and water sources, all agricultural land and the source of our livelihoods, including the Perijá forest reserve where the water sources, aquifers, and springs are located” (Ternera, 2010)

The coal threat to livelihoods is also expressed through local culture, as in the case of the song "El Drumero" which compares the life of a fisherman with a miner:

Box 3. Traditional vallenato song “El Drummero”

El Drumero
Compositor: Alberto Bolaño López

Ya mi negra, ya mi negra me dejó,
porque lo que yo gano no me alcanza para mucho.
Ella dice que quiere un hombre mejor,
que trabaje en la Drummond y le de todos los gustos (bis).

Cuando le echaba el cuento le dije a mi amada,
la máquina que opero ha sido mi redención,
y eso la alegro tanto que eso la pensaba,
ya me llego el drumero de mi salvación.

Yo ya le hice esta broma pa’ ver que pensaba,
porque es una estrategia que yo siempre he usado.
Y ella creyó que era una maquina pesada,
y era mi carretilla de vender pescao.

Yo no sé qué es lo que pasa con las hembras de La Jagua,
que si tú no eres drumero ya no te quieren ni ver.
Yo me voy a hacer un curso de maquinaria pesada,
o si no a mi carretilla orugas le poner.

(Coro)
A poner, a poner orugas le voy a poner,
para ver si buldociando me consigo otra mujer.
A poner, a poner, orugas le voy a poner,
y trabajo siete por cuatro y a veces siete por tres.
A poner, a poner, orugas le voy a poner,
y en los cuatro me emborracho y ella goza de placer.

Yo conozco un drumero muy especial,
que antes de entrar a la empresa era sencillo y muy decente.
Pero apenas que plata empezó a ganar,
se volvió un engreído y desconoce hasta su gente (bis).

No toma Medellín porque eso es lava gallo,
ya no toma aguardiente porque es petróleo.
Pero yo sé bien que cuando estaba varado,
vivía harto de chirinchi del que trae Mindolo.

A mi hembra le gusta el hombre que le gaste plata,
en whisky, ropa fina y mucha diversión.

Yo no gasto ni las suelas de mi par de abarcas,
pues son originales de llanta de tractor.

Mi negra me exige viajes, pulseras y zapatos finos,
pero es que lo pescaítos no me alcanza para na.
Yo le dije si es así busca alguien que te camine,
que drumero paganini aquí en las jaguas es lo que hay.

(Coro)
Aquí hay, aquí hay, paganinis aquí hay,
que tienen cuatro mujeres cada una con su caimán.
Aquí hay, aquí hay, paganinis aquí hay,
que regalan la quincena y después no hayan donde fiar.
Aquí hay, aquí hay, paganinis aquí hay,
y la pobre de la casa que coma yuca con sal.

Mi esperanza era el curso que yo iba hacer,
pero pa’ entrar al SENA de un aval se necesita.
Resulta que el concejal que yo apoyé,
cayo fue en un trasmallo cerca de Bocas de Cenizas (bis).

Nadie se escapa ya de la drumomanía,
que muchos se olvidaron de su profesión.
Profesores, abogados y hasta policías,
sueñan con la fantasía de operar un camión.

Yo tendré que resignarme con mi carretilla,
vendiendo a veces fresco y otras veces salado.
Y a la espera de una dama que al fin se le mida,
a disfrutar conmigo el tufo del pescao.

Si no me llega la dama que quiera vivir conmigo,
no lo pensare dos veces, ya se lo que voy a hacer,
me convierto en el caimán de un drumero parrandero
y mientras él toma trago yo le cuido a su mujer.

(Coro)
La mujer, la mujer, esa que vive con él,
pero que la desatiende por buscarse otro querer.
La mujer, la mujer, esa que sufrió con él,
cuándo no había trabajo que no había ni pa’ comer.
La mujer, la mujer, esa que vive con él,
pero que ahora se rebusca para que él chupe también.
La mujer, la mujer, esa que vive con él,
que aburrida de tanta vaina se dispuso a serle infiel.
La mujer, la mujer, esa que vive con él,
que mantiene al caimancito pero con el sueldo de él 𝄞

Similarly, protests typical of an “environmentalism of the poor and the indigenous” are taking place in La Guajira due to the Cerrejón mining expansion plan that includes diversion of rivers like the Ranchería and Arroyo Bruno. The Wayuu Indigenous Peoples protested against the diversion of the Ranchería River and the Bruno stream stating that for the past 30 years of mineral exploitation they have not seen any royalty income

invested in their territory:

> CERREJÓN THAT'S ENOUGH! of that media discourse where you boast about being our green ally. Who do you think you are, Cerrejón? With your mining,you have diverted rivers, mountains, and displaced communities. And now you intend to divert the Bruno stream... NO MORE!... Stop lying Cerrejón, because when there is thirst, the first to feel it is the land and if the land is thirsty, it cannot feed us, and it is precisely thirst and hunger that affects those who live in La Guajira. The government is outraged because of the malnutrition and drought in La Guajira, but it does not condemn the assassins of our rivers, our culture, our people ...I tell you and I warn you, it is my voice and that of all the people in the peninsula of La Guajira: Don't mess with El Bruno or any other river!" Letter from a Wayuu Indigenous person to Cerrejón mining company[33]

Box 4. Coal resistance in La Guajira

Source: Censat.org

4. The role of unions in the coal mining conflicts

There are two strong union organizations: Sintracarbón which represents workers at Cerrejón in La Guajira and Sintramiergetica which represents the workers from different coal mining companies in Cesar. In 2013, both organizations went on two months strike for better wages and working conditions. In addition, union workers wanted an agreement that recognizes their position on occupational health issues. They claim that the company must accept that "the 700 workers suffering from silicosis, lead poisoning and severe muscle and skeletal injuries acquired these conditions at work and that workers need appropriate protection from the work hazards encountered when working with coal"[34]

[33] http://www.las2orillas.co/tu-te-crees-cerrejon/
[34] http://www.industriall-union.org/sintracarbon-continues-on-strike-but-open-to-negotiations

The strikes finished after long negotiation with the mining companies and the Labour Ministry. They agreed to a bonus payment and a 5% wage increase.

As in so many other cases of environmental conflicts around the world (Barca, 2015) in La Guajira and Cesar, the unions have a fundamental role in denouncing the mining environmental pollution and defending the rights of the community. The union leaders have provided evidence of environmental pollution to journalist and social movements, such as the pictures of a barge owned by Drummond dumping approximately 2,000 t of coal into the ocean in an attempt to keep the barge from sinking, which was widely reported in the media (see Box 5). After this denouncement, Drummond was fined US$ 3.5 million by Colombian environmental authorities for failing to report the incident within three days, in breach of Colombian environmental regulations.

Box 5. Drummond barge accident

Source: Arias (2013)

Also, unions committed themselves to the struggle of the communities affected by the mine's expansion:

"We invite all other unions and social organizations in Colombia, and especially La Guajira, to join in the struggle of these communities for better conditions and quality of

> life, and to take on the communities' problems as our own. As a union committed to the struggle of these communities, we have established the short-term goal of working to help unify the affected communities, to participate in their meetings, to take a stand with the local and national authorities regarding the absence of public services in the communities, and to begin a dialogue with the company about the reality we are now aware of, and to take a public stand locally, nationally, and internationally about the situation of the communities affected by the Cerrejón mine and its expansion".
>
> (Sintracarbón international declaration reported in Chomsky et al., 2007)

5. Why not leave the coal in the hole if the environmental liabilities are higher than the market price of coal?

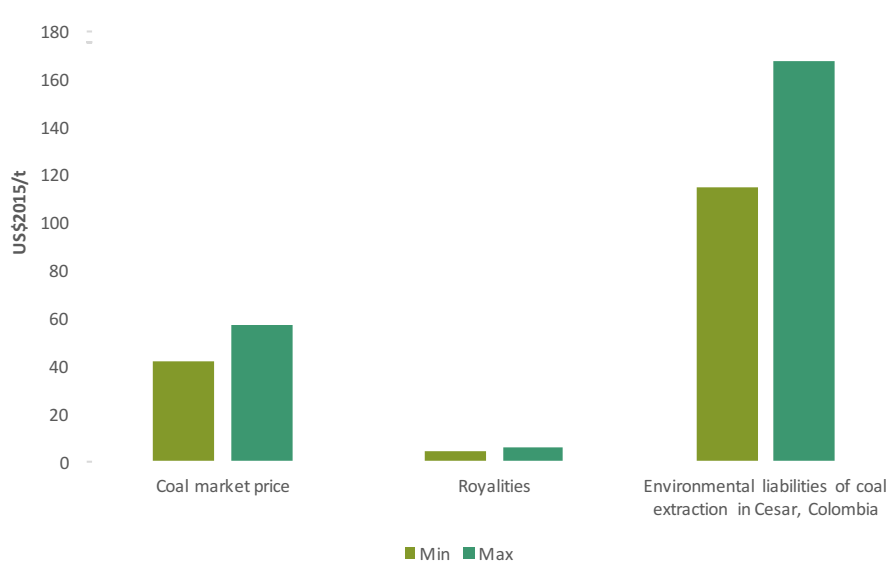
The economic valuation of the socio-environmental liabilities of coal mining in Cesar, Colombia developed in (Cardoso, 2015a) and presented in Chapter 2 gives the arguments to compare these values with the coal market price and coal royalties. Given the changes in the coal market and the decrease in coal prices is worthy of updating those values to 2015. Then, the economic valuation of these liabilities determines that each ton of extracted coal in Cesar produces socio-environmental liabilities at the national level valued between US$114.54/t– US$167.52/t (updated to 2015 prices) during the extraction phase and until transportation to harbor for export. These results were in 2015 almost triple the market price of one ton of thermal coal, which in 2015 fluctuated between US$42/t - US$56.5/t. These values far exceed the very low government royalties earned from coal concessions that, as we have seen, were given away as tax exemptions. In Colombia, coal mining companies must pay 10% of the coal price as royalties (different from taxes on profits) when production is over 3 million tons per year (Figure 7).

In a review of this work published in "Yale Environmental Review,"[35] Wu(2016) optimistically expressed: "Cardoso's findings reinforce the scientific understanding that fossil fuels are costing society more than what they are worth. For decades, the coal industry has positioned itself as a source of jobs and economic prosperity. While the social and environmental damages of (mining and) burning coal have long been known,

[35] http://environment.yale.edu/yer/article/burning-problems-estimating-the-social-and-environmental-costs-of-coal-mining-in-colombia#gsc.tab=0

it has been difficult to incorporate such factors into the dominant decision-making framework, which disproportionately focuses on monetary value. Papers like Cardoso’s, however, substantially reduce this barrier, and can play a key role in catalyzing the shift towards sustainable energy use.”

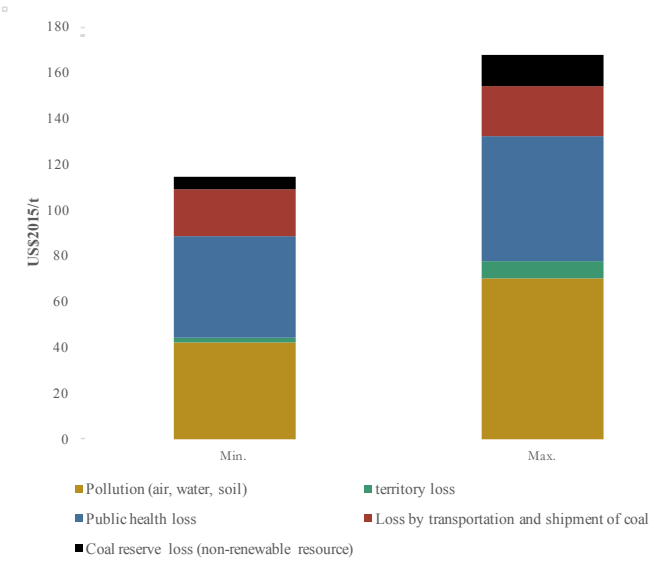
Figure 7. Coal Price vs. Coal mining socio-environmental liabilities



Source: Author

In addition, Wu(2016) pointed out that the economic valuation of the socio-environmental liabilities presented show that the most economically significant were the pollution of air, water and soil (see Figure 8). The mining waste and its impact on soil share the highest values (valued in 2015 at US$41.39/t - US$62.02/t), followed by the public health loss in terms of mortality from occupational diseases (valued in 2015 US$44.45/t - US$54.24/2). The 2015 coal price (US$42/t - US$56.5/t) could not compensate those liabilities (to which carbon dioxide production should be included, after export and burning of coal).

Figure 8. Coal mining socio-environmental liabilities share



Source: Author

Given the mismatch between the very meager financial benefits (if any) and the significant socio-environmental liabilities (in Colombia and outside) that are several times the magnitude of income, and which are increasing as coal prices drop. The question arises to both the Colombian government and to the world, why not leave “the bones” in the ground?

In the next chapters, I shall indeed show that at other links in the coal chain of Colombian coal exports (in The Netherlands and Turkey) the social and political awareness of damage from coal burning on human health and climate change reinforces the pertinence of this question.

III. Political ecology of the new geographies of coal: The coal chain between Colombia and Turkey

1. Introduction

The COP21 Paris Agreement clearly blew the final whistle on the dominance of coal in the global energy mix (Wong, De-Jager, & Van-Breevoort, 2016). Calls for rapid decarbonization to avoid dangerous interference with climate systems foster coal phase-out in the Global North. The US has plans to retire coal-fired power plants (CFPPs) while UK policy aims to phase out CFPPs within the next 10-15 years (Greenpeace, 2015; IEEFA, 2015). Moreover, in the EU, coal consumption has been falling since 2012, and this has been linked to the increase in the renewables sector (Greenpeace, 2015). With the decrease of coal in China (IEA, 2015b), energy geographies are bound to change drastically, and the future of coal will be decided in the Global South (AbdelGawad et al., 2015). This includes countries like India, South Africa, Colombia, and Turkey, where the coal trade has increased in the recent years (IEA, 2015d). A substantial change in the energy sector was produced from 2014 to 2015 due to the rapid drop in world oil prices, which had consequences on natural gas and coal prices (IEA, 2015c). In the Global South, the lower coal prices are likely to act as a form of economic stimulus, using a higher proportion of coal to satisfy the growing energy demand (AbdelGawad et al., 2015; Steckel et al., 2015).

Coal profits are achieved through the externalization of the socio-environmental local costs of extraction (Cardoso, 2015a), electricity production and the cost of climate change (Epstein et al., 2011; Richards & Boom, 2015). In addition, extraction, transportation and processing generate even more CO_2 emissions (Heinrich-Böll-Stiftung and FoE, 2015). In 2013, coal accounted for 46% of the global CO_2 emissions, even though coal represented 29% of the global total energy supply (IEA, 2015d). McGlade and Ekins (2015) have warned that the world can only burn about 12% of current global coal reserves to meet the target temperature of a 2°C increase. That means that more than 80% of known coal reserves must stay in the ground, even in the Global South.

Coal extraction and consumption for energy production are deeply interwoven through socio-environmental interactions across a variety of scales and new geographies (Zimmerer, 2011). We identify as a new geography of coal the emerging South-South relationship between coal that is mined in Colombia and coal consumed in CFPPs in Turkey. A larger coal chain connects Indonesia to India and China, and a slightly smaller one South Africa to India. The Colombia-Turkey coal chain is not the only interesting South-South coal chain, but it is an important one. Turkey is the second largest importer of Colombian coal after the Netherlands (SIMCO, 2016). In 2014, 33% of the coal imported by Turkey came from Colombia (IEA, 2015b). Both countries have strong pro-coal policies to extract coal for export (Colombia) and to increase CFPPs (Turkey). These coal-driven energy strategies increasingly lead to ecological distribution conflicts and the local communities bear the heaviest social and environmental costs (Cardoso, 2015a).

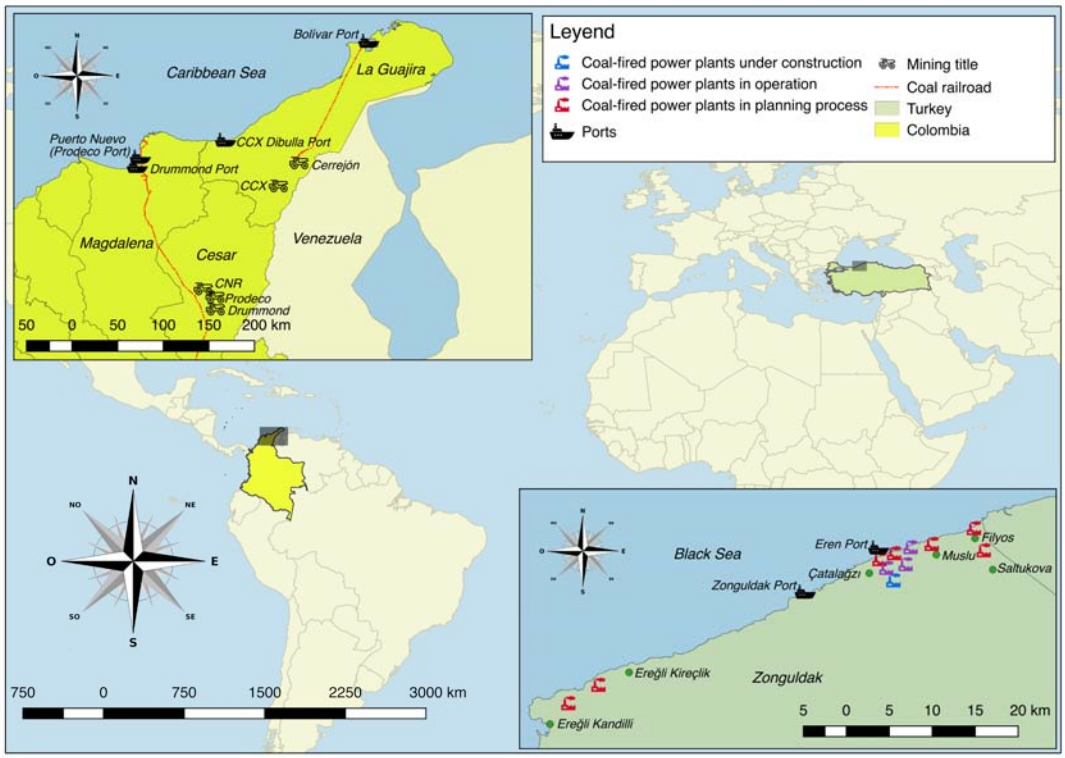
Some of these communities do not leave such interference with their livelihoods undisputed (Arsel et al., 2015; Cardoso, 2015b). For example, in La Guajira, Colombia, (Figure 9) which is the home of one of the ten biggest coal mines in the world, owned by Cerrejón (Heinrich-Böll-Stiftung and FoE, 2015), the affected Afro-Colombian and indigenous communities came together (7-9 August 2014) to host a popular tribunal against aggression by the mine in their territory. They visited sacred Afro-Colombian and indigenous sites and performed autonomous consultation voting. Representatives of national and international NGOs and human rights organizations attended the event as observers and jury members on the tribunal (Banks, 2014). The verdict found Cerrejón guilty of violating the rights of communities and violating labor rights. Also, it found the Colombian state complicit by omission, having forgotten its responsibility to protect, respect and guarantee the communities' rights.[36]

The picture is not so different at the other end of the chain, regarding coal consumption in CFPPs. In south-eastern Europe and Turkey the building of over a 100 new CFPPs is being planned, of which around 75 will be in Turkey (CAN, 2015). Among the CFPPs in Turkey burning Colombian coal, a prime example is the ZETES (Zonguldak Eren Termik

[36] The judgment of the popular tribunal against Cerrejón can be found here: http://www.colectivodeabogados.org/?Sentencia-Tribunal-Etico-y-Politico-Agresion-Minera-en-La-Guajira

Santrali) in Çatalağzı (Figure 9), with an installed capacity of 1390 MW. Opposition to the coal imports unites both the coal mining communities in the region as well as the local groups campaigning against new CFPPs. The anti-coal movements are not new in this region. In 1991, a group of women volunteers founded the Environmental Protection Association of Zonguldak, first of its kind in this coal basin; they organized protests, denouncing air and sea pollution, and eventually they won a key legal case against dumping coal ash into the sea. In November 2015, when Turkey hosted G20 leaders' meeting, a big protest took place in Çatalağzı. The local groups, with the support of some national NGOs with international connections, called out to the G20 countries for a future with a healthy climate and without CFPPs. This new step in the history of local resistance to coal also demonstrated a new step in the struggle on a global scale. Local struggles are no more limited to concerns about pollution and public health, but they also aim to send a global message, thereby connecting their struggles with the broader climate justice debates (Okereke & Coventry, 2016).

Figure 9. Coal mining area in the Colombia Caribbean region (La Guajira and Cesar) and CFPPs projects in Zonguldak province, Turkey



Source: Author based on Colombian Mining Registry (July 2014) and (Yıldırım, Özlüer, Uygar, & Öğüt, 2015)

The objective of this study is to examine such emerging new geographies of coal, the rapidly transforming landscapes in Colombia and Turkey, by examining the coal chain

operating at different layers (market, physical, and socio-environmental) and on a number of scales. Our analysis focuses on local (La Guajira and Zonguldak), national (Colombia and Turkey) and the global scales, as shown in Figure 9. The environmental conflicts on all three scales will be analyzed. We will discuss issues of democratic deficit, understood as tensions that arise from the imbalance between the weakness of social movements and the governments' strong pro-coal policies in both countries.[37] Moreover, by discussing the new geographies of coal, we will show how the democratic deficit perpetuates the environmental/climate injustices both on regional and global levels.

Section 2 elaborates the theoretical political ecology framework of new energy geographies and environmental/climate justice. Section 3 is dedicated to the analysis of the new geographies of coal as the emerging South-South links. Next, we move on to the Colombian case on coal extraction (Section 4) and coal consumption in Turkey (Section 5). In Section 6, we discuss how these new geographies produce multiple socio-environmental landscapes charged with injustices, drawing conclusions in Section 7.

2. Political Ecology of the New Geographies of Coal

A political ecology approach reveals the terms of trade, the existing physical deficits[38] in international trade in the Global South, and the associated ecological distribution conflicts (Martinez-Alier, 2015). One of the main contributions of political ecology is the analysis of ecological distribution conflicts (Martinez-Alier, 2002; Robbins, 2004). Ecological distribution conflicts refer to struggles that emerge from the structural asymmetries in the distribution of the burdens of pollution, the access to natural resources, or the sacrifices made to extract resources. Such conflicts are grounded in unequal distributions of power and income, in social inequalities of ethnicity, social class and gender (Martínez-Alier & O'Connor, 1996; Martinez-Alier et al., 2010; Robbins, 2004). These occur at different stages of the commodity chains (from extraction to transport, consumption to waste disposal) and involve various social actors (peasant or tribal groups, national or multinational companies, national governments, local or international NGOs, consumer groups) that have stakes at different stages of the chain (Martinez-Alier et al., 2016; Martinez-Alier et al., 2010). The conflicts arise in the context of different economies,

[37] The idea of democracy deficits questions the legitimacy of the decision-making process (Norris, 2011).
[38] Physical deficit refers to the huge discrepancy between the tonnage exported, which is depleting or degrading natural resources, and the tonnage imported (Samaniego et al., 2015; Vallejo et al., 2011).

cultures and forms of knowledge, together with biodiverse ecosystems, where local groups get involved in struggles to defend their territory (Escobar, 2011).

The ecological distribution conflicts are expressed in different "valuation languages" (not only economic) such as environmental and esthetic values, ecosystems, territorial and human rights, environmental justice and sacred values of Indigenous and Afro-descendant communities (Rodriguez Labajos & Martinez-Alier, 2013). These languages are revealed through petitions, mobilizations, protests, riots, and court cases denouncing environmental degradation (Martinez-Alier et al., 2010). The focus of these manifestations is often the distribution of environmental bads and goods, participation in decision-making, and recognition of particular group identities and rights, which constitute the representative concerns of environmental justice (Schlosberg, 2004, 2007; Sikor & Newell, 2014). The environmental justice concept is an activist contribution to the social sustainability sciences (Martinez-Alier et al., 2014). The concept was initially born in the US in the 1980s (Bullard, 1990) and focused on how injustices are constructed, questioning "why those already exposed to other forms of disadvantage are also subject to environmental bads" (Schlosberg and Collins, 2014:361). The environmental justice movements link the concerns of human rights and social inequality to environmental concerns and emphasize the idea that they are inseparable (Taylor, 2000).

Environmental justice is perhaps becoming a global movement (Martinez-Alier et al., 2016; Sikor & Newell, 2014) and it has a large influence on the way climate justice has been conceptualized across multiple notions of justice. Every set of climate justice principles mirrors the call in environmental justice movements (Schlosberg & Collins, 2014). Climate change becomes a violation of the basic human rights, not only because of the inequity of climate change impacts but also because it involves other forms of injustice such as a lack of recognition and inclusion in political decision-making (Schlosberg & Collins, 2014). Climate justice movements have focused on the reduction of emissions of CO_2 and other greenhouse gasses, the health impacts of the burning of fossil fuels in vulnerable communities, and more recently, on keeping fossil fuels in the ground.[39]

[39] As proposed since 1997 by Ogonization and Yasunization movements (L Temper et al., 2013) and more recently by the "Break free from fossil fuels" campaign https://breakfree2016.org/ and by Klein (2014) with her notion of "Blockadia"

Environmental/climate justice contains embedded notions of the scale of the problem and the geography of responsibility. Fisher (2015) argued that climate justices need to be reconceived as multi-scalar to explore its multiple manifestations and the ways in which different scales contradict or support each other in the search for climate solutions. Furthermore, geography is central to understanding and addressing the current energy dilemmas, where global and national levels are principal circuits. However, many political actions on energy, as well as climate and environmental conflicts, are at the local level (Zimmerer, 2011). The "new geographies of energy" examine changing landscapes in the production and consumption of energy by combining the perspective of globalization processes operating at multiple scales with a focus on environmental change and global climate issues (Zimmerer, 2011). The "new geographies of coal" give particular attention to the Global South where climate change provokes questions of uneven development processes as well as environmental concerns (Fisher, 2015).

The global environmental/climate justice movements generate a pressing need to further document and understand the effects of coal on global and local environments and to analyze the forces that drive coal production and consumption (Bell & York, 2012). The conflicts associated with coal are influenced by powerful regional actors, such as private coal companies, and the global power structures that drive markets (Clark, Jorgenson, & Auerbach, 2012). Bell and York (2012) pointed out the importance of recognizing that coal producers are linked to the global market and that local processes need to be understood in a global context. Morrice and Colagiuri (2013) explored and analyzed coal injustices, conflicting priorities, and power asymmetries between political and industry interests versus communities. They illustrated the tensions between health and economic gain regardless of national culture, geographical location, and economic development.

3. New geographies of the coal: Emerging South-South links

"*Today we celebrate*
that Turkey and Colombia are getting close, above the geographical distance,
and are recognized similar and complementary in many aspects."
Colombian President Santos on a visit to Turkey (2011)

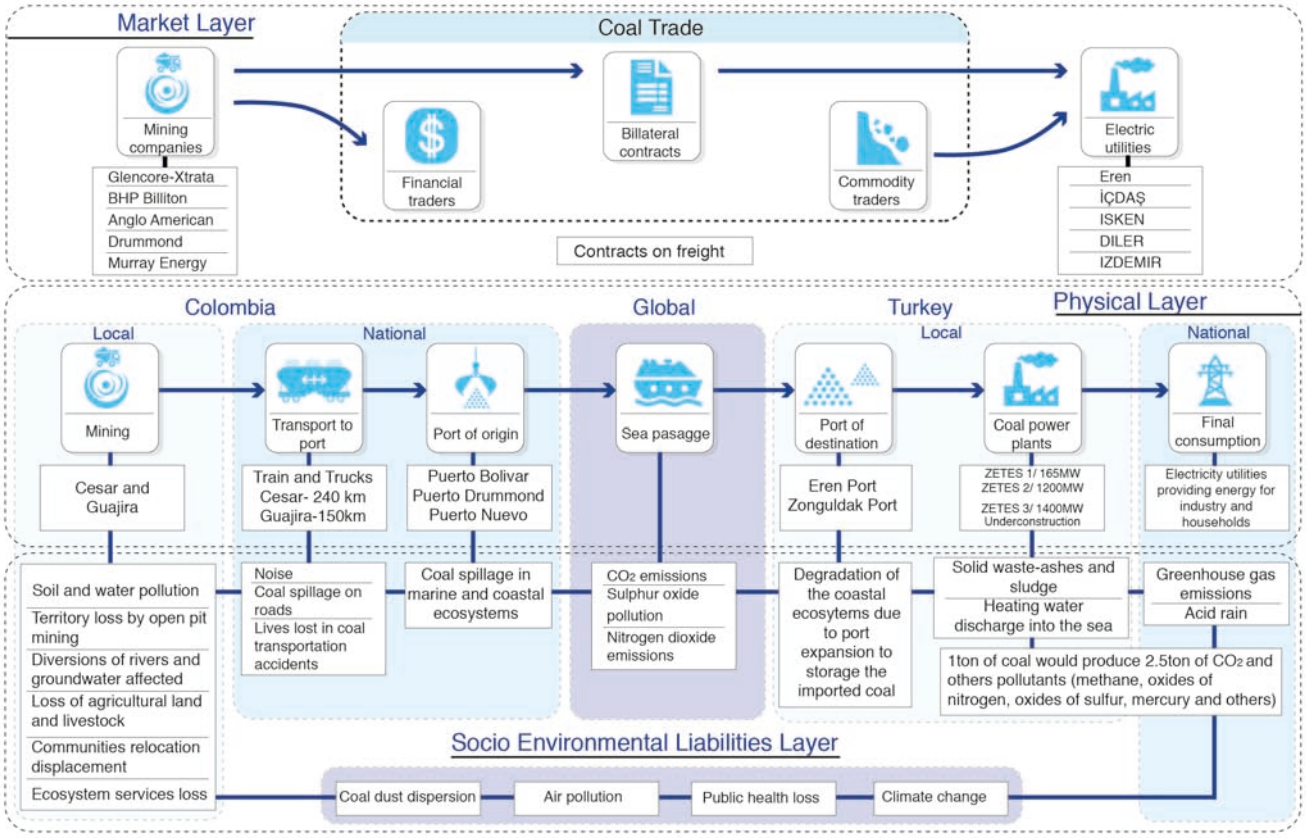
The new geographies of coal are embedded in the emerging trade relationships between developing and fast growing economies. Commercial links between Turkey and Latin America have recently become a new horizon for a strategic relationship (González-Levaggi, 2013). Colombia and Turkey started free trade negotiations in 2011, with President Santos visiting Turkey. During the visit of President Erdoğan to Colombia (February 2015) relevant agreements, including cooperation agreements in defense, tourism and agriculture, were signed. Moreover, the Turkish International Cooperation and Development Agency (TIKA) regional office was opened in Bogotá.Colombia became Turkey's second biggest trade partner in Latin America in 2015, with a trading volume of US$ 1.1 billion, a figure which is heavily dominated by the coal trade (Ministry of Foreign Affairs, Turkey, 2015b).

The coal chain between Colombia and Turkey, two countries that are members of the upcoming economies CIVETS, is highly influenced by these bilateral agreements between both governments.[40] There are well-established relations between the Embassy of Colombia in Turkey, coal trading consulting firms which facilitate coal negotiations between the two countries, major importer holdings, and the Turkish authorities.[41] Behind the coal trade interest, there are economic and political powers that define the coal chain. The ecological distribution conflicts in La Guajira and Zonguldak are connected by the coal chain between these two countries. Wilde-Ramsing and Steinweg (2012) structured the coal chain as two layers: the market and the physical. Here we add the third layer to be taken into account, consisting of the socio-environmental impacts of the coal chain between Colombia a Turkey (Figure 10).

[40] CIVETS are six favored emerging countries (Colombia, Indonesia, Vietnam, Egypt, Turkey and South Africa). The acronym CIVETS was created by Robert Ward, Global Director of the Global Forecasting Team of the Economist Intelligence Unit (EIU) in 2009.

[41] Ethemcan Turham and Author interview with the Colombia embassy in Ankara, Turkey (November, 2015)

Figure 10. The three layers of the coal chain between Colombia and Turkey



Source: Adapted from Wilde-Ramsing and Steinweg (2012) and Cardoso (2015a)

In the market and physical layers, there are three main players. First, the multinational mining companies. In La Guajira, three of the so-called "Big Four" are present: Anglo American, BHP Billiton and Glencore (see Section 4). Second, the financial traders and commodity traders. Large mining and energy companies are increasingly involved in trading (A. Harris, Hall, Brown, & Munnion, 2016). For example, Glencore is involved in far more than just coal mining in La Guajira. In 2013, it was the world's largest commodity trader, buying and selling coal and many other commodities (Halley, 2013). Third, the electric utility companies that own and operate CFPPs. In Turkey, we focus on the CFPPs in Çatalağzı, owned by Eren, which in 2014 imported 3.5 Mt from Colombia (see section 5). According to the interview conducted at Eren, Turkish electric utility companies are increasingly buying coal from Colombia, because domestic coal is not effective in caloric terms. Moreover, Eren explained different decision criteria for importing coal from Colombia which includes price, coal quality, transportation time, and the condition that they negotiate with the coal mining companies (see Table 6).

Table 6. Decision-making criteria for importing coal from Colombia

Criteria	Description
Price	• The coal market price from Colombia and South Africa is lower than Russia coal.
Scale economy in transporting coal	• 150,000-160,000t per ship and takes 22 days to arrive in Turkey (from South Africa takes 30 days). • Colombia can make the price more competitive compared to Russia, which cannot use big ships at the Black Sea (ships can only transport 44,000t).
Coal quality	• Turkey mainly produces lignite which has a low energetic value. While Colombia mainly exports Anthracite, the highest net calorific value (IEA, 2015e) • Colombian coal has lower Sulfur emissions and volatile matter (Morales & Carmona, 2007). • In 2014, the Turkish environmental authority increased the limit on the volatile content of imported coal. Cerrejón satisfied all of Turkey's imported thermal coal quality restrictions, but also Drummond and Prodeco (mining companies operating in Cesar) became eligible to export to Turkey (Platts, 2014).
Other conditions	• Conditions that the energy company negotiates directly with the coal mining companies such as futures contracts. • The tendency in Turkey towards protectionism in the coal trade, imposing duties on imported coal.

Source: Author based on Eren interview.

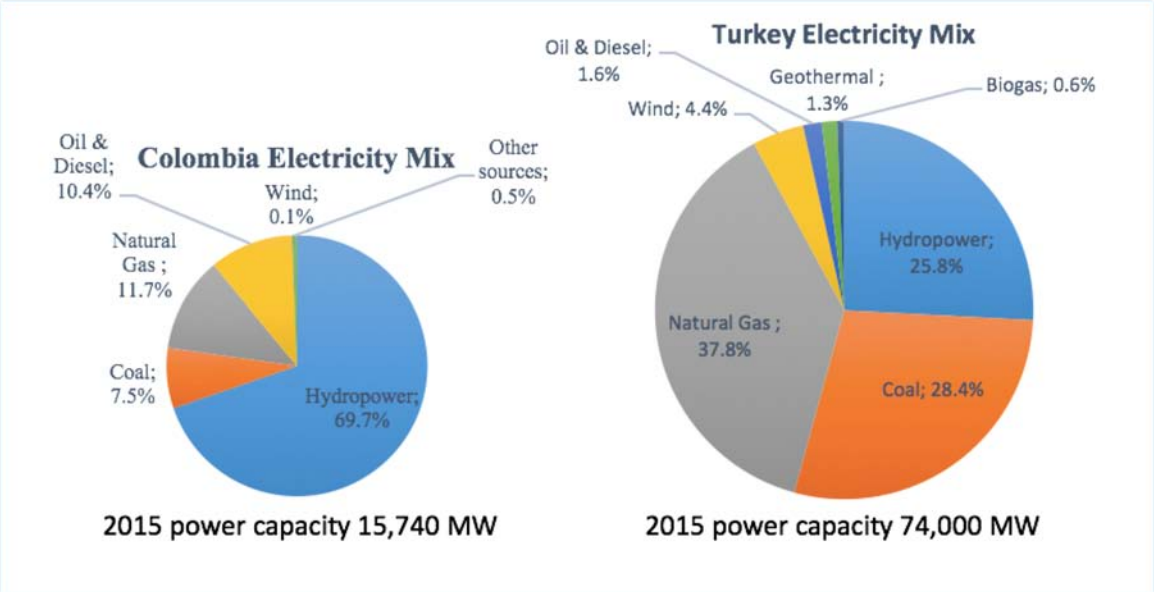
The dynamics of the South- South coal chain perpetuates and increases the ecological distribution conflicts born from the socio-environmental liabilities at each stage of the coal chain. Figure 10 shows the socio-environmental liabilities layer at different scales: bi-local (La Guajira and Zonguldak), bi-national (Colombia and Turkey) and global. Coal dust dispersion, air pollution, public health loss and climate change are the critical socio-environmental liabilities that remain at all stages of the coal chain. Nevertheless, local communities bear the heaviest social and environmental costs (Cardoso, 2015a). In the case of La Guajira, these are the Indigenous and Afro-Colombian communities (Pérez-Rincón, 2014); while at the other end of the coal chain, in Çatalağzı, the combustion of coal affects the communities in the areas surrounding the CFPPs. In addition, the coal chain impacts climate change that affects areas in highly unequal ways, prejudicing the most vulnerable (Richards & Boom, 2015).

4. Scavenging the Earth: Export-oriented coal extraction in Colombia

Colombia is an upper middle-income economy, and it is Latin America's fourth largest economy (IMF, 2016). Despite having been mired in half a century of internal war, in the past decade Colombia has seen a rapid increase in direct foreign investment and since 2013 Colombia has been in the process to join OECD (Gehring & Koch, 2016). The country has also been hailed for its progressive position at the UN climate negotiations (AbdelGawad et al., 2015), where Colombia committed to reducing its greenhouse gas

emissions by 20%, and subject to the provision of international support this reduction could increase to 30% by 2030 (Gobierno de Colombia, 2015). However, these intentions do not take into account CO_2 emissions from exported coal.

Figure 11. Colombia and Turkey electricity mix and power capacity



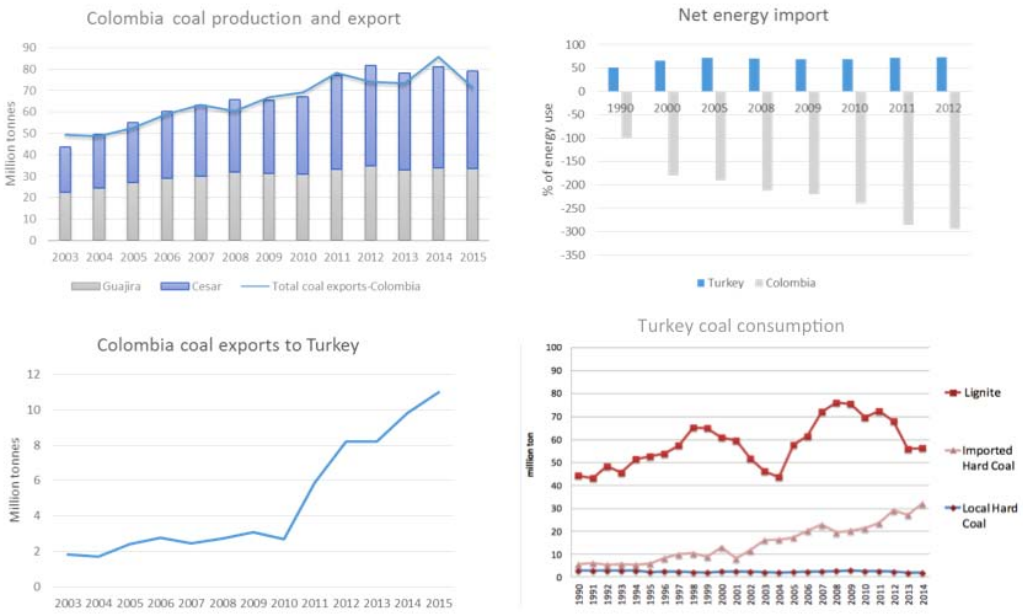
Source: UPME (2015) and Ministry of Foreign Affairs, Turkey (2015a).

While most of the world's 50 coal-producing countries use coal for domestic energy production, Colombia exports over 90% of its coal (SIMCO, 2016). Measured coal reserves were estimated at 6,419 Mt and the potential reserves at 16,347 Mt, which at the current rate of exploitation will keep Colombia producing for another 100 years (SIMCO, 2016). In 2015 just 7.5% of electricity generated in Colombia came from coal, with 69.7% of the electricity being generated from hydropower (UPME, 2015a). Colombian energy policy has focused on tilting the energy mix towards hydropower (Figure 11), because of its potential due to its feasibilities (topographic features and climatic regime) and the foreign direct investment in that energy sector (PROCOLOMBIA, 2015). However, during the country's recent electricity crisis due to "El Niño" (October 2015 - April 2016), thermal power plants based on coal and hydrocarbons came to cover 47% of the electricity demand (Clavijo, Vera, & Cuéllar, 2016). The government projection for 2050 outlines plans to diversify the electricity mix with greater participation of renewable energies as well coal (UPME, 2015b).

4.1 The boom of Colombian coal exports and its royalties

There is a clear connection between the world's consumption of coal and Colombian coal exports. Colombia is the fourth largest net exporter of hard coal after Indonesia, Australia and Russia (IEA, 2015d), and almost 8% of the Colombia GDP is based on mining and oil extraction (UPME, 2014). Coal exported by Colombia comes mainly from La Guajira and Cesar states (Figure 9), where the production of coal represents 42% and 52% of their GDP respectively (Bayona, 2016). Coal exports increased by 73% from 49.2 Mt in 2003 to 85.2 Mt in 2014. Exports to Turkey reached 10.99 Mt in 2015 (SIMCO, 2016). Turkey is a net energy importer, importing 74% of the country's energy, whereas Colombia is a net exporter, exporting the equivalent of 294% of the country's energy used (Figure 12). In 2014, Colombia reached its highest level of coal exports, an increase of 16.6% (from 73.4 Mt to 85.6 Mt) compared to 2013 (SIMCO, 2016).

Figure 12. Changing patterns of coal trade between Colombia and Turkey



Source: SIMCO- Colombian Mining Information System, 2016; World Development Indicators (The World Bank, 2015)

The factors behind the increasing coal exports are a combination of a boom in commodity prices (in 2008 and 2011-2013) and the governments' neoliberal policies that consider mining as a "development locomotive", offering incentives to foreign firms to invest (Fierro, 2012). The neoliberal line of Mining Code (Law 685 of 2001) ended with state

mining companies, limiting government participation to a regulatory role and favoring the foreign investment (Fierro, 2012; Pardo, 2013).

Moreover, several multinational coal mining companies have benefitted from tax exceptions and deductions. The coal mining companies must pay 10% royalty (different from a tax on profits) for a production larger than 3 Mt per year. Rudas and Espitia, (2013) compared coal mining royalties with tax exceptions for the coal mining sector. They found that mining tax exemptions ranged from 68% to 103% of the total mining royalties. Thus, in mining coal, the Colombian government has given away its royalties (ABColombia, 2012).

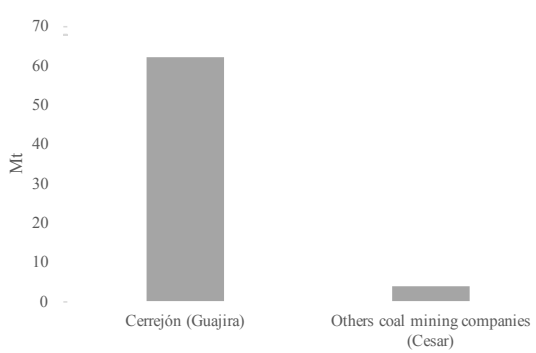
4.2 Coal trade between La Guajira and Turkey

Coal mining extractions by Cerrejón in La Guajira began more than 30 years ago. Cerrejón owns the biggest coal mine (69,000 ha) in Colombia. In 2000, the Colombian government sold its shares to three transnational corporations: BHP Billiton, Glencore, and Anglo American[42]. In 2015, Cerrejón reported 47% of the total coal exports (SIMCO, 2016). To export the coal, Cerrejón transports the extracted coal by train (150 km) to the Bolivar port. Both the railway line and the port are entirely owned by Cerrejón.

This study focuses on the ecological distribution of conflicts in Guajira, since Cerrejón is the coal company that provides most coal to the Turkish companies (SIMCO, 2016), including Eren in Çatalağzı. In 2015, Cerrejón sold more than 3 Mt to Eren[43]. During the period 2004 - 2015 more than 66 Mt of Colombian coal has been exported to Turkey, with 98% being exported by Cerrejón (see Figure 13). This is mainly because Cerrejón was apparently the only Colombian producer that could ship coal that satisfies all of Turkey's imported thermal coal quality restrictions. However, in 2014, Turkish environmental authority increased the limit on the volatile content of imported thermal coal, and now other major mining companies operating in Colombia became eligible to export to Turkey (Platts, 2014).

[42] http://www.cerrejon.com/site/english/our-company/history/our-history-2000.aspx
[43] Data base on Eren Interview (November, 2015).

Figure 13. Colombian coal exports to Turkey by coal mining companies (2004-2015)



Source: SIMCO (2016)

In fact, we found a particular interest from the Turkish energy companies to invest in La Guajira. A well-known Turkish investment in La Guajira was the transaction between CCX (a subsidiary of the EBX Group in Brazil, run by Eike Batista) and the Turkish company Yıldırım, which in March 2014 signed a purchase agreement for US$ 125 million to acquire three coal mines in La Guajira. CCX's assets include the San Juan mine (671.8 Mt of reserves, railway and port infrastructure) (see Figure 9). The intention of Yıldırım was to directly export the coal produced from these coal mines in La Guajira to Yıldırım's 4,000MW CFPPs in Turkey (Ship2Shore, 2014). However, after the signing of the agreement, Yildirim begun a legal battle against CCX for continuing to sell its Colombian assets to other potential buyers (El Tiempo, 30 March 2015). Finally, in October 2015, Yıldırım informed that it would give up the business and demanded the return of the initial fee, claiming that CCX did not meet the initial conditions related to the environmental licenses. The port and the mines failed to obtain environmental permits due to strong opposition from indigenous communities who considered the area a sacred place (El Pilón, 13 October 2015).

4.3 Ecological distribution conflicts and coal resistance in La Guajira.

Coal mining and transport to the harbor are the most important causes of the numerous environmental conflicts in the Caribbean-Colombian region, due to open-pit mining and the railway transportation of coal that produces environmental damage throughout the area (Cardoso, 2015a; Pérez-Rincón, 2014). Additionally, open-pit coal mining transforms landscapes. For example, 1t of extracted coal produces 18t of mining waste (Fierro & López, 2014). The communities are losing their territory given the fact that open-pit mining does not share land use with any other activity. The main impacts are air pollution, local health deterioration, groundwater depletion, land and ecosystem services

losses, and damages from transportation and shipping due to coal dust dispersion (Cardoso, 2015a). The main groups affected are the impoverished, particularly farmers, as well as the indigenous and Afro-descendants communities (Pérez-Rincón, 2014).

In La Guajira, local communities, indigenous peoples, Afro-Colombian communities, and peasant farmers have denounced the numerous impacts and conflicts of the Cerrejón mining activities, such as pollution of air, soil and water; cultural uprooting, health problems, violations to the right to food and the right to a healthy environment. These conflicts are mainly linked to land grabbing, dispossession, and appropriation of communal water sources (Ortiz et al., 2014), and have led to local communities losing their health, livelihood, as well as identity and territory rights (CENSAT and Cordaid, 2016).

Chomsky et al. (2007) demonstrated how coal-mining in La Guajira is the agent behind the dispossession and displacement of the Indigenous Wayuu and Afro-descendant communities. While some communities were relocated because of mining expansion, other communities located close to the mines have been displaced due to dire environmental pollution and social conditions. Many communities have lost their traditional territories and cultural heritage. As the leader of the *Fuerza de Mujeres Wayúu* group[44] indicated in an interview:

"*Coal mining should not be like that, because they benefit from this resource that our land provides, but this coal does not benefit La Guajira community as such; only the multinationals are profiting. It is not fair that they are extracting our resources and they do not leave anything to the people, only problems and the hole. So we cannot say that this is responsible mining. Today Cerrejón has taken over our water resources, which for us have a spiritual and cultural value." (June, 2016)*

In the recent years, various reports (AbdelGawad et al., 2015; Harris et al., 2016; Heinrich-Böll-Stiftung and FoE, 2015; Wilde-Ramsing and Rácz, 2014; Wilde-Ramsing and Steinweg, 2012) documented human rights violations at coal mines in La Guajira.

[44] It is an indigenous women's organization created and composed of members of women from the Wayuu community in La Guajira.

These studies have reported that social and environmental conditions at coal mines often fail to meet international standards for the protection of workers, communities and the environment (Wilde-Ramsing & Steinweg, 2012). They also reported that resistance had been criminalized to weaken the protests (Harris et al., 2016). Moreover, violence has silenced critical voices within the local communities from denouncing the human, social, and environmental consequences of mining (Heinrich-Böll-Stiftung and FoE, 2015). In the popular tribunal, mentioned before in the introduction, workers from the Sintracarbón Union presented evidence that Cerrejón has violated their labor and economic rights (Banks, 2014). Workers reported that Cerrejón has tried to weaken the Sintracarbón Union by increasing the number of third-party contracted workers who do not receive the same benefits or salaries as workers employed directly by the mine, even though they do the same job. Also, they denounce that Cerrejón refuses to accept its responsibility for injured or sick employees who develop conditions such as silicosis, as a direct result of working in the mine (Banks, 2014).

In 2012, the coal resistance became stronger and reached national attention, because the mining company Cerrejón began a diversion project of the Ranchería River, announcing that 500 Mt of coal under the river would generate royalty income for the local community. In La Guajira, a very dry region, all the local organizations came together and organized the "Guajira Dignity Group" to resist the diversion of the Ranchería River. They stated that not only had they not seen any royalty income invested in their territory during the past 30 years of coal exploitation, but that the deviation of the river would also undermine the survival of the local communities (Siosi-Pino, 2012). In fact, La Guajira ranks third regarding poverty in Colombia, with 65% of the population lacking basic needs (PNUD, 2013). For example, between 2008 and 2013, as many as 3,000 children under the age of five (most of them belonging to indigenous communities) died due to malnutrition, lack of sanitation, and poor health infrastructure (El Espectador, 26 March 2014).

Local communities, with the support of national and international allies, have won the battle to halt the redirecting of the Ranchería River. However, Cerrejón is now trying to divert stream by stream. In 2014, they announced another diversion project on a branch

of the Ranchería called the Bruno water stream. The coal mining resistance continues, according to the leader of the Guajira Dignity Group in an interview:

> "*The government cannot continue granting mining titles here, and Cerrejón cannot come every two years and say – we are planning the deviation of this stream – and tomorrow another, and so on. We have to limit this expansion because this is a deserted region and has a limited water supply. Cerrejón cannot continue diverting streams to increase profits. To reach 70Mt they will destroy everything and everyone*." (June, 2016)

Although, the Colombian government is negotiating a peace agreement with the Revolutionary Armed Forces of Colombia (FARC), the neoliberal governmental policies that favor extractive industries will continue generating environmental conflicts. For example, the EJatlas (www.ejatlas.org) have recorded 120 environmental conflicts across the country. Moreover, in the Colombia political situation, mining as well as hydropower and palm oil plantations, have attracted violence from different sources, not the least of which has been the paramilitary, as noticed in the following statement from an interview: "*With the arrival of coal mining came the armed groups, which was a disaster… This peaceful town became a holocaust where death was everyday bread; that's why many people abandoned their land*" local (March 2014).

5. Dark faultlines: Turkey and its coal rush under turbulent times

Turkey is an upper middle-income developing country with a significant uneven geographical development, turbulent (geo)political landscape and mounting pressure on the ecosystems. Coal (both lignite and hard coal), along with natural gas, has a significant role in electricity production in Turkey. In 2015, coal accounted for 28.4% and gas for 37.8% of the total electricity consumption (Figure 11). Turkey's energy demand will double by 2023, with an increase of around 90% in primary energy demand between 2016-2023 (Acar, Kitson, & Bridle, 2015; Acar & Yeldan, 2016). Although these figures are highly contested, Turkey is still a net importer of energy, ranking 8th in terms of global hard coal imports (IEA, 2015d). This fact is most lucidly reflected in the negative trade deficit due to hydrocarbon imports, with The World Bank (2014) estimating Turkey's 6% of GDP energy shortfall accounting for 58% of the trade deficit.

The Turkish government has emphasized the use of domestic resources to push its 'coal rush', most notably due to the geopolitical tension with Russia, a country with which Turkey has a very high level of hydrocarbon dependency (Kaygusuz et al., 2015; Öniş & Yılmaz, 2016). This cannot be better demonstrated than in the words of President Erdoğan, whose term in office is generating an appalling record for environmental organizations(Boşnak, 2016) and ecological integrity (Şekercioğlu et al., 2011). Erdoğan referred to anti-coal groups in this statement: "*Do not listen to them. We need to do what is needed*" and continued saying that *"[Turkey] has local coal reserves. Rather than using, imported coal, [it] can use local reserves, thus pushing down the current account deficit. This step must be taken*" (HDN, 2016). Despite this rhetoric, 95% of the fuel used by CFPPs built in Turkey in the last five years has been imported (Carrington, 2015). When brought together with the inadequacy of Turkey's INDC (Intended Nationally Determined Contribution) to take its fair share in global efforts to limit climate change well-below 2ºC, this coal rush may cause a serious 'carbon lock-in' in the country's energy and climate policies in the short-medium term (Turhan, et al., 2016).

5.1 National coal market

Turkey's energy imports skyrocketed between 1990-2013, parallel to the liberalization push, increasing by 211% during this time period (Türkyılmaz, 2015). The installed capacity of CFPPs has increased 77% between 2004 and 2015 (Acar, et al., 2015), reaching 28.4%. Parallel to such moves in electricity generation, Turkey also witnessed a rise of 125% in greenhouse gas emissions between 1990-2014 (TUIK, 2016). Turkey ranks 4th in the world for new CFPPs, with more than 70 in the pipeline after China, India and Russia (Shearer et al., 2015). Turkey's energy strategy aims at using all existing domestic lignite and hard coal potential for energy generation purposes while also relying heavily on imported coal with high calorific value (such as that from Colombia) to ensure supply-side security. The 2015-2019 strategic plan of the Ministry of Energy and Natural Resources aims to increase power generation based on domestic coal to 60 billion kWh by 2019, with the power generation from coal expected to increase from 43 billion kWh/year to 57 billion kWh/year by the end of 2016. By 2023, Turkey wants to add 18.5 GW of coal-fired electricity generation capacity, putting its own climate targets at risk (CAT, 2015b; Richert, 2015).

5.2 New geopolitics and coal rush in Turkey

On the 24th of November 2015, a Russian fighter plane was downed as it breached Turkish territory near the Syrian border, marking the end of cheap and easy energy imports in Turkey. This incident not only climaxed the building geopolitical tension but also blew a danger signal for Turkey's hydrocarbon-dependent economy. Turkey is receiving 63% of its natural gas and approximately 30% of its hard coal imports from Russia. However, after the rising tensions, the Turkish government accelerated its efforts to diversify its fossil fuel sources including both a push on domestic lignite and a renewed quest for new hard coal imports. The president of the Turkish Miners Association concluded, "*[Russian] coal used in [the Turkish] industry can easily be substituted by Colombian or South African coal almost without a cost*" (Milliyet, 2015).

Although the seven-month standstill in bilateral relations, which was partially relieved by a formal apology from the Turkish government to Russia, was particularly detrimental to the tourism sector, the key debate was on energy dependence. As we heard in the interviews:

> *"We want to balance the electricity mix by decreasing the gas proportion and increasing the use of other sources. It is known that CFPPs using imported coal should operate in an environmentally friendly manner, with low emissions levels. Therefore, with regard to the importer country, we follow [the regulations] closely, because currently we depend on a single country for the majority of gas. […] We want to diversify importation of all energy sources"*. Head of Department, Ministry of Energy and Natural Resources (November, 2015)

> *"Having local resources and supporting them with reliable imported resources is very important in order for us not to be in a political position that would make us weak and dependent on the political repression from Russia"* Energy company employee (November, 2015).

However, the highly profitable energy sector, ridden with crony relations and clientelism, is still fragile. Energy companies are already struggling to repay loans accumulated during an acquisition spree before energy prices dropped (Bloomberg, 2016). Although the recent coal rush seems to be legitimized by the government sources suggesting that

domestic lignite will be promoted, emphasis on a particular technology (fluid bed boilers) makes it possible to run these CFPPs both on lignite or imported coal. The rapid and subsidized lignite-fueled power plant build-out would put upward pressure on currently low electricity prices (Yenigün-Dilek & Schlissel, 2016). Deloitte (2014) argues that "uncertainties related to natural gas power plants and unexpected delays in lignite projects lead investors to hard coal as a relatively more eligible and cheaper energy source." Although Turkey's main challenge in relation to energy was its budget deficit due to skyrocketing energy imports (IEEFA, 2015), new energy policy after the geopolitical reshuffling focuses on both diversifying sources of imports as well as pushing for more lignite.

In the light of brittle relations with Russia and a political will pushing for more coal in the country's energy mix, Colombian coal appears to be a good alternative for business and government. Moreover, a rapid change in the Law on Electricity Market, enacted on June 4th 2016, brought substantial changes to electricity production in Turkey. This revision not only brought 'environmental immunity' to domestic lignite-powered plants until 2020 by exempting them, as well as state-owned CFPPs privatized before 2018, from environmental legislation, but it also prioritized electricity production from lignite-based power plants in the case of supplies being insufficient to meet the demand (EKD, 2016). In a recent attempt to address this budget deficit, Turkish government benefitted from the state of emergency regulations after the failed coup d'état attempt and imposed an import duty of 15 US$/t on coal imported for power generation by August 2016. Reports suggest that by the end of June 2016, Turkey had ten power plants, totaling to 6,780 MW of burning imported coal, with the country importing 33.226 Mt of coal in 2015 (Platts, 2016a). Hence, although these legislative changes can be read as a counter-attack on energy imports, Turkey's thermal coal imports increased by 29.5% from the previous year (2015) with Colombian coal leading the market (Platts, 2016).[45] Nonetheless, such coal rush has both local and national implications for the climate change policy (Turhan et al., 2016) as well as for the socio-ecological conflicts sparking around the energy investments.

[45] This is most clearly reflected in President Erdoğan's words in late April 2016: "*I am personally against imported coal coming into this country. We can lower current deficit by using more local coal*." Erdoğan also acknowledged that the quality of local coal might be lower than its imported counterpart but said it remained better to use the local variety rather than import it. (Source: http://aa.com.tr/en/economy/turkish-president-erdogan-wants-less-coal-imports/560632)

5.3 The case of Çatalağzı, Zonguldak (NW Turkey)

The past decade under Erdogan's rule has led to both an expanding social metabolism, particularly due to construction of energy sectors as well as an exacerbating trend in ecological conflicts (Knudsen, 2015; Özkaynak et al., 2015). Environmental movements in Turkey spent the last decade opposing hydropower (Harris & Işlar, 2014), gold mines (Hurley & Arı, 2011), and urban transformation (Elicin, 2014), with an increased frequency of anti-coal movements across the country, some ending in victories others in failures (Arsel et al., 2015). Currently, there are a significant number of anti-coal groups in the country fighting both the government's pro-coal policies as well as the investors, where the rule of law is falling short. However, the reach of such grassroots groups is rather limited, unless they manage to get international attention, as was the case with BreakFree mobilizations in May 2016, which resulted in a strong link to the global climate justice debate (see anti-CFPPs campaign in Box 3)

Box 6. Turkish anti-coal movements campaign

We want a future without CFPPs

Our planet or CFPPs?

Our future or CFPPs?

Our health or CFPPs?

Our air or CFPPs?

Our seals or CFPPs?

Our fishes or CFPPs?

Our trees or CFPPs?

"Karabiga" does not become black!

We want a life without CFPPs

Source: Yuva campaign "Future Without Coal Power" http://www.yuva.org.tr/

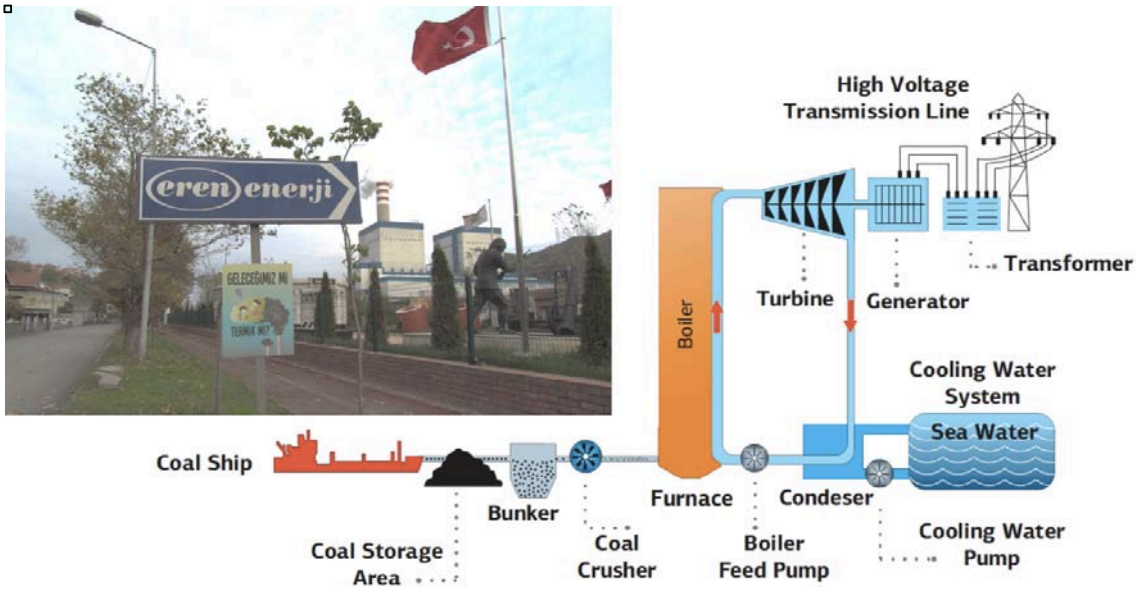
The first coal mine in Zonguldak was opened in 1848, which was a turning point in the history of this coastal town. Private French, Italian and Turkish companies began mining in the basin with a concession given in 1896 (Şengül, & Aytekin, 2012). The government nationalized the mines in 1940 and with nationalization, a new era began. The state coal company became a major provider of infrastructure investments, including social, cultural, and even municipal services. Zonguldak was then transformed into a town of "*Black Diamond*." Since the urban identity has developed around coal and coal mining, most urban institutions are named after this precious mineral, as in the case of Zonguldak Karaelmas (*Black Diamond*) University. The local economy, the commerce, and the politics have all focused on coal production over the past century. With the liberalization of Turkish mining and energy markets in the aftermath of the 2001 economic crisis, topped with low yields of coal in the region, the main focus in Zonguldak has started to shift from a region extracting coal to a region importing coal.

In Çatalağzı (17 km away from Zonguldak city center), the first CFPP was built by the state in 1948. It used the coal from the region, employed thousands of people and invested some portion of the surplus in different social facilities including 300 units of social housing, schools, mosques and a cinema for the workers. However, things turned sour when the coal market was liberalized in 2001. When Eren (based in Istanbul) came with the proposal of a new CFPP, local groups did not object to the project, as they saw it similar to the already existing state-owned enterprises that provided them with a good living. The locals believed that the new projects would bring employment and social investment, such as social housing and new infrastructure. Nonetheless, after Eren opened the ZETES-1 (160MW) and ZETES-2 (1230MW) plants, the locals were still unemployed and without social investments. In addition, local grievances regarding public health were rapidly increasing. A leader from the local anti-coal group commented:

> *"But of course, because there is a difference in mentality between state-owned and private sectors, these expectations [of secure, well-paying jobs] didn't happen. Why does the state do a certain thing? Because there is a need, a necessity. Why does private sector do anything? For profit. They have different aims. The state says 'Yes, Turkey has a need for energy, so we will build a CFPP*

here', we need to produce energy. The logic behind these private investments are fundamentally different". (November, 2015)

Box 7. Eren ZETES 2 and its process



Source: Adapted from Isken (2011)

The primary goal of the Turkish government and the new energy investments is to create an energy hub on the western Black Sea (Su & Toroğlu, 2015), with energy companies like Eren getting more permits. In addition to the existing Eren 1390MW-installed capacity, the company obtained a license for ZETES-3, which is currently under construction, with an installed power capacity of 1400MW (2x700MW). Moreover, Eren has already applied for its fourth plant, estimated to be of the same capacity. Eren facilitated its permit processes by legitimizing the use of local coal, however, it also obtained permits to construct a coal port nearby. Eren not only meets its coal demand via imported coal from this port, but also sells it to other companies (Enerji Enstitüsü, 2013). Çatalağzı and the whole province of Zonguldak are producing 7% of Turkey's electricity and once the investments are realized this will increase to 10% (Evrensel, 2016).

These investments caused serious opposition from the residents, most of whom are either former employees of the nearby coal mines or retired workers from the once state-owned CFPP. Together with the environmental groups, they are denouncing the socio-environmental impacts of these CFPPs, including: unemployment, respiratory diseases, increasing risk factors for childhood asthma (Tomac et al., 2005), appearance of cancers

due to radioactivity of coal and ash (Aytekin & Baldık, 2011), loss of traditional crops due to acid rain, and the increase in surface temperature in this region (Sekertekin et al., 2016). The failure of Eren to comply with EIA commitments as well as the failure of the government to require and enforce pollution controls has exacerbated local resistance (Myllyvirta et al., 2014). It is not surprising that no cumulative impact assessments have been performed regarding the development of these new CFPPs in Çatalağzı (Stefanova & Popov, 2013).

6. Discussion

Although coal is (at least, rhetorically) losing its importance in the global energy mix after the COP21 Paris Agreement, we argue that there be emerging new geographies of coal extraction, trade, and burning within the Global South. The future of coal will not be defined by the traditional extractive relationship between North-South, but it will be defined by the domestic extraction and consumption in countries like China and India, and (as suggested in this study) by the emerging trade relationships embedded in geopolitical and economic interests from South to South. Different socio-environmental liabilities can be observed in these new geographies of coal trade as a result of the democratic deficits that exacerbate socio-environmental conflicts, not only by pro-coal government policies but also by coal market players which make the South-South trade less transparent (AbdelGawad et al., 2015). Local democracy as expressed in local consultations, referendums or appropriate EIA meetings, could reduce injustice (Martinez-Alier, 2015; Walter & Urkidi, 2014).

Coal expansion in the Global South should not only be viewed in terms of its impacts on environmental/climate justice but also as a consequence and a trigger of combined and uneven development processes (Fisher, 2015). For example, in our analysis, the coal chain between Colombia and Turkey is influenced by the political and economic power of both governments as well as by the interests of multinationals. On the one hand, Turkey's main interest is diversification of the electricity mix, because currently the country highly depends on gas importation from Russia. On the other hand, the trade agreements benefit the coal multinationals that operate in Colombia, and the Colombian government expects to receive more royalties due to coal exports. However, the study

shows that the trade relationship between these two developing countries is anchored in ecological distribution conflicts associated both with mining and consumption of coal.

The ecological distribution conflicts caused by the extraction and consumption of coal across multiple scales (bi-local, binational and global) prove that the political ecology of coal is a "macro-scale project of the resource extraction and trade" (Bebbington, 2015). The ecological distribution conflicts along the coal chain between Colombia and Turkey are related to air pollution, public health loss, relocation, and displacement of local communities, environmental degradation (diversion of rivers and coastal ecosystems affected), and climate change. There are many different players involved in the coal chain. The multiple layers and scales of the coal chain, along with the democratic deficit through the chain, enable companies to ignore their responsibility over such socio-environmental liabilities (Harris et al., 2016). There is, however, a possibility of linking socio-environmental movements across cultures and borders, over long distances (Robbins, 2014).

The coal chain between Colombia and Turkey has a relatively short history, and this short-term perspective could be a limitation of this study. The coal trade relationship between the two countries has been strengthened since 2011, due to the search for preferential commercial agreements, together with an economic growth desire. While in Turkey some anti-coal movements link their struggles to climate change, in Colombia the international link is human rights violation. We did not, however, find any international network linking coal injustices in both countries. We see this as an opportunity for connecting the claims and actions of the local anti-coal movements at both ends of the coal chain to demonstrate the possibility of an emerging international coalition on environmental justice that questions the development model (see Robbins, 2014).

In both countries, there are a number of different actors, such as environmental justice organizations, academics, or different groups that are working together to build alternatives to traditional development models beyond extractivism and consumption of fossil fuels (Başkaya, 2016; CENSAT, 2014; Escobar, 1994; Gudynas, 2011). In Colombia, the post-conflict scenario resulting from the peace agreement with FARC and ELN, may provide a good opportunity to explore post-extractivism scenarios and address the structural causes of the Colombian conflict (inequalities in the distribution of land,

wealth and environmental goods and bads) that persist beyond the peace negotiations. In Turkey, the developmentalist rush will continue, with a growing number of CFPPs projects affecting the local people, increasing domestic extractivism, and most likely, augmenting coal import.

7. Conclusion

In this Chapter, we have attempted to explore the political ecology of new geographies of coal, with the specific example of the coal chain between Colombia and Turkey, in order to demonstrate how the coal chain shapes the local ecological distribution conflicts. Our analysis reveals that these new geographies are anchored in socio-ecological injustice or cost-shifting, associated both with mining and consumption of coal, as well as irreconcilable tensions between public health, economic gain, and the political power in these two countries. The coal chain layers and scales show the spatial organization and political power regimes. The emergent voices on both ends of this chain face democratic deficits, not only due to pro-coal government policies but also as a result of the different players in the market and the various physical layers of the coal chain. We found that the emergent anti-coal mining and anti-CFPPs movements in these countries, along with the support of international NGOs, are working to expose the impacts of coal on a global scale. Colombia and Turkey are connected through coal trade, but to date, there is no network linking coal injustices in both these countries. There is, however, a growing link between the local effects of coal burning and the awareness of climate change, creating a potential opportunity to build alliances between environmental justice organizations in Colombia and Turkey. The analysis of these new geographies of coal results in emerging interaction shaping the South-South relations, and creates a specific opportunity to understand climate justice, as well as related economic and social inequalities, on a new scale. The lack of accountability for these injustices in the allocation of wealth and distribution of environmental goods and bads contributes to the global increase use of coal.

IV. Valuation languages along the coal chain from Colombia to the Netherlands and to Turkey

1. Introduction

Although COP21 Paris Agreement actions do not match long term goals on a clear path towards reducing CO_2 emissions, it marks a new direction for energy and climate change politics across the world (CAT, 2015; Wood Mackenzie, 2016). The USA and China, the world's biggest emitters of greenhouse gasses, ratified the Paris Agreement at the 2016 G20 Summit. However, for climate activists, G20 failed to mention their decarbonization plans and set a deadline to end fossil fuel subsidies (CAN, 2016).

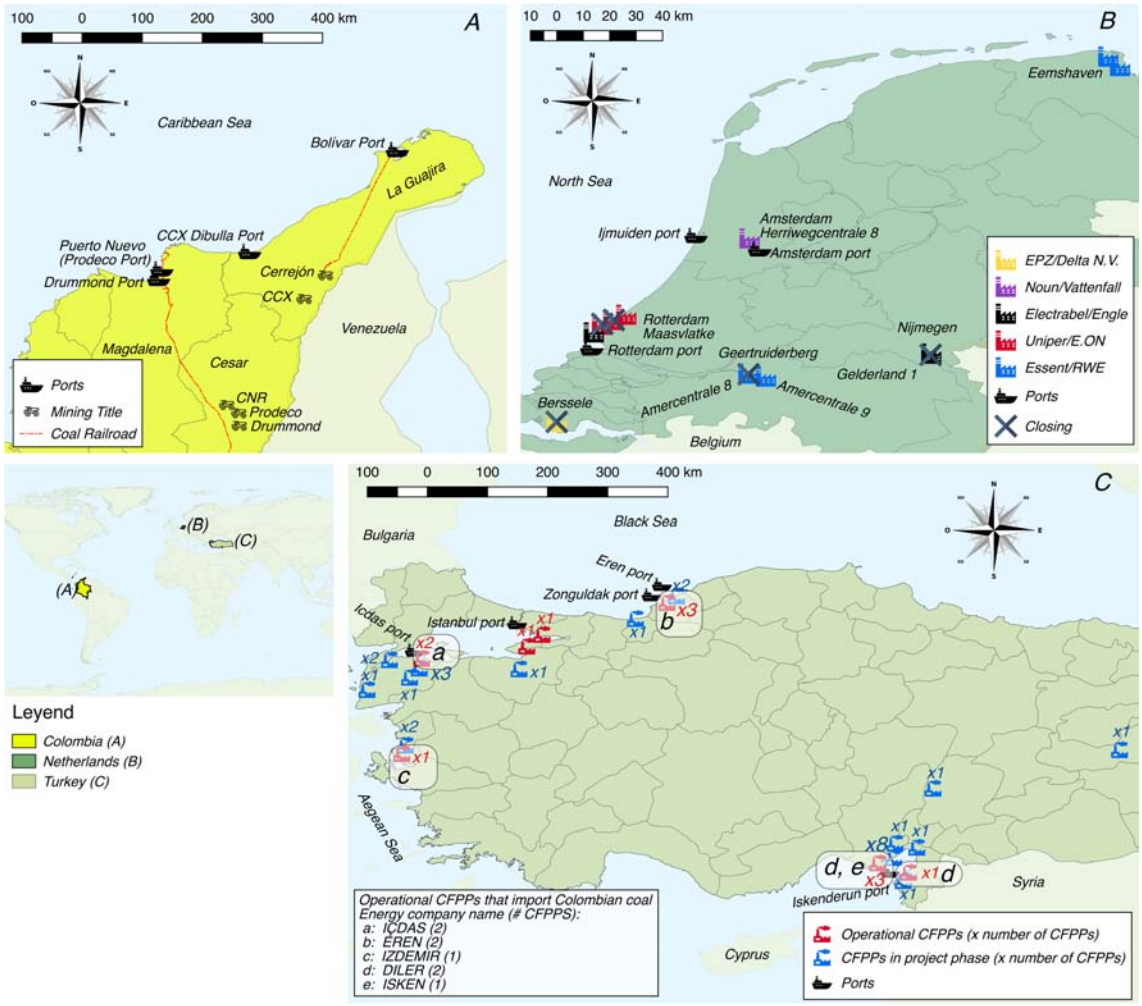
In this decarbonization era, the coal industry is under debate. On the one hand, coal industry promotes new coal-fired power plants (CFPPs) as a solution to energy poverty and sustainable development through Carbon Capture and Storage (CCS) and High-Efficiency, Low-Emissions Technologies (WCA, 2015, 2011). On the other hand, in a new study recalculating the climate change mathematics, Muttitt et al., (2016) show that the potential carbon emissions from the coal, oil, and gas industry in the world's currently operating fields and mines would take us beyond 2°C of warming. Moreover, even if we stop burning coal, the currently operating oil and gas reserves alone would take the world beyond 1.5°C. Climate justice movements are claiming that "we cannot dig any new coal mines, drill any new fields, build any more pipelines… if we want to prevent global warming… keeping fossil fuels in the ground is the only realistic approach." (McKibben, 2016). Therefore, the fossil fuel industry and climate change are locked in a zero-sum game (Krane, 2016).

A number of different international NGOs have also questioned the entire coal supply chain (AbdelGawad et al., 2015; Harris et al., 2016; Heinrich-Böll-Stiftung and FoE, 2015; Ortiz et al., 2014; PAX, 2014; Re:Common, 2016; Schücking and Rötters, 2016; Shearer et al., 2015; Torres et al., 2015; Wilde-Ramsing and Rácz, 2014; Wilde-Ramsing and Steinweg, 2012). They have reported that the coal supply chain not only produces CO_2 emissions but damages the natural ecosystems, generates air and water pollution, agricultural losses, displacement, public health loss, human rights violations.

Some studies have attempted to assign an economic value to the socio-environmental cost of coal. For example, Epstein et al. (2011) estimated a broad range of costs associated with the coal chain (from extraction to combustion), demonstrating that if health and environmental externalities produced by coal were included in its price, the general American public should pay an additional US$ 345 billion, which corresponds to 17.8 ¢/kWh of electricity generated from coal. These values are equivalent to approximately triple of the regular electricity price per kWh[46]. In a previous study (Cardoso, 2015a), which applied a similar approach, the economic value of the socio-environmental cost of coal mined for export was estimated in Cesar, Colombia. The key socio-environmental costs identified were those arising from pollution, public health risks, groundwater depletion, land and ecosystem services losses, community displacement, loss of sacred territories and cultural heritage, damages from transportation and shipping, and coal reserve loss. Climate change costs were not considered. These costs are valued at between US$ 114.54/t - US$ 167.52/t (updated to 2015 prices), which is almost the triple of the market price of one ton of coal. Meanwhile the coal prices are plummeting even faster than oil prices, government justifications for mining-led development are ringing increasingly hollow (Cardoso, 2015b). Numerous socio-environmental costs cannot even conceivably be calculated in monetary terms and should be accounted for in their own units of value. The politically and ecologically different valuation languages are all relevant and should be included in the ecological economics of climate change and the coal industry.

[46] They included the cost of the whole coal chain. Particularly, the cost of the coal combustion could reach US$ 392.26/t - US $ 1,977.71/ ton per ton (updated to 2015 prices). These values are used in Figure 15. Epstein et al. (2011:20) presented the costs in terms of ¢/kWh. A conversion to tons of coal equivalent was made: 1 ton coal equivalent = 8141 kWh. Source: http://www.unitjuggler.com/convert-energy-from-tSKE-to-kWh.html

Figure 14. Coal extraction and transportation to coal export in Colombia, import ports and CFPPs in the Netherlands and Turkey



Source: A. Colombia Mining Registry (2014), B. http://www.wijstoppensteenkool.nl/, C. Yıldırım et al. (2015)

In 2015, Colombia was the world's fourth largest net exporter of hard coal, after Indonesia, Australia and Russia (IEA, 2016). The Netherlands is the largest buyer of Colombian coal in the world, closely followed by Turkey, which is in the second place. In 2015, 18.4% and 15.4% of the Colombian coal was exported to the Netherlands and Turkey, respectively. The coal exported by Colombia comes mainly from La Guajira and Cesar states, where the coal is extracted from open-pit mines, then lightly processed on the surface, transported by train, and uploaded to cargo vessels at the docks in the Caribbean (Figure 14A). These vessels land at the ports of Rotterdam, Amsterdam, or Ijmuiden in the Netherlands (Figure 14B) or at the ports Iskenderum, İçdaş, Zonguldak or Istanbul in Turkey (Figure 14C). Along each stage of the coal chain, the environmental goods and bads are accumulated and unequally distributed, producing multiple landscapes of environmental injustices. The social actors involved use different

arguments to complain or defend the use of coal, either to resist or to legitimize ways of extracting and consuming this natural resource.

The current Chapter seeks to incorporate the alternative voices and epistemologies that are used to reveal the ecological distribution conflicts along the coal chain. More specifically, this work analyzes the ecological distribution conflicts of the coal chains between Colombia-Netherlands and Colombia-Turkey, as it aims to question how the actors' valuation languages and their own coal "meanings" are defended and handled in accordance with their specific position within the coal chain and their relationship with the territory where coal is extracted and burned. Assessing and comparing both these coal chains through the analylsis of the valuation languages enables us to better comprehend the various dimensions of the ecological distribution conflicts and differentiate between the valuation languages deployed in each country.

Following the introduction portion of this Chapter (Section 1), Section 2 outlines the theoretical framework of commodity chain analysis and explores the definition of valuation languages. Section 3 elaborates on methods used to analyze the coal chain through different layers (market, physical, socio-environmental liabilities, economic valuation of those liabilities, the actors and their valuation languages) and scales (local, national and global). Section 4 presents the Colombian case on coal extraction, followed by the description of the coal imports and consumption in the Netherlands (Section 5) and Turkey (Section 6). Section 7, analyzes the valuation languages along the coal chain, and finally, Section 8, discusses the environmental justice actions along the coal chain that try to reconcile those multiple valuation languages, drawing the conclusions.

2. Coal Chain Analysis and Valuation Languages

Commodity chain (CC) as an analytical frame was introduced by Hopkins and Wallerstein (1977) to describe the territorial influence of capitalism. Later, the book edited by Gereffi and Korzeniewicz (1994) introduced Global Commodity Chain (GCC) analysis which identified the different dimensions: the input-output process; the geographical scope; the governance structure, including power relations and chain drivers; and the institutional context. Therefore, the unit of analysis is not the commodity itself, but rather the whole global economic and political system which the commodity is

embedded in (Smith & Mahutga, 2009). Moreover, each CC has its own history, its own geographical space, its own conflicts and governance structure (Bair, 2009).

Ciccantell and Smith (2009) proposed extending the GCC analysis that incorporates the exportation of raw materials, by including the examination of techniques and technologies applied in extractive regimes, as well as the environmental degradation and the mobilization of social movements that this entails. Extending the analysis to the consumption phase implies that GCC also deals with the final waste disposal phase, including the global issue of greenhouse gasses in the case of coal. Similar to the oil CC presented by Bridge (2008), coal is extracted from the environment, commodified through trade, and at the end of the chain, de-commodified through its consumption, dissociation and the disposal accumulated as air pollution or CO_2 emissions. The North-South linkage along the CC makes it ideal for contributing to the current debate on ecological debt[47] and ecologically unequal exchange (Ciccantell & Smith, 2009; Talbot, 2009). Concerns about the transparency of CC also raise the following questions: Who benefits? Who is at a disadvantage? The answers to these questions depend on the structures of chains, their geographical distribution, and their forms of governance (Guthman, 2009; Talbot, 2009).

The different CC methodologies are both descriptive and normative; they can be employed to describe or to explain, to create or reveal transparency, and to capture or to redistribute value (Guthman, 2009). Alternative analytical frameworks also exist, such as the French filière to analyze the agricultural commodities (Raikes et al., 2000) or the feminist CC approach that includes an ecological perspective and a gendered analysis integrating race, age, and regional differences (Barndt, 2008; Ramamurthy, 2004). The current study uses the CC approach to analyze how environmental goods and bads are accumulated and distributed along the coal chain, and how these produce ecological distribution conflicts. This study attempts to incorporate "mapping the connection of micro-political ecologies and linking disparate sites of injustice by exposing their

[47] This debate was started by Latin America environmental organizations in 1992. According to Acción Ecológica the Ecological Debt is the responsibility of industrialized countries for the gradual destruction of the planet as a result of their forms of production and consumption, the disproportionate occupation of the carbon sinks, and the ecologically unequal exchange, because goods are exported without taking into account the social and environmental damage http://www.accionecologica.org/deuda-ecologica

positions along a chain" (Robbins, 2014), with the social dynamics and actors' contestations being crucial to understanding the CC (Conde & Kallis, 2012).

To better understand the ecological distribution conflicts along the coal chain, it is essential to identify the different valuation languages and analyze their commonalities and differences (Avci et al., 2010). These conflicts are expressed in different valuation languages, including the language of economic valuation of negative externalities and various other valuation languages (Martinez-Alier, 2013). Essentially, conflicts are ultimately value system conflicts (Martinez-Alier, 2001, 2003; Martinez-Alier et al., 2010; O'Connor, 1993), where values can be articulated in different expressions of approval or disapproval, in the form of a judgment (Muraca, 2016), or the attribution of worth and importance to the environment (Centemeri, 2015).

Valuation is understood as the result of an evaluative judgment through which actors frame a given situation to express themselves and carry out an action (Centemeri, 2015). Valuation languages, therefore, are the specific 'grammar' of valuation, though which actors express their values and their ways of engaging with the environment (Centemeri, 2015). They "represent actors' worldviews and knowledge systems (epistemology and ontology), socio-economic interests and cultural and political relations, expressed through concepts, discourses and normative frames" (Duarte-Abadía and Boelens, 2016:18). Valuation languages are plural due to the diversity of actors involved, all having different perspectives and different degrees of immediate dependency on natural resources (J Martinez-Alier et al., 1998), the multiplicity of issues raised, as well as the economic, political and social forces in each particular case (Avci et al., 2010).

This plurality and multiplicity make values incommensurable, meaning not reducible to a single value (J Martinez-Alier et al., 1998). In the current neoliberal policy practices, it is common to see the dominant actors impose market-based and monetary language in cost-benefit frameworks, generally disregarding other valuation languages related to personal attachments to territory or environmental significance (Duarte-Abadía & Boelens, 2016). Therefore, commensuration is an act of power, and we should ask, who has the right to simplify complexity and impose a particular language of valuation? (Martinez-Alier, 2001, 2013; Martinez-Alier et al., 2010).

Avci et al. (2010) reviewed the plurality of valuation languages employed by different actors involved in environmental conflicts over resource extraction activities (Table 7). Our study uses this classification of valuation languages to see which one is adopted at each stage of the coal chain and by whom.

Table 7. Valuation languages employed in most environmental conflicts over resource extraction

Valuation Language	Description
Opposition	
Community life and livelihood	Local people's dependence on the environment as a source and requirement for livelihood and thus they defend their communal access to natural resources (Guha & Martínez-Alier, 1997; Martinez-Alier, 2002)
Unequal distribution of costs and benefits	Communities may complain about the low prices companies pay for the land acquired, unfair distribution of royalty payments, lack of redistribution of taxes and low prices offered in compensation (Bury, 2002; Hilson, 2002; Muradian, et al., 2004).
Identity and territorial rights	Tensions within and between communities regarding the positive and negative impacts of resource extraction are expressed in terms of ethnic identity (Ballard & Banks, 2003; Boyce, 2002) or to defend their territory and their culture (Escobar, 2006).
Health impacts and risks	People express their concern about health impacts and uncertain risks due to impacts over local ecosystems that may threaten public health (Bebbington et al., 2008)
Appreciation of nature	Belief in other species' right to exist, and concerns for wild habitat and biodiversity loss (Garner, 1996).
Critiques of the concept of development	Large-scale resource extraction projects can also be viewed as manifestations of the development paradigm that prioritizes economic growth over social and environmental goals. Questions that engage with other types of development approaches and economies (Escobar, 2006).
Local participation, local democracy in decision making processes	Opposition is focused on the form of governance that often excludes local people from decision-making processes concerning their habitat (Adger, at al., 2001). Right to local prior consultation (Walter & Urkidi, 2014).
Support	
National economic development	Central governments usually consider natural resources as important assets to be exploited, their aim being earning foreign exchange, increasing state revenue, and transferring technology and skills (Bridge, 2004; Bryant & Bailey, 1997; Ciccantell, 1999).
Sustainable development ecological modernization	The vision of sustainable development, in which ecological modernization and eco-efficiency are touted as the solution to environmental problems, is also advocated by private sector (Ballard & Banks, 2003; Martinez-Alier, 2002; Seippel, 2000).
Local development	Local economic opportunities through employment generation and increasing demand in the economy, may lead to improvements in infrastructure and social services (Hilson, 2002).

Source: (Avci et al., 2010)

3. Layers and scales in the coal chain

Wilde-Ramsing and Steinweg (2012) explained that the physical trade of coal is complex, since coal is not only traded physically but also financially. They structured the coal chain into two layers: the market and the physical. This section of the Chapter will explain these two layers. To complete the socio-ecological dynamics of the coal chain, three additional layers were incorporated into the coal chain analysis: the socio-environmental liability; the economic valuation of the liabilities; and the actors and their plurality of valuation languages (see Figure 15).

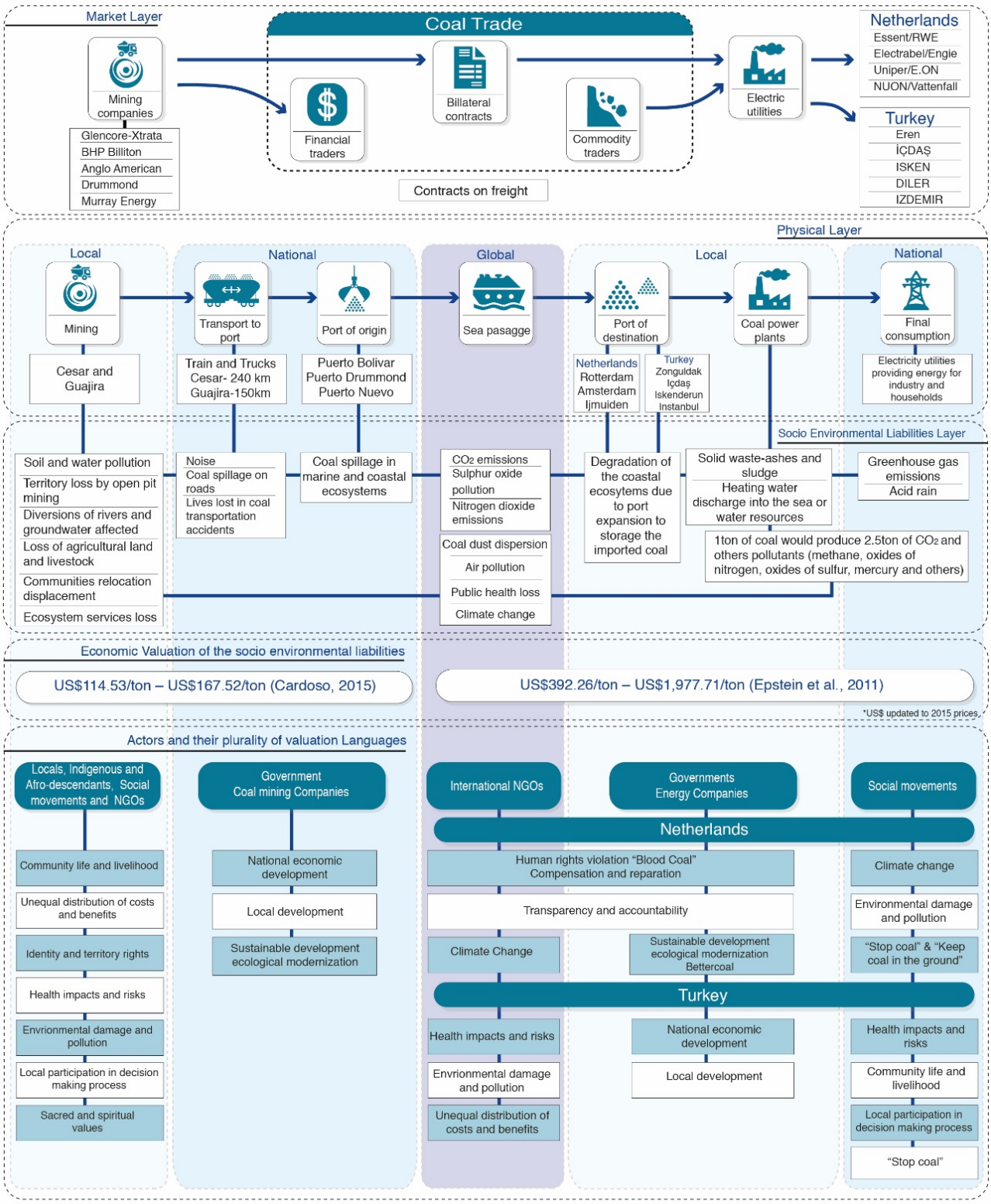
The physical trade of coal consists of various stages, from coal mining to export, including shipping, import, storage, and combustion of coal to produce energy. Wilde-Ramsing and Steinweg (2012) identified four different players according to their core businesses. The first of the four groups of players are the multinational mining companies, which in Cesar and La Guajira export all the produced coal, transporting it by train to the port (see Section 4.1 & 4.2). The second players are the financial traders and commodity traders, who trade coal either through the financial futures markets or by buying, stockpiling and selling physical coal. These include large corporate banks and other financial players that traditionally trade in futures contracts, but that are increasingly getting involved in the physical trade of coal (Wilde-Ramsing & Steinweg, 2012), while mining and energy companies become more and more involved in trading (A. Harris et al., 2016) (see Section 4.3). The third players consist of the logistic companies. These include shipping agents of the coal transport vessels who generate their profits through the fees charged for transporting coal, as well as stevedores that load and offload the vessels at the ports (Wilde-Ramsing and Steinweg, 2012) (see Section 5.1). The forth, and the final, players are the electric utility companies that own and operate CFPPs (see Section 5.2, 6.1 & 6.2).

In the market layer, the coal is traded financially with contracts to supply coal to futures markets where physical traders (mining companies and electric utility companies) agree upon a delivery price for coal in the future (Wilde-Ramsing & Steinweg, 2012). Financial institutions and commodity traders speculate on the market price for coal, buying and selling these contracts for hedging and financial gain without being involved in the physical delivery of the coal. This can lead to stockpiling of coal at ports, which causes additional confusion regarding its origin (Harris et al., 2016; Wilde-Ramsing & Steinweg, 2012) (see Section 5.1).

While the coal trade advances along the chain, socio-environmental liabilities produce socio-environmental conflicts at every scale. In Figure 15 the socio-environmental liabilities layer show that coal dust dispersion, air pollution, public health loss and climate change are the critical socio-environmental liabilities that appear at all stages of the coal chain. The economic valuation layer shows the estimated values of those socio-environmental liabilities defined by Cardoso (2015a) and Epstein et al., (2011) updated

to 2015 prices. The last layer of the actors and their plurality of valuation languages is discussed in detail in Section 7.

Figure 15. Scales and layers in the coal chain

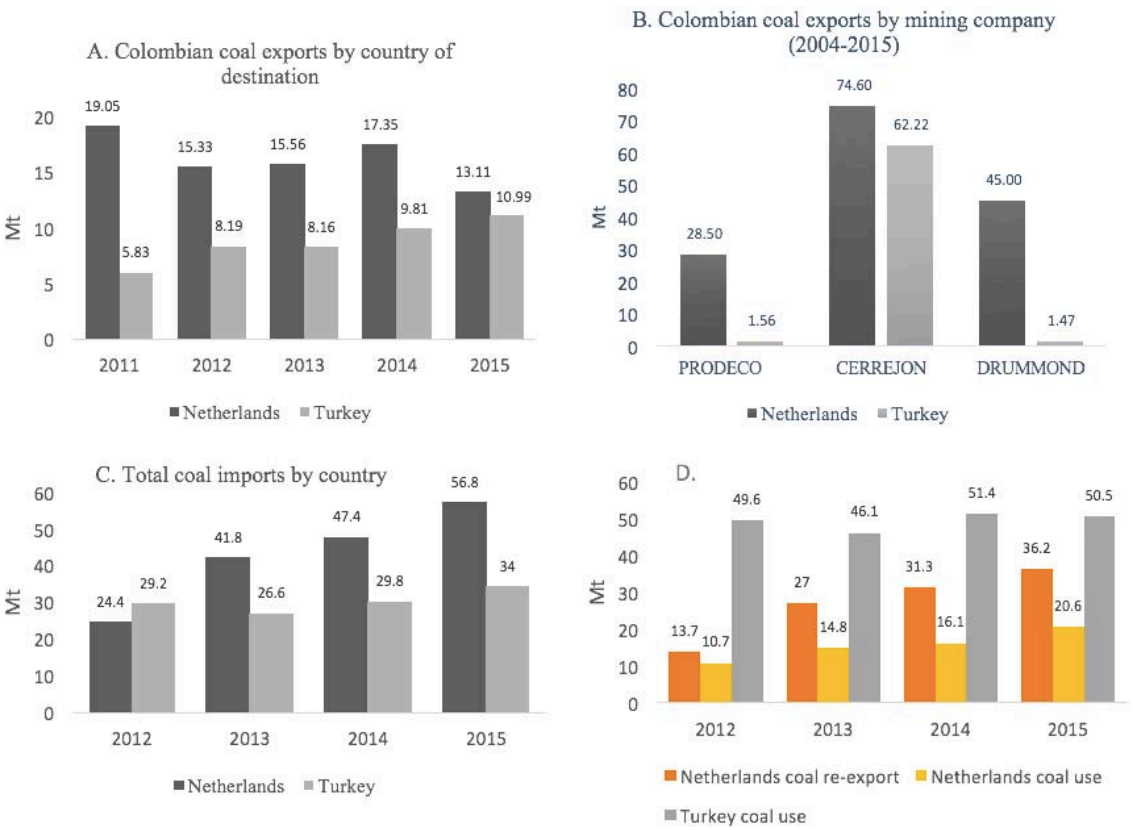


Source: Adapted from Wilde-Ramsing and Steinweg (2012)

4. Colombia: coal extraction and transportation for export

The expansion of large-scale coal mining in Colombia is driven by a combination of a boom in the international demand for coal and the continued neoliberal governmental policies that consider mining as a way to bring about "development" (Cardoso, 2015a). Colombian coal export increased by 74% from 49.2 million tons (Mt) in 2003 to 85.6 Mt in 2014, when Colombia reached its highest level of coal exports (SIMCO, 2016). All coal extracted in La Guajira and Cesar is exported. Cesar's coal production increased by 123.6%, from 21.15 Mt in 2003 to 47.3 Mt in 2014, overtaking the production in La Guajira, which was traditionally the largest exporter. In the same period, La Guajira increased its production by 52%, producing 34.5 Mt in 2014 (SIMCO, 2016). Overall, 8% of Colombia's GDP is based on mining and oil extraction (UPME, 2014), while the production of coal represents 42% of the Cesar GDP and 52% of La Guajira GDP (Bayona, 2016). This high concentration in the production of coal generates uncertainties in the sustainability of the regional economy due to the high dependence on changes in the international coal market (Bayona, 2016).

Figure 16. Colombia coal export to Netherlands and Turkey



Source: A & B: SIMCO- Sistema de información Minero Colombiano (2016); C & D: IEA-International Energy Agency (2016)

In 2015, 50.8% of the Colombian coal was exported to Europe, especially to the Netherlands (18.4%), while 22.5% was exported to Asia, mainly to Turkey (15.4%), 7.8% to the U.S. and 15.7% to the rest of Latin America (SIMCO, 2016). In the last five years, the Colombian coal exports (Figure 16A) to the Netherlands have decreased by 31%, most likely due to the "blood coal" debate (see Section 5), while exports to Turkey have increased by 88% due to the country's pro-coal policies (See Section 6).

4.1 Open-pit coal mining in Cesar and La Guajira

Over the past 20 years, in La Guajira and Cesar, several multinational companies have been granted open-pit coal mining concessions to extract and export coal. The main multinational mining company in La Guajira is Cerrejón, a joint multinational company equally owned by BHP Billiton, Anglo American and Glencore. The Cerrejón coal open-pit mine has 69,000 ha with five operation zones, making it one of the world's ten largest open-pit mines (Heinrich-Böll-Stiftung and FoE, 2015). In Cesar, the two main companies are Drummond (U.S.-based), with two mines totaling to 48,540 ha, and Prodeco (a subsidiary of the Switzerland-based Glencore), with a mine of 6,677 ha. These multinationals reported 47%, 39% and 13% of the total Colombian coal exports in 2015, respectively (SIMCO, 2016).

The socio-environmental impacts of coal operations in Cesar and La Guajira caused by various multinationals are cumulative (are added together), synergists (affect more than the simple sum of individual impacts), and residual (persist even after implementing corrective and impact-minimizing measures) (Fierro, 2014). For these reasons, the socio-environmental cost of coal mining is derived from the interactive effects of extraction, transportation, and shipping of coal in the Colombian Caribbean region.

According to the interviews conducted, coal is affecting the livelihood of the communities in aspects such as food security and public health. Coal mining companies have degraded the surrounding soil and contaminated or dried up water sources, with devastating impacts on farming and livestock keeping (Heinrich-Böll-Stiftung and FoE, 2015). In La Guajira, indigenous Wayuu people and Afro-Colombian communities are disproportionately evicted for coal mine expansion and forced into malnutrition through loss of traditional lands (Harris et al., 2016). In Cesar, farmers have been relocated due to mines' expansion, but also because of dire environmental pollution and health problems (Cardoso, 2015a).

The main concern in the whole region is air pollution, resulting from the coal dust that spreads not only during extraction but also during transportation to the port, producing respiratory diseases (Agudelo et al., 2012).

The rising social movements question the government and coal mining discourses regarding the relevance of large scale coal mining. Table 8 shows the evidence alleged by NGOs and academics to dispute and undermine government policy favorable to coal mining in the territories of Cesar and La Guajira. As a result, social movement struggles are focused on the democratization of the decision-making process, allowing communities and local authorities to participate in the decisions that affect their lives and their territories (Torres et al., 2015).

Table 8. Colombian Government Pro-coal discourses and how NGOs and academics demonstrate the contradictions in such discourses

Colombian Government	NGOs and academics responses
Coal mining generates great revenues (taxes and royalties) for the Colombian State.	Coal mining is NOT generating great taxes neither royalties for the Colombian State (Torres et al., 2015). Rudas, (2014) investigated the model of royalties within the mining sector, delving into the economic model that articulates coal extraction. The analysis compares the fiscal resources generated by mining companies in Cesar and La Guajira with those generated by the Colombian State owned petroleum company Ecopetrol. The studies revealed that Ecopetrol pays 13 times more taxes than the Drummond and Cerrejón companies together, and Ecopetrol also pays 8 times more royalties compared to those coal mining companies.
Coal mining pays the cost of foreseeable environmental and social impact	The coal mining costs of production DO NOT internalize the true impact produced by coal extraction (Torres et al., 2015). This means that the value of the socio-environmental damages are not compensated by the royalties since they represent only a 10% of the coal market price. Cardoso (2015) estimated that the economic value of socio-environmental damages is almost the triple of the market price of a ton of coal.
Mining is not detrimental to other economic activities such as agriculture	In Cesar and La Guajira, coal mining hasn't been able to co-exist with local or rural economies such as agriculture or fishery; Mining activity is associated with the dismantling of the agriculture sector since both compete for land and water resources (Torres et al., 2015).
Poverty and other community issues are being alleviated with the economic growth that the coal mining generates.	The figures of economic growth and foreign investment do NOT reflect poverty alleviation in the territories where it operates (Torres et al., 2015). Foreign investment has shown a rising trend; in the 90´s ranged from 2 and 3 billion dollars a year, increasing to more than 10 billion dollars in 2005 and topping more than 16 billion dollars in 2012 (Rudas and Espitia 2013). This rise has a direct effect in the economic growth of Colombia. However, 76% of the municipalities where coal mining operates have their basic needs unsatisfied.

Source: Adapted from (Torres et al., 2015)

PAX (2014), a Dutch NGO, published a significant and far-reaching report called "The Dark Side of Coal" which connects the human rights violations in the mining areas in Cesar with the consumption of coal in the Netherlands. They reported that in the period between 1996 to 2006 the mining companies Drummond and Prodeco had provided financial and logistical support to the paramilitaries in the Colombian Caribbean region. This report is based on testimonies from former paramilitary commanders, contractors, and former employees. The support of Drummond and Prodeco to the paramilitaries

consisted not only of monetary payments but also the exchange of information and coordination activities. According to the report, mining companies take advantage of such cooperation until present day, because paramilitaries have displaced tens of thousands of inhabitants from areas granted to Drummond and Prodeco for coal mining. PAX (2014) estimated that there were 2,600 victims of selective killings, 500 victims of massacres, and 240 victims of enforced disappearances, attributed to the paramilitaries in the Colombia Caribbean region. The impact of PAX report and the actions taken in the Netherlands to acknowledge and compensate the coal victims will be discussed in Section 5.3.

4.2 Coal transport

Mining companies transport extracted coal by train and trucks. The distance traveled by the train from Cesar to the port is 240 km, and from Cerrejón to the port is 150 km. The trains operate every 20 minutes, during 24 hours a day. In La Guajira, the railway line is entirely owned by Cerrejón; in Cesar, since 1999 it has been managed by Fenoco, a Colombian company controlled by the multinational mining companies, Glencore (40%), Drummond (40%), with the remaining being divided among the other mining companies.[48] These railways do not have clear specifications regarding prevention and security measures, resulting in frequent accidents. Between 2008 and 2011 there have been 25 deaths and 280 injuries reported in the Fenoco railway (Cardoso, 2015a).

The coal mining companies also own the ports, with. over 90% of Colombian coal bieing exported from three privately owned ports: Puerto Bolivar owned by Cerrejón located in La Guajira; Puerto Nuevo owned by Prodeco and Puerto Drummond by Drummond, both in Ciénaga, Magdalena. Additionally, the coal loading has been controversial due to the coal dust dispersions that affects the tourism in Santa Marta beaches and the loading accidents that spill coal into the sea (Hansen-Bundy, 2013).

4.3 Shipping - Sea passage logistics

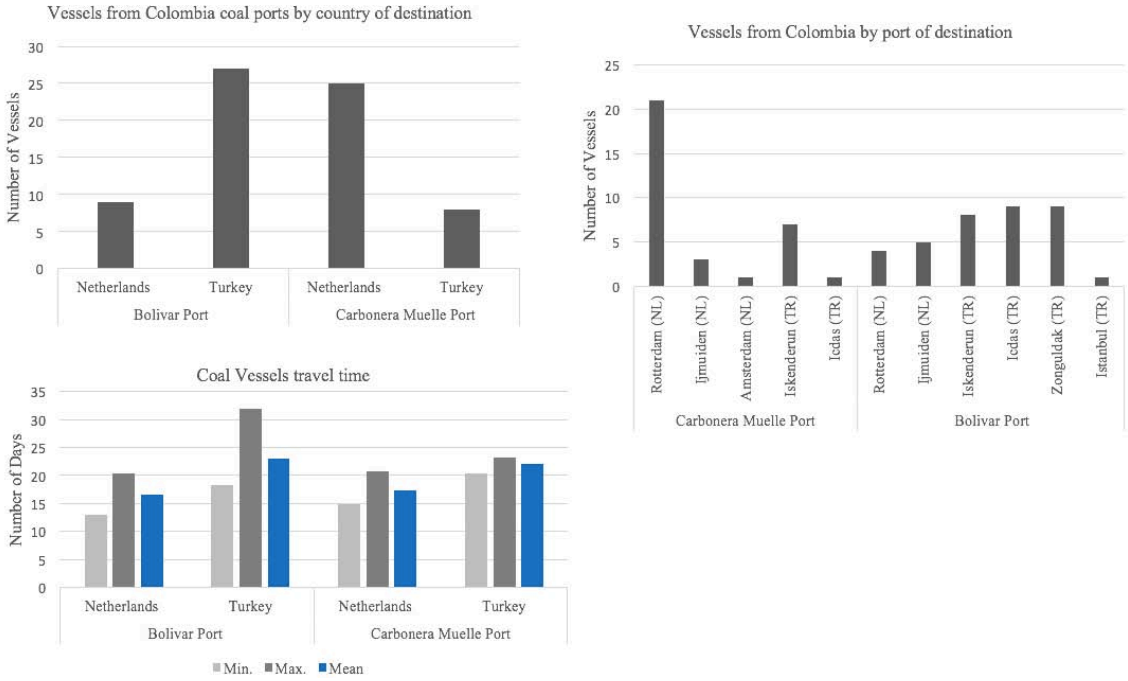
Unlike other coal mining companies, Cerrejón and Drummond themselves arrange the shipping and offer port-to-port delivery to their clients. The multinational companies that own Cerrejón, also own the Marketer CMC that was established in January 2003 as the

[48] http://www.fenoco.com.co/

exclusive marketer of Cerrejón coal. CMC coordinate both the sale and coal delivery[49]. Drummond and ITOCHU Corporation (Japan-based) work together in marketing coal internationally. Since 2011, Drummond agreed to enter into a partnership with ITOCHU, where Drummond owns 80% and ITOCHU owns 20% of the new entity, Drummond International LLC.[50] Both, Cerrejón and Drummond, use coal vessels with capacity that range from 160,00 to 185,000 t.

To explore how to track coal from mines in Colombia to CFPPs in the Netherlands and Turkey, the vessels leaving from Puerto Bolivar and Carbonera Muelle (includes Drummond port and Prodeco port) to these countries were monitored during the months of February to August 2016[51]. Figure 17 shows the number of vessels by the port of origin, the principal ports of destination and the time traveled.

Figure 17. Coal Vessels from Bolivar Port (Cerrejón)) and Carbonera Muelle port (Drummond and Prodeco) to Netherlands and Turkey (February-August 2016)



Source: Marine Traffic www.marinetraffic.com

[49] http://www.cmc-coal.ie/index.html
[50] http://www.drummondco.com/drummond-company-enters-into-partnership-with-itochu-corporation-in-colombia-2/
[51] I use https://www.marinetraffic.com/

5. The Netherlands: The first destination of Colombian coal

The Netherlands is the most important hub for coal import from different continents, as it plays a key role in supplying coal to north-western Europe (Wilde-Ramsing & Steinweg, 2012). Moreover, the Netherlands is important as the prime destination for Colombian coal in Europe (MFTDC-Netherlands and MME-Colombia, 2015). Every year, approximately 50 Mt of coal flow into the Netherlands, destined either for combustion in CFPPs in this country or for re-export to other European countries for electricity generation (See Figure 16D). In 2015, the EU imported 195 Mt of hard coal, compared to 220 Mt in 2014. The leading countries exporting to EU are Russia (30.4%), Colombia (23.7%) and USA (17.4%) (Eurostat, 2016). These statistics are different from those in 2012, when the main countries of origin for coal coming into the Netherlands were Colombia (47%), Russia (28%), USA (19%) and South-Africa (4%) (Nuon-Vatenfall, 2013). It is important to note, that although the proportion of coal imports coming from Colombia is decreasing, Netherland's overall coal imports and coal use are increasing (See Figure 16C&D).

5.1 Ports of destination (coal offloading)

Rotterdam is the largest coal harbor of Europe, importing more than 30 Mt annually. Amsterdam is the second biggest, with more than 18 Mt (Wilde-Ramsing & Steinweg, 2012). Amsterdam port is also the largest petrol and gas storage port in the world (Fossielvrij Nederland, 2015). In addition, there is an accelerated expansion of the Ijmuiden port, which is primarily intended to access increasingly larger vessels with coal and oil (Fossielvrij Nederland, 2015). In these three ports, the stevedores are the ones responsible for loading and offloading the vessels, as well as transporting the coal to CFPPs and other end users. The stevedores are also responsible for the long-term and short-term storage of coal reserves, and the blending of coal from different sources (Wilde-Ramsing & Steinweg, 2012). The blending of coal is carried out to optimize and control the physical-chemical characteristics of the coal before using it in CFPPs. Colombia coal is very suitable for this blend due to its low ash and low sulfur content, which helps fulfill the environmental standards with a high calorific value to meet stringent emissions criteria (Bettercoal, 2016). In 2015, 36% of the coal imported by Netherlands was used in CFPPs in this country, while the remaining 64% was re-exported

(IEA, 2016). Germany is the largest final destination, with coal being sent to the country by inland barges and railways (Fossielvrij Nederland, 2015).

5.2 CFPPs closing and the new projects

There are seven CFPPs in operation in the Netherlands (see Figure 14B), with some of the old CFPPs closing as part of the Dutch energy agreement (SER, 2013). The new CFPPs are more efficient than the old ones, but also have a higher power capacity (Table 9). The Dutch government is approving the construction of new CFPPs with the ambitious goal that requires these CFPPs to be CCS ready in order to fulfill the Dutch and international climate agreements; even the city and the port of Rotterdam base their "Rotterdam Climate Initiative" on CCS (EER, 2015). However, there are a number of old CFPPs that are not being considered for closing in the Dutch energy agreement, such as the Noun/Vattenfall CFPP in the port of Amsterdam, which was built in 1995 (Fossielvrij Nederland, 2015). Greenpeace NL (2015) criticizes the energy companies' demands for compensation due to the closing of CFPPs, arguing that the claims to compensation are not justified as the current economic value of the CFPPs is significantly lower than the investment costs. These demands for compensation affect the government policy for reducing CO_2 emissions.

Table 9. Energy companies, CFPPs closing and the new ones

Energy company	Parent company	CFPPs for closing	Year Build (closing year)	Power (MW)	New CFPPs	Year Build	Power (MW)	Extra power by energy company (MW)
EPZ	Delta N.V. (Netherlands)	Borssele	1988 (closed end 2015)	406				
Essent	RWE (Germany)	Amercentrale ketel 8	1981 (closed early 2016)	645	Amercentrale ketel 9	1994	600	1,555
					Eemshaven	2015	1,600	
Electrabel	Engie (formerly GDF Suez) (France)	Nijmegan	1985 (closed early 2016)	570	Maavlakte	2015	800	230
Uniper	E.ON (Germany)	Maasvlakte 1	1988 (from 2017)	500	Maasvlakte 3	2015	1,070	70
		Maasvlakte 2	1989 (from 2017)	500				
NUON	Vattenfall (Sweden)	Hemweg 8	1995	630				
Total				3251			4070	1,855

Source: Greenpeace NL (2015)

The high point of the anti-CFPPs action was the climate court case in 2015, in which the NGO Urgenda and nine hundred co-plaintiffs were victorious (Urgenda, 2015). The

verdict ordered the Netherlands to reduce CO_2 emissions by a minimum of 25% (compared to 1990) by 2020, while current ambitions are hovering at 16% (Government of the Netherlands, 2015a). This is the first time that a judge has legally required a State to take precautions against climate change. One year after the verdict, activists occupied CFPPs in Amsterdam and Groningen with a long banner that read: "If you do not shut it down, we will!". This protest was part of a nationwide day of action on the first anniversary of the climate-Urgenda case (DVHN, 2016).

5.3 Colombian coal debate

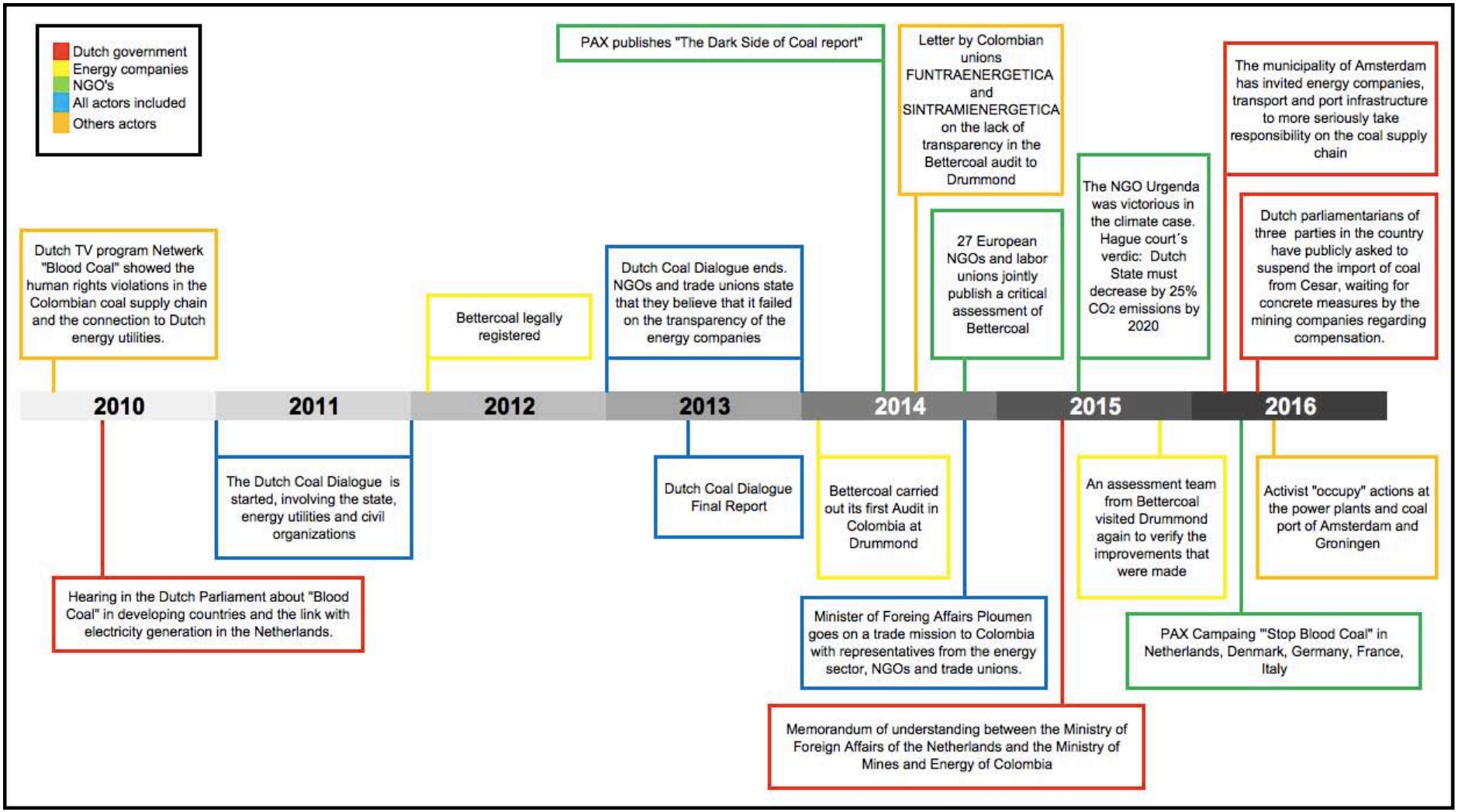
The import of Colombian coal into Netherlands is controversial and it has been in the public arena since 2010, when a TV program (Blood Coal) documented the human rights violations at the coal mining area in Cesar, Colombia (See Figure 18). Different Dutch NGOs and civil organization collaborate together in the Colombia Platform (PAX, Cordaid, CNV, FNV- Dutch Federation Union, PBI - Peace Brigades International, Action Aid, among others). These groups have pointed out the negative environmental and social impact of coal production and the human rights violations that this entails[52]. In 2011, they initiated a multi-stakeholder Dutch Coal Dialogue (governments, coal buyers, coal suppliers, industry associations, NGOs and others) to better understand what responsible mining should look like and how the various players could work together to bring transparency to the coal supply chain (Dutch Coal Dialogue, 2013). The Centre for Research on Multinational Corporations (SOMO) has published two reports that found a chronic and acute lack of transparency in the coal supply chain, resulting from effective shielding of coal-importing power companies from a potential association with the adverse social and environmental conditions at the Colombian coal mines (Wilde-Ramsing & Rácz, 2014; Wilde-Ramsing & Steinweg, 2012).

Although the Dutch Coal Dialogue was a very promising initiative, it was only continued during three years, following which the energy companies stopped participating in the Dialogue.[53] While in existence, the Dutch Coal Dialogue designed a participative and transparent framework to carry out audits along the coal supply chain, however, the energy companies themselves started a parallel audit initiative called “Bettercoal” that

[52] Author interviews with some Dutch NGOs and civil organization (April-June 2016)
[53] Author interview with Pax researchers (June, 2016)

engages with stakeholders. Bettercoal does not have a genuine multi-stakeholder governance structure, as it allows only businesses involved in the coal industry to become regular members, with other organizations participating merely as associate members that do not posess voting rights (Harris et al., 2016). Bettercoal has its own audit process which includes completing a self-assessment questionnaire, making a visit to the site, and conducting re-assessment by Bettercoal approved assessors. Drummond was the first company to have completed the full audit process (Bettercoal, 2016). As many as 27 European NGOs and labor unions stated that the Bettercoal site-assessment of Drummond had breached basic requirements for a credible assessing procedure, due to conflicts of interest, lack of independence and the exclusion of mining-affected parties from the process (ASK et al., 2014).

Figure 18. "Blood coal" or "Better coal": the debate in the Netherlands



Source: Author based on interviews conducted in May-June 2016

Although initially the role of the government in the Dutch Coal Dialogue was the one of an observer, in 2014 it started to play a stronger role promoting corporate social responsibility (CSR) and transparency in the coal supply chain (Jansen & Veeneman, 2016). The government signed the voluntary agreement ("Steenkool convenant") with the energy companies to work on making improvements in the coal supply chain (MFTDC, 2014), an objective that was mainly carried out through Bettercoal.[54] In November 2014, the Minister of Foreign Affairs, Lilianne Ploumen, visited the coal mining area in Colombia with the representatives of the energy companies and NGOs, and in May 2015, Ploumen signed a Memorandum of Understanding with the Colombian Ministry of Mining and Energy (MFTDC-Netherlands and MME-Colombia, 2015).

PAX (2015a, 2015b) concluded that the last five years spent discussing ways to tackle 'blood coal' from Colombia have not led to any significant results, and they have therefore considered three possible actions: i) engaging in a dialogue between energy companies and the coal suppliers while continuing coal production and sales ii) temporarily suspending the coal import from coal mining companies until they have a clear reconcilation with the victims[55]; and iii) disengaging from the suppliers (i.e. stoping to buy coal from them). The first action has already been implemented during the last five years, and currently, PAX (2016) has started to promote the second action with the campaigns to "Stop Blood Coal" throughout Europe. They are working together with other European environmental organizations, such as Rural Youth, PowerShift in Germany, Re:Common in Italy and Greenpeace in Switzerland, among others.

6. Turkey: the second destination of Colombian coal

Turkey's carbon policy has led to increasing fossil fuel dependency as well as energy import dependency (Algedik, 2016). While between 1990 and 2014 Turkey almost doubled its total coal consumption, coal imports reached 30.2 Mt in 2014, which is six times the level reported in 1990 (5.5Mt). The determining factor in the increase of coal consumption is the presence of the CFPPs, which are responsible for 41.5 Mt of the 42.5 Mt increase between 1990-2014 (Algedik, 2016). In addition to burning coal in CFPPs, Turkey also imports coal for steel production and domestic heating (Platts, 2016b). In

[54] Author interview with a representative of the energy company Essent/RWE (June, 2016)
[55] For PAX reconciliation includes: truth, acknowledgment, reparation and guarantees of non-repetition.

2015, Turkey imported 34 Mt of coal, 33% of which came from Colombia (IEA, 2015; SIMCO, 2016) (See Figure 16 A, C&D).

The most critical effects of this coal consumption increase are the increases in air pollution and CO_2 emissions (Algedik, 2016). The contribution of coal in CO_2 emissions is nearly 33% in Turkey, and today this country has become one of the top 20 CO_2 emitters in the world (Turhan, 2015). A key underlying source of these problems is Turkey's 'growth at all costs' approach to development, prioritizing CFPPs as a means of achieving economic growth and energy security (Iskender-Aydın, 2016; Stefanova & Popov, 2013). Nevertheless, in 2016 the power generation market in Turkey appears to be oversupplied as a result of a slowdown in economic growth and past official forecasts that emphasized the need for new generating capacity. For example, in February 2016, the amount of electricity generated from lignite and natural gas-fired plants fell by 10% and 18%, respectively, compared to the same period in 2015 (Yenigün-Dilek & Schlissel, 2016). Additionally, more than 70% of gas imported to Turkey comes from Russia and Iran, and the growing concern of whether these are reliable sources or, on the contrary, whether these sources could signal dependency on regional and global political conflict, may favor imported coal from more distant locations, such as Colombia (Yenigün-Dilek & Schlissel, 2016).

6.1 Ports of Destination in Turkey

The Turkish energy companies Eren, İçdaş, Isken, Diler and Izdemir import coal from Colombia, each company having its own port next to their CFPPs.[56] Almost all the CFPPs that use imported coal are located on costal sites to facilitate coal imports, as well as to use sea water for refrigeration in the power generation process (See Figure 14C). The coal vessels from Bolivar port and Carbonera Muelle arrive first to the main ports such as Zonguldak, İçdaş, Istanbul, Iskenderum and then they offload the coal in the respective energy company ports[57].

[56] Author interview with energy companies representatives (November, 2015)
[57] Monitoring of vessels through https://www.marinetraffic.com/

6.2 The boom of new CFPPs

Turkey is ranked fourth in the world, after China, India, and Russia, in the construction of new CFPPs (Acar, et al., 2015). In 2016, 59 plants are in operation, with an installed power of 16 GW. A total of 37 plants are licensed, however, none of their units are in operation. These plants have either obtained a preliminary license, or their preliminary license application is under assessment, with 14 of these candidate plants being planned to burn domestic coal, while the remaining 23 plants will use imported coal. The total power of all these candidate plants will reach 29.4 GW (Algedik, 2016). Overall, this means that Turkey will add an installed power of 4 GW to burn its own coal and an installed power of 25 GW to burn the world's coal as a result of its high-carbon policies (Algedik, 2016).

The external costs caused by CFPPs regarding harm to human health and the environment are not included in the price of electricity. The Health and Environment Alliance-HEAL (2014) estimated the economic costs of the health impacts (respiratory and cardiovascular conditions) from coal combustion in Europe at up to €42.8 billion per year. Adding emissions from CFPPs in Croatia, Serbia and Turkey, the figures for mortality increase to 23,300 premature deaths, or 250,600 life years lost, while the total costs are up to €54.7 billion annually. The countries with the highest share in this estimation are the Netherlands (€8.2 billion), followed by Turkey (€6.7 billion).

Anti-coal movements are rising across Turkey, a phenomenon that Arsel et al. (2015) have referred to as "environmentalism of the malcontent", since it reflects both the contestation to the political repression in the country and the new CFPPs conflicts. The main concern is air pollution that threatens the health and livelihood of the locals. In November 2015, when Turkey held the 10th edition of the G20 leaders' meeting, a big protest took place, with the protesters calling out to the G20 countries for a future without CFPPs (YUVA Association, 2015) This shows that these local resistances not only network nationally but also have a global scale. The local struggles are not limited to concerns about pollution and public health, as the anti-coal movements aim to send a global message and connect their struggles for climate justice (Chapter 3).

The entire Turkish health community, led by the Turkish Medical Association and HEAL, has developed a leading role in helping the local communities in their struggle. They have brought together evidence that demonstrates the harmful effects of coal power generation on health and summarizes the current state of health and the environment in their territory. HEAL (2016) also provides several suggestions on how to effectively communicate health threats, combined with the related evidence, to different audiences. They provide the communities with tools that are based on successful activities of various Turkish and international health groups, which can be used by the locals in their local actions (such as court cases, EIA meetings, street protests and media).

6.3 Domestic coal or imported coal - The debate in Turkey

The Turkish amendment to the electricity law in a 2016 post-coup environment has been controversial due to the subsidies and exemptions from environmental regulations that have been granted for "strategic investments", especially domestic lignite power plants (The Guardian, 6 September 2016). While in the last five years the Turkish government has encouraged CFPPs to burn imported coal as a means of diversifying the power sector away from imported gas, currently, the new import duty on coal shifted the government's aim towards stopping the construction of new plants that burn imported coal (O'Bryne, 2016). Given the low global prices for hard coal, investors are showing little interest in using domestic coal for power generation (O'Bryne, 2016). With the CFPPs being developed at coastal sites that allow easy access to the imported coal combined with the fact that Turkey's own coal reserves are found far inland, the possible changes due to this amendment over any pre-license projects readjusted to domestic coal are slim (O'Bryne, 2016) (see Table 10).

Meanwhile, campaigners against the new amendment say that this could show Turkey's extraordinary generosity for the coal sector and other large scale energy projects at the expenses of the environment (The Guardian, 6 September 2016). They argue that it is completely contradictory to the transition to a low-carbon economy and goes against the energy transformation currently occurring in the EU (Gündüzyeli, 2016). Additionally, the amendment would create excess generating capacity, which would have to be paid for by consumers and businesses, regardless of whether or not that capacity is needed (Gündüzyeli, 2016). Yenigun-Dilek and Schlissel (2016) estimates that lignite subsidies

schemes would cost at least $1.1 billion and perhaps as much as $2 billion annually, which would increase electricity prices by 19% to 29%.

Table 10. Domestic coal vs. Imported coal

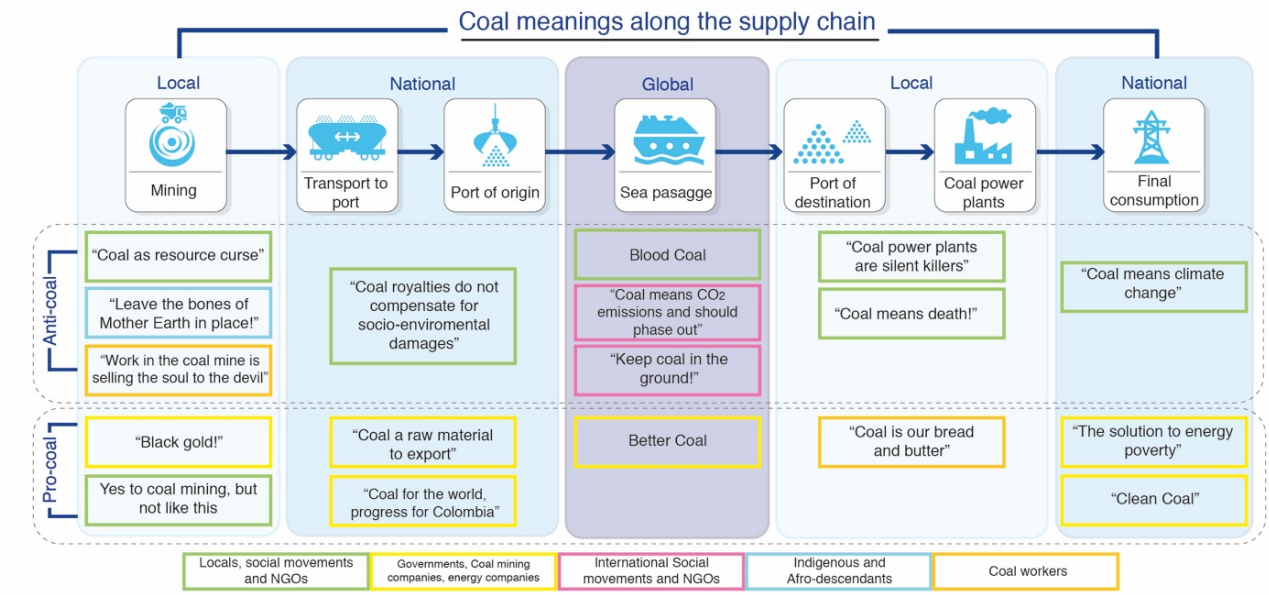
	Domestic coal	Imported coal
Economic measures (Subsidies and import duties)	Turkish state has set the price of electricity generated from local coal to about 5 Euro cents per kWh and committed to purchase 6 billion kWh of electricity from local CFPPs, until the end of 2016 (Gündüzyeli, 2016). The domestic lignite cost of technology required to extract and increase its efficiency is quite high, the new subsidies scheme was designed to increase its competitiveness against imported coal (Gündüzyeli, 2016)	Turkish state has imposed an import duty of US$15/t on coal imported for use for power generation. The duty is being imposed to reduce the negative effects of imports on the Turkish economy. those exempt from the new duty are EU countries, members of the European Free Trade Association, Israel, the west Bank and Gaza, Macedonia, Bosnia Herzegovina, Morocco, Tunisia, Egypt, Georgia, Albania, Jordan, Chile, Serbia, Montenegro, Kosovo, South Korea, Mauritius and Malaysia. (Platts, 2016b).
Quality	Lignite has a lower energy content than hard coal, perhaps twice as much lignite needs to be burned in order to generate the same amount of energy (HEAL, 2014)	Colombia mainly exports anthracite, with the highest net calorific value (IEA, 2015e) Colombian coal has lower Sulphur emissions and volatile matter (Morales & Carmona, 2007).
Air pollution Control	A lignite plant with the same electrical power output as a hard coal fired plant will have more hazardous air pollution emissions, correlated also to the lower efficiency of the plant. These plants also have to meet lower emission standards than hard coal plants, then if new lignite plants were built they would be an even larger source of health damage than hard coal plants (HEAL, 2014)	In 2014 Turkish environmental authority increased the limit on the volatile content of imported coal from 40% to 43% air dried basis. Cerrejón was apparently the only Colombian producer that can ship coal that satisfies all of Turkey's imported thermal coal quality restrictions. But now Drummond and Prodeco are also exporting coal to Turkey (Platts, 2014)

Source: Author

7. Valuation languages in the coal chain

Following the coal chain along these three countries, each stage is perceived differently by each actor engaged along the coal chain. In fact, actors have their own coal "meanings", which depend on the stage of the coal chain and their involvement in it. Figure 19 shows the contradictions of these meanings along the coal chain, with some of the meanings revealing if the actor supports coal or is against coal, which makes it very difficult to reconcile those meanings in one single valuation system.

Figure 19. Coal discourses or meaning along the coal chain



Source: Author

The multiple valuation languages are manifested in the ecological distribution conflicts, which are very particular to each country, given the economic and political context in which the different stages of coal chain are embedded. Some actors have some sense of the links between coal chain stages that come just before and after their own stage. For example, the actors in the Netherlands are very concerned about the environmental impacts and human rights violation at the coal mines as well as the consumption of coal in Europe. Nonetheless, in Colombia the coal debate is focused on the socio-environmental liabilities at the local and national level and only some Colombian NGOs link these concerns to climate change and CO_2 emissions from exported coal. While in Turkey, the anti-coal movements link their struggles with the climate justice movements regardless the origin of the imported coal.

Table 11 shows the analysis of the actors' valuation languages deployed in each country according to the frequency and relevance of the categories presented in Avci et al. (2010). As part of this research, six more value categories of the coal chain were found. First, for the environmental damage and pollution, actors express their worries based on coal impacts which include air, water and soil pollution and damages on the ecosystems. Second, for compensation and reparation, actors prioritize that the coal companies pay for the damages and compensate the victims. Third, the global claims “Stop Coal” and

"Keep coal in the ground"[58] are found in some local claims. Fourth are the sacred and spiritual values which represent the cosmogony of the Indigenous and Afro-Colombian descendants. Fifth are the human rights violations, which has been described by PAX (2014) and the "Blood Coal" campaign. Sixth, for transparency and accountability, actors in the Netherlands use these languages to express the importance of the energy companies' responsibility and the necessity to inspect whether human rights are respected.

Table 11. Valuation Languages deployed along the coal supply chain (from Colombia to the Netherlands and Turkey)

Valuation Language	Colombia	Netherlands	Turkey	Actors
Community life and livelihood	+++++	+	+++	Locals, social movements and NGOs
Unequal distribution of costs and benefits	+++	++	++	
Identity and territory rights	+++++	+	++	
Health impacts and risks	+++	+	+++++	
Appreciation of nature - Climate Change	+	++++	+++	
Critics to the concept of development	++	+	++	
Local participation in decision making process	++	+	++	
National economic development	+++	++	+++++	Governments, Coal mining companies, energy companies
Sustainable development-ecological modernization	++	++++	+	
Local development	++	+	+	
Environmental damage and pollution	+++++	+++	+++++	Social movements and NGOs
Compensation and reparation	+++	++	+	
"Stop Coal" & "Keep coal in the ground"	+	+++	+++	
Sacred and spiritual values	+++	-	-	Indigenous and Afro-descendants
Human rights violation	++++	+++++	-	Dutch NGOs, Government and Energy companies
Transparency and accountability	+	+++++	+	

Five + are the most frequent valuation languages. Empty cells imply the valuation languages was no mentioned.
Red: relevance of the valuation languages according to its frequency.

In Colombia, the valuation language most relevant for most actors is Community life and livelihood. This is also related to other valuation languages such as health impacts and risks, environmental damages and pollution, identity resistance and sacred and spiritual values. It is not surprising that to date, the "Stop Coal" and "Keep Coal Claims" are not

[58] As proposed since 1997 by Ogonization and Yasunization movements (L Temper et al., 2013) and more recently by the "Break free from fossil fuels" campaign https://breakfree2016.org/ and by Klein (2014) with her notion of "Blockadia"

frequent and relevant for the locals in the Colombian Caribbean region, however, this discussion has been taking place in other regions of Colombia (concerning coal from the paramos)[59]. Interestingly, in Cesar and La Guajira there are conflicts between the need for employment at the coal mine and land for sustenance, which is represented by the expression "Yes to coal mining, but like this" (See more quotations in Appendix 1&2).

The social actors included in Table 11 are certainly not the only ones deploying their own valuation languages in the environmental conflicts under discussion, and at different points of the coal chain. Other potential social actors could be feminist organizations, academic or professional groups, or labor unions, such as Sintraminergética (as discussed in Chapter 2), which have their own opinions and vocabularies. For simplicity, no attempt is made to provide a list of all relevant social actors.

In the Netherlands, due to the far-reaching (PAX, 2014) and "Blood Coal" campaigns, the valuation language most relevant for most actors is the human rights violation, which is also related to transparency and accountability. For example, after analyzing Minister Ploumen's speeches, it was found that the main focus areas were transparency, the responsibility of energy companies, dialogues between actors, and sustainable mining industry (Government of the Netherlands, 2013, 2014a, 2014b, 2014c, 2015b).

In Turkey, the anti-coal movement that is taking place across the country, and its alliances with the Turkish health community, have shown the relevance of the CFPPs health impacts and the risks expressed in terms of community life and livelihood. They relate those concerns with the environmental impacts and pollution generated by CFPPs as well as with the global concern of climate change. In addition, during the protests, these claims are based on the "Stop Coal" global claim and the 350.org campaign.

8. Discussion and conclusions

The coal chain involves a number of different coal trade players (multinational coal mining companies, coal traders, logistics companies and energy companies) and many different actors (local citizens and communities, Indigenous peoples, Afro-Colombian descendants, social movements, national and international NGOs, energy consumers, and

[59] See the case of the Páramo el Almorzadero https://ejatlas.org/conflict/paramo-el-almorzadero-colombia

governments). The multiple layers of the coal chain (market, physical, socio-environmental liabilities and their economic valuation, and the actors' plurality of valuation languages) show the various dimensions of the ecological distribution conflicts along the chain of ecologically unequal exchanges (Hornborg, 1998) between the countries involved. Furthermore, the valuation languages deployed by the actors and their own coal "meanings" reveal pronounced differences, which are at the roots of the conflicts.

Therefore, the question is, how do we reconcile multiple valuation languages? The fact that they are multiple and are immersed in different layers of the coal chain makes this a challenging task. According to Centemeri (2013), the most frequent scenario is that of conflicting valuations reconciled in an arrangement or compromise held in public. In this setting the various actors can express their own valuation languages, while having the opportunity to reconcile with the other valuation languages. The comparative analysis between the coal chains of Colombia-Netherlands and Colombia-Turkey shows large differences regarding actions to reconcile different valuation languages, which at the end are environmental justice actions in the coal chain. In the Netherlands, due to the presence of international NGOs that are working together with the Colombia Platform, different initiatives for transparency and accountability along the coal chain have been pursued. Although the Dutch Coal Dialogue was a very promising initiative to reconcile the multiple valuation languages, overall it failed. This failure shows that not all the actors involved in the coal chain are willing to negotiate their valuation languages. One could argue that the language of sacredness or territorial rights cannot be reconciled with the language of economic growth or economic compensation, if not by force.

In Colombia and Turkey, which are both developing countries, it was seen that the discourse of the Colombian government to continue extracting coal as a means of generating great revenues (taxes and royalties) for the national development is very similar to the discourse of the Turkish government to consume coal as a means of achieving economic growth and energy security. Both discourses have similar consequences: lack of local participation in the decision-making process, repression of the social movements, weak environmental regulations, coal mining and energy companies ignoring the socio-environmental liabilities over the local communities. As a response, social movements refuse to justify coal mining and coal burning in the name of

development when this entails the drying up of water sources, polluting the soil and air, and emitting greenhouse gasses. They claim that there cannot be development without social and environmental justice (Torres et al., 2015).

Regarding climate justice, the climate movements in Europe could potentially find ways to phase out coal consumption within the next 10 to 20 years. However, this solution is not necessarily beneficial for Colombia, as emerging economies such as Turkey or India are increasing Colombian coal imports. Eventually, the global climate movement may try a political deal with countries like Colombia to keep the coal under the ground and stop mining.

Besides this, the peace process in Colombia has been seen by international NGOs as a unique opportunity to pursue corporate accountability in the transitional justice process. This is part of the post-conflict transformation where European NGOs, such as PAX, could demand the European energy companies to take an active leadership role in peacebuilding in Colombia, while the coal mining companies (Drummond and Prodeco) should dialogue with the victims and reach a compensation agreement.

The main contribution of this study is the examination of the different valuation languages according to the social actors' position in the coal chain and their relationship with the territory where coal is extracted and burned. While this study shows the political and ecological relevance of these multiple valuation languages in the ecological distribution conflicts along the coal chain, it does not closely examine how these valuation languages are constructed, nor does it evaluate the role of power in such constructions. Future research could potentially assess the ways in which power shapes the valuation languages and the conflicts along the coal chain.

Appendix 1. Elicitation of Valuation Languages Quotations

Valuation Language	Actors	Quotations
Community life and livelihood	Locals, social movements and NGOs	"With the arrival of coal mining the local communities underwent a drastic change; these companies were so irresponsable that they never thought about the future of these communities, they started to bring machinery and never showed interest in training the locals". Everything changed, the rivers dried up; we don´t have any land to farm, neither water to survive. There´s no longer fishery or livestock farming in the area. The hunting areas are now non-existent, because since they started the opencast mining operations, then obviously the animals were chased away and don´t have wild zones where they can live." Local (March 2014) - Colombia
Unequal distribution of costs and benefits		"Coal mining should not be like that, because they benefit from this resource that our land provides, but this coal does not benefit the La Guajira community as such; only the multinationals are profiting. It is not fair that they are extracting our resources and they do not leave anything to the people, only problems and the hole. So we cannot say that this is responsible mining. Today Cerrejón has taken over our water resources, which for us have a spiritual and cultural value." Leader of Fuerza de Mujeres group (June, 2016) - Colombia.
Identity and territory rights		"The indigenous peoples from the Sierra Nevada de Santa Marta" and the Wayuu people are spiritually resisting and demanding respect for their sacred territories. On the other hand, we articulate the resistance with the communities, mobilizing to demand respect for our rights. These are the two types of resistance: the spiritual resistance and the social protest." Leader of Fuerza de Mujeres group (June, 2016) - Colombia.
Health impacts and risks		"Using the argument of health in the discussions against coal, you know, there are scientific studies. There is a lot of evidence out there. But the local people are not necessarily medical experts. So there has to be a linkage between scientific evidence and the local actions. This is why we are trying to develop tool kits which can be used by the locals, so that they can use health data in their actions. They can use it in court cases. They can use it to advocate for compensation from the government". Member of HEAL-Health and Environmental Alliance (November, 2015) - Turkey.
Appreciation of nature - Climate Change		"We are people who, just like you, worry about the climate crisis. A crisis which no longer lies somewhere in the future. It is our own future that is at stake. The causes of the climate crisis are complex and multifaceted. Sometimes we feel powerless, and that feeling of helplessness prevents many people from coming into action. We want to break that blockade with a campaign that will contribute and impact. We want the actions to actually stop CO2 emissions". Grassroots group - Wij Stoppen Steenkool - We Stop Coal – Netherlands (June,2016).
Critics to the concept of development		"Development is now a days a very controversial idea when it comes about representing hope, wellbeing, improvement; to back up decisions of the Government and the State, and ultimately, prevalent decisions. Development is invoked to conduct whole countries and standardise their world vision; to transform, and if necessary, to lay waste whole territories, cultures, life projects, and justify it all. Inevitably some fundamental questions arise : could it be a failed attempt of development which leads to all this? Or the promise of a development which is yet to be fulfilled? Or is it perhaps mythified?". Tierra Digna NGO (Torres et al., 2015-7) - Colombia.
Local participation in decision making process		"Locals need to get help from people with sufficient technical skills and carry out research on the projects beforehand. They need to inform the local communities before it comes to the public involvement meetings. The public opinion should be built to pressure in the very early stages. Because when it comes to the public involvement meetings stage, it's already too late, the project has more or less become unstoppable". Greenpeace lawyer activist (November, 2015) - Turkey.
National economic development	Governments, Coal mining companies, energy companies	"We are a developing country and the gas and energy demand is increasing. That means high investment needs, for the energy sector… Security of energy supply is a high priority for us. Of course we don't want the environment to be polluted, but we have also to take into consideration the concerns regarding the energy supply, since we are a developing country" Head of Department, Ministry of Energy and Natural Resources (November, 2015) - Turkey.
Sustainable development-ecological modernization		'Step by step, we hope that these efforts will result in a sustainable mining sector…. This would be to everyone's benefit: the mining companies, the local communities and, ultimately, the Dutch consumers. Because they will be able to have complete confidence in the origin of the coal that went into generating their electricity.' Ploumen Ministry of Foreign Affairs (November,2014) - Netherlands. (Government of the Netherlands, 2014c)
Local development		"The Colombian government is fully committed to having a strong and responsible mining sector that benefits the country as a whole and helps local communities to develop. International cooperation is vital in our efforts to achieve this purpose. This Memorandum of understanding with the Netherlands is one of the tools we want to use to strengthen our commitment for better practices in the Colombian mining sector.' Maria Isabel Ulloa, Vice-Minister of Mining (May, 2015) - Colombia. (Government of the Netherlands, 2015b)
Environmental damage and pollution	Social movements and NGOs	"The first complaint in our movement is the air pollution because we breath the dirty air, a lot of bad gases in the air in the atmosphere. And the second one is that the power plants do too much harm to the sea and the soil and the trees, and to the whole nature. So we believe that these power plants will deteriorate our health, the health of people." TEMA Activist (November, 2015) -Turkey
Compensation and reparation		"A small part of the victims in Cesar has received reparation from the government, but none of them has received reparation from the mining companies. There is something important to point out here; we need to clearly distinguish between reparation from the Colombian Government, and corporate social responsibility reparation from mining companies, which somehow have been involved in paramilitary violence". Marianne Moore, spokesperson of the Dutch NGO, Pax (November, 2014) - Netherlands.
"Stop Coal" & "Keep coal in the ground"		"Coal means death! Zonguldak, don´t be silent! Don't breath coal! We are searching for our future. We want to raise healthy children. Murderer Eren, get out of Zonguldak! We want a future without coal". Protest chanting (November,2015) - Turkey.
Sacred and spiritual	Indigenous and Afro-descendants	"The indigenous people from the Sierra Nevada de Santa Marta brought a writ for protection of rights to the Constitutional Court, in order to demand respect for the Bruno Stream as a sacred place" Leader of Fuerza de Mujeres group (June, 2016) - Colombia.
Human rights violation	Dutch NGOs, Government and Energy companies	"These are important factors why the mining companies could continue to grow and export coal from Cesar at competitive prices. European energy companies have been the foremost clients of Drummond and Prodeco. For instance, in the years 2011 through 2013 the energy companies imported an average of 58% of the coal from Cesar, thus indirectly profiting from the human rights violations and supplying millions of European households with blood coal-fueled electricity". PAX, (2015b) - Netherlands
Transparency and accountability		"One of the big issues is the transparency of the coal supply chain. Dutch energy companies should at least be clear about from whom they buy their coal; from Cerrejón, Drummond, whoever. They can´t just buy disregarding human and labor rights violation, or environmental implications". SOMO researcher (June,2016) - Netherlands.

Appendix 2. Elicitation of Valuation Languages quotations by country

Valuation Language	Actors	Quotations		
		Colombia	**Netherlands**	**Turkey**
Community life and livelihood	Locals, social movements and NGOs	"Con la minería de carbón, las comunidades sufrieron un cambio drástico, porque estas empresas fueron tan irresponsables que no miraron el futuro de las comunidades, comenzaron a traer maquinaria y nunca tuvieron el interés de capacitar a los locales. Todo cambió, los ríos se han secado; no tenemos ni tierra para cultivar ni agua para sobrevivir; la pesca y ganadería se acabó. Lo que era la zona de cacería ya no existe, porque a raíz de que ellos fueron explotando a cielo abierto pues lógico que los animales se van ahuyentando no tiene zonas silvestre donde ellos puedan vivir" local (March, 2014) -Colombia	"Research by Pax earlier this year found that the coal industry in this region has made agriculture impossible and caused lung disease among the population. Child prostitution and venereal diseases have increased exponentially since the advent of the mines" Dutch firms investigate coal miners' abuse claims - NL Times.pdf	"the locals who didn't come to EIA meetings of ZETES1 and -2 came [to the -3]. There was a higher participation, they explained their observations. "Our husbands, sons are still unemployed, you promised for the 1st and the 2nd…" I also remember notes about daily life. An old man said "I have an apple garden here. During years I collected cases full of apples. After your ZETES-1 and -2, my trees dry in bloom…" this might be a simple thing for us but it is important for him. Another woman said "this year we weren't able to dry our tarhana [sundried food made of yogurt, tomato and flour]", she couldn't lay it outdoors because ashes were falling. Another young girl said "My mom makes me clean 3 times a day … in summer we cannot sit on the balcony or in the garden…" TEMA activist (November (2015)
Unequal distribution of costs and benefits		"una minería sí, pero no así, porque es ellos se llevan todas las tajadas de este recurso que es nuestro, pero este carbón no se ve reflejada en la sociedad Guajira como tal, sino en las inversiones, capitales financieros poderosos. No es justo que una minera se lleve el 92% de los recursos y que no le dejen nada en absoluto al pueblo, te dejan el hueco, entonces no podemos hablar de que es una minería responsible" leader of the Fuerza de Mujeres group (June, 2016)- Colombia	"The imbalance between these social-environmental conflicts and the destruction in the region on one hand, and the company's profits for exporting 33,5 Mt of coal in 2013 alone to industrialized countries on the other hand, makes evident that there is a social and climate debt acquired with the communities in the region" Degrowth & the Climate Crisis – from a Climate Justice Perspective | Transnational Institute.pdf	"In the global system where inequalities are continually deepening the G20 countries are primarily responsible for the climate injustice. From Zonguldak whose soil, air, and water are being poisoned. We call out to the G20 countries and particularly to Turkey, the term president. Your subsidies for fossil fuels are killing us. Your support for fossil fuels for cheap energy makes Çatalağzı, Zonguldak, black sea, Turkey and the whole world an unlivable place. We as the people of Zonguldak demand future without coal power plant for a livable Zonguldak. We as the people of Zonguldak are watching the decisions you will be taking at the G20 summit. protest claiming (November, 2015)
Identity and territory rights		"Los pueblos indígenas wiwa de la Sierra Nevada de Santa Marta y el pueblo Wayuu están haciendo resistencia espiritual y exigiendo respeto por sus lugares sagrados. Por otro lado, nosotros articulamos la resistencia con las comunidades de movilizarnos para exigir que se respete nuestros derechos. Estos son los dos tipos de resistencia, la espiritual y las protestas sociales" leader of the Fuerza de Mujeres group (June, 2016)- Colombia		"For Greenpeace and the environmental NGOs was very hard to push forward social movements in Zonguldak, because Zonguldak is a coal city. We received a lot of negative reaction of the local. However, people started to experience how coal is bad; they experience the impacts because of the health impacts cancer, and respiratory diseases and also environmental impacts. Because in Zonguldak right now there are a lot of coal mines and people are still working there, even it is insecure job and their salary is lower. So, coal is not anymore kind of employment field for local people" Greenpeace lawyer and activist (November, 2015)
Health impacts and risks		"Aquí en la Jagua un grupo de mineros crearon una cooperativa de enfermos mineros cuando arrancaron habían 43 hoy en día tienen de 1400 afiliados que están enfermos por su actividad en la mina. A la comunidad los mismos médicos le dicen si quieren seguir viviendo se tiene que ir porque aquí se va a morir" habitante de la Jagua	"Soon there are going to be a complaint under OECD guidelines against Drummond, not for past things but thing on environment and health situation of workers" SOMO researcher (June, 2016) "En Drummond y en Cerrejón hay problemas en reconocer la responsabilidad de la salud de sus empleados" representative of FNV Trade Union Confederation.docx	"The people most affected by coal power plants are those that live within 50 km to beyond 100km. This air pollution could be the second cause of people died early. It doubles the number of people that died in car accidents. Studies show the correlation between the air pollution and Lung cancer. Also, it may increase the blood cancer. Many people complain asthma, and allergies and the children are the most vulnerable" Medical Doctor Member of the Turkish Medical Association (November, 2015)

Valuation Language	Actors	Colombia	Netherlands	Turkey
Appreciation of nature - Climate Change	Locals, social movements and NGOs	"Afirmamos que no puede existir desarrollo sin que se garantice una justicia que pase por lo social y trascienda a lo ambiental, entendiendo a la naturaleza no como un instrumento, sino como nuestro escenario vital…no es adecuado llamar desarrollo a aquello que quebranta la justicia socio-ambiental, por tanto nos sumamos a las voces preocupadas que, en distintas latitudes, reaccionan en torno al cambio climático" Tierra Digna NGO (Torres et al., 2015: 8)	"We are people who, just like you, worry about the climate crisis. A crisis which no longer lies somewhere in the future. It is our own future that is at stake. The causes of the climate crisis are complex and multifaceted. Sometimes we feel powerless, and that feeling of helplessness prevents many people from coming into action. We want to break that blockade with a campaign that will contribute and impact. We want the actions to actually stop CO2 emissions". Grassroots group - Wij Stoppen Steenkool - We Stop Coal (June,2016).	"Scientific researchers demonstrate that the climate change and air pollution are among of the most important public health problems of our era. In fact, the threats that climate change presents to human health have reached alarming proportions that they may now hinder the global advancement that has been made in the field of human development and health within the last fifty years. Thus, the fight against climate change is one of the most important and highest-priority challenges that must be addressed in order to improve the global health in our century" Temiz Hava Hakkı Platformu.pdf
Critics of the concept of development		El desarrollo es una idea hoy muy polémica. Es una voz empleada, con algo de intrepidez – por decir lo menos – para representar la esperanza, el bienestar, la mejoría; para sustentar decisiones de Gobierno y de Estado y, en últimas, decisiones prevalentes. El desarrollo se invoca para dirigir y uniformar naciones y visiones del mundo; para transformar, y si es preciso, ayermar territorios, culturas, proyectos de vida, y sustentar todo ello bajo la poderosa fuerza de la expresión "el bien común." Sin embargo, son múltiples las historias – historias de campo, historias de calle, historias cotidianas – las que controvierten su prospera versión, y sugieren en cambio grandes interrogantes. ¿Será acaso un desarrollo mal-logrado el que los suscita? ¿O un desarrollo prometido y nunca alcanzado? ¿Tal vez mitificado? Tierra Digna NGO (Torres et al., 2015: 8)	"Están trabajando el carbón desde la perspectiva desde la perspectiva del tratado Libre Comercio Unión Europea-Colombia. Acompañamos el proceso de negociación, luego de ratificación y de implementación del tratado y dentro de eso somos conscientes que es muy difícil, medir impactos directos del tratado y el argumento es que hemos manejado siempre ha sido, el modelo como tal que se implementa en los tratados de libre comercio y en particular entre la unión Europea y Colombia, viola los derechos humanos, económicos, culturales y ambientales. El modelo en sí mismo genera conflictos socio-ambientales, entonces ninguna cláusula, ningún aspecto que formalmente diga que va a mejorar los derechos humanos o que va a promover el desarrollo sostenible, en realidad lo va generar porque el modelo mismo está generando lo contrario" Interview with TNI researcher (May,2016)	"Ok, the country needs energy, but the produced amount is already enough for us. We got past it. First, [the energy] based on fossil fuels should finish; second, the State should prepare the infrastructure and increase the promotions regarding the renewable energy, third, there is such thing called the cumulative effect […] this is ignored" TEMA activist (November, 2015)
Local participation in decision making process		"Para el gobierno Santos, la consulta previa a comunidades étnicas, procedimiento que garantiza la participación y la autodeterminación y que está consignado en el Convenio 169 de la OIT, la Ley 121 de 1991 y la declaración de los derechos de los pueblos indígenas de la ONU, es uno de los mayores "obstáculos" para el país…Al respecto, el gobierno nacional, ante las dificultades para reformar las disposiciones actuales frente a la consulta previa y el consentimiento libre, previo e informado, Suscribió un convenio interadministrativo con el grupo de consulta previa del Ministerio del Interior para coordinar las consultas en los casos que los proyectos mineros lo requieran" Conflictos Mineros en América Latina Extracción, Saqueo y Agresión 2015 Censat	"The convenant does say like that, in the part about the stakeholder engagement: nothing about the two ways dialogue with communities and incorporate their prospective, it just the only thing that is there is about having once a year have a big meeting here in the Netherlands, discuss issues that the stakeholders may be taking on account by the companies, it is really the complete wrong idea of what the content and the standards about stakeholders engagement should be, there is nothing in there about the diligent to try identify, try to prevent the impacts in the supply chain that is about" Interview with SOMO researcher (June,2016)	"Locals need to get help from people with sufficient technical skills and carry out research on the projects beforehand. They need to inform the local communities before it comes to the public involvement meetings. The public opinion should be built to pressure in the very early stages. Because when it comes to the public involvement meetings stage, it's already too late, the project has more or less become unstoppable". Greenpeace lawyer activist (November, 2015)

Valuation Languages	**Actors**	**Colombia**	**Netherlands**	**Turkey**
National economic development	Governments, Coal mining companies, energy companies	“La minería constituye probablemente más de la mitad de las exportaciones en millones de dólares y ningún país del mundo va a suicidarse de decir NO, no vamos a vender eso… Eso sería un suicidio económico” Official Colombia Embassy in the Netherlands (May, 2016)	“The importance of the mining industry as a source of economic development for Colombia” Memorandum of Understanding	"We are a developing country and the gas and energy demand is increasing. That means high investment needs, for the energy sector… Security of energy supply is a high priority for us. Of course, we don’t want the environment to be polluted, but we have also to take into consideration the concerns regarding the energy supply, since we are a developing country” Head of Department, Ministry of Energy and Natural Resources (November, 2015)
Sustainable development-ecological modernization		El Cerrejón claims it is “known for its social and environmental programs” and that its four CSR foundations work “closely with the Colombian government and with national and international bodies to promote... sustainable, fair development for La Guajira and its people.”11 17_foei_corporate_capture_report_eng_mr.pdf	‘Step by step, we hope that these efforts will result in a sustainable mining sector…. This would be to everyone’s benefit: the mining companies, the local communities and, ultimately, the Dutch consumers. Because they will be able to have complete confidence in the origin of the coal that went into generating their electricity.’ Ploumen Ministry of Foreign Affairs (November,2014)	“The issues of efficiency and environmental problems in Zonguldak is due to the oldest plant it is from 1960. For the other coal plants, I can not understand why people say don’t import coal. If there is not a good quality coal to feed the boiler. You should support the import but also support minimizing the natural gas consumption. If you want to cut the import coal, you are going to be dependent importing natural gas. Also support the renewables, but that will take years to develop” Energy company worker (November, 2015)
Local development		“Su propósito es construir acuerdos sobre cómo la minería en Colombia puede contribuir al desarrollo sostenible e incluyente del país, orientado por el cuidado de su singularidad ecológica, étnica y cultural, la inclusión social, el desarrollo socioeconómico y la construcción de la paz, brindando debida consi- deración a los intereses tanto de las actuales como de las futuras generaciones. Pretende, por lo tanto, convenir una visión de la minería que apoye la construcción de una sociedad que promueva la creación de valor económico, social y ambiental, articulando al Estado, las comunidades, el sector privado y las organizaciones de la sociedad civil” GDIAM	“The Colombian government is fully committed to having a strong and responsible mining sector that benefits the country as a whole and helps local communities to develop. International cooperation is vital in our efforts to achieve this purpose. This Memorandum of understanding with the Netherlands is one of the tools we want to use to strengthen our commitment to better practices in the Colombian mining sector.’ Maria Isabel Ulloa, Vice-Minister of Mining (May, 2015)	“The construction of the plants has contributed to the local development: First of all, the employments. Second… They build football fields, playgrounds… They help to the schools, mosques… That place you see there was a cafeteria. … Now we turned into a meeting hall. They did this […] they make the showcase … they built one school” " Interview with the Director of the School next to Eren coal power plant (November,2015)
Environmental damage and pollution	Social movements and NGOs	“La megaminería de carbón genera contaminación del aire, los suelos, el agua, los ríos, arroyos y reservorios de agua (jagüeyes); despojo de tierra y cooptación de líderes sociales. Persisten los impactos en la salud como brotes en la piel, dificultades para respirar, el cáncer de seno y de cuello uterino. Se pierde la soberanía alimentaria y aumenta la corrupción. ”De las vivencias del pueblo Wayúu memorias del rio rancheria	“Impact of the coal mines. Failure to provide material information about social and environmental risks to stakeholders is a violation of the OECD Guidelines (Chapters III and VI)” memo SOMO	"The first complaint in our movement is the air pollution because we breath the dirty air, a lot of bad gasses in the air in the atmosphere. And the second one is that the power plants do too much harm to the sea and the soil and the trees, and to the whole nature. So we believe that these power plants will deteriorate our health, the health of people." TEMA Activist (November, 2015)
Compensation and reparation		“La acción popular es para reclamar los daños que le han causado tanto al municipio por el daño ambiental y a la población, hay gente que ha mostrado exámenes de su enfermedad. La acción popular es para reclamar los daños ambientales” Abagado representate de los locales en el Cesar (Marzo, 2014)	“A small part of the victims in Cesar has received reparation from the government, but none of them has received reparation from the mining companies. There is something important to point out here; we need to clearly distinguish between reparation from the Colombian Government, and corporate social responsibility reparation from mining companies, which somehow have been involved in paramilitary violence”. Marianne Moore, spokesperson of the Dutch NGO, Pax (November, 2014)	"Using the argument of health in the discussions against coal, you know, there are scientific studies. There is a lot of evidence out there. But the local people are not necessarily medical experts. So there has to be a linkage between scientific evidence and the local actions. This is why we are trying to develop tool kits which can be used by the locals, so that they can use health data in their actions. They can use it in court cases. They can use it to advocate for compensation from the government”. Member of HEAL-Health and Environmental Alliance (November, 2015)
Stop Coal & “Keep coal in the ground”		"Dejar los huesos de la tierra en su lugar" indígena de la Sierra Nevada de Santa Marta (2012)	“We don’t want to improve the coal conditions in this framework, we want them to stop using it” Greenpeace Netherland activist (May 2016)	"Coal means death! Zonguldak don´t be silent don’t breath coal. We are searching for our future. We want to raise healthy children. Murderer Eren get out of Zonguldak. We want a future without coal" protest claiming 15/11/2015

Valuation Languages	Actors	Colombia	Netherlands	Turkey
Sacred and spiritual values	Indigenous and Afro-descendants	"Los indígenas de la Sierra Nevada de Santa Marta pusieron un tutela en la Corte Constitucional para exigir el respeto del arroyo Bruno como lugar sagrado" leader of the Fuerza de Mujeres group (June, 2016)- Colombia	-	-
Human rights violation	International NGOs, Government and Energy companies	"De forma concreta, la minería de carbón a gran escala en Cesar y Magdalena vulnera los derechos fundamentales de sus habitantantes a la salud y al acceso efectivo al agua y a la tierra (y a los recursos que de estos dependen). Adicionalmente, estas comunidades viven en un estado de incertidumbre sobre su futuro dada la falta de transparencia por parte del Estado, respecto de la información existente sobre la calidad del medio ambiente, los recursos naturales que lo componen y las consecuencias que pueden generarse en sus vidas por la contaminación atmosférica, hídrica y paisajística" Tierra Digna NGO (Torres et al., 2015: 152)	"These are important factors why the mining companies could continue to grow and export coal from Cesar at competitive prices. European energy companies have been the foremost clients of Drummond and Prodeco. For instance, in the years 2011 through 2013 the energy companies imported an average of 58% of the coal from Cesar, thus indirectly profiting from the human rights violations and supplying millions of European households with blood coal-fueled electricity". PAX, (2015b)	-
Transparency and accountability			"One of the big issues is the transparency of the coal supply chain. Dutch energy companies should at least be clear about from whom they buy their coal; from Cerrejón, Drummond, whoever. They can´t just buy disregarding human and labor rights violation, or environmental implications" SOMO researcher (June,2016)	"Now we are going to do a good campaign for more transparency, as long they don't have real data for air pollution and also cancer and other diseases rates it is impossible to them make a scientific research, so for the first part will be like this and also there are ongoing legal processes, this platform will support these legal processes" Greenpeace lawyer-activist (November, 2015)

V. General Conclusions

Main conclusions

The social actors involved in extraction, transport, and burning of coal along the coal chain have diverse opinions regarding what should be done, and also different ways of expressing their grievances or objectives. While in Cesar, Colombia, local interviews did not reveal any concerns for the global movement on "unburnable fuels" ("leave oil in the soil, leave coal in the hole …"), in Turkey, international NGOs, such as the Network 350.org, are already present.

Energy geographies are changing, with the future of coal to be decided in the Global South, and new geographies of coal are being revealed through the emerging South-South relationships, connected by the coal chain. Thus, in the future, the emerging anti-coal mining movements in Colombia will connect their struggles to the global climate justice movements, a phenomenon that is already seen the anti-coal power plant movements taking place in Turkey. The actors along the coal chain have some sense of the links between the different stages of the chain that come just before and after their own. While social actors in the Netherlands are concerned about the human rights violations at the Colombian coal mines and are pursuing actions to improve the coal supply chain transparency, in the coal chain between Colombia and Turkey no international network that would link coal injustices in both countries was found. Therefore, there is a potential opportunity for connecting the claims and actions of the local anti-coal movements at both ends of the Colombia-Turkey coal chain as a coalition on global environmental climate justice. In Turkey, the anti-coal movements are already connecting their struggles with climate injustices, while in Colombia, the coal debate focuses on the local socio-environmental liabilities of coal mining.

To begin with, a localized and modest approach applied the "environmental liability framework" to the open-pit coal mining in Colombia. This was an improvement over the standard externalities framework, as it allows for an explicit incorporation of moral, legal and economic responsibilities. The identification of environmental liabilities allocates moral responsibility. Legal responsibility is needed for effective reparation, and the

economic valuation provides arguments for claiming compensation, as well as seeking remediation and mitigation of damages. Thus, neoclassical environmental economics was applied using the monetary valuation of the damages from coal mining as a possible instrument to achieve environmental justice. Results demonstrated that every extracted ton of coal in Cesar produces socio-environmental liabilities in Colombia (related to extraction and transport to harbor), which are larger than the actual price of coal. There are other externalities (i.e., combustion) present in the importing countries, as well as on a global scale, that are also amenable to economic valuation with appropriate methods and in appropriate contexts, such as court cases in international tribunals. However, the achievement of environmental justice and climate justice goes far beyond economic compensation. There are many other valuation languages involved.

The coal chains between Colombia-Netherlands and Colombia-Turkey were examined through different layers (market, physical, socio-environmental liabilities, social actors and their valuation languages) and scales (local, national and global) to show the spatial organization and political power regimes that shape the local ecological distribution conflicts. Along each stage or link of the coal chain, the environmental goods and bads are accumulated and unequally distributed generating ecological distribution conflicts. Social actors show different values to resist or legitimize ways of extracting and consuming coal. The multiple valuation languages are manifested in such ecological distribution conflicts. They are particular for each country, given the economic and political contexts in which the different stages of coal chain are embedded. Additionally, the valuation languages deployed by the actors and their own coal "meanings" reveal pronounced differences, which are at the roots of the conflicts.

Research trajectory

To reach these conclusions, I started with a strong motivation, which was not only academic and rooting from the fact that Colombia is a major exporter of coal from Cesar and La Guajira, with over 80 million tons per year. I also parted from my personal experiences and motivations, as I live and teach in Santa Marta, which is one of the major export ports. In Chapter 2, I attempted to identify the socio-environmental liabilities through social and biophysical indicators involving different aspects (damage to health, railway transport accidents, displacement of people, damage to water and soils). This

section's main aim, however, was to reach plausible money valuations in a comparative framework with similar studies from the US and China. This research was published in the journal "Ecological Economics" in December 2015. Subsequently, more research was conducted regarding the links between the coal economy and the rest of the Colombian economy, for instance in terms of taxes and royalties, and the lack of their payment by the transnational companies who own the mines. I am aware of the debates on development economics on "the resource curse," and on the terms of trade for primary exports. In 2013-14, Colombia had a deficit in the physical trade balance (more exports in volume than imports, signaling depletion of resources) as well as a deficit in the monetary trade balance. The large exports in tonnage (over 2 t per person per year of coal) could not pay for the imports. Such facts are analyzed in the Appendix of Chapter 2.

Following my research in Colombia, I started research in the two countries that are among the major importers of Colombian coal, the Netherlands, which burns some of it in its own CFPPs and re-exports most of it to Germany and other countries, and Turkey, whose production of electricity based on coal is growing quickly. I spent some time in both countries doing interviews. The 2015 paper in "Ecological Economics" had left aside the externalities produced by coal burning for electricity production in the importing countries, including local externalities, such as air pollution and damage to health, or global externalities from the emissions of CO_2 producing climate change. The research in Chapter 3 and 4 takes these factors into account, although no monetary valuation is performed.

An essential concept in this thesis is that of Commodity Chains coined in world system history or world system theory, by Hopkins and Wallerstein (1986) and others. I use the theory of commodity chains in two different contexts. In the Netherlands, there is a growing movement against coal burning in general, as a result of the issues surrounding climate change and campaigns such as "blood coal" that fight against coal imports from Colombia due to the human rights violations in the mining regions. Additionally, there is an "eco-efficiency", "green growth" movement in the Netherlands, sponsored by industries, and sometimes by the government, favoring the import of certified "better coal" and trying to sell the technology of carbon sequestration and storage.

In Turkey, there is an ongoing debate between more gas imports from Russia and Iran that imply geopolitical dependency, more use of domestic lignite that provides local jobs but creates vast pollution effects, or increased imports of high-quality coal (anthracite) from Colombia or other locations to feed the wave of newly build CFPPs. For the purposes of this thesis many social actors were interviewed. Altogether, 53 semi-structured interviews were performed in Colombia (on two separate occasions), 18 in Turkey, and 13 in the Netherlands. Each interview lasted between one and two hours.
In my research on political ecology (the study of ecological distribution conflicts and the valuation languages which are deployed), I was able to ask questions such as the following: From the point of view of the social actors along the coal commodity chain, is economic compensation for damages a satisfactory outcome? How to calculate such compensations? How to take into account human rights violations, or lack of respect for indigenous values and territorial rights? Chapters 3 and 4, which contain some of the answers to these questions, are therefore contributions to international ecological economics and political ecology.

Through the content analysis (Atlas-ti) of the interviews carried out in Colombia, the Netherlands and Turkey, I elicit and classify the variety of incommensurable "valuation languages" deployed by the social actors at different links of the coal commodity chain. One drawback of this thesis could be the lack of deeper analysis of political power. As Martinez-Alier (2002) wrote in the conclusion to The Environmentalism of the Poor: who has the right and the power to impose one hegemonic valuation language over other valuation languages (e.g. economic valuation and compensation of externalities or national economic development at any cost vs indigenous territorial rights, local democracy, human health, cultural sacredness of a landscape or avoidance of climate change)?. The success of the environmental justice actions to reconcile the multiple valuation languages along the coal chain depends on the willingness or the power of social actors to give up or negotiate or impose their own valuation languages.

Future research

Through my work on this thesis, I feel I have become knowledgeable and able to teach courses not only in the field of political ecology and ecological economics of coal mining, transport, and burning, but also in the fields of energy economics and geography, public

policies of climate change, and political ecology and ecological economics in general. Through the research and analysis presented here, I have also learned the applications of different methodologies (economic valuation of externalities, qualitative methods of discourse analysis). I have grasped two main analytical concepts, "commodity chains" and "valuation languages," and I would be able to apply them in other research projects.

During the Ph.D. in ICTA, and as Professor of the Universidad del Magdalena, I arranged a cooperation agreement between the UAB and the Universidad del Magdalena, which has been signed by both Rectors. Under this agreement, the ICTA researcher Beatriz Rodriguez Labajos and I formulated the project "Audiovisuales para la Justicia Ambiental-¡AJA!" which has gotten financial support from the 2016 Call XXXIII of "Fons of Solidaritat UAB" within the category of cooperation university projects aimed at developing countries. The project ¡AJA! will be developed during 2017-2018 and it aims to promote and provide training through the use of audiovisual tools (videos, participatory cartography, photography) in environmental justice research at the Universidad del Magdalena, Santa Marta, Colombia. This thesis is a contribution to the ¡AJA! project as it reveals the struggle of social movements and indigenous peoples to defend their rights from coal mining expansion by multinational corporations. The Universidad del Magdalena has been involved in research on coal mining from different perspectives and disciplines. However, the dimension of artistic dissemination and production has been surprisingly absent. The ¡AJA! project sees the audiovisual tools as a meeting point of different disciplines and research approaches on the local coal environmental conflicts. Therefore, we expect that the opportunity of using audiovisual tools represent an innovative way to approach coal mining conflicts in the Colombian Caribbean region.

In future, I would like to expand this thesis in a South-South direction looking at the coal chain between Colombia and India, and to the role of coal in the economies of South Africa and Indonesia (Kalimantan). I would also like to cooperate with research projects focusing on other primary commodities chains, such as iron ore exports from Brazil or copper from Peru. I could try to suggest public policies in Colombia to get out of the "extractivism" paradigm (as characterized by Eduardo Gudynas, Alberto Acosta, Maristella Svampa) and escape the resource curse. My thesis is, in fact, a contribution to

the growing post-extractivism school in South America, although its original focus was not designated in this way direction.

VI. References

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