Just Energy Transition in Colombia: Status Quo, Challenges and Chances

An assessment with a focus on the coal regions in the departments Cesar and La Guajira

Kerstin Mohr, Johannes Thema, Maria Cecilia Bonet, Vasudha Vasudha

August 2023

Just Energy Transition in Coal Regions

The Innovations Regions for a Just Energy Transition project is jointly funded by the German Federal Ministry for Economic Affairs and Climate Action (BMWK) under the International Climate Initiative (IKI) and by the European Commission's Directorate-General for International Partnerships (DG INTPA) for the Just Energy Transition in Coal Regions Interregional Platform (JET-CR). The project is implemented by a consortium of six organisations led by GIZ as Joint Project Coordinator and with the Climate Action Network (CAN), International Institute for Sustainable Development (IISD), International Labour Organisation (ILO), International Trade Union Confederation (ITUC)/Just Transition Centre, and Wuppertal Institute für Klima, Umwelt, Energie gGmbH (WI) as implementing partners.

IKI JET and its JET-CR Platform aim to support and accelerate just energy transitions away from coal to renewable energies and other sustainable economic activities in Colombia, Chile, South Africa, India, Indonesia, Vietnam, Thailand, and Mongolia.

The Just Energy Transition in Coal Regions (JET-CR) Knowledge Hub is an online platform building bridges between experts, policymakers, coal industry, trade unions and civil society organizations. It's a space to bring together different perspectives, share real stories and search for effective tools and solutions.

It aims to particularly amplify the voices of workers and communities dependent on coal showing how knowledge can work in practice. It also turns practice into knowledge by bringing local experience into global conversations and advancing just energy transition expertise.

Providing regular digests of articles, research papers, news stories and events it serves as a "one-stop shop" for collecting up to date information related to just energy transitions away from coal around the world.

jetknowledge.org

Supported by:

Federal Ministry for Economic Affairs and Climate Action

IKI INTERNATIONAL CLIMATE INITIATIVE

Co-funded by the European Union

on the basis of a decision by the German Bundestag

This publication was produced with the financial support of the International Climate Initiative of the German Federal Ministry of Economic Affairs and Climate Action (BMWK) and the European Union under a Grant Agreement with GIZ. Its contents are the sole responsibility of their authors and do not necessarily reflect the views of BMWK, the EU or GIZ.

Published by the Just Energy Transition for Coal Regions Knowledge Hub

Image right cover picture: Getty Images

About Wuppertal Institute

The Wuppertal Institute for Climate, Environment, Energy (WI), founded in 1991, is one of Europe's leading sustainability think tanks and focuses on enabling transformation processes towards sustainable development at local, regional, national and international levels. Through its transdiciplinary approach, WI develops models, strategies and instruments that assess and initiate technological and social innovations aiming at decoupling the use of natural resources from economic growth. The institute has a rich history in working at the boundary between research and policy at all levels of governance. The majority of WI's research projects are highly application-oriented and practice-relevant, comprising dialogue processes with stakeholders from industry, policy and civil society. WI receives basic funding from the German federal state of North Rhine-Westphalia (NRW), but third-party funding supports most of its projects. Scientists at the Wuppertal Institute conduct 150 to 170 projects each year on behalf of local, regional and national governments, EU institutions, charities, NGOs and companies. The institute employs approximately 300 staff.

Head Office

Wuppertal Institut für Klima, Umwelt, Energie gGmbH
Döppersberg 19
42103 Wuppertal, Germany
+49 2887458-13
Website: www.wupperinst.org

Just Energy Transition in Colombia: Status Quo, Challenges and Chances
An assessment with a focus on the coal regions in the departments Cesar and La Guajira

Written by Dr. Kerstin Mohr, Johannes Thema, Maria Cecilia Bonet, Vasudha Vasudha

August 2023

Acknowledgements

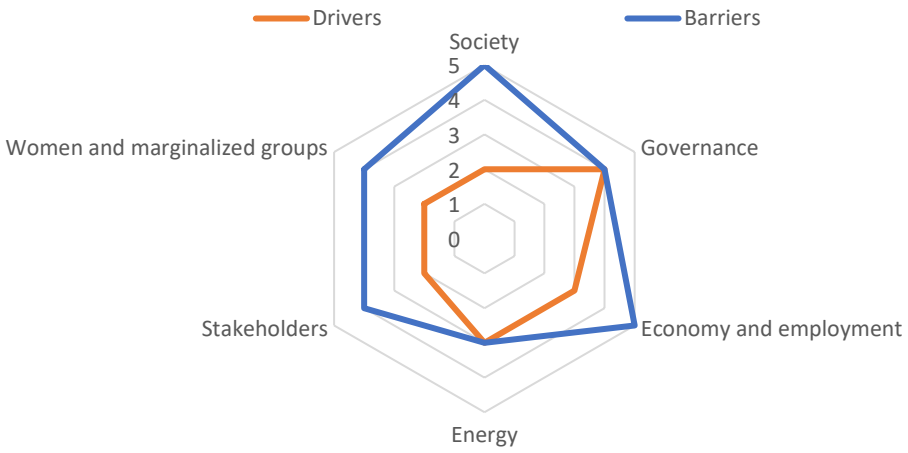
We owe great thanks to all stakeholders in Colombia who took the time to speak with us, shared their knowledge and indicated where to find further information, among them i.a. researchers, policy makers, frontline communities, unionists, industry representatives, civil society organizations, and activists. Without their support, this work would not have been possible. Moreover, we would like to express our gratitude to Paola Yanguas Parra, Santiago Aldana Rivera, and Sree Harica Devagudi for their helpful feedback on earlier versions of this report.

Executive Summary

This report provides an assessment of the current situation in Colombia regarding a **just energy transition** (JET) away from coal to renewable energy and other sustainable economic activities. The focus is on the two major **Colombian coal mining regions Cesar and La Guajira**. It analyzes the situation and perspectives in sections for **society, governance, economy and employment, and for energy.** Each section includes an analysis of the role of **women and marginalized groups** and a summary of key drivers and barriers.

Results at a glance

Society	The high polarization and mistrust are strong barriers. The evident necessity and urgency of a JET are driving factors.
Governance	Clear agenda setting and political will, international support and the initiation of a pilot project in Cesar are drivers. Not yet existing policy and regulatory frameworks, a gap between national and local level, the need to increase stakeholder participation, to create a common understanding of JET and to ensure intersectional representation of women and marginalized groups are barriers.
Economy & employment	Unclear alternatives for regional development and employment, increased international demand for coal in some world regions, state interest, conflicts on local level and an unclear route towards a full scale decarbonization are barriers. Reduced international demand for coal in other world regions, hopes for green hydrogen exports and investments are drivers.
Energy	Commitment to international agreements and international interest, financial and other support are drivers. Lack of ownership, environmental risks, lack of statehood in coal regions, resistance to fossil phase-out and lacking capacities are barriers.
Stakeholders	Strong polarization is a barrier. Improved stakeholder involvement can be a driver.
Women and marginalized Groups	Insufficient representation in decision-making, and insufficient focus on intersectionality and agency are barriers. Increasing focus on gender is a driver.



Policy recommendations

The report derives the following policy recommendations. **More details on each recommendation are given at the end of the full report.**

Protecting human and environmental rights

- Ensure safe participation of human and environmental rights defenders.
- Increase sensitivity for violent and polarized situation in the regions.

Strengthening stakeholder participation

- Continue and expand engagement with a wide range of stakeholders as has been started by the Colombian government.
- Foster existing and create new intermediary/accompanying actors, to bridge the gap between the government and local level communities.
- Foster multistakeholder round tables and create regional JET transition plans.
- International actors can
    - help to gather polarized actors by acting as intermediaries in spheres of mistrust,
    - monitor the dialogue processes,
    - provide financial support,
    - bring in international experience, including the facilitation of North-South-South learning,
    - represent the voices of marginalized groups in the international discourse,
    - unite fragmented civil society organizations to support building wide alliances.
- Create common understanding of Just Energy Transition as basis for collaboration.

Investing in research and knowledge generation

- Conduct rigorous studies i.a. on sustainable national RES potentials, the national energy system and sectoral energy transition trajectories that combine to an entire system transition.
- Increase the capacity to absorb international funding e.g. by creation of knowledge generating and facilitating organizations, such as think tanks.
- Capacity building in the coal regions: Build up of technical expertise.

Promoting cross-sectoral coordination

- Promote cross-ministerial cooperation: Specifically include the areas of Labor, Energy, and Environment and the newly incorporated Ministry of Equality and Equity.

Ensuring responsible closure of coal mines and repurposing of coal mining land

- Develop sustainable mine closure plans.
- Ensure and enforce renaturation requirements.

Structural support to coal mining regions

- Integrate short, medium and long-term measures.
- Analyze differentiated needs and avoid one-size-fits-all approaches.
- Implement actions to increase access to water, environmental restoration & arable land.
- Ensure the provision of essential state services in the regions.
- Make funding directly accessible by communities.

Comprehensive skills development for coal regions

- Implement comprehensive skills development programs in coal regions.
- Improve education to develop workers' foundational skills and adaptability by investments in technical and vocational institutes.

Boosting economic diversification

- Conduct comprehensive assessment of potential economic diversification options.
- Integrate ethnic approaches and ancestral practices in local development projects.
- Foster gender-just economic diversification.

Investments and development in green energy

- Ensure sustainability of green energy value chains.
- Ensure benefit-sharing of RES.
- Set framework for scale-up of investments in renewable energy.
- Conduct critical assessment of green hydrogen projects.
- Accelerate sustainable RES expansion.

Integrating gender-just measures

- Integrate psychological support programs for women in coal mining regions.
- Integrate roundtables for women.

Table of Contents

List of Figures

List of Tables

Abbreviations and Acronyms

ACPM	Diesel (Spanish: Aceite combustible para motores)
AFD	French Development Agency (French: Agence Francaise de Développemen)
ANM	National Mining Agency (Spanish: Agencia Nacional de Minería)
BEV	Battery electric vehicle
CIF	Climate Investment Fund
CIP	Copenhagen Infrastructure Partners
CN	China
COP	Conference of Parties
EU	European Union
FENOGE	Colombian Fund for Non-Conventional renewable Energies and Efficient Energy Management (Spanish: Fondo de Energías No Convencionales y Gestión Eficiente de la Energía)
FNCER	Non-Conventional Sources of Renewable Energies (Spanish: Fuentes No Convencionales de Energía Renovable)
GDP	Gross domestic product
GHG	Greenhouse gas
GIZ	German Agency for International Cooperation (German: Deutsche Gesellschaft für Internationale Zusammenarbeit)
GWP	Global warming potential
IEA	International Energy Agency
IADB	Inter-American Development Bank
JEP	Special Justice for Peace (Spanish: Jurisdicción Espacial Para La Paz)
JET	Just Energy Transition
JET-P	Just Energy Transition Partnership
JP	Japan
KfW	Kreditanstalt für Wiederaufbau (Credit Institute for Reconstruction)
MADS	Ministerio de Ambiente y Desarrollo Sostenible (Ministry of Environment and Sustainble Development)
NGO	Non-governmental organization
NRW	North Rhine-Westphalia

OECD	Organization for Economic Cooperation and Development
PIGCCME	Integrated climate change management plan for the mining and energy sector 2050 (Spanish: Plan Integral de Gestión del Cambio Climático del Sector Minero Energético 2050)
PND	National Development Plan (Spanish: Plan Nacional de Desarrollo)
R&D	Research and development
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USD	United States Dollar
UPME	Energy and Mining Planning Unit (Spanish: Unidad de Planeación Minero Energética)
WTW	Willis Towers Watson

1. Introduction

To achieve global climate targets**, all energy systems need to be decarbonized by mid of the 21st century**. However, in order to not perpetuate or aggravate global inequalities, it is important that these are just energy transitions (JET) – worldwide and also in the case of Colombia. An important pillar of this transition is the phase-out of coal as most polluting energy source. The exit from mining, trading and combustion poses major challenges as well as chances, especially from a JET perspective.

This report is elaborated in the frame of the "IKI JET" project titled "Innovation Regions for a Just Energy Transition" funded by the International Climate Initiative (IKI). IKI JET supports and accelerates just energy transitions away from coal to renewable energy and other sustainable economic activities in the Global South. Focusing on the required economic transformations in coal regions, IKI JET works with government, industry, employers, unions, communities, civil society and academia to spur localized pathways to low-carbon and resilient energy systems and sustainable and just local economies and decent jobs.

The **objective of this study** is to provide an assessment of the current situation in Colombia. It comprises the two major coal regions in the departments Cesar and La Guajira, with a more enhanced focus on Cesar which has recently become the country's pilot region for JET.

The **underlying understanding of JET** is based on several principles including a focus on climate protection, a focus on vulnerable and marginalized groups, inclusive and transparent decision-making processes, an alignment of measures to the diversity of countries, regions and sectors, a fair distribution of opportunities and risks, a focus on particularly affected regions and long-term and flexible support services.

With regards to **methodologies**, this report is based on desk research, on-site interviews, and focus groups. The desk research comprised a literature review of research articles, policy documents and grey literature such as national and international NGO publications and newspaper articles. The interviews and focus groups were conducted in Colombia in April 2023. Interviewees comprised a balanced set from academia, policy and decision making, unions, industry representatives and affected communities. Stakeholder meetings in the department of Cesar were facilitated by the Colombian NGO Tierra Digna. Not least for reasons of source protection, the findings from the interviews are mostly incorporated indirectly into this report.

A just energy transition with the key component of a coal phase-out requires the implementation of three strategic workstreams: 1) coal phase-out, 2) renewable phase-in and 3) management of the transition process. In order to fully assess these aspects and give a holistic picture of the current situation, **this report is structured as follows:**

The introduction is followed by the **society chapter (2)** which focuses on the socio-cultural context of Colombia in general and the two coal regions Cesar and La Guajira in particular. The

governance chapter (3) gives an overview of key political institutions and instruments as well as existing and planned JET policies. The **economy and employment chapter (4)** elaborates the role of coal in mining and trade, the employment situation and potential future alternatives. The **energy chapter (5)** depicts the energy matrix and the potential for renewable energies. All of these chapters comprise sub-chapters elaborating **the role of women and marginalized groups** and summarizing the key drivers and barriers. The **stakeholder chapter (6)** sheds light on the key actors before the **conclusion (7)** gives a brief summary. Finally, the **policy recommendations derived from this study are presented in chapter (8).**

2. Society

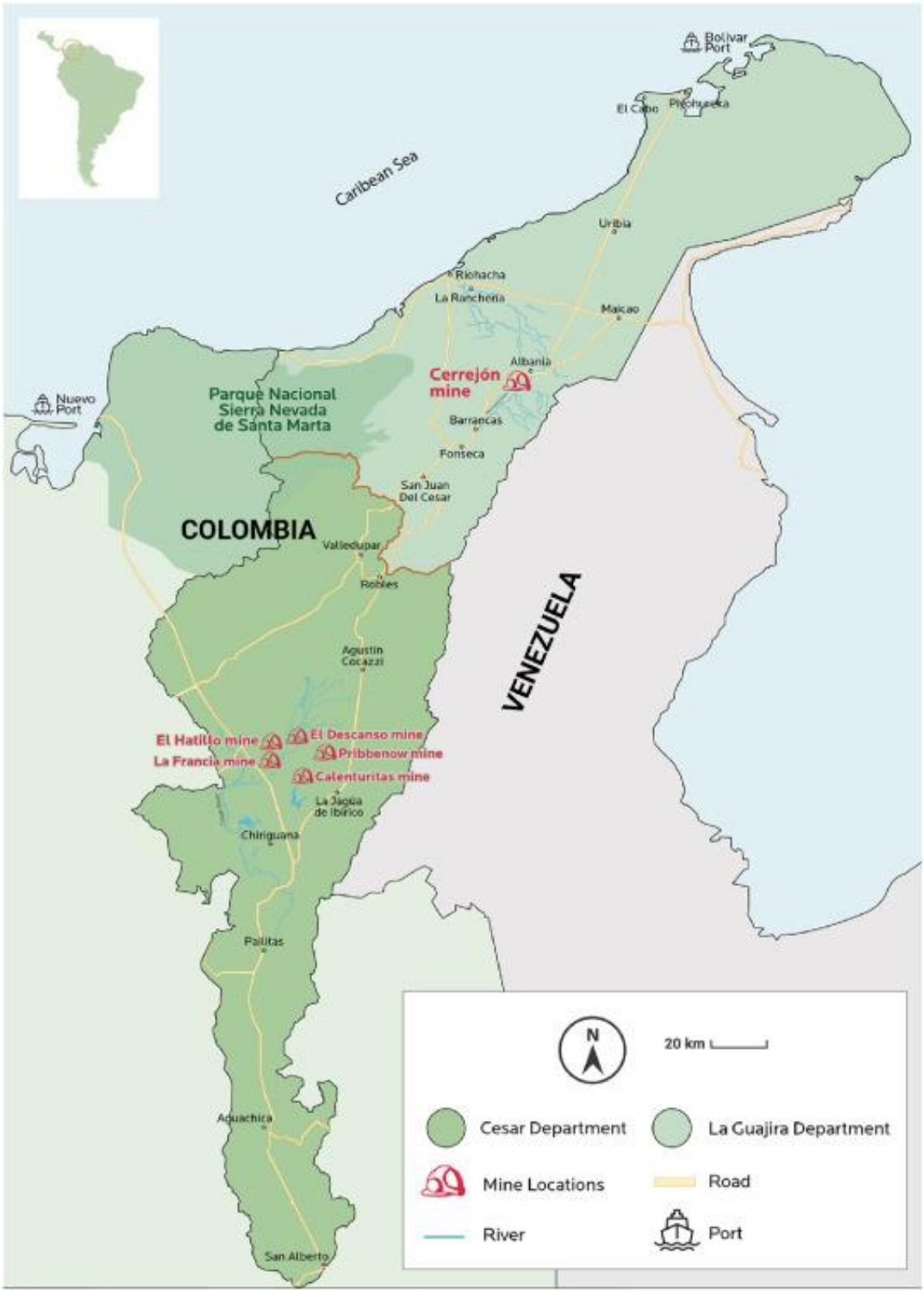
2.1 Socio-cultural context

With a population of 51.5 million in 2023, Colombia ranks as the third-most populous country in Latin America. Its history is marked by a prolonged internal conflict that lasted for more than 50 years, leading to significant political, social and economic disparities. Over the past decade, the country has witnessed rapid economic growth driven by its natural resource endowments, such as petroleum, coal, coffee, flowers and gold (OEC, 2020). As a result of this, Colombia joined the OECD in 2020 (OECD, 2020). However, despite this growth, Colombia remains among the most unequal countries worldwide (World Bank, 2020). In 2016, a peace agreement was signed between the government and the Revolutionary Armed Forces of Colombia (FARC), as a first step of the country's transition into a post-conflict era.

The **impacts of over five decades of armed conflict and high inequality** continue to shape Colombian society which is characterized by disparities between the rich and the poor as well as substantial gaps between urban and rural areas. Ideational dimensions, such as strong ideological divisions and low levels of social trust, persist (Ortiz Ospina & Roser, 2016; Reardon, 2019). Although there was a slight improvement in the state-civil society relationship and overall security after the peace agreement, the security situation for social and environmental leaders has deteriorated significantly since 2018. This becomes visible in violence and a sharp rise in killings targeting specific groups including Indigenous and Afro-Descendants as well as female and social leaders (Global Witness, 2020; Minambiente, 2020; UN, 2020). Accordingly, the latest Frontline Defenders report lists Colombia as the country with the highest risk for human rights defenders and environmental defenders, with 46% of the total number of defenders killed globally in 2022 (Frontline Defenders, 2023). Widespread paramilitary actors are considered to create "systems of violence" (Paetau, 2023).

These societal characteristics have implications for a just energy transition as they feature strongly in the country's two major coal regions, Cesar and La Guajira. These coal mining regions are characterized by specific demographic and cultural factors, particularly a **high percentage of Afro-Descendant and Indigenous communities**. In La Guajira, for example, the Indigenous Wayúu constitute 44% of the department's population (Gilbertson, 2019; Healy et al., 2019). Paramilitary activities in these regions instil fear of assassination and displacement (Pax, 2014). Mistrust, especially towards mining companies and government institutions, is high (Strambo et al., 2018), as poverty and human development problems have not been resolved historically. Multinational mining companies have been repeatedly accused of financing paramilitary groups. In the frame of the country's Special Jurisdiction for Peace (Jurisdicción Especial para la Paz – JEP), a former paramilitary trooper indicated names and direct connections between the company Drummond, paramilitary financing and direct orders by company heads and officials to killings of union members (Semana, 2023).

Figure 1: Map of Colombian coal mining regions Cesar and La Guajira



Source: Weber et al. (2023)

Recent events in the department Cesar around the Prodeco/Glencore coal mine reinforce challenges

The Prodeco coal mines are located in the municipality of La Jagua and consist of two open pit mines, “La Jagua” and “Calenturitas” (see map in figure 1). Here, the coal mining company Prodeco, a subsidiary of Glencore, unexpectedly halted operations in March 2020, citing declining prices, high operating costs and the pandemic as reasons. In February 2021, the mining company returned both Cesar mines to the Colombian government. This announcement raised concerns among various Colombian civil society organizations, who feared that Glencore might abandon the Prodeco mines without presenting a suitable closure plan. In April 2021, Colombia’s national mining agency (Agencia Nacional de Minierí a - ANM) rejected Glencore’s proposal to hand back the mining concessions but then reversed its initial decision in September of the same year.

As of September 2022, the Colombian government’s intentions regarding the continued operation of the mines remained unclear, and numerous unresolved matters persisted concerning the closure of the mines. These included addressing the environmental impacts, providing compensation, establishing viable job transition prospects for laid-off mine workers, and overseeing the government-mandated relocation of El Hatillo residents, a community heavily affected by coal pollution resulting from mining activities.

The withdrawal occurred around ten years prior to the expected closure of the mines and Prodeco argues that no environmental dismantling plan is necessary as the mine is not yet exploited and handed over in functional conditions (Prodeco, 2023). The sudden withdrawal of the company triggered a local economic crisis as the labor market and a substantial part of the regional economy were heavily dependent on the coal extraction since the 1990s. This crisis affects the entire mining corridor from Cesar to the department of Magdalena. The decline in tax and royalty revenues impacts the public finances of the department Cesar.

In **absence of a closure plan**, environmental aspects, especially the restoration of territory and water sources have not been addressed. The economic crisis, unemployment and the insecurity faced by the communities affected by this have moreover triggered a social crisis with increased insecurity and polarization of actors, including among civil society. The region is thus in the midst of a structural transformation for which there are yet no concrete plans nor funds. The public consultations held by the Colombian government in the municipalities at the end of 2022 have not clarified the mines’ futures but led **to the announcement of the Cesar mining corridor becoming the country’s first energy transition pilot** (Prodeco, 2023).

At the same time, mining operations by other companies have been expanded, feeding a recent increase of total coal exports (see details in chapter 4 on economy and employment).

These activities take place against the background of **different narratives and discourses**.[1] The mining sector has long been framed as the "locomotive of development" in Colombia, i.e. as the basis for economic growth. Great relevance for workers in the energy mining sector refers to the attention to the jobs that will disappear with the extraction of fossil fuels, especially in the Caribbean region. Narratives for a transition or a time without this locomotive were hardly existing and are only now starting to emerge. Hereby, decarbonization is still mostly understood from an economic point of view. The predominant understanding is that high-emission technologies are complemented with low-carbon alternatives, arguing that countries heavily reliant on fossil fuel export, like Colombia, should continue to profit from international markets also when transitioning to cleaner energy sources. In that sense, the Caribbean region with its solar and wind potential is seen as a promising source as renewable energy for the world (see chapter 5 for more details). Only non-dominant discourses refer to the physical limits of minerals needed for low-carbon technologies (DERA, 2021; Skowron & Fünfgelt, 2021) or question the socio-political structures and environmental injustices (Farley, 2021; Martin & Iles, 2021). A holistic and overarching **understanding of just energy transition that is mutually agreed on by a wide range of stakeholders is yet to be developed.**

2.2 The role of women and marginalized groups

The negative impacts of the coal mining sector – which include i.a. negative economic, environmental and cultural impacts such as forced displacement, health issues, destruction of social tissue and loss of traditional knowledge – are predominantly borne by vulnerable groups, namely Afro-Descendant and Indigenous communities (Chomsky & Striffler, 2014; Healy et al., 2019; Strambo & González Espinosa, 2020). Moreover, the sector has been shown to contribute to political and economic violence as well as human rights violations against women who occupy different roles in this sector, such as workers, managers and heads of households (Red Nacional de Mujeres, 2015; Tierra Digna, 2023). While the general impacts and vulnerabilities have become well known, **an intersectional understanding**, i.e. an understanding that recognizes the interconnected nature of social categorisations such as gender, race and class which overlap and create interdependent systems and dynamics of discrimination, is still missing. Also, the **agency** of these groups has not yet been included in the discourse.

[1] Parts of this report are based on the WI Paper by Thema and Roa García (2023) which also offers further details and insights especially on sectoral energy consumption and provision, renewable energy potentials and an estimation of RES requirements for a Colombian full energy system decarbonization.

2.3 Drivers and barriers of a just energy transition

Table 1: Drivers and barriers of a just energy transition (Society)

Drivers	Barriers
• **Recent events of sudden mine closure** in Cesar show necessity and urgency of JET	• **Local history of conflict** • **Strong polarization and ideological division** • **High levels of mistrust** • **Women and marginalized groups**: Absence of intersectional understanding and focus on agency

3. Governance

3.1 Political context

The election of Gustavo Petro as president and Francia Márquez as vice-president represents a historic change in Colombia as Petro is the country's **first left-wing president** and Márquez **the first Afro-Descendant vice president**. A coal phase out is high on the political agenda of the new government. In the presidential campaign (Gobierno de Colombia, 2022a), the government's plan called for a gradual phase-out of fossil fuels, starting with coal and no further exploration of oil and gas, accompanied by an expansion of non-conventional renewable energy sources (NC-RES, FNCER in Spanish), i.e. renewables other than hydro energy. Moreover, the electoral campaign programme had a **focus on progressive social policies**, next to tackling extractivism also addressing the inequality suffered by Indigenous and Afro-Descendant groups. This is also included in the National Development Plan (PND) 2022-26 (Gobierno de Colombia, 2022b).

Overall, Colombia has made constant progress with its **climate policy** in recent years, passing a number of crucial pieces of climate legislation (such as the 2019 EV bill, the 2018 and 2021 climate laws), upgrading its Nationally Determined Contributions (NDC) target, and setting a net zero goal. However, although there is general agreement that action must be taken to combat climate change, the **details of energy policy are particular divisive**. Irene Vélez, the Minister of Mines and Energy who had been clear that no additional oil and gas exploitation is necessary, had come under harsh and persistent criticism from some members of Congress and repeated calls for her to quit (Climate Action Tracker, 2023). In July 2023, she resigned after two state bodies initiated investigations. Omar Andres Camacho was named as new minister (Reuters, 2023). A major challenge to the energy transition and related fossil fuel phase-out is the **yet missing consistent policy framework**. A number of sectoral strategies are available but these lack interconnection. There is no assessment of decarbonisation options for all sectors, how these may join into an intersectoral plan, and whether sustainable RES potentials suffice to cover a national decarbonisation and potential additional exports. An overview of key energy transition policies in Colombia is given in table 2.

Interviews showed that the government is currently working on the creation of numerous policies, roadmaps and regulatory frameworks which includes the involvement of key stakeholders. The **roadmap for the energy transition** originally scheduled for May 2023 has been delayed until February 2024 (Elespectador, 2023). In August 2023, first documents were released (Ministry for Mines and Energy, 2023). This process also includes dialogue processes with local communities and Indigenous communities. On-site interviews however showed that these are challenging. Bridging national-level policy making with local level needs is a complex task, especially in regions that have been characterized by an absence of the state for decades. Interviewees stated the need for serious dialogue processes.

The events in Cesar described in chapter 2 led the government to decide that the affected region (i.e. the municipalities La Jagua de Ibirico, Becerril, Codazzi, El Paso and Chiriguaná) would become the first pilot region for the just energy transition and therefore started the program **"Corredor de vida del Cesar" (Cesar Corridor of Life).** The communities will hence be the first ones for which regional just energy transition plans will be developed. Furthermore, the government is currently working on the revision of the Mining Code (Codigo Minero) and is considering the establishment of a Just Transition Center (Centro de Transición Justa) under the lead of the Ministry for Mines and Energy.

The interviews held in Colombia showed that there is **no shared understanding of just energy transition yet**. At the government level, there is a strong focus on the expansion of renewable energies and the generation of investments, i.e. a techno-economic understanding of an energy transition. The focus of affected communities is on establishing justice through the restauration of access to water, land and income-generating alternatives, i.e. an understanding of a just transition. So far, there is no national process for achieving a common, country-owned and widely-accepted understanding as for example the one undertaken by the Presidential Climate Commission in South Africa.

Discussions and conversations in Colombia also indicated that there is a need for more knowledge generation and research-based consultancy on JET. First civil society initiatives, such as for example the "Permanent Council for a Just Energy Transition in Colombia" (Consejo Permanente para la Transición Energética Justa en Colombia) are starting to emerge (*Consejo Permanente para la Transición Energética Justa*, n.d.) However, there is more need to build capacities for knowledge generation and knowledge transfer, especially knowledge that can combine technical knowledge with knowledge on the societal impacts and policy processes.

Table 2: Energy transition policies in Colombia, key documents[2]

Theme	Document	Content	Author/reference
Electricity/ wind power	Wind Energy in Colombia	Techno-economic analysis of wind energy	(World Bank, 2010)
Electricity	Generation – generation baseline expansion plan	Results of quantitative model of electricity capacity evolution up to 2034	UPME (2020)
Hydrogen	Hydrogen Roadmap	Techno-economic analysis, national/international demand, potentials, roadmap for action	i-deals et al. (i-deals & Montoya & Asociados, 2021)
Long-term carbon neutrality	Colombia's E2050 long-term climate strategy to comply with the Paris Agreement [Duque Government].	Assessment: quantitative carbon neutral modelling scenarios to 2050	Evaluation: Government of Colombia (2021) Journal paper version: Delgado et al. (2020)
Imports/exports, economy	Understanding the impact of the low-carbon transition in Colombia	Analysis of economic risks in the climate and energy transition	UA & WTW (2022)
Offshore wind	Offshore Wind Roadmap	Analysis of offshore wind energy: techno-economic, environmental and social, supply, financial, regulatory framework	World Bank et al (2022a)
General energy transition	Colombia, a world power for life. Basis of the National Development Plan 2022-2026	Basis of the NDP	Government of Colombia (2022a)
General energy transition	Social dialogue to define the roadmap for the Just Energy Transition in Colombia [Petro Government].	Definition of the roadmap development process (the same foreseen for 2023)	Ministry of Mines and Energy (2022a)
Energy carbon neutrality roadmap	Integrated climate change management plan for the mining and energy sector 2050	National GHG emission scenarios 2030-2030 covering mitigation, GHG capturing, compensation, adaptation	Ministry of Mines and Energy (2021)

[2] This table is taken from Thema and Roa García (2023). It has been slightly adapted.

3.2 The role of women and marginalized groups

In spite of their deep involvement and practical knowledge, **intersectional representation of women** in formal decision making is scarce due to participation hurdles and gender-based discrimination. Especially the gap between local level and national level is large. Women have been active on local level and in informal decision-making spaces but have not been well represented on other levels and in formal spaces. The role of women as caregivers is paradoxical as it is both a motivating and a hindering factor (Mohr et al., 2020). The underrepresentation of women and marginalized groups leads to their needs and contributions being underestimated (Mohr, 2021).

Interlocutors pointed out that **dialogue processes, which are initially conducted with women only** and in a second step are combined with dialogue processes with all genders, can make an important contribution to focusing on agency, differentiated needs and respect for traditional knowledge.

3.3 Drivers and barriers of a just energy transition

Table 3: Drivers and barriers of a just energy transition (Governance)

Drivers	Barriers
• **Agenda setting and political will:** The topic is high on the political agenda of the current government • **International support:** There is high international interest in JET in Colombia and financial support • **Pilot project:** A pilot project for JET named “Corredor de Vida” has been started in Cesar	• **Policy and regulatory framework** still under development • **Gap between national and local level**: Challenge to bridge the gap between national-level policy making and local level needs • **Stakeholder engagement:** Sufficient stakeholder engagement still in process • **Common understanding of JET:** Lack of country-owned, mutually agreed and widely accepted understanding of JET • **Insufficient intersectional representation** of women and marginalized groups

4. Economy and employment

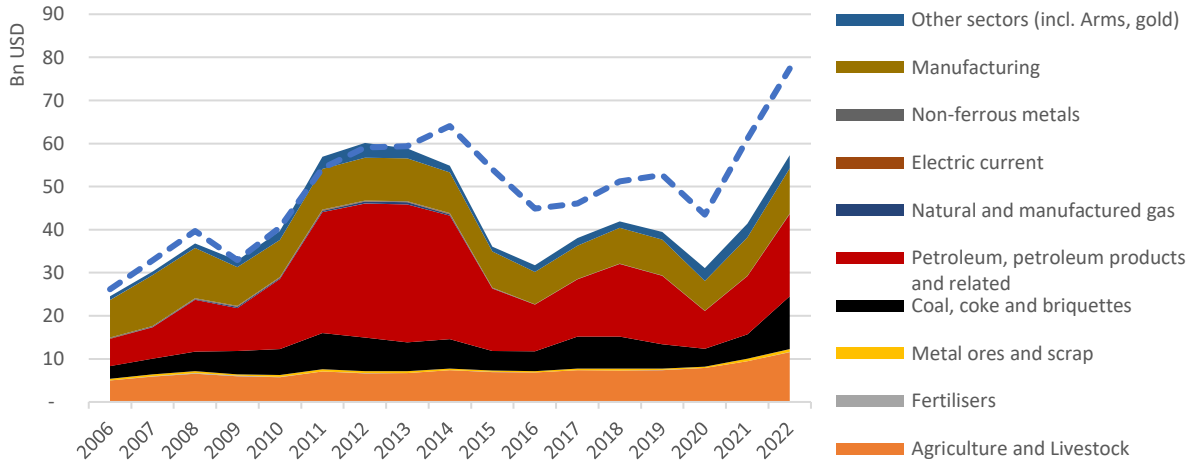
4.1 The role of coal mining and coal trade

4.1.1. Role of coal in mining, trade, the economy

As mentioned in chapter 2, **coal mining in Colombia is concentrated in the department of Cesar (61,40%) and la Guajira (30,98%)** (Transforma, 2021a). Open pit coal mining started at the end of the 70s with the first mine El Cerrejón in La Guajira. In the mid 1980s, the La Jagua mining district was opened in the departments of Cesar and Magdalena. This mining area has more than 12,000 hectares with 8 large-scale open-pit coal mines operated by different multinationals (Drummond, Glencore and Colombian Natural Resources). It has rail and port infrastructure transporting coal to the ports of Santa Marta and Ciénaga (Magdalena) with an average annual coal export of around 55 Mt/a.

At the beginning of 2020, **coal accounted for 65% of mining GDP** and 1.1% of national GDP, in 2019, coal exports accounted for **80% of annual royalties** from the mining sector and 14.4% of national exports (Transforma, *2021b*), which increased to 22% in 2022 (most important export good after petrol, see **Figure 2**). **Petrol and coal exports add to 55% of total export values** and the Colombian balance of payment thus highly dependent on fossil export revenues.

Figure 2: Exports 2006-2022 (dashed line: imports)

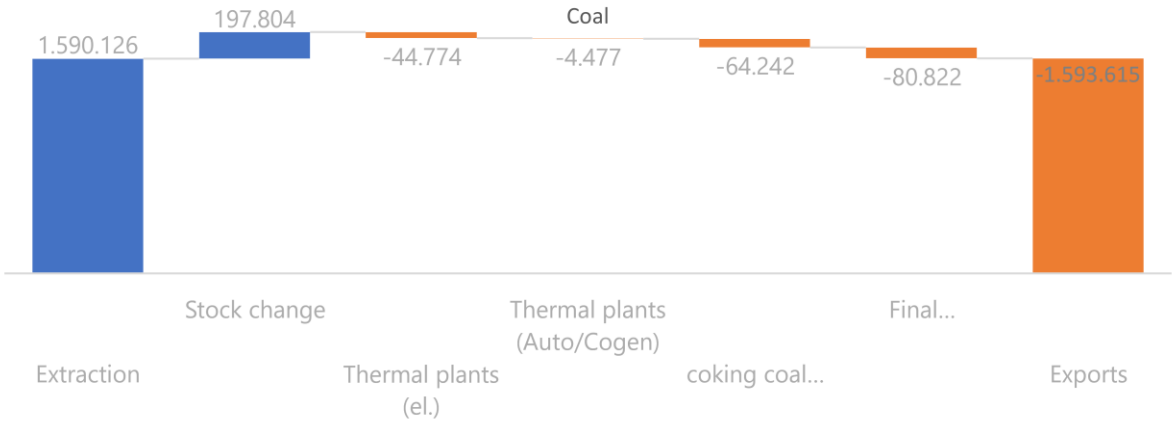


Data source: DANE (2023)

Oil exploitation is declining at 8% p.a., without significant investment in exploration and enhanced recovery, Colombia could become an oil importer from 2028 (Moncado, 2022; UA & WTW, 2022). Colombia is self-sufficient in natural gas supply, but also gas exploitation is

declining and Colombia may become an importer from 2025 onwards (Moncado, 2022). This renders future coal export revenues even more important.

Figure 3: Extraction and use of coal 2021 (MJ)



Data source: UPME (2023b), graph by author

Almost all of the extracted coal is exported. Only a small share (about 12%) is consumed in Colombia (see following sections).

Apart from the unexpected closure of the two mines in Cesar (and expansion of Cerrejón in la Guajira in return), a general closure of coal mines is not in sight yet: a continued global demand (with shifts in destination countries), no national phase-out in electricity, dependence on export revenues and resistance from fossil energy companies and political representatives, the mines are currently not set to close. Since the 1990s, there have been **incentives for the extraction of minerals and fossil fuels**. Main types of support include (for details see Transforma, 2021b, p. 14f):

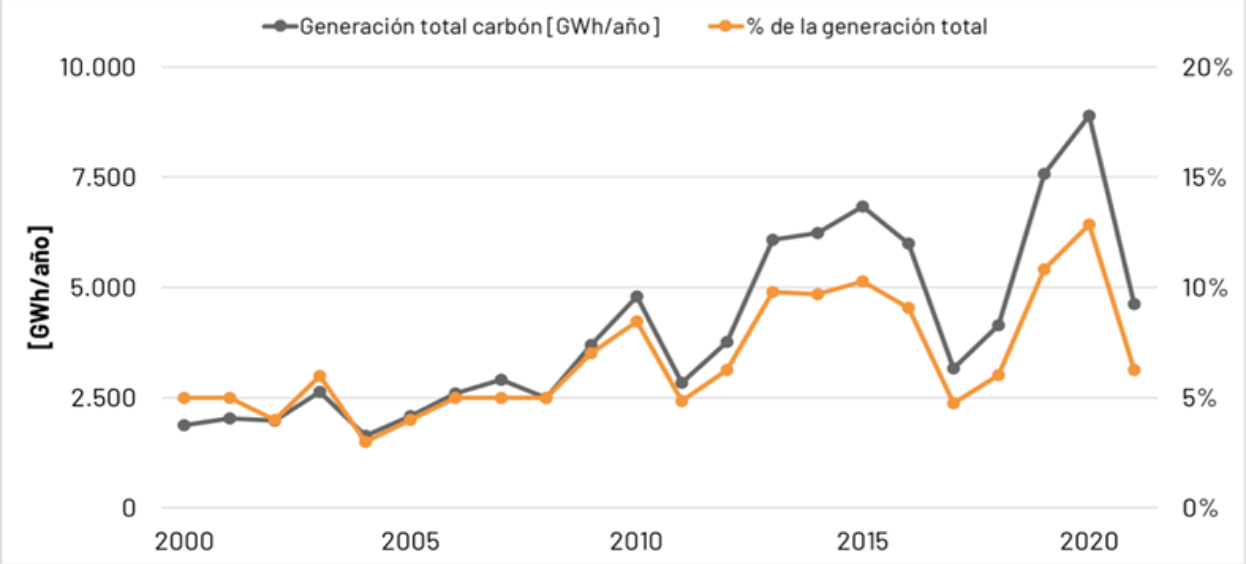
- **Taxation**: exemption from departmental and municipal taxes (on industry and commerce), tax rebates in return for public works/infrastructure (up to 50%), environmental protection (25%), R&D, technology and innovation (25% on income taxes), prohibition of local/regional levies, exemption from income taxes and social security contributions for staff earning <10 minimum wages
- **Reduced royalty payment**: exemption from royalties in return for public works
- **Investment**: in assets for exploration or exploitation of non-renewable natural resources.
- **Under-valued government goods and services**: The mining sector receives special security and protection services by the Colombian government
- **Exceptional legal treatment**: Private projects that are defined as strategic for the social and economic development can benefit from special procedures relating to environmental licensing and land ownership applications

4.1.2 Coal in electricity

The installed fleet of electricity generation plants in Colombia amounts to almost 20 GW, of which 2/3 are hydro and 1/3 are thermal (XM, 2023). The plants generate around 70 TWh/a (UPME, 2023b), of which 60 TWh are hydro and the remainder are coal- or natural gas-fired thermal, with a small share of Diesel (Spanish: Aceite combustible para motores - ACPM), especially in the Caribbean and other regions not connected to the national grid.

Of the around 10-20 GWh/a of thermal-generated electricity, less than half is generated from coal. Annual **variations in coal use** over the last decade (**Figure 4**) are **related to water shortages in reservoirs** especially during *El Niño* events. The trend in coal use is increasing, given the construction of new thermal plants in the last decade. In 2022, there were **19 active plants with a capacity of 1.7 GW**.

Figure 4: GWhel generated by coal source



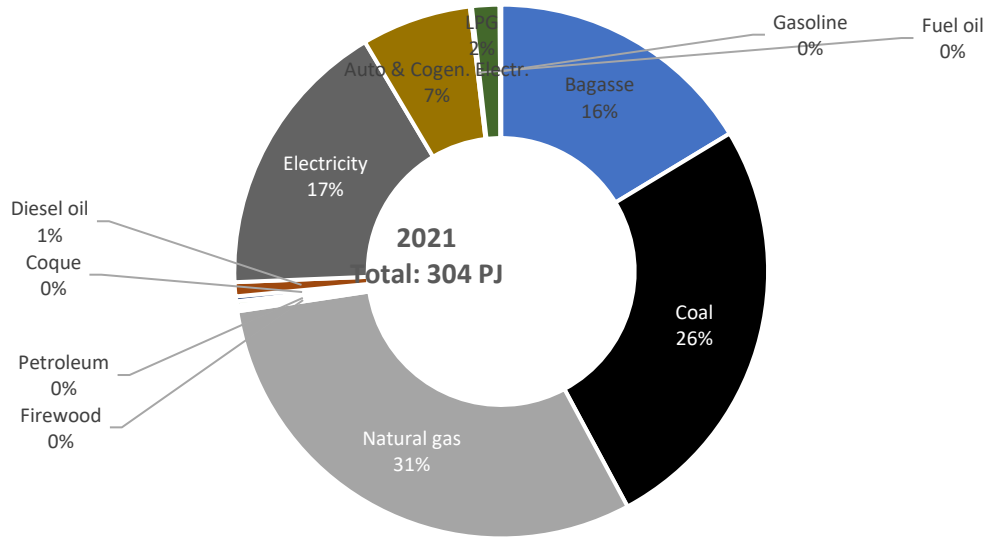
Data source: XM (2022), cited in Flechas Mejía et al. (2022, p. 5)

Publications of UPME projecting the electricity generation fleet foresees increasing renewable generation, but currently no phase-out of thermal power plants. UPME representatives indicated that in the future, a full decarbonisation of the electricity sector will be analysed. The organisation Transforma proposed a roadmap for phasing out coal-fired plants (Flechas Mejía et al., 2022).

4.1.3 Coal in industry

The Colombian industry is the second-largest coal-consuming sector in the country, with 26% of industrial energy consumption being covered by coal in 2021 (**Figure 5**).

Figure 5: Energy consumption in the industrial sector 2021



Data source: UPME (2023b)

The main industrial **branches using coal are cement production, the ceramics and textile industry, and the food sector** (Transforma, 2021a). As in the other sectors, there are several substitution options, the main ones being direct electrification or biomass. A detailed study of the uses in Colombia and the most favourable substitution options is needed.

There is **not yet a governmental roadmap for decarbonising the industrial sector** in Colombia. The main challenges will be the substitution of the current use of natural gas and coal. (Latam, 2022) recommends a substitution by biomass, charcoal, hydrogen and electricity, depending on industrial applications.

4.1.4 Other uses of coal

In Colombia's higher Andean coal regions there is a marginal use of coal for heating (UPME, 2023b).

4.1.5 Future opportunities for coal regions

The question of economically, ecologically and socially sustainable income-generating alternatives is key in the coal regions. In Cesar and partially in La Guajira, large-scale coal mining has become the main source of regional economic income over the last 30 years. For the future, current coal mining regions have been argued to **possibly become renewable energy producers** (wind and solar PV). This is especially the case for the North of Colombia, the Guajira (and off-shore Caribbean) region for wind energy (i-deals & Montoya & Asociados,

2021; Stockholm Environment Institute et al., 2023; World Bank, 2010; World Bank et al., 2022a). However, there are widespread fears that renewable energy projects will be implemented top-down by private investors and national-level government, without true participation of local communities (Barney, 2021). For communities to benefit from future opportunities of renewable energy projects, it is thus necessary to secure true participation in decisions, in ownership and benefits, and in employment (Brot für die Welt & Boell Foundation, 2023).

The idea of the current government is additionally a **boost in agricultural productivity** by re-distribution of land to peasant farmers. This is realistic max. in the South of La Guajira and Cesar and requires high institutional efforts, **a close dialogue with local farmer and Indigenous and Afro-Descendant communities, respect of the region's culture and history** based on self-sufficiency agriculture (i.a. cotton, corn, livestock) and a clear plan for mine closures and restoration of nature.

The development of regional alternatives that are sustainable and provide non-precarious incomes is one of the key challenges of JET in Colombia.

4.2 Employment situation

Coal mining in Colombia generates approximately 130.000 direct jobs, and a similar number of indirect jobs. The direct and indirect jobs are estimated to be the income of about 500.000 families. Most of these workers are employed in small-scale mining operations in the rural areas of the country, while only one-third of the workers are assigned to large-scale projects in Cesar and La Guajira (Transforma, 2021b).

Working conditions in the mining sector in Colombia are often in violation of multiple rights under labour law. Coal miners' work schedules can consist of shifts of more than 12 hours, with a rest day after seven consecutive days of work. Furthermore, coal miners face high health risks as they are more prone to suffer from respiratory disorders, lumbar pain, hearing and even cognitive impairments. Especially in informal mining, workers do not necessarily have health coverage and safety standards are not strictly enforced (Jaime Artega, 2016; Strambo et al., 2018)

Many coal mines have hired mostly external employees. Additional informal employment such as restaurants, sex work, smaller shops and waterway workers also strongly depend on the coal industry and need to be taken into consideration as well when examining the effects of a potential coal phase-out (see Tamra Gilbertson, 2019, p. 13f).

Concrete measures and policies for employment aspects of the just energy transition will still have to be developed. As described in the previous chapters, the "Corredor de Vida Cesar" will be a key pilot project. Here, Prodeco's latest sustainability report (2019) indicated that within the Calenturitas mine, the La Jagua mine and its harbor in Ciénaga,

it had 2,494 employees (labor contract) and 5,004 contractors (provision of services). When the mines were closed, most of the workers were laid off. Interviews with local union representatives confirmed that there are no policies in place yet for re- and upskilling of workers. Measures to **provide technical training** were named as key. First initiatives have begun for this in cooperation with regional universities such as the Universidad del Magdalena.

4.3 Role of women and marginalized groups

Many times when mines are closed it is assumed that the male mine workers are more affected by the closure, but there is less account on how it impacts women, especially their position as a dependant spouse of laid-off miners (World Bank et al., 2022b). However, it has been shown that women hold a larger share of the negative impacts since many of them work in informal sector by Lahiri-Dutt (2021). **Gender-blind labor policies thus risk reproducing inequalities**.

In addition to the inclusion of the informal sector, an intersectional understanding is important, i.e. an understanding that recognizes the different realities of women and does not understand them as one homogenous group. **The need of an intersectional approach** can be illustrated with the example of three different women: For one woman, the closure of a mine can be positive as it preserves her territory. For another woman whose husband loses his job and thus the family income, the impacts are negative. Under a just transition approach, her husband's job would be replaced, safeguarding her from potential secondary effects such as unemployment leading to alcoholism and domestic violence. Unless accompanied by further measures, her economic dependence would not be addressed and her agency not included. A third woman, working in the informal sector around the mine, would lose her job without any compensation. The women in this example can self-identify as Indigenous, white or Afro-Descendant (Mohr et al., 2020).

Interlocutors in the coal regions pointed out that many women in the Colombian coal regions have experienced harsh violence due to hypermasculinization and that a gender-just energy transition thus also needs to include specific components such as psychological services to restore social tissue. Furthermore, it was pointed out in many discussions that the equal representation of women offers a lot of potential. It was repeatedly pointed out that women have the concerns of the entire communities in mind and that an explicit inclusion of the care economy in the design of economic alternatives in the region offers great opportunities for sustainable and equitable development.

4.4 Drivers and barriers of a just energy transition

Table 4: Drivers and barriers of a just transition (Economy and employment)

Drivers	Barriers
• **Reduced international demand for coal:** Energy transitions in EU and potentially the US lead to less demand on the Atlantic market • **Green hydrogen:** Hope for green hydrogen exports as substitute for fossil exports on national and international level foster expansion of renewables • **Investment:** Good business climate for green energies makes them a potential alternative investment sources	• **Increased international demand for coal**: Increasing consumption in Turkey and continuously high demands in the Pacific market (CN, JP, IN) offer potential, yet hard to access alternative markets due to geographical barriers (coal harbors on Atlantic shore) • **State interest**: Royalties and balance of payment deficit cause a dependency on coal exports. Aggravated by dwindling petrol exports • **Conflicts on local level**: Transition from coal to wind/hydrogen generates conflict with/among communities due to no secured participation in ownership and benefits. • **Full scale decarbonization**: Full decarbonisation of the Colombian energy system (beyond electricity, including industry, transport) will require large amounts of green electricity/hydrogen → probably little margin for exports. Green hydrogen projects may endanger a national just energy transition. • **Alternatives for regional development and employment unclear**: Despite a clear and urgent need for alternative economies, there are currently few alternatives and visions for a life beyond coal.

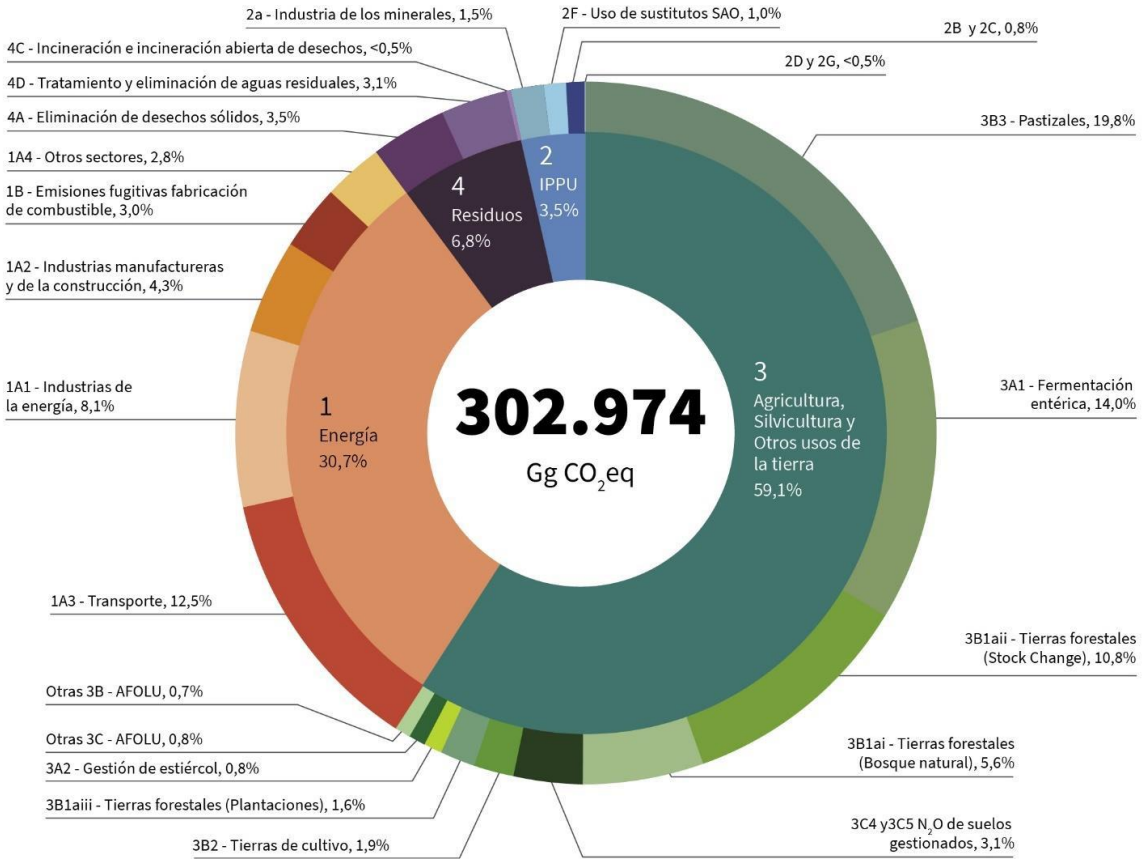
5. Energy

5.1 Description of the energy sector

5.1.1 GHG emissions, energy consumption and provision in Colombia

In Colombia, **59% of GHG emissions are from the AFOLU sector** (**Figure 6**). This highlights the importance of this sector in GHG mitigation, especially its sub-sectors land use change (grassland, forest land in the graph) and livestock (enteric fermentation), which are connected to ownership inequality, internal conflict and displacement and illicit crops. Unsuccessful efforts over the last 20 years to control deforestation as a major source of GHG emissions indicate that it is necessary to refocus efforts in the AFOLU sector and diversify the strategy to include other sectors.

Figure 6: GHG emissions by sector Colombia (2018)

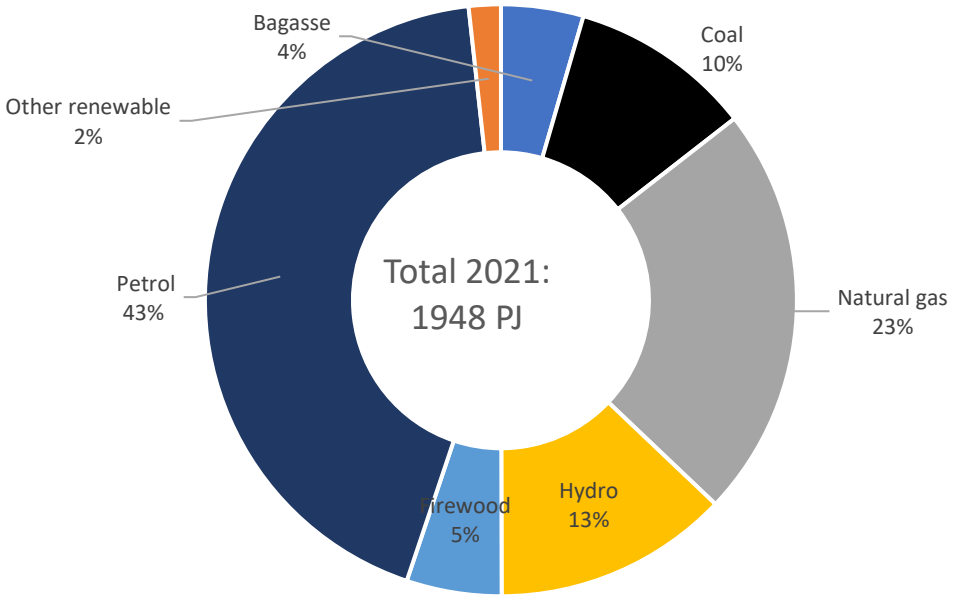


Source: IDEAM et al. (2022, p. 95)

Only **31% of Colombian GHG emissions are from the energy sector** (including sub-sectors). These approx. 100 Mt CO2eq need to be mitigated and are thus subject to a JET. Although smaller than AFOLU emissions, energy-related emissions **require early action**, as the transition of the energy system with sub-sectors industry, buildings, transport requires **substantive changes and investments, and thus political action and time**.

Total primary energy supply in Colombia amounted to 1948 PJ in 2021, with fossil fuels constituting 76% and coal amounting to 10% (Figure 7). For comparison, exports amounted to 2624 PJ, with 1593 PJ coal and 1030 PJ petrol.

Figure 7: Primary energy supply Colombia 2021



Data source: UPME (2023b)

Energy consumption is highest in the transport sector (48%), followed by industry (25%) and residential (21%). The use of energy carriers varies strongly by sectors. In the residential sector, electricity is used for standard electricity applications (lighting, white goods, appliances), fuel wood for cooking in rural areas, and natural gas (mostly in urban areas). In industry, additionally coal is used and bagasse in the sugar industry. The transport sector is almost exclusively fuelled with gasoline and diesel, the agricultural and mining sectors play a marginal role.

The electricity sector is based on hydro energy (2/3 of installed capacity) and thermal plants (1/3, for details on coal see section 4.1). The national authority granting permits for new capacity expansions (UPME) projects almost exclusively “non-conventional renewable energy sources” (NC-RES, FNCER in Spanish, i.e. RES excluding hydro) for the future, but currently no phase-out of thermal power plants.

UPME also projects an increase of transport fuel demand until 2036 by 20-34% (road) and up to 80% (jet fuel).

5.1.2 Beyond coal: renewable potentials and energy transition

Renewable electricity expansion

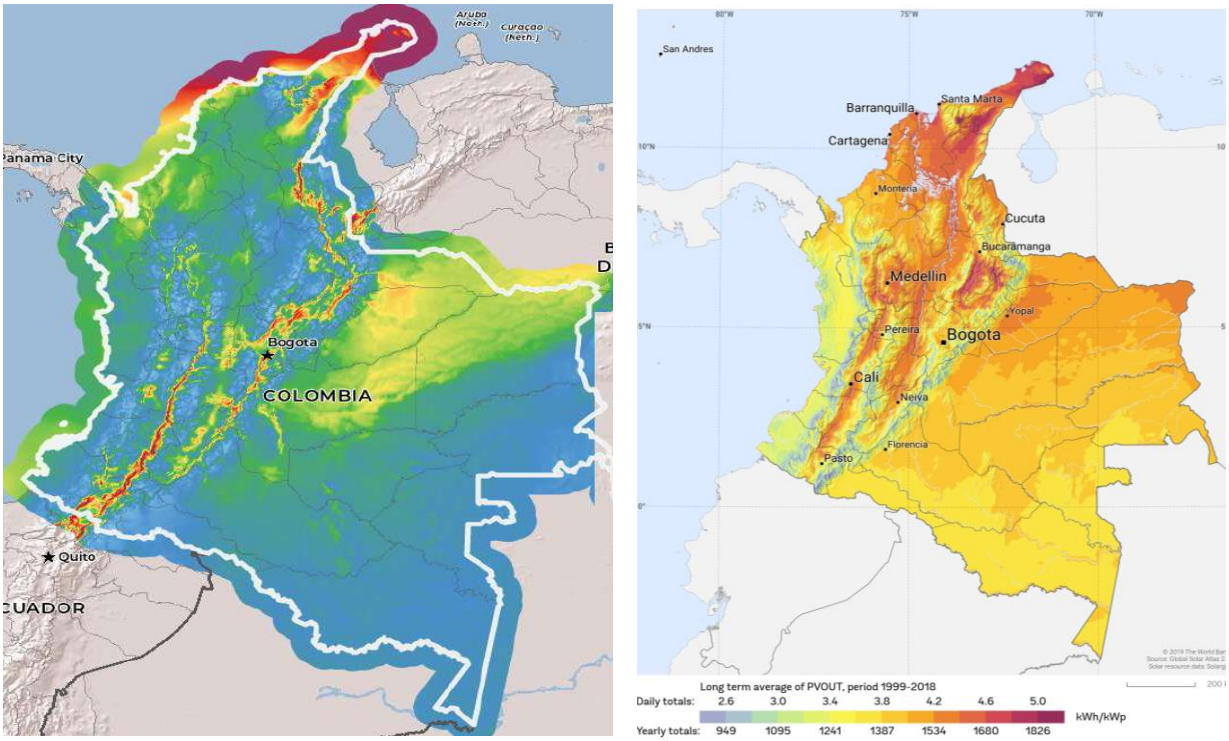
The RES expansion focus currently lies on the electricity sector. **Key RES sources studied are wind and solar PV**. Colombia also has **significant potentials of biomass, geothermal and tidal energies, but potentials** that can be sustainably exploited (without e.g. socially detrimental impacts or further deforestation and land-use change) have **to be assessed**.

The potentials for the expansion of wind or solar power plants are concentrated in certain areas. For wind power the wind speed counts, which is typically higher on the coasts. In Colombia, the most **suitable onshore areas are concentrated in the Guajira peninsula, Cesar department and the Andean Mountain ranges**. Offshore, the areas with the highest wind speeds (m/s) are along the entire Caribbean coast (

Figure 8, left). The effectiveness of **solar PV** depends on solar irradiation. The areas most suitable for generating most energy (kWh/kW_p) are also concentrated **in the north, Guajira and Cesar, but include the Magdalena and Cauca river valleys, a large area north of the capital (Boyaca/Santander) and the north of the eastern plains** (

Figure 8, right). Capacity expansions allocated by the UPME follow the distribution of these potentials. Large wind projects under planning or implementation are located in the indicated area of La Guajira and the offshore Caribbean.

Figure 8: Wind (left) and solar (right) energy potentials in Colombia



Sources: DTU et al. (2023), Solargis et al. (2023)[3]

Onshore and offshore wind **projects in many cases generate discussion, conflict and resistance** for various reasons. A successful realisation of projects is only possible with consent of the local population and resolved local conflicts. In Colombia, the situation is especially delicate, because the area identified as having the **highest potential is territory of the Indigenous Wayúu and other communities**. NGOs such as Indepaz report "rigged and unfairly treated prior consultations" (Barney, 2021), fragmentation of communities and resulting inter-ethnic conflicts. They also report that the area that has historically been abandoned by the state, with a vulnerable population, does not benefit. The distribution and ownership of land according to Wayúu traditions does not coincide with the forms of distribution by the state, which again generates conflicts (Barney, 2021).

The complexity of project planning and implementation is compounded by the challenges of corruption, insecurity, risks of ecological and tourism impacts, and lack of opportunities for

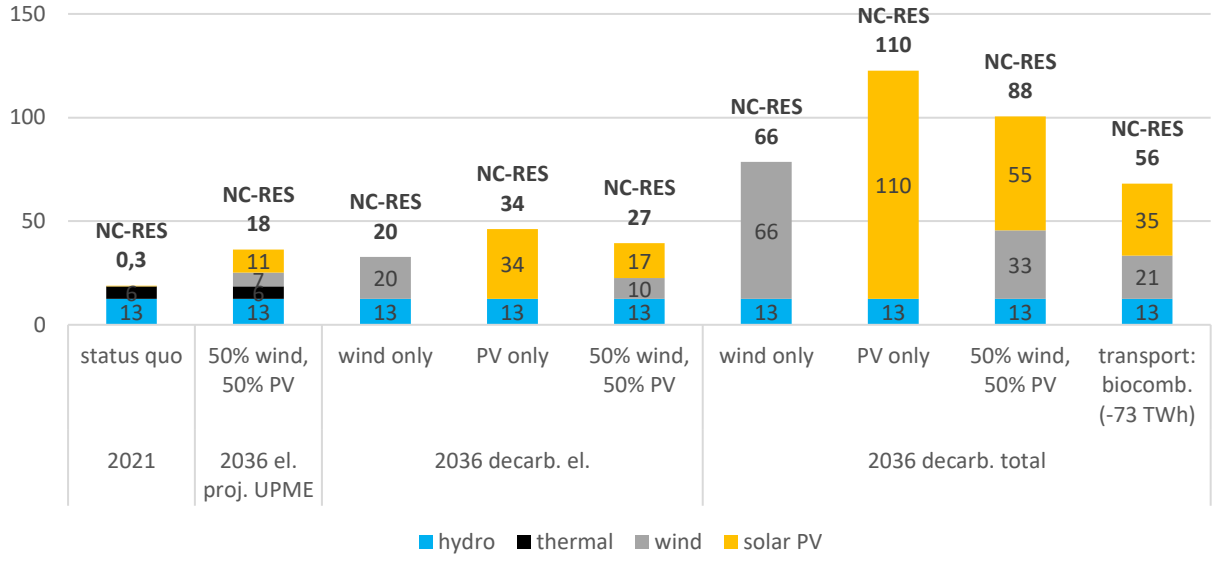
[3] Full citation as requested by authors:
Wind: map obtained from the Global Wind Atlas 3.0, a free, web-based application developed, owned and operated by the Technical University of Denmark (DTU). The Global Wind Atlas 3.0 is released in partnership with the World Bank Group, utilizing data provided by Vortex, using funding provided by the Energy Sector Management Assistance Program (ESMAP). For additional information: https://globalwindatlas.info
Solar: map obtained from the Global Solar Atlas 2.0, a free, web-based application is developed and operated by the company Solargis s.r.o. on behalf of the World Bank Group, using Solargis data, with funding provided by the Energy Sector Management Assistance Program (ESMAP). For additional information: https://globalsolaratlas.info

local communities. The **management and implementation of projects in La Guajira must find ways of prior consultation, agreements and participation of local communities in ownership and benefits** that are fair, orderly and reliable for all and in accordance with the rules of the communities. Otherwise, they run the **risk of perpetuating and deepening the environmental injustices** that have existed for more than 30 years of coal exploitation in the territory.

Energy transition

For the key energy-consuming sectors (transport, industry, residential) in Colombia, **no consistent decarbonisation strategies and studies** exist yet. A first assessment (Thema & Roa García, 2023) of sectoral energy consumption volumes and their hypothetical sector-coupling through electrification (the standard approach in European decarbonisation strategies), yields that a **substitution of current fossil consumption** by renewable electricity in Colombia **would require additional NC-RES capacity in the range of 56-88 GWp** for a decarbonisation of the Colombian energy supply (see **Figure 9**).

Figure 9: Estimated installed capacity needed (GWp) for decarbonisation, assuming electrification by wind/PV/mixed/biofuel transport



Source: Thema and Roa García (2023), calculations based on UPME data (2023a, 2022, 2023b)[4]

Given total current generation capacities of 19 GW, a total technical potential estimated at 138 GW (Thema & Roa García, 2023) and the challenges presented in the section on wind and solar

[4] The retention of hydropower in all scenarios at 13 GWp assumes that no net additional hydropower plants enter the system. Although this is realistic for large hydropower, some medium or small-scale hydropower is feasible and in some cases can be good complements to solar and wind projects (such as pumped hydro). Other hydro plants may be decommissioned.

projects, these figures show that a decarbonisation of the Colombian energy system will require massive and joint efforts.

Green hydrogen as coal export substitute: international demand or national need?

The production of hydrogen from the immense wind and solar PV potentials (especially in the Caribbean zone) have been discussed in the Colombian policy and media arena. This is based on studies like the early World Bank wind energy report (World Bank, 2010), the follow-up road maps on offshore wind energy (World Bank et al., 2022a) and hydrogen (i-deals & Montoya & Asociados, 2021).

Colombia's hydrogen roadmap estimates that global hydrogen demand could reach 99 Mt/a by 2050 (i-deals & Montoya & Asociados, 2021).

Reliable global demand projections are difficult, but current energy scenarios clearly coincide that **Global North countries** (for Germany see SCI4climate.NRW, 2022) will not be able to fully auto-supply their energy demand in a decarbonized future and demand **substantial import amounts of energy as hydrogen or derivates**. Accordingly, German and other international institutions have supported the build-up of a Colombian green hydrogen industry:

- H2LAC (https://h2lac.org/): "collaborative platform whose objective is to boost the development of green hydrogen and its derivatives in Latin America and the Caribbean in order to **promote its production, use and export",** created 2020 by GIZ, World Bank, ECLAC, EU Euroclima Programme to foster cooperation between stakeholders
- Hidrógeno Colombia (https://www.hidrogenocolombia.com/) receives support from H2LAC
- GIZ Colombia conducts training together with the Ministry of Mines and Energy, FENOGE and the support of HINICIO (H2LAC, 2022)
- Financing of 10 studies on green and blue hydrogen in Colombia for more than $6.5 billion through FENOGE (Minenergia, 2022b) and with the support of GIZ
- Project to "Promote hydrogen projects in developing and emerging countries: H2-Uppp" (giz, 2023)

The basis of a hydrogen industry is renewable electricity. Various national **financing mechanisms** include the FONENERGIA, FENOGE and SGR funds (Stockholm Environment Institute et al., 2023, p. 3) For the planned dimensions, additional funds are required, currently supplied by **international credits and institutions**. Financing includes for example

- 2017 IADB: USD 45M funding line (IADB, 2021)
- 2021 KFW: 150M €
- 2022 KFW: 200M € financing of wind and photovoltaic farms
- 2022 World Bank: USD 1bn "to accelerate Colombia's climate action by advancing the low-carbon energy transition, promoting sustainable land use, and strengthening climate resilience and adaptation" (World Bank, 2013)

- Colombia applied for a USD 350M credit:USD 70M from the CIF (disbursed by IDB) with reduced interest rate and USD 3.5M non-refundable. Remaining USD 280M are market credits from IDB, CTF, Bancoldex, FDN, FENOGE or other banks (CIF, 2023, p. 36)

In many renewable energy projects, **energy companies and construction companies** are also involved in the financing, management, ownership, operation and maintenance of the projects. Examples include:

- Ecopetrol agreement with Ministries of Mines and Energy, and Science and Technology to advance the energy transition. Initiatives funded by Ecopetrol (COP$33 billion)
- The company Alumbrado Público de Barranquilla signed a MoU with the Danish company Copenhagen Infrastructure Partners (CIP) for the development of the first 350 MW offshore wind power plant (to be expanded later)(Mayor's Office of Barranquilla, 2022). CIP also offers financing support
- Ecopetrol selected Total eren to finance, build and operate a nearly 100 MW_p Solar PV plant (Ecopetrol & TOTAL eren, 2023). The project will be 51% owned by Total eren and 49% by Ecopetrol, the amount of investment is not mentioned in the press release.

There are **additional international cooperation initiatives** in the energy sector (for more details see Thema & Roa García, 2023). International support is high and includes expectations of potential hydrogen exports. However, a study how this matches with Colombian decarbonization is not yet available – and **first assessments indicate that generation potentials beyond national decarbonization needs may be limited** (Thema & Roa García, 2023).

5.2 Role of women and marginalized groups

Women's movements such as for example the Force of Wayuu women (Fuerza de mujeres Wayuu) which previously worked to raise awareness about the negative effects of coal mining have started to also **highlight the impacts of large-scale solar and wind energy projects**, which have further encroached upon their territories. In such circumstances, women are striving to envision a future beyond coal, engaging in community-driven initiatives that promote the productive transformation of these mining areas. Moreover, studies have shown that women working in the informal sector of coal mining and experiencing violence also results in women not being able to find formal employment later in the renewable energy economy. A gender-just energy transition thus needs to include plans and measures to address this inequality.

5.3 Drivers and barriers of a just energy transition

Table 5: Drivers and barriers of a just transition (Energy)

Drivers	Barriers
• **International commitment:** Colombia has committed to international treaties and processes such as the Paris Agreement and the UNFCCC process. • **International interest, financial and other support:** There is high interest in Colombia's JET. Colombia is receiving bi- and multilateral support to expand it renewable energies which can be expected to increase more. There is also institutional, knowledge and technology support.	• **Lack of local ownership**: Danger of insufficient participation in decisions and ownership by local communities. Leads to resistance, delayed project implementation and lack of justice. • **Environmental risks:** Wind expansion (on- and offshore) may lead to environmental degradation if not well planned. • **Lack of statehood** in RES-expansion departments • **Resistance to fossil phase-out** by industry (national/international stakeholders) • **Capacities**: Lacking institutional/expert staff planning capacities in key institutions and funds for studies, decarbonization roadmap development

6. Key Stakeholders

Stakeholders are important for decision-making processes as they bring diverse perspectives, knowledge, and expertise. Their involvement can foster collaboration, ensuring a comprehensive understanding of issues and leading to balanced outcomes, if their arguments are truly heard, included and addressed. In conflictive processes and projects, stakeholder involvement and mediation of interests can be essential success factors and its omission can lead to delays and even failure of projects.

In Colombia, the following **government entities** on national and regional level are key for a just energy transition:

1. Ministry of Mines and Energy: The Ministry of Mines and Energy is responsible for formulating and implementing policies related to the mining and energy sectors, overseeing exploration and exploitation activities, and ensuring the sustainable development of these industries in the country (DevelopmentAid, 2023).
2. Ministry of Environment and Sustainable Development: The Ministry of Environment and Sustainable Development is tasked with developing and implementing environmental policies, regulations, and strategies to protect and conserve the country's natural resources (Ministry of Environment and Sustainable Development (Colombia) | Devex, n.d.).
3. National Planning Department: The National Planning Department is responsible for coordinating and formulating the national development plan, which outlines the government's long-term vision and strategies (Regional Development Planning Observatory, n.d.)
4. National Mining Agency: The National Mining Agency is the regulatory body overseeing the mining industry in Colombia, responsible for granting and managing mining titles, enforcing mining regulations, and promoting sustainable mining practices (EIA, 2019).
5. National Authority for Environmental Licenses: The National Authority for Environmental Licenses is responsible for granting environmental licenses and permits, evaluating environmental impact assessments, and ensuring compliance with environmental regulations for various projects, including mining operations (Our Mining Sector Experts, 2022).
6. Ministry for Equality and Equity: The newly incorporated Ministry for Equality and Equity aims to foster a more inclusive and equal society.
7. Mayors of the municipalities and departmental governors: They are responsible for managing and governing their respective territories, including overseeing land use, infrastructure development, and ensuring the well-being of local communities impacted by mining activities.

Regarding the **fossil fuel industry**, the privatized nature of the coal mining sector in Colombia means that the operating **multinational companies** in charge of the mining activities play a key role. The central companies are Drummond Company, Prodeco (a subsidiary of Glencore), and Murray Energy in Cesar. In La Guajira, the major players are BHP Billiton, Anglo American, and Glencore (Tamra Gilbertson 2019, 17). At a national level, Ecopetrol is the state oil and gas company, now also in charge to develop renewable projects.

The national **renewable energy enterprises** have formed a branch association "Ser Colombia", which is a private non-profit entity aiming at becoming the platform for growth and implementation of renewable energy projects. Moreover, international industry (e.g. General Electric, Siemens Energy), and investors (e.g. Enel, Energía de Bogotá, EPM) are present.

In Colombia, the trade **union** movement exhibits fragmentation, consisting of over 2,000 registered unions and three main national centers: the Central Union of Workers (CUT), Confederation of Workers of Colombia (CTC), and General Confederation of Labor (CGT). Among them, the CUT stands out as the largest center, boasting 746 affiliated unions and representing over 600,000 members (Justice for Colombia, 2018). Sintracarbón and Sintraminergia are unions representing formal coal worker, with Sintracarbón representing 3000 workers at the Cerrejón mine and aiming to organize an additional 7000 workers employed by subcontractors (Chomsky & Striffler, 2014; IndustriALL, 2020).

Funding comes from **national and international funding bodies and development cooperation institutions**, such as the World Bank, Inter-American Development Bank and national development banks such as the German Kreditanstalt für Wiederaufbau (KfW), USAid, GIZ, and the French development agency Agence Francaise de Développement (AFD).

The **local population** in the mining regions comprises numerous Afro-descendant and Indigenous communities. In recent years, local communities have increasingly been supported by NGOs in making their interests and rights visible, e.g. through political campaigns and demanding legal action.

Colombian NGOs representing **civil society** are usually supported by international NGOs as they otherwise lack sufficient capacities. Particularly active NGOs in the area of JET comprise the NGOs Cinep, Cajar, AIDA, Das, Censat Agua Viva, Cesar sin Fracking which are united as "Coalicion Caribe" as well as Tierra Digna and others.

National and international **research** on the Colombian coal sector has been slowly increasing over the past years. Examples of universities with a particular knowledge set on JET comprise the National University of Colombia, the University of Magdalena and the University of the Andes along with the regional universities in the departments Cesar and Magdalena. Think tanks comprise for example the Colombian organizations Transforma, INDEPAZ, POLEN and the international Stockholm Environment Institute (SEI).

A further overview of relevant stakeholders with particular regards to **gender aspects** in the Colombian coal sector can be found in (Mohr et al., 2020).

7. Conclusion

The analysis has shown that there are **currently two tendencies in Colombia, which at first glance seem ambivalent**: On the one hand, there is a strong focus on the sudden and unexpected mine closures in Cesar, large-scale wind projects in La Guajira (many with significant delays due to opposition by local communities) and solar PV projects throughout the country. On the other hand, coal exports have increased, coal mines have been opened or extended and new thermal power plants installed.

This shows that the mine closures and new RES installations do not automatically mean that there already is a coal phase-out and a just energy transition in place. However, it does **show the urgency of planning such a transition now** in order to avoid negative social, economic and environmental impacts in the future, such as those currently taking place in Cesar following sudden coal mine closures, or in la Guajira following coal mine extension and large-scale on- and offshore wind energy projects.

For this reason, the recently launched **"Corridor of Life"** pilot project is very important to develop plans for structural change, job creation and renaturation. Furthermore, the current situation in Colombia shows that international companies can act unpredictably. For governments, this means reactive behavior to external factors that it cannot influence. To avoid falling victim to a "boom and bust" effect, it is important to plan now for the upcoming change.

Moreover, the assessment of the aspects on Society, Governance, Employment and Economy and Energy has shown the following:

Society: The two coal regions Cesar and La Guajira are impacted by a history of over five decades of armed conflict and high inequality and characterized by a high percentage of Afro-Descendant and Indigenous communities. These groups are typically vulnerable populations and negatively affected by the mining sector in terms of health, access to arable land and clean water, security and displacement.

Governance: The current government under Petro has put the energy transition and a limitation of coal mining high on its agenda, however, a comprehensive policy framework is still under development. First parts of the "Energy Transition Roadmap" have currently been published and are expected to be finalized in 2024. A widely shared understanding of just energy transition is yet to be built. International support and funding are increasing. There is a need to establish dialogue processes and ensure equal participation of women and marginalized groups in decision-making processes.

Economy and employment: The roughly 50Mt of annually exploited coal in Colombia is almost exclusively exported and plays a vital role in the national export basket. National coal consumption is limited and almost exclusively in the electricity generation and industry sector. Colombia depends on coal export revenues to ease its payment balance deficit and additionally

receives royalty payments. To this end, the state grants a range of preferential treatments to mining companies including tax and royalty rebates, provision of state security and exceptional legal treatment. A shift away from coal exploitation thus requires alternative sources for government revenues and balance of payment equilibration. There is an urgent need to develop sustainable economic alternatives for the coal regions, including the creation of employment alternatives and restoration of arable land. The informal sector and intersectional gender perspectives need to be considered in both.

Energy: There is a need for more knowledge regarding a transition of the entire Colombian energy system to renewable energies. First estimates indicate that decarbonizing the current Colombian system may already require very high additional RES capacities (in the range of 50-100 GW). A short to medium-term strategy of green hydrogen exports may be questioned, as exports may lead to shortages in the supply for national decarbonization. On the other hand, installations for export may help to kickstart national production chains and skill creation needed to build up a RES industry. In any case, first, a consistent national energy transition roadmap for all sectors is needed that may include exports if generation potentials suffice. The majority of technically first-best renewable generation sites in Colombia are located in Indigenous, Afro-Descendant peasant farmers and/or ecologically sensitive areas. It thus needs to be ensured that renewable energy projects do not run the risk of being implemented in ways that create similar negative impacts as the coal mining sector. Instead, the transition needs to include plans and measures to address the existing inequalities and lead to equal opportunities for vulnerable groups.

Based on the results of this study, the following policy recommendations can help achieving the just energy transition in Colombia.

8. Policy recommendations

The study at hand leads to the following policy recommendations:

Protecting human and environmental rights

Enforce full legal protection for marginalized groups and the environment in Colombia's coal mining regions.

- **Ensure safe participation:** Ensure that there are legislative measures in place to protect human rights and environmental rights defenders so that they can participate in discussions without fear. Ensure that vulnerable groups have access to competent legal counseling. If necessary, provide funds.
- **Increase sensitivity:** Increase sensitivity for violent and polarized situation in the regions.

Strengthening stakeholder participation

Any transition needs to take place in close dialogues with all stakeholders. The following recommendations can help to foster wide and equal stakeholder participation:

- The **Colombian government** has started to engage with a wide range of stakeholders in the planning of a just energy transition, including affected communities. This should be continued and expanded.
- Fostering existing and creating new **intermediary/accompanying actors**, e.g. in the area of academia and civil society, can help to bridge the gap between the government and local level communities.
- Dialogue processes such as **multistakeholder round tables** to address the economic crisis, environmental damage, and health impacts, and to **create regional JET transition plans** are urgently needed in Cesar and La Guajira. Here, the weakest actors at the tables (communities, unions, local authorities) should be strengthened to ensure equal participation, e.g. through negotiation training, knowledge and legal support.
- **International actors** can
    - help to gather polarized actors by acting as intermediaries in spheres of mistrust,
    - monitor the dialogue processes,
    - provide financial support,
    - bring in international experience, including the facilitation of North-South-South learning,
    - represent the voices of marginalized groups in the international discourse,

    - unite fragmented civil society organizations and thus support building wide alliances.
- A mutually agreed-on, country-owned and **widely shared understanding of Just Energy Transition** can provide an important basis for effective collaboration. The **experience from South Africa**, including the creation of a representative high-level body such as the South African Presidential Climate Commission and the broad stakeholder engagement and a focus on transparency e.g. through livestreaming meetings on social media, can serve as an orientation.
- Colombian **civil society** can unite to build alliances.

Investing in research and knowledge generation

Support the creation of knowledge (and knowledge workers) that combines techno-economic expertise with socio-cultural and political expertise.

- **Rigorous studies:** As a basis for policymaking and RES project implementation, there is a need for rigorous studies on sustainable national RES potentials, the national energy system and sectoral energy transition trajectories that combine to an entire system transition.
- **Increase the capacity to absorb international funding:** In light of the high international support of Colombia's JET, international funding can be expected to increase. The creation of knowledge generating and facilitating organizations, such as think tanks, can help to absorb those means. Establish transparency criteria.
- **Capacity building in the coal regions**: Build-up of technical expertise where RES alternatives are viable to ensure labor market participation where this can be consented local projects. For example, at University of Magdalena, respective works have been initiated to set up dual (schooling and industry practice) careers following the German example.

Promoting cross-sectoral coordination

A holistic just energy transition needs cooperation and coordination across all relevant ministries and departments.

- **Promote cross-ministerial cooperation:** Specifically include the areas of Labor, Energy, and Environment and the newly incorporated Ministry of Equality and Equity.

Ensuring responsible closure of coal mines and repurposing of coal mining land

Mine closure needs a clear regulation and strict enforcement. To this end, there is a need to:

- **Develop sustainable mine closure plans** keeping in mind the short, medium and long-term requirements. These plans should address intra- and inter-generational equities. Active engagement of all stakeholders, especially communities affected by mining and civil society organizations should be ensured to optimize planning.
- **Ensure and enforce renaturation requirements** in accordance with international norms, even if mines have not yet been fully exploited, to mitigate the risk of no renaturation if no successor takes control.

Structural support to coal mining regions

Coal regions have historically been structurally weak, and the impending structural change threatens to exacerbate this. The following is important for structural support:

- **Integrate short, medium and long-term measures.** Vulnerable communities need immediate measures, while policy making in the area of climate change is more long-term oriented.
- **Analyze differentiated needs** and avoid one-size-fits-all approaches. The needs of workers are different from the needs of communities. Needs of women need to be given particular consideration.
- Implement targeted actions to **increase access to clean water, environmental restoration, and arable land.**
- Ensure the **provision of essential state services** in the regions, including but not limited to security, access to healthcare facilities, reliable energy supply, and clean drinking water. This entails prioritizing the allocation of resources and implementing comprehensive measures to guarantee the availability and accessibility of these vital services.
- Make **funding directly accessible by communities**.

Comprehensive skills development for coal regions

The transition out of coal mining and into renewable energies requires the training of workers to ensure employment. This should not just be a re- and upskilling, but follow a holistic understanding of education, including:

- **Implementing comprehensive skills development programs** in coal regions, including women, youth, and children, to prepare them for future workforce participation and ensure a just and inclusive transition away from coal. These programs should offer diverse training opportunities, including vocational training, entrepreneurship development, and digital literacy, while also providing necessary support services and resources to enhance their access and participation.

- **Improving education** to develop workers' foundational skills and adaptability by investments in technical and vocational institutes. As an example, following the German model, work has begun at the University of Magdalena to establish dual (schooling and industry practice) professions.

Boosting economic diversification

In coal regions that are otherwise pre-dominantly agricultural, alternative income options need to be secured. This includes access to clean water, restored nature and arable land. Moreover, there is a need to:

- **Conduct a comprehensive assessment of potential economic diversification options** and revamp industrial and economic policies to stimulate investments in renewable energy, green industries, local resource-based economic sectors like forestry, agriculture, livestock, fisheries, and encourage the growth of green small and medium enterprises.
- **Integrate ethnic approaches and ancestral practices in local development projects** and to recognize the expertise and traditional wisdom of Afro-Descendant and Indigenous communities for sustainable just transition planning.
- **Foster gender-just economic diversification** in coal regions, through i) integration of care economy, ii) financing priority on women-led opportunities.

Investments and development in green energy

- **Sustainability of green energy value chains:** Ensure that green energy value chains are both sustainable and socially just (including but not limited to ensuring that technology is not only imported but local value chains set up local labour force and expertise trained)
- **Benefit-sharing of RES:** Developing mechanisms for benefit-sharing of RES projects with the local communities. This should include local job provision, ownership of the projects and involvement in decision making. Provide support to groups affected by coal or RES projects: finance and independent legal support.
- **Set framework for scale-up** of investments in renewable energy, R&D and incentives for green energy initiatives.
- **Critical assessment of green hydrogen projects**: Careful study of green hydrogen projects: first, encompassing cross-sectoral studies on a national energy transition and national RES potentials need to be carried out to evaluate the potential for hydrogen exports. Dialogue processes with stakeholders are needed prior to the implementation of RES/hydrogen projects to ensure full and informed consent and participation of local communities. This is essential to avoid top-down projects that negatively affect local

populations and carry the risk of increasing/perpetuating colonial injustices (local exploitation for foreign demands).

- **Accelerate RES expansion:** Rapid expansion of RES needed for substituting oil and natural gas consumption and avoiding negative impacts on balance of payment deficit. This, under consideration of above recommendations.

Integrating gender-just measures

In order to be truly just, an energy transition needs to address the differentiated needs of women and marginalized groups and incorporate their contributions. This is the basis to transform existing inequalities instead of reproducing and enforcing them. Besides the recommendations integrated above, the following specific measures can help to create a gender-just transformation:

- **Psychological support programs for women** in Coal Mining Regions: Women in the coal regions have experienced harsh violence, including but not limited to physical, psychological, economic and political violence. Psychological support programs that address the individual needs of women can also contribute to the reconstruction of social tissue in the area.
- **Roundtables for women:** Given the social dynamics in the coal regions, where women often feel uncomfortable and unsafe expressing their opinions in mixed-gender settings, it is crucial to create spaces that allow for meaningful and equal participation. Women-only roundtables can be organized to provide a safe and supportive environment for women for freely expressing their opinions and ensure their perspectives are considered in the decision-making processes.

References

Alcaldía de Barranquilla. (2022, May 2). *Desde Barranquilla, Gobierno nacional pone en marcha hoja de ruta de energía eólica costa afuera*. Alcaldía de Barranquilla, Distrito Especial, Industrial y Portuario. https://www.barranquilla.gov.co/mi-barranquilla/desde-barranquilla-gobierno-nacional-pone-en-marcha-hoja-de-ruta-de-energia-eolica-costa-afuera

Barney, J. (2021, April 19). La Guajira, entre un nuevo aire o un desastre. Panorama actual de la violencia en la Guajira con la llegada de las empresas energéticas al territorio Wayuu. *Indepaz*. https://indepaz.org.co/la-guajira-entre-un-nuevo-aire-o-un-desastre-panorama-actual-de-la-violencia-en-la-guajira-con-la-llegada-de-las-empresas-energeticas-al-territorio-wayuu/

Brot für die Welt, & Boell Foundation. (2023). *Green Hydrogen: Key success criteria for sustainable trade & production A Synthesis based on Consultations in Africa & Latin America*. https://www.boell.de/sites/default/files/2022-11/green-hydrogen.pdf

Chomsky, A., & Striffler, S. (2014). Labor Environmentalism in Colombia and Latin America. *WorkingUSA*, *17*(4), 491–508. https://doi.org/10.1111/wusa.12135

CIF. (2023). *GCAP Sub-Committee Meeting*. Climate Investment Funds. https://d2qx68gt0006nn.cloudfront.net/sites/cif_enc/files/meeting-documents/gcap_colombia_rep_ip2.pdf

Climate Action Tracker. (2023, March 20). *Climate Governance in Colombia*. Climate Action Tracker. https://climateactiontracker.org/publications/climate-governance-in-colombia/

Consejo Permanente para la Transición Energética Justa. (n.d.). Consejo Transición. https://consejotransicion.org/

DANE. (2023, March 27). *Exportaciones*. https://www.dane.gov.co/index.php/estadisticas-por-tema/comercio-internacional/exportaciones

Delgado, R., Wild, T. B., Arguello, R., Clarke, L., & Romero, G. (2020). Options for Colombia's mid-century deep decarbonization strategy. *Energy Strategy Reviews*, *32*, 100525. https://doi.org/10.1016/j.esr.2020.100525

DERA. (2021). *DERA Rohstoffliste 2021—Angebotskonzentration bei mineralischen Rohstoffen und Zwischenprodukten—Potentielle Preis- und Lieferrisiken* (49; DERA Rohstoffinformationen, p. 108). Deutsche Rohstoffagentur - Bundesanstalt für Geowissenschaften und Rohstoffe. https://www.deutsche-rohstoffagentur.de/DE/Gemeinsames/Produkte/Downloads/DERA_Rohstoffinformationen/rohstoffinformationen-49.pdf?__blob=publicationFile

DTU, ESMAP, World Bank, & Vortex. (2023). *Global Wind Atlas*. https://globalwindatlas.info

Ecopetrol, & TOTAL eren. (2023). *Colombia: Ecopetrol selects TOTAL eren to develop, finance, build and operate a nearly 100 MWp Solar PV farm*. Press release. https://www.total-eren.com/wp-content/uploads/2023/01/Press-Release-Rubiales-Ecopetrol_English-final.pdf

Elespectador. (2023, May 16). *Se aplaza la publicación de la hoja de ruta para transición energética en Colombia* [Online News]. Elespectador. https://www.elespectador.com/ambiente/se-aplaza-la-publicacion-de-la-hoja-de-ruta-para-transicion-energetica-en-colombia/

Farley, M. (2021). Making the connections: Resource extraction, prostitution, poverty, climate change, and human rights. *The International Journal of Human Rights*. https://doi.org/10.1080/13642987.2021.1997999

Flechas Mejía, L., Arias Gaviria, J., Andrea Rueda, M., Pabón Restrepo, G., & Daniel Pinzón, Á. (2022). *Eliminación gradual del carbón en la generación eléctrica en Colombia*. Transforma.

Frontline Defenders. (2023). *Global Analysis 2022*. https://www.frontlinedefenders.org/en/resource-publication/global-analysis-2022

Gilbertson, T. (2019). *Power, Conflict and Environmental Violence: 21st Century Coal Transition in Colombia* [ASA Draft Working Paper 9].

giz. (2023). *Fomentar proyectos de hidrógeno en países en desarrollo y emergentes: H2-Uppp*. https://www.giz.de/en/worldwide/107567.html

Global Witness. (2020). *Defending Tomorrow—The Climate Crisis and Threats against Land and Environmental Defenders*.

Gobierno de Colombia. (2021). *Evaluación de las vías de neutralidad de carbono a través de la metodología de toma de decisiones robustas (RDM) en varios escenarios futuros inciertos utilizando el modelo GCAM*. Universidad de los Andes, Universidad de Ibagué, Universidad de Maryland. https://e2050colombia.com/wp-content/uploads/estudios/EstudioAEvaluacionDeLasViasDeNeutralidad.pdf

Gobierno de Colombia. (2022a). *Colombia, Potencia mundial de la vida. Bases del Plan Nacional de Desarrollo 2022-2026*. DNP Departamento Nacional de Planeación.

Gobierno de Colombia. (2022b). *Colombia, Potencia mundial de la vida. Bases del Plan Nacional de Desarrollo 2022-2026*. DNP Departamento Nacional de Planeación.

H2LAC. (2022, November 8). *GIZ Colombia realiza capacitación junto con el Ministerio de Minas y Energía, el FENOGE y el apoyo de HINICIO*. https://h2lac.org/noticias/giz-colombia-realiza-capacitacion-junto-con-el-ministerio-de-minas-y-energia-el-fenoge-y-el-apoyo-de-hinicio/

Healy, N., Stephens, J. C., & Malin, S. A. (2019). Embodied energy injustices: Unveiling and politicizing the transboundary harms of fossil fuel extractivism and fossil fuel supply chains. *Energy Research & Social Science*, *48*, 219–234. https://doi.org/10.1016/j.erss.2018.09.016

IADB. (2021). *BID aprueba línea de crédito para acelerar la transición energética en Colombia | IADB*. https://www.iadb.org/es/noticias/bid-aprueba-linea-de-credito-para-acelerar-la-transicion-energetica-en-colombia

i-deals, & Montoya & Asociados. (2021). *Hoja de Ruta del Hidrógeno*. Ministerio de Minas y Energía. https://www.minenergia.gov.co/static/ruta-hidrogeno/src/document/Hoja%20Ruta%20Hidrogeno%20Colombia_2810.pdf

IDEAM, Fundación Natura, PNUD, MADS, & DNP. (2022). *Informe del inventario nacional de gases efecto invernadero 1990-2018 y carbono negro 2010-2018 de Colombia*. https://unfccc.int/sites/default/files/resource/Annex%20BUR3%20COLOMBIA.pdf

Jaime Artega. (2016). *Resultados de la Brújula Minera 2016*. https://www.youtube.com/watch?v=ZYeHu8JyUzA

Lahiri-Dutt, K. (2021, May 31). *Just Transition for All: A Feminist Approach for the Coal Sector*. World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099405206192237419/p1711940b3d5590820b3480a4662ace12ea

Latam, M. (2022). *El camino hacia la descarbonización en la industria de América Latina*. Manufactura Latam. https://www.manufactura-latam.com/es/noticias/el-camino-hacia-la-descarbonizacion-en-la-industria-de-america-latina

Martin, A., & Iles, A. (2021). The Ethics of Rare Earth Elements Over Time and Space. In J. Schummer & T. Børsen (Eds.), *Ethics of Chemistry* (pp. 317–346). WORLD SCIENTIFIC. https://doi.org/10.1142/9789811233548_ 0012

Minambiente. (2020). *Corporaciones Autónomas Regionales* [¿Qué son las Corporaciones Autónomas Regionales?]. Ministerio de Ambiente y Desarrollo Sostenible. https://www.minambiente.gov.co/index.php/noticias/2067#:~:text=Las%20Corporaciones%20Aut%C3%B3nomas%20Regionales%20y,unidad%20geopol%C3%ADtica%2C%20biogeogr%C3%A1fica%20o%20hidrogeogr%C3%A1fica%2C

Minenergia. (2022a). *Diálogo social para definir la hoja de ruta para la Transición Energética Justa en Colombia*. https://bit.ly/HojaRutaTransicionEnergeticaJustaCO

Minenergia. (2022b). *El Gobierno financiará 10 proyectos de estudios para el desarrollo de hidrógeno verde y azul en Colombia por más de $6.500 millones*. https://www.minenergia.gov.co/es/sala-de-prensa/noticias-index/el-gobierno-financiar%C3%A1-10-proyectos-de-estudios-para-el-desarrollo-de-hidr%C3%B3geno-verde-y-azul-en-colombia-por-m%C3%A1s-de-6500-millones/

Ministry for Mines and Energy. (2023, June 16). *Documentos de la Hoja de Ruta de la Transición Energética Justa*. Colombia Potencia de La Vida. https://www.minenergia.gov.co/es/servicio-al-ciudadano/foros/documentos-de-la-hoja-de-ruta-de-la-transici%C3%B3n-energ%C3%A9tica-justa/

Mintransporte. (2022). *Estrategia Nacional de Transporte Sostenible*. https://www.mintransporte.gov.co/loader.php?lServicio=Tools2&lTipo=descargas&lFuncion=descargar&idFile=29787

Mohr, K. (2021). Breaking the Dichotomies: Climate, Coal, and Gender. Paving the Way to a Just Transition. The Example of Colombia. *Energies 2021*, *14*(17), 5457. https://doi.org/10.3390/en14175457

Mohr, K., Rojas Castro, S., Meyer, K., Mahecha Groot, A. M., Natalia, D. N., & María Laura, R. V. (2020). Gender Responsive Climate Policy. A Case Study of the Colombian Coal Sector. *Polis*, *180*.

Moncado, A. (2022, May 27). *Situación del autoabastecimiento de hidrocarburos en Colombia*. Blog del Sector Minero - Energético. https://boletinmineroenergetico.uexternado.edu.co/situacion-del-autoabastecimientos-de-hidrocarburos-en-colombia/

OEC. (2020). *Colombia (COL) Exports, Imports, and Trade Partners*. Observatory of Economic Complexity. https://oec.world/en/profile/country/col/

OECD. (2020). *Colombia's Path towards OECD Accession*. https://www.oecd.org/colombia/colombia-accession-to-the-oecd.htm

Ortiz Ospina, E., & Roser, M. (2016). *Trust*. Our World in Data. https://ourworldindata.org/trust

Paetau, M. (2023). Systeme der Gewalt Paramilitarismus in Kolumbien. *Soziale Systeme*, *27*(1–2). https://doi.org/10.1515/sosys-2022-0005

Pax. (2014). *The Dark Side of Coal—Paramilitary Violence in the Mining Region of Cesar, Colombia*. Pax.

Reardon, S. (2019). *Peace is killing Colombia's jungle-and opening it up*.

Red Nacional de Mujeres. (2015). *Environmental Security for Women in the Context of Extractive Industries*. National Network of Women.

Reuters. (2023, August 3). *Colombia names new energy minister*. https://www.reuters.com/world/americas/colombia-energy-ministry-confirms-camacho-new-minister-2023-08-03/

SCI4climate.NRW. (2022). *Quantitativer Vergleich aktueller Klimaschutzszenarien für Deutschland*. Wuppertal Institut/Sascha Samadi. https://www.energy4climate.nrw/fileadmin/Service/Publikationen/Ergebnisse_SCI4climate.NRW/Szenarien/2022/SCI4climate.NRW-Samadi-2022-Vergleich-aktueller-Klimaschutzszenarien-fu__r-Deutschland.pdf

Semana. (2023, April 13). *Financiación a las AUC y asesinatos de sindicalistas: La declaración de un exparamilitar ante la JEP que vincula a directivas de la Drummond*. Semana.com Últimas Noticias de Colombia y el Mundo. https://www.semana.com/nacion/articulo/financiacion-a-las-auc-y-asesinatos-de-sindicalistas-la-declaracion-de-un-exparamiltar-ante-la-jep-que-vincula-a-directivas-de-la-drummond/202315/

Skowron, A., & Fünfgelt, J. (2021). *Regulating the H2ype: Renewable hydrogen in the Global South* [Policy Brief]. World Future Council and Brot für die Welt. https://www.worldfuturecouncil.org/wp-content/uploads/2021/09/WFC-policy-brief-hydrogen.pdf

Solargis, ESMAP, & World Bank. (2023). *Global Solar Atlas*. World Bank. https://globalsolaratlas.info/download/colombia

Stockholm Environment Institute, Vega Araújo, J., & Muñoz Cabré, M. (2023). *Solar and wind power in Colombia: 2022 policy overview*. Stockholm Environment Institute. https://doi.org/10.51414/sei2023.015

Strambo, C., Espinosa, A. C. G., Velasco, A. J. P., & Atteridge, A. (2018). *Privileged coal: The politics of subsidies for coal production in Colombia*. Stockholm Environment Institute. https://www.sei.org/wp-content/uploads/2018/03/sei-2018-pubs-coal-subsidies-political-0129.pdf

Strambo, C., & González Espinosa, A. C. (2020). Extraction and development: Fossil fuel production narratives and counternarratives in Colombia. *Climate Policy*, *20*(8), 931–948. https://doi.org/10.1080/14693062.2020.1719810

Tamra Gilbertson. (2019). *Power, Conflict and Environmental Violence: 21st Century Coal Transition in Colombia* (ASA Draft Working Paper 9).

Thema, J., & Roa García, M. C. (2023). The energy transition in Colombia: Current situation, projections, challenges, narratives and public policies - in relation to the energy transition in Germany [Application/pdf]. *Wuppertal Paper*, *200*, 4094 KB, 68 pages. https://doi.org/10.48506/OPUS-8316

Tierra Digna. (2023). *Violencias contra la mujer en el corredor minero del Cesar y Magdalena*. Centro de Estudios para la Justicia Social Tierra Digna.

Transforma. (2021a). *Coal Market Situation and Incentives to its Extraction and Commercialization in Colombia*. https://drive.google.com/file/d/1Sm6JFJxPUPUJSIHQRUjzzRnVRcGyoI2H/view

Transforma. (2021b). *Coal Market Situation and Incentives to its Extraction and Commercialization in Colombia*. https://drive.google.com/file/d/1Sm6JFJxPUPUJSIHQRUjzzRnVRcGyoI2H/view

UA, & WTW. (2022). *Understanding the impact of a low carbon transition on Colombia*. Universidad de los Andes & Willis Towers Watson.

UN. (2020, January 14). *Colombia: 'Staggering Number' of Human Rights Defenders Killed in 2019*. https://news.un.org/en/story/2020/01/1055272

UPME. (2020). *Plan de expansión de referencia generación—Generación 2020-2034. Volumen 2. Generación*. https://www1.upme.gov.co/siel/Plan_expansin_generacion_transmision/Plan_expansion_2020_2034.zip

UPME. (2023a). *Capacidad asignada por recurso*. twitter. https://twitter.com/UPMEOficial/status/1641163178913456128/photo/2

UPME. (2022). *Proyección Demanda 2022/2036*. Looker Studio. http://lookerstudio.google.com/reporting/f1ef21bf-9ca1-4df8-9bed-4f59ee7515d8/page/iX4iB?feature=opengraph

UPME. (2023b, March 29). *Balance energético colombiano*. https://www1.upme.gov.co/DemandayEficiencia/Paginas/BECO.aspx

Weber, G., Cabras, I., Peredo, A. M., Yanguas Parra, P., & Prime, K. S. (2023). *Exploring resilience in public services within marginalised communities during COVID-19: The case of coal mining regions in Colombia. 415*. https://doi.org/10.1016/j.jclepro.2023.137880.

World Bank. (2010). *Wind Energy in Colombia*. World Bank. https://documents1.worldbank.org/curated/en/766921468018592029/pdf/558420PUB0wind1IC0disclosed071221101.pdf

World Bank. (2020). *World Development Indicators | DataBank*. https://databank.worldbank.org/reports.aspx?source=2&series=SI.POV.GINI&country=COL

World Bank. (2013). *Energy use (kt of oil equivalent) | Data | Graph*. http://data.worldbank.org/indicator/EG.USE.COMM.KT.OE/countries/EU-US-Z4-8S-ZQ-ZG-ZJ?display=graph

World Bank, The Renewables Consulting Group, & ERM. (2022a). *Hoja de ruta Energía Eólica costa afuera (ES/EN)*. Ministerio de Minas y Energía. https://www.minenergia.gov.co/es/micrositios/enlace-ruta-eolica-offshore/

World Bank, The Renewables Consulting Group, & ERM. (2022b). *Hoja de ruta Energía Eólica costa afuera (ES/EN)*. Ministerio de Minas y Energía. https://www.minenergia.gov.co/es/micrositios/enlace-ruta-eolica-offshore/

XM. (2023, March 29). *Capacidad efectiva por tipo de generación*. http://paratec.xm.com.co/paratec/SitePages/generacion.aspx?q=capacidad

Just Energy Transition in Coal Regions