Talk Renewables, Walk Coal: The Paradox of India's Energy Transition

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Abstract

Coal is on the rise in India: despite the devasting impacts of the climate crisis, the awareness for land and forest rights, and political talk of a coal phase-out. In this article, we demonstrate that despite the renewables-led rhetoric, India is in the midst of a transition to (not away from) greater use of coal in its fossil energy system and in the electricity system in particular. We investigate this paradox by combining socio-metabolic and political-ecological analysis of the Indian coal complex. Our framework integrates material and energy flow data as characterizing the Indian fossil energy transition, indicators on the development and structure of the coal industry, and studies of ecological distribution conflicts around coal. The dominant claim to expansive use of coal and the competing counterclaims are indicative of underlying power relations which can also be witnessed in other countries. In India, they extend into the conflicted development of renewable energy including hydropower, in which the land dispossession, exclusion, and injustices associated with the expansion of the coal complex are reproduced. We conclude that the current energy transition – in which coal continues to play a dominant role – is neither sustainable nor just.

Keywords: environmental justice, just transitions, energy transition, fossil energy, political ecology

1. Introduction: The paradox and the logic of extracting coal in times of climate crisis

The need for significant absolute reductions in coal combustion to limit global heating[1] below 2 degrees Celsius is well-established in the literature (Fankhauser and Jotzo 2018; Spencer et al. 2018). According to McGlade and Ekins (2015, p.187), to meet this target, "over 80 per cent of current coal reserves should remain unused from 2010 to 2050". Any transition *to* a renewable energy system must also involve a transition *away from* fossil fuels. Such a transition is not, however, occurring; instead, total primary energy supply (TPES) from fossil energy carriers has continued to increase, contributing over 80% annually to growing global TPES. Between 1990 and 2015, growth in renewables (hydro, wind, solar, biofuels, and waste: +0.7 Gigatons of oil equivalent, Gtoe) has occurred but has been outstripped by growth in fossils (coal, natural gas, and oil: +4 Gtoe) (Figure 1). In 2015, China was by far the world's largest coal producer, followed by the United States of America, and India. Globally, much of growth in renewables is in biofuels and waste: here, traditional uses of firewood in countries currently expanding their fossil energy systems is an important component (Schaffartzik and Fischer-Kowalski 2018). To speak of a transition to renewables at such a time is both premature and potentially misleading (York and Bell 2019; Edwards 2019a). It seems that renewables are contributing to rather than challenging the fossil energy system (York and Bell 2019).

[1] The more commonly-used term "global warming" fails to convey the gravity of the change in average surface temperatures (Karl and Trenberth 2003); we therefore use "global heating".

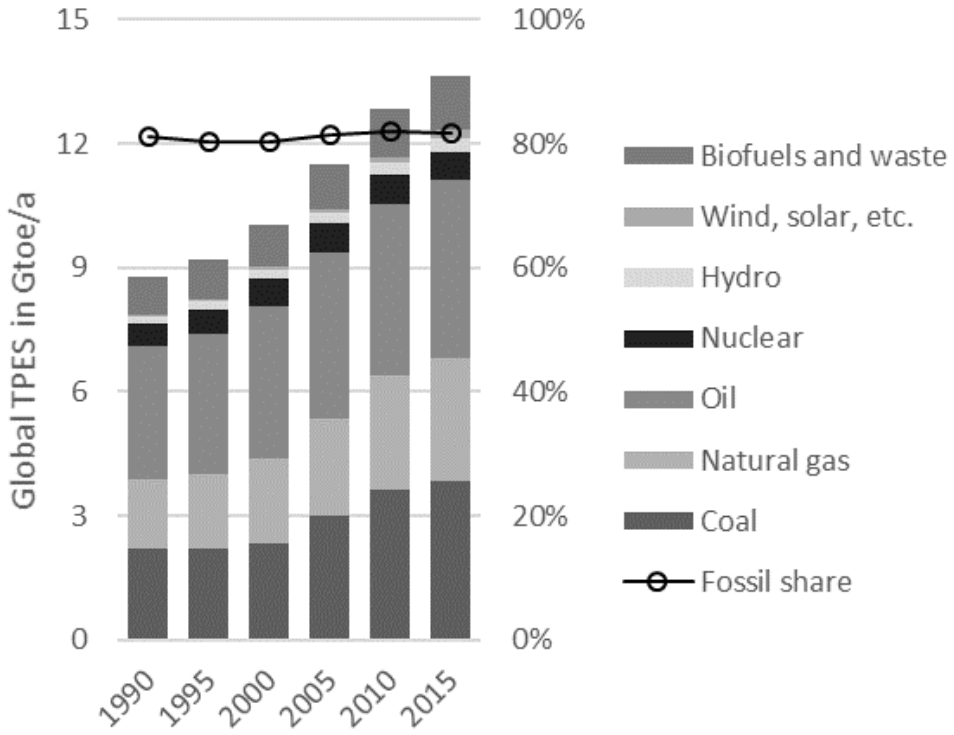


Figure 1: Global total primary energy supply (TPES) by sources in Gigatons (1 Gt = 10^9 tons) of oil equivalent per year (Gtoe/a), 1990-2015. The share of fossil energy carriers (coal, natural gas, and oil) in TPES is indicated on the secondary y-axis. Source of data: (IEA 2019)

Growth in coal's contribution to TPES was more than twice that of all renewable energy sources combined. In the Global South especially, emerging coal geographies are expected to play a decisive role in the future of the energy mix (Cardoso and Turhan 2018a). Claims that coal is on its "terminal decline" appear exaggerated and premature (Edenhofer et al. 2018a), especially in the face of geographies of coal "moving east" (Liu and Geman 2017), with future global coal trade expected to be dominated by India, Australia, Indonesia and Russia.

With the fossil energy system and the use of coal in it expanding rather than contracting amidst the climate crisis, "there is a critical need for normatively engaged and reflective work on coal in the context of climate change" Edwards (2019, p-12), and, with this article, we aim to make a contribution toward this need. We focus on the development and the role of the coal complex (more on this below) in India. The International Energy Agency (IEA 2018a) estimates continued average annual growth of 4% in India's energy demand, primarily met by electricity generated by coal combustion. In 2017, India was the world's second largest producer, consumer and importer of coal, the most carbon-intensive and the dirtiest of the fossil fuels (IEA 2018b). Coal accounted for 72% of India's electricity generation and was the source of 65% of its carbon dioxide emissions (Central Electricity Authority 2018). As recently as May and June 2020, in an attempt

to address from the financial impact of the Covid-19 crisis, a Rs. 50,000 crore (US$ 6.5 billion approx.) investment was announced for the coal sector, putting India on the path to extracting one billion tonnes of coal annually by 2023-24 (Bomnalli 2020). Auctions for coal mining concessions to private companies were also launched for 41 coal blocks in the country, including in regions of rich biodiversity (Ellis-Petersen 2020), with further plans to auction 55 concessions for new coal mines and expanding at least 193 current mines in the next five years (Aggarwal 2020). This poses serious threats in the shape of the climate crisis and the future of global coal, as well as to local socio-ecological wellbeing.

In the face of the climate crisis and the other risks and adversities associated with coal, and despite manifest political intention to expand renewables, coal extraction and use continue to grow, adding to the lock-in for the foreseeable future (Jakob et al. 2020). How can this be? While we cannot fully and unequivocally answer this question, our combined socio-metabolic and political-ecological analysis of Indian coal extraction, distribution and use does provide some insight on the reasons for the paradoxical success of coal. Such analyses are prerequisites to identifying potential points of intervention into and possibly even leverage over currently unsustainable development, not just in India, but also globally.

Despite political initiative and action to boost renewables, fossil fuels, and coal in particular, appear to enjoy unfettered growth in India: The share of fossil energy carriers in TPES increased from 37% in 1975 to 70% in 2015 and the Exajoules (1 EJ = 10^{18} Joules) added from coal surpassed that of oil and natural gas together, with coal consistently contributing more than 50% to overall fossil TPES (Figure 2). By 2015, 10% of global TPES from coal was generated in India and reliance on coal is not expected to decline anytime soon (Seetharaman 2019). It is the promise of industrialization and economic growth – as one particular interpretation of what constitutes 'development' (Escobar 1995; Esteva and Escobar 2017) that is offered as justification for the continued adherence to coal (Parasuraman 2016; Padel and Das 2010; Ghosh 2016).

Decreasing production costs for solar electricity reflect the fierce competition and low profit margins accepted by actors in this sphere, leading to questions as to the long-term viability of current bidding prices (Shidore and Busby 2019; Ghoshal 2017). As recently as 2015, production costs for solar electricity were still higher than for its coal-fired counterpart: In 2015, solar photovoltaic electricity was auctioned at an average price of approximately 80 US dollars per Megawatt hour (USD/MWh) (IEA 2020b, 113), compared to approximately 50 USD/MWh for electricity from non-renewable sources (Shidore and Busby 2019). Since 2017, the average price for solar has fallen to approximately 75% of that for coal-based electricity, leading observers to remark on India's strong alliance with coal despite the existence of seemingly cheaper energy alternatives (Hemalatha 2020). Projected price developments may provide support for this

relationship: According to the International Energy Agency, levelized costs of electricity (LCOE) of new solar PV are projected to be lower than those of coal-fired power plants by 2025. Solar PV's value-adjusted LCOE (VALCOE), however, is expected to reach 59.8 USD/MWh by 2025 and 65.4 USD/MWh by 2040, compared to a VALCOE of 54.3 USD/MWh in 2025 and 48.6 USD/MWh by 2040 for coal-fired power plants (Wanner 2019).

These prices, however, fail to reflect the 'true costs' of coal, beyond market prices and related to its socio-ecological effects, with recent studies stressing the need to move away from a coal-based development paradigm (Kalkuhl et al. 2019).

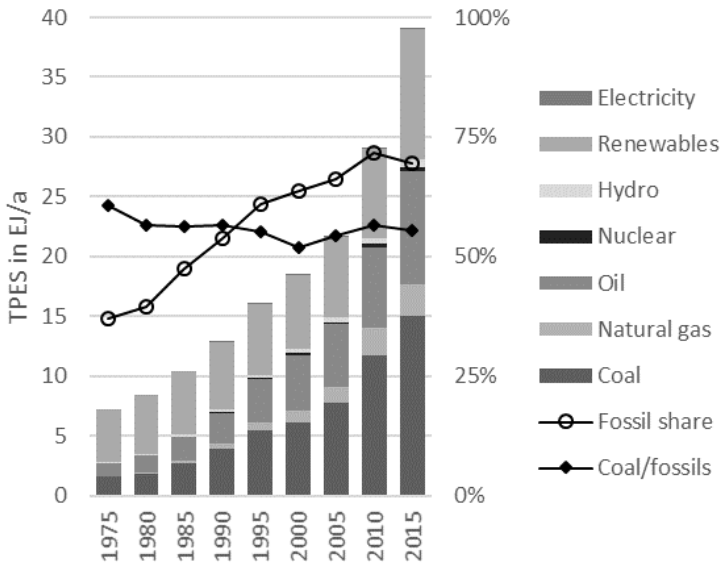


Figure 2: India's total primary energy supply (TPES) by sources in Exajoules (1 EJ = 10^{18} Joules) per year (EJ/a), 1975-2015. The share of fossil energy carriers (coal, natural gas, and oil) in TPES and the share of coal in fossil energy carriers are indicated on the secondary y-axis. Source of data: UNEP (2019)

Part of what is at stake here is clearly not only coal as an energy carrier but an entire coal *complex*, an intricate web of multiple stakeholders wielding power and allowing for certain sector(s) to flourish. Brown and Spiegel (2019, p. 153-4) have described the contemporary coal complex as "a global assemblage of finance, infrastructure, and expertise that together constitutes the political economy of coal and determines the speed and scale of its extraction, transportation, and eventual combustion". Conceptually, the coal complex is akin to the 'polluter-industrial complex' of research centres, non-profit institutions, committees and political actions that hinder stricter environmental regulations, through a variety of methods including lobbying (Faber 2008) and to the 'oil complex' (Watts 2005) as the interplay of social, political and economic factors that allow for continued production of oil, despite the environmental conflicts and human rights violations associated with it.

Not just in India, but globally, the expansion of coal mining and coal combustion (cf. Figures 1 & 2) in the context of the climate crisis seems contradictory and anachronistic (Goodman, Marshall, and Pearse 2016). The demands for extensive emissions reductions on the one hand and for economic growth and capital accumulation on the other appear irreconcilable. The tension is manifest in energy policy and the (lacking) transformation of energy supply systems (Goodman 2016; Tyfield 2014; Blühdorn 2007). India's National Action Plan on Climate Change does not directly target supply and use of coal in order to achieve emission reductions, focusing instead on the expansion of renewables, improved efficiency, and the creation of sinks and on adaptive measures (Government of India 2008). In fact, the narrative commonly provided by representatives of the Indian government is that continued extraction of coal and expansion of the electricity system are necessary in order to meet the 'needs' of the population, especially those of India's poor, making coal "a compulsion" rather than "an option" (Milagros 2015). Coal is needed, the argument goes, for development – the expansion of industries and services for economic growth and employment, improved access to electricity and to clean cooking fuel for those considered to be "energy poor" (Jaeger and Michaelowa 2016). However, the largest and fastest-growing consumer of Indian electricity is industry: approximately 40% compared to less than 25% for households (with vast inequalities within household consumption) (Ranganadham 2018).

In India, coal may represent more than 'just' a fossil fuel: a key to the country's sovereignty as a nation-state, crucial for an energy-secure future (Lahiri-Dutt 2014). Coal has wider social, cultural, and political connotations which link it to economic development, nationalism, and nation-building, allowing coal extraction to symbolize a moral endeavor (Lahiri-Dutt 2016). However, even as approximately 240 million people and 18% of the total population are without access to electricity and many more people only have intermittent access, India became an exporter of electricity in 2017, with neighbouring Nepal, Bangladesh, and Myanmar as the most important destinations (Press Information Bureau 2017).

Power relations are an intricate part the Indian coal complex and ecological distribution conflicts (Martinez-Alier 2002) over coal form the centerpiece of our analysis. In these conflicts, the dominant claim to expansive use of coal and competing counterclaims are indicative of the underlying power relations. These power relations extend well into the current conflicted development of renewable energy in India in which the land dispossession, exclusion, and injustices associated with the expansion of the coal complex are also reproduced (Lakhanpal 2019; Yenneti, Day, and Golubchikov 2016). We frame our study with the material and energy flows that biophysically characterize the Indian energy system and the socio-economic variables that unveil its political-economic structure. We demonstrate that despite the renewables-led rhetoric, India is in fact in the process of deepening its transition *to* fossil energy carriers,

including coal, rather than moving away this energy form. This puts India well within observable global trends (Schaffartzik and Fischer-Kowalski 2018). From extraction to transportation and combustion, we find coal to be a contested resource and a commodity that does not address India's interlinked socio-ecological challenges of poverty (both economic and energetic) and unemployment, environmental degradation, and the climate crisis.

In the next section we describe the challenges of India´s sustainability issues and the multiple worlds of coal. This is followed by a section describing the frameworks used in the paper, viz social metabolism and the metabolic transition, ecological distribution conflicts and political ecology. Section 4 explains the methodology used in the paper to arrive to the results in section 5. The following section discusses the findings to show that India is moving towards, and not away from coal, despite conflicts and associated environmental justice movements, and section 7 concludes that this energy transition is neither sustainable nor just.

2. India's contested coal complex

As leaders of the G77 in international climate policy negotiations, Indian government representatives have repeatedly insisted that emission reduction targets (and, by extension, emission reduction *measures*) necessary because of the past and current high emissions of the world's wealthy countries must not interfere with the possibilities for development of the poorer countries (Goodman 2016). Nonetheless, during the 2015 UN Climate Change Conference in Paris (COP21), the Indian government pledged to generate about 40% of electricity from non-fossil sources, both renewable and nuclear, by 2030 (Government of India 2015a). According to the current National Electricity Plan (Central Electricity Authority 2018), by 2027 rising electricity demand is to be met with 275 Gigawatts (GW) of total renewable electricity generation capacity, and 464 GW of coal based capacity, which is in addition to the already existing 478GW of coal based capacity at different stages of construction and likely to be materialized by 2022. The National Electricity Plan also echoes decisions, made between 2015 and 2016 in particular, to abort the construction of coal-fired power plants (Central Electricity Authority 2018; Edenhofer et al. 2018b). In 2017 alone, India added three times as much power generation through renewables as through thermal power plants (Central Electricity Authority 2018).

Global heating puts large parts of the Indian population at risk, especially people in low-lying, densely populated coastal regions and islands (Kumar and Tholkappian 2006), in cities and at industrial sites, already contaminated by particulate air pollution (Khosla and Bhardwaj 2019; Revi 2008; Guttikunda and Goel 2013). Agriculture, on which the country heavily relies, is expected to experience devastating impacts (Kumar and Parikh 2001; O'Brien et al. 2004; Rama Rao et al. 2016; Zaveri et al. 2016; Taraz 2018). Based on their income, 70-80% of India's

population can be classified as poor, living in households with less than Rs 5000 monthly income or subsisting on less than 3 USD per day. This vast majority also accounts for CO_2 emissions below the national average (Ananthapadmanabhan, K. Srinivas, and Vinuta Gopal 2007; Hubacek et al. 2017) while they are disproportionately affected by the climate crisis (Bidwai 2012). A study on the Indian metropolis of Bangalore indicates that higher income tends to be associated with higher domestic energy consumption and hence greenhouse gas emissions (Ramachandra et al. 2017). Simultaneously, the country's expanding electricity system is depleting its reserves of fossil energy carriers. For coal, these are, at 6.6 % of total global reserves, large in absolute terms (Shafiee and Topal 2009), but dwindle compared to the population (17.7% of the global total). Despite sizeable reserves, coal is not an energy source that can sustain India's energy system into the future. The practical implications of this unsustainability will be felt if and when the fossil energy system, most notably the electricity system, extends its coverage, especially in rural areas (Palit and Bandyopadhyay 2017).

Beyond its part in the climate crisis, the coal complex in India has significant health impacts – mainly through local air pollution – including premature mortality, ranging from 80,000 to 115,000 premature deaths per year in the local population living around coal-fired power plants (Guttikunda and Jawahar 2014). Coal-mine workers and communities around coal mines face many adverse diseases, prominent among them is pneumoconiosis (commonly known as black lung disease) due to inhalation of coal dust as well as diseases due to polluted drinking water (Sahu, Patra, and Kolluru 2018; Mishra 2015). Next to the slow violence of pollution, mining accidents are a persistent hazard (Maiti, Khanzode, and Ray 2009) with usually fatal consequences. From 2001 to 2014, more than 7000 accidents were reported across all coal mining companies in India (Tripathy and Ala 2018). In the three years between 2015 and 2017, more than 200 coal miners lost their lives in such accidents (Singh 2019). In 2017, the death rate per 1000 persons employed was 0.2, and the death rate per million tonnes of coal was 0.1 (Tripathy and Ala 2018). The rise of the coal complex is associated with land dispossession for construction and expansion of coal mines and thermal power plants across the country, with the associated loss of livelihood resources for the local population (Lahiri-Dutt, Krishnan, and Ahmad 2012).

Coal is a heavily contested resource, the subject of protests and conflicts across India: because coal combustion causes global heating and local pollution detrimental to human health, because the working conditions in coal mines are terrible, and because land and water and thereby livelihoods are appropriated for the expansion of the coal complex (Oskarsson and Bedi 2018; Kohli and Menon 2016; Ghosh 2016). Coal extraction and combustion play a pivotal role in the climate crisis and stopping these processes is crucial for socio-ecologically just sustainability transformations (Edwards 2019a). Conflicts over coal are part of a broader environmental justice

movement in India, claiming autonomy and socio-ecological well-being in the face of the country's growth trajectory (Roy and Martinez-Alier 2019; Randeria 2004).

Land dispossession, on which the expansion of coal mining often relies, is heavily protested at other extractive frontiers as well (D´Costa and Chakraborty 2017). Many environmental justice movements in India arise from conflicts over land acquisition (Chakravorty 2013), related to extractive as well as to renewable energy projects (Avila 2018; Lakhanpal 2019) and to wider regimes of dispossession (Oskarsson and Nielsen 2017), placing them within the global environmental justice movement (Martinez-Alier et al. 2016a). As the coal complex continues to expand - between 1994 and 2014, coal extraction doubled from approximately 250 to 500 million tons per year (Government of India 2015b) while coal's contribution to TPES increased from approximately one third to just under half (IEA 2019) – its infringement on land and livelihoods deepens.

Especially as coal mining becomes more heavily contested, access to and control over information are pivotal in the expansion of the extractive frontier, allowing for "dispossession by confusion" (Oskarsson 2013). Land for coal mining in central India, for example, is commonly secured through a series of 'micro' land grabs which are not appear to be significant individually and hardly register as land grabbing but do, in sum, allow for the large-scale territorial transformations that the coal complex requires (Oskarsson, Lahiri-Dutt, and Wennström 2019). The full extent of the coal conflict in India may be underestimated if the explicit opposition is not to coal extraction but to the violation of the local population's rights to resources.

The Indian struggles within and against the coal complex are reflected in other countries, such as Bangladesh (Kotikalapudi 2016), Colombia and Turkey (Cardoso and Turhan 2018b), and Poland (Kuchler and Bridge 2018), and can be expected wherever coal is on its paradoxical rise despite the climate crisis (Tyfield 2014). The Indian context can, however, be distinguished from conflicts in countries in which coal mining is a (neo-)extractive endeavour, that is, resource extraction for the sake of export, subject to protest and conflict and widely studied for Latin America, in particular (Burchardt and Dietz 2014; Svampa 2019). In fact, India has been supporting its expanding electricity generation not only with coal from domestic sources and renewables, especially hydropower, but also increasingly with imported coal, linking the country's production and consumption to the conflicted coal complex elsewhere (Rosewarne 2016; Misra and Mookerjea 2017).

As large and as internally heterogenic as the Indian economy is, it comes as no surprise that the coal complex is no homogeneous monolith, either. In dynamic spatio-temporal configurations, multiple economies of coal co-exist and have co-existed in India. Four broad types of economies

can be distinguished according to the meaning attached to and realized through coal extraction (Lahiri-Dutt 2016):

1) *national coal* represented by state-owned Coal India Limited (CIL) and its subsidiaries,

2) *neoliberal coal* mined in privately owned and/or operated mines, usually linked to thermal power plants and contracted by CIL,

3) *institutionalized informal coal*[2] produced in states of northeastern India, such as Meghalaya and Assam, in small-scale mines without legal recognition, and

4) the generally illegalized extraction of *subsistence coal* throughout the country.

From large-scale, high-tech to small-scale, no-tech, the materiality of coal extraction varies vastly between these economies, as do labour requirements and monetary value realized. Next to the conflicts between those in favour of and those opposed to coal extraction, conflicts arise between the differing interests of these (and possibly additional other) types of coal economies.

3. Conceptual framework, methods, and material

Studying the contested Indian coal complex clearly requires considering it in socio-metabolic as well as political-economic dimensions: How much coal is being extracted? How is extraction organized? Who are the actors upholding or contesting the functioning of the complex? We have based our study on a conceptual framework informed by social and political ecology. Fieldwork and interviews, data work and analysis contribute to our empirical insights.

3.1. The social and political ecology of coal

In order to fully study the coal complex and the social and the ecological implications of its trajectory, we must consider it in both biophysical and socio-cultural terms. The coal complex consists of land, of people, of water and air, of coal, of mines, of roads and rails, of power plants, of transmission lines and electricity. It also spans institutions and organizations, movements and alliances, values and beliefs.

In adopting a social-ecological perspective on the coal complex, we understand coal mining as occurring at the intersect of society's biophysical and socio-cultural spheres of causation (Fisher-Kowalski and Erb 2016). Within this social-ecological conceptualization, coal mining forms part of society's overall metabolism, of the processes of material and energy appropriation, transformation, and disposal required for socio-cultural and biophysical reproduction (Fischer-

[2] Kuntala Lahiri-Dutt calls this *statecraft* coal.

292 Kowalski and Haberl 2015). In contrast biotic resources (crops, fruits, vegetables, for instance)
293 which are an indispensable part of human nutrition and hence of the metabolism of the societies
294 they form, coal – especially in the amounts it is currently extracted and combusted – has a function
295 only in the metabolism of a society in which coal is used for heat (and the generation of thermal
296 power). As industrializing societies accumulate material stocks for electricity use (e.g., lighting,
297 appliances), distribution (grid, storage), and, of course, generation (power plants), they direct not
298 only material and energy resources to the construction of these stocks but are also very likely to
299 continue directing them to their future use. The lock-in into the fossil energy system is not only a
300 question of financial investments and their amortization but also of societal material stocks
301 (Krausmann et al. 2017). In this sense, the energy transition from a biomass-based to a fossil-fuel
302 system occurs gradually and requires vast material resource investments; this is a process that
303 began much earlier in some of the European countries (Great Britain, the Netherlands) than in
304 other parts of the world (Fischer-Kowalski et al. 2018) where it is currently still ongoing
305 (Schaffartzik and Fischer-Kowalski 2018). Socio-ecological transitions become evident as
306 changes in society's average metabolic profile, coinciding with social, economic, and ecological
307 shifts as new production, consumption, and trade networks emerge (Fischer-Kowalski and Haberl
308 2007). As far as simplified, data-driven manifestations of such a transition are concerned, the
309 process of industrialization following the Western blueprint tends to involve both a significant
310 rise in per capita resource use with most of the growth occurring in abiotic materials such as
311 construction minerals and fossil energy carriers (Schaffartzik et al. 2014). Between 1970 and
312 2015, India's metabolic rate increased by a factor of 2.5, and the share of biomass therein dropped
313 from 74% to 42% (UNEP 2019). Despite the expansion of renewable energy, the underlying
314 inertia continues to stem from the transition *to* a fossil energy system (Schaffartzik and Fischer-
315 Kowalski 2017; 2018).

316 The changing social metabolism requires the reconfiguration of society-nature relations, often
317 against the will of the directly affected population (Scheidel and Schaffartzik 2019), giving rise
318 to ecological distribution conflicts that overlap with social conflicts related to class, caste, gender
319 and ethnic identities (Martinez-Alier et al. 2016a) and are studied in political ecology as
320 environmental injustices (Martinez-Alier 2002). Political ecology understands environmental
321 issues as political, and analyses the relationships between the political, social, and economic
322 factors responsible for socio-ecological distribution conflicts (Robbins 2004). In adopting a
323 political ecology perspective, power relations have to be considered across levels of scale to
324 elucidate coal's continued dominance in India's energy mix amidst the global climate crisis and
325 despite local mobilizations contesting the (expansion of the) coal complex. Political ecology
326 provides the analytical tools to examine the roles of multiple actors and their power relations,

327 highlighting the connections between vested (economic) interests and the degradation of land and
328 destruction of livelihoods.

329 Integrating the social-ecological and political-ecological perspectives allows us to consider
330 conflicts with the coal complex as conflicts over the " (re)configuration of metabolisms" with
331 biophysical and social aspects (Demaria and Schindler 2016, 295). Specifically, we integrate
332 insights on energy and climate policy, ecological distribution conflicts and land rights, and
333 alternative approaches to development. This can be considered the 'political ecology of social
334 metabolism' (Scheidel et al. 2018).

335

336 **3.2. Materials and methods**

337 To assess and analyze the coal complex in India from a socio-metabolic and a political ecology
338 perspective, a mix of methods and tools have been implemented in this paper. The initial desk
339 research on movements against coal in India was carried out based on the Environmental Justice
340 Atlas (EJAtlas). The EJAtlas is a tool for collaborative research on environmental justice
341 movements with a theoretical framing rooted in activist knowledge (Temper, Del Bene, and
342 Martinez-Alier 2015; Martinez-Alier et al. 2016b). As of July 2020, the EJAtlas covers 3216 cases
343 worldwide, with the highest number of cases from India (336). Out of these, 72 are coal related.
344 Academic articles as well as grey literature such as newspaper articles, recorded interviews, court
345 documents and reports, were consulted as necessary to update or modify understanding of the
346 cases. Many of the environmental justice movements in India are long-drawn, with substantial
347 intervals between multiple court decisions as well as final outcomes, hence the need to
348 continuously update our understanding of them (Roy 2019). After reviewing secondary literature
349 and/or speaking with local actors, new cases of environmental justice movements emerging in
350 India were added to the atlas, mostly focused on coal, such as the Goa Against Coal movement
351 against expansion of Mormugao port for increased coal imports (EJAtlas 2017) and the conflict
352 on rat hole coal mining in Meghalaya (EJAtlas 2018a).

353 Brototi Roy then conducted fieldwork in multiple locations in India for a total of six months
354 between 2017 and 2019. Table 1 provides an overview of how many interviews were carried out
355 in which context. The interviewees were people from the communities affected by the coal
356 projects, district administration officials, as well as activists and journalists who have been
357 associated with the movements.

State	District	Name of Conflict	Type	No. of Interviews
Jharkhand	Latehar	Forest rights claims	Coal mine	8

Jharkhand	Godda	Land disputes	Thermal power plant	12
Andhra Pradesh	Srikakulam	Sompeta wetlands	Thermal power plant	9
Goa	South Goa	Mormugao port	Coal transport	11
			Total	**40**

Table 1: Overview of interviews carried out at each site of coal-related conflict during fieldwork

While most interviews lasted from forty-five minutes to an hour, some were also two to three hours long, requiring flexibility in terms of preparation and planning. In the semi-structured interviews, Roy did not offer a definition of the conflict at hand, leaving it up to the interviewees to identify causes, triggers, opponents, and aims. The main structured themes then revolved around the history of the conflict, the methods and motivations for resistances, the outcomes of the protests, the present situation and the perceived future plan of action. Except for the case of Sompeta in Andhra Pradesh, where translation was required from Telugu, all the other interviews were carried out in Hindi or English. In each of the places, Roy had an initial point of contact, who was either a member of the community, or had worked in the region for many years and was trusted by the locals. The movements in Godda and South Goa are currently active, whereas in Latehar and Srikakulam, the mobilization was at its peak from 2009 to 2013.

Interviews were supplemented by site visits and attendance at activists' meetings, gatherings and conferences, such as a meeting on forest rights in Ranchi, the state capital of Jharkhand, a national gathering of activists fighting against coal mining and thermal power plants in Dhanbad, the 'coal capital' of India, and academic workshops on land and tribal rights in New Delhi, where Roy participated as a direct observer. These contexts offered the chance for informal conversations with activists, policy makers and academics involved in the sphere of environmental justice, social movements, tribal rights and climate activism.

In May and June 2020, following the announcement of an investment of Rs. 50,000 crores (US$ 6.5 billion approx.) in the coal sector of India and introduction of commercial coal mining auction for 41 coal blocks, 8 additional interviews were carried out virtually with climate justice activists to understand how this would shape the grassroots mobilization on ground, in the midst of a global pandemic. These interviews were also semi-structured and lasted between forty-five minutes and one hour.

These interviews and informal conversations over the last three years were triangulated with government reports, academic articles, grey literature and court documents to examine the multiple ways in which coal is contested, from a political ecology and environmental justice perspective.

Coal mining is simultaneously a social process, part of a wider political-economic configuration, and a socio-metabolic process. Next to the political ecology lens, we therefore also considered the Indian coal complex through the lens of social ecology, considering its role in the social metabolism, that is in the material and energy inputs, transformations, and outputs required to reproduce society (Fisher-Kowalski and Erb 2016). We considered the role of coal in India's overall material and energy metabolism, using data on extraction, imports, and exports and the resulting supply and consumption indicators (UNEP 2019; IEA 2019). Information on access to electricity was extracted from the World Development Indicators (World Bank 2019) and interpreted in the knowledge that these figures may represent an overestimation of access.

India does not have a centralized system of collection and reporting of energy data which makes it difficult to assess the current status and future national scenario in terms of the different energy mixes (IEA 2020a). As a result, we had to rely on international databases (UNEP, IEA) to some extent but wherever information was directly available from Indian statistical sources, we gave preference to this data. This especially pertains to Government of India coal statistics (Government of India 2015b).

4. Results

4.1. The rise in Indian coal extraction and use

India is expanding and solidifying its centralized fossil energy system, of which the electricity system is an important component. By 2015, coal contributed 39% to India's total primary energy supply (TPES), compared to 23% in 1970. Including petroleum and natural gas, 70% of India's TPES stemmed from fossil sources, compared to 37% in 1970 (Figure 3). The rise of renewables – hydro, wind, solar, biomass combustion and gasification – does not lead to slower growth and certainly not to reductions in fossil energy supply. The use of coal in TPES is growing more strongly in India than anywhere else in the world: Between 2010 and 2015, India's average annual growth rate was 6.2%, while China's was 2.2%, the USA's -5.7%, and the world average was 1.1%. Yet, India's per capita energy consumption is only a fraction of that of the wealthy, mature industrialized countries: 10% of that of Japan and less than 5% of that of the USA (all data discussed in this paragraph is from (UNEP 2019)).

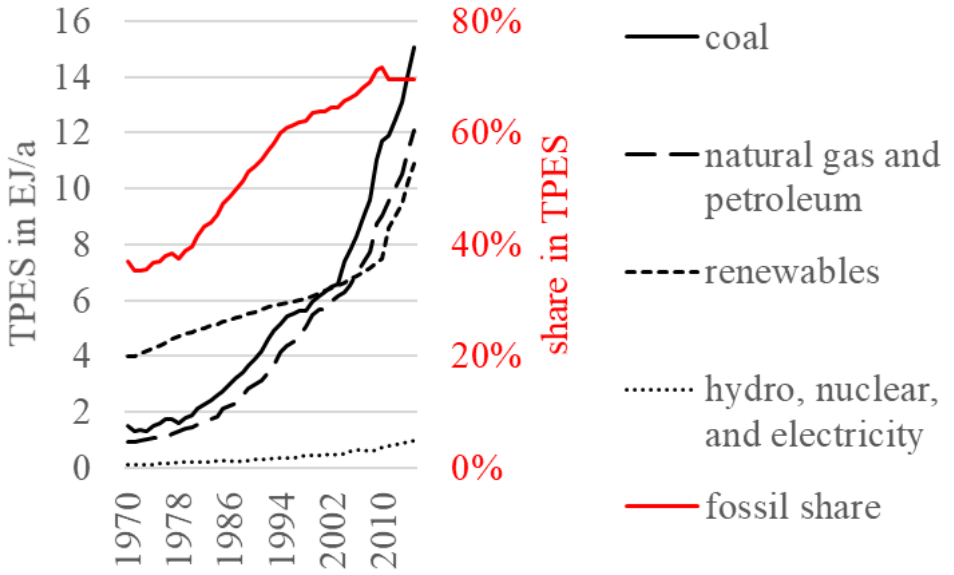


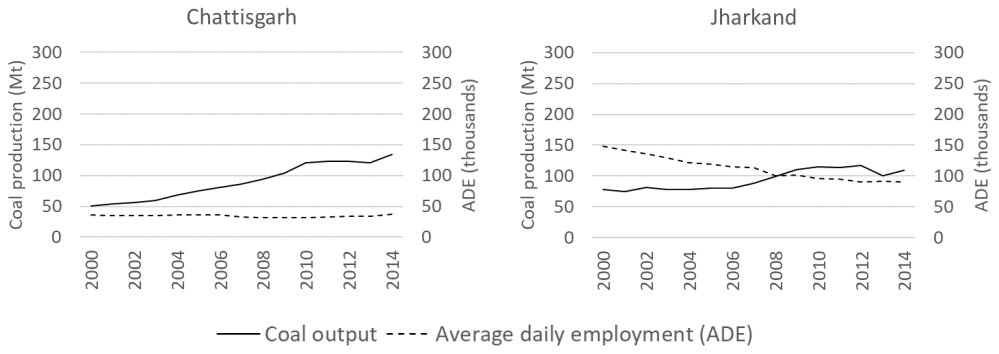
Figure 3: Between 1970 and 2015, India's total primary energy supply grew from 6.5 Exajoules (10^{18} Joules) per year (EJ/a) to 39.1 EJ/a. Although renewables grew consistently and especially strongly from 2010 onwards, this growth was outstripped by the accelerated supply of coal, natural gas, and petroleum. 70% of TPES stemmed from fossil sources by 2015. Source of data: (UNEP 2019)

India primarily extracts (and imports) coal for electricity generation. Approximately ¾ of India's electricity is coal-based with the remaining ¼ stemming almost exclusively from renewables and nuclear (IEA 2019). Imports have become important in meeting India's coal demand: For hard coal, the most commonly extracted and used type of coal in India, imports in 2015 corresponded to 20% of domestic production. Imports stem from other Asian countries: India receives the second largest share (after China) of Indonesia's coal exports, for example. India is also the main importer of steam coal – also primarily used to generate electricity – from the USA (IEA 2018a). As India accelerates its transition to a fossil energy system, it requires extractive expansion domestically and abroad. India's dependence on coal imports and Indian investments in coal extraction in other countries link its energy consumption to conflicts in, for example, Australia (Rosewarne 2016) and Bangladesh (Misra and Mookerjea 2017), and in the recent past even in the Russian Arctic (Peter 2019).

Unlike the patterns identified in Latin American economies of resource (neo-)extractivism, the expansion of coal extraction in India is not driven by exports (Burchardt and Dietz 2014). This is framed politically as an argument in support of expanding coal extraction: In the shape of economic growth and employment (not just in coal mining but also in related industries) and

industrialization with the associated access to electricity and other services, coal extraction is supposedly for the common good of the Indian people (Bidwai, 2012).

In direct terms, the Indian coal industry is not an important source of employment for the working population, over 50% of which are employed in agriculture, 25% in services, 11% in manufacturing, and 10% in construction (NSSO 2014). Less than 1% of employment is in mining and electricity, gas, and water supply combined (S. Chowdhury 2011). Coal mines are sources of employment during their initial establishment and provide less employment once the mine is 'up and running' – employment in resource extraction in general tends to be temporary and/or seasonal (Schaffartzik 2018). Of course, all other industries, including the service sectors, depend on electricity, generated mainly through coal combustion. A large share of the economic value added by the country's government-run Indian Railways is obtained in the transport of coal. However, neither Indian Railways nor Coal India Limited have created additional employment in step with the growth of their revenues. The coal complex replicates the "virtually jobless" growth that has characterized India's economy in the late 20th and early 21st century (Dasgupta and Singh 2005). As coal output increased, average employment in coal mining either stagnated or even declined. This can be observed for the Indian average as well as for the three main coal-mining states (Chhattisgarh, Orissa, and Jharkhand, Figure 4). Labor productivity, i.e., the coal produced per average person employed daily, tends to be higher in those states with large, open-pit coal mines, more conducive to mechanization than in those states and areas where coal is mined manually. Both types of mining are subject to different conflicts as we will demonstrate in Section 4.2.



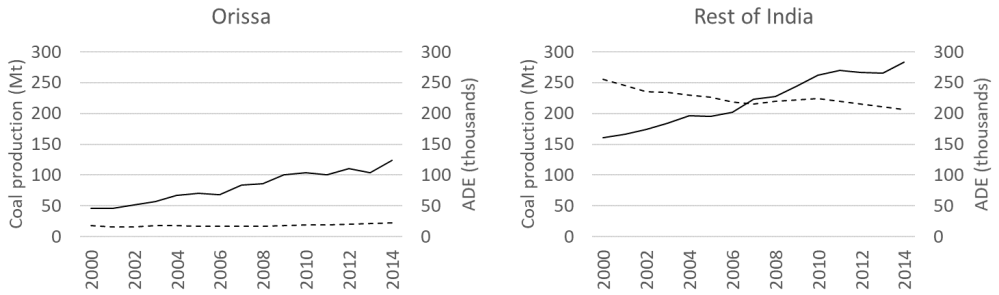


Figure 4: In all of India and in the major coal states, average daily employment (ADE) in coal mining (in 1000 people) decreases or stagnates as coal output (in Megatons (10^6 tons) per year (Mt/a)) increases. Source of data: Government of India (2015b)

Overall access to electricity, in urban as well as rural areas, improved during the period of rising coal extraction and use: While just over 40% of the Indian population had access to electricity in 1990, this rate more than doubled to 85% by 2017 (World Bank 2018). This average, however, is the result of almost complete access to electricity for the urban population (so long as the very important informal settlements in urban areas are not considered) and lower access in the rural areas. The gains in terms of electricity access are not proportional to the extracted coal: Between 1990 and 2010, access to electricity tended to improve by about 3% per year (World Bank 2018), irrespective of whether 2 million tons less coal than in the previous year were extracted (as was the case in 1998) or 35 million additional tons (2008). At the very least, this seems to indicate that access to electricity is not functionally hinged on expanding coal extraction.

4.2. Conflicts about coal

The conflicts erupting over coal indicate that significant parts of the population are not in agreement with extractive expansion as the development pathway. The underlying power relations that have been (and continue to be) sustained by coal became nationally very visible by what is popularly known as the CoalGate scandal. On September 24, 2014, the Supreme Court of India, the apex court of the country, ordered the deallocation of 214 of the 218 coal blocks allocated between 1993 and 2010. This was based on a court ruling that the allotments of coal blocks made by the government were illegal and arbitrary. Amidst discussions on corruption and crony capitalism, CoalGate became one of the major political scandals of recent years, causing an uproar about the illegal and corrupt ways of the Indian coal complex (Sarma 2013).

However, despite generating national awareness, the realities on the ground didn't change much. There were instead more worries and uncertainty over lost land and rehabilitation processes

(Chakravartty 2015). Mining auctions also re-started soon after, and as of June 2020, privatized and commercial mining are being boosted, generating renewed protests.

A multitude of old and new struggles directly and indirectly related to coal have emerged of which we discuss only a few that are exemplary of the central contestations in many more conflicts. High levels of violence, including the deaths of protestors, are a frightening and common feature and a cross-cutting issue in protests over coal mining. Those who are confronted by the brutality of police and private security companies are oftentimes tribals (also known as *adivasis*) who are also at the forefront of many other ecological distribution conflicts (Shrivastava and Kothari 2012). The competing claims to extractive expansion include indigenous (tribal) or other local rights to land, sacredness, and protection from pollution and risks to health. The resulting disagreement with the current or looming configuration of coal extraction may be expressed in written communication and consultations, through demonstrations, or through blockades of mining or production sites or of transport routes for coal.

In understanding why, in times of such conflicts and the climate impacts of coal combustion, the coal complex continues to expand, the diversity of the Indian coal economies is not casual but causal. We follow Lahiri-Dutt (2016) in generally distinguishing national coal, neoliberal coal, institutionalized informal (statecraft) coal, and subsistence coal and investigate the conflicts to which each of these economies gives rise.

4.2.1. National coal - The state's claim to land

Jharkhand in India's east contains one-third of the country's coal reserves and is the largest coal-producing state. The state also has a large indigenous population who have historically been marginalized and oppressed (Munda and Bosu Mullick 2003). The indigenous communities displaced by coal mines experience livelihood insecurity and poor living and working conditions despite provisions for compensation and for employment in the mines operated by Coal India Limited (Meher 2009).

As a result, there are numerous conflicts against coal, many lasting for decades. One such conflict, ongoing since 2004 and located in the district of Hazaribagh, is against a coal mining project which is a joint venture between Coal India Limited and the National Thermal Power Corporation (NTPC), the largest power utility company in the country. Coal is to be mined from the Punkhri-Barwadih coal block of the North Karanpura coal field which has a confirmed deposit of 1400 million tons of coal. If realized, not only would forest and agricultural land be destroyed , but also the prehistoric megaliths discovered in the region (Imam 2003). Local villagers, many of them tribal, organized to protest the land appropriation for the sake of mining (Meher 2009). Since

2004, the *Karanpura Bachao Sangarsh Samiti* (Committee for the Struggle to Save Karanpura) had been protecting farmland against NTPC's coal mining ambitions, organizing a number of marches and demonstrations (fieldnotes, October 2017). Amidst protest, and with heavy security, mining had commenced on May 17, 2016 in the Punkhri-Barwadih coal block.

Soon afterwards, opposition politicians began to back the villagers in their struggle for rights to land and livelihood. This was because, out of the 8,745 families that NTPC had urged to the sell their land, only 2,614 had accepted the compensation offered. Others protested the unjust level of compensation and the illegal methods of land appropriation (M. Chowdhury 2016). On August 14, 2016, approximately 200 villagers prevented NTPC contractors from building a resettlement colony. The police responded to this with tear gas and 22 rounds of bullets, injuring six people who were arrested when they reached a civil hospital in Hazaribagh for treatment. On September 15, some thousand villagers began a sit-in near a mining site in Chiru Barwadih village. On October 1, five of them were killed and at least 40 others injured, when in the early morning hours, police fired 60 rounds of bullets at these villagers (M. Chowdhury 2016). The fate of the villagers, the jungle, and the heritage of the Karanpura Valley remains undecided still as forced acquisition continues despite the protests (Iqbal 2016; Pal 2019).

4.2.2. Neoliberal coal – Threats to local livelihoods for coal production

India's south eastern state of Andhra Pradesh highlights the illegalities and violence associated with the coal complex, where both local livelihoods and ecologically sensitive regions are ignored in the construction of thermal power plants. In and around Andhra's coastal district of Srikakulam, at least seven thermal power plants were proposed in the early 2000s on fertile wetlands, which were allegedly falsely denoted as wasteland for obtaining environmental clearances (Dasgupta and Tata 2010). Kakarapalli (EJAtlas 2018b) and Sompeta (EJAtlas 2019), two of the proposed sites in Srikakulam district, were the epi-centers of protests against the power plants. These protests continued despite the deaths of activists at the hands of the police. The proposed sites for Kakarapalli promoted by East Coast Energy Private Limited and for Sompeta by Nagarjuna Construction Company, were on expanses of wetlands where construction would destroy the livelihoods of the farmers and fisherfolks (Sarma 2011; 2010). As a result, both regions saw different forms of mobilization to stop these coal projects, including relay hunger strikes (fieldnotes, February 2017).

Under the banner of Paryavaran Parirakshana Sangham (Committee for the Preservation of Environment), 3000 people gathered in Sompeta on July 14, 2010 to protest the destruction of their land, water, and air that the proposed power plant would cause. In the brutal repression of their protest, three of them were killed when police opened fire on the protestors. In Kakarapalli,

protests were similarly directed against the locally proposed power plant on February 28, 2011 when two people were killed by police fire. In both instances, many more protestors were injured. Due to these protests and the associated violence which made national news, the Union Ministry of Environment and Forests set up a committee which confirmed the existence of wetlands and the dire socio-ecological consequences of setting up thermal power plants in the regions (Narayanan 2015).

In Sompeta, it took several years for the state government to concede to the protestors' demands and assure the site be used only for "eco-friendly" projects such as agri-business which the locals are still struggling against to conserve the unique wetland on which their sustenance depends (Rajeev 2015). In Kakarapalli, it was only in August 2017 that some indication was provided that the project would not proceed – reportedly due to financial issues and changed government policy (Venkata Rao 2017). However, according to the May 2019 report of the Ministry of Power on thermal power projects in India, the plant is still under construction, despite slow progress due to financial problems (CEA 2019). According to local sources, the plant was partially set up and then abandoned, but not before destroying roughly a thousand acres of wetland (Adve Forthcoming).

4.2.3. Institutionalized informal coal - Legal grey areas created by statecraft

Coal mining in the north-eastern state of Meghalaya is quite different from the rest of the country (EJAtlas 2018a). Under the Indian constitution, Meghalaya has special status as a Sixth Schedule state which gives indigenous communities the rights to the natural resources (unlike the rest of the country, where these resources are owned by the state governments). This implies that whoever owns the land also owns the coal. However, according to the Mines and Minerals Development and Regulation Act, coal is a major mineral that cannot be mined by individuals. The legal grey area in which coal is nonetheless mined in Meghalaya is the result of rights granted in the process of statecraft nation-building.

The most common form in which coal is mined on the individually held lands of Meghalaya is rat-hole mining: manual coal extraction in which workers reach the coal seam by digging and crawling through small tunnels, approximately 1 meter in diameter. On April 17, 2014, the National Green Tribunal (NGT) banned rat-hole mining in Meghalaya as well as transport of coal previously extracted in this manner, stock-piled at mining sites in the East Jaintia Hills, West Khasi Hills and South Garo Hills regions of the state. The ban followed a petition filed in the neighboring state of Assam, where acidic discharge from the mines in the Jaintia Hills had polluted the Kopili river basin. The petition further cited illegal and unscientific (rat-hole) mining methods leading to hazardous working conditions for the miners (NGT 2014).

582 The ban on rat-hole mining triggered fundamental debates on livelihoods and indigenous rights
583 (McDuie-Ra and Kikon 2016). The practice of rat-hole mining enabled people to make a living
584 from coal with very low capital requirements. This was argued to allow people to meet their
585 livelihood needs and to be within the rights of the indigenous population within the Sixth Schedule
586 areas to use their land and the resources it harbors. On these grounds, a lifting of the ban was
587 requested. At the same time, many activists claimed that rat-hole mining only benefitted a few
588 powerful people, including politicians, while the tribals had been displaced in large numbers and
589 for decades. This raised the issue of what kind of development rat-hole mining allowed for and
590 what conceivable alternatives there were.

591 The presence of a coal mafia (and the violence it exercises) is an open secret in Meghalaya (Saikia
592 2019). On November 8, 2018, activists Agnes Kharshiing and Anita Sangma were assaulted,
593 reportedly by the coal mafia's henchmen, for documenting the extent of illegal coal mining in the
594 East Jaintia Hills. A few years prior, in 2015, P J Marbaniang, a sub-inspector of police, was
595 found dead under suspicious circumstances after he had seized 32 trucks that had been used in
596 violation of the NGT ban on transport of coal (Press Trust of India 2015). The mafia consists of
597 people with social, economic and political power who stand to gain much from continued coal
598 extraction. As a result, there have been multiple petitions made to lift the ban, and in July 2019,
599 the Supreme Court revoked it (Mazumdar 2019).

600

601 **4.2.4. Subsistence Coal - *Koyla Satyagraha* livelihoods and entrepreneurs**

602 In many parts of central and eastern India, there exists a subsistence coal economy of people who,
603 in most cases, are former farmers who have been displaced by larger mines (fieldnotes, October
604 2017). Within the affected communities, small-scale coal mining is a claim to subsistence which
605 has been formalized in a movement called *Koyla* (Coal) *Satyagraha*[3]. By extracting coal
606 manually, the miners and their communities exercise non-violent protest against the current
607 patterns of coal extraction while simultaneously claiming as theirs the resources that their land
608 harbors. 'If the government wants the coal beneath our land, we will give it to them, but we won't
609 part with our fertile land.' The first such *Satyagraha* started in 2011 in Gare village, in Raigarh,
610 Chhattisgarh and since then has spread in other parts of the state as well as to Jharkhand (Amnesty
611 International India 2015).

[3] The term Satyagraha, translated from Hindi to mean 'holding onto truth' was a form of passive political resistance used by M.K. Gandhi first in South Africa and then during the freedom struggle in India in the first half of the twentieth century, and has been replicated in many social and political struggles in the country since then.

612

613 **5. Discussion: More power relations than electric power**

614 Despite strong opposition to the expanding coal complex; despite the local environmental
615 destruction through mines, and air pollution associated with mining, transport, and combustion;
616 despite the disastrous effects that the climate crisis has on India; despite the political commitment
617 to renewable energy and environmental protection, "King Coal" continues to reign in India.

618 In just two decades, between 1994 and 2014, India's annual coal extraction doubled from 250 to
619 500 million tons and fossil fuels use continues to grow rapidly. That the Indian government so
620 strongly adheres to the coal project is indicative of the multiple socio-economic functions of coal
621 beyond energy provision (Lecavalier and Harrington 2017).

622 The most visible justification for the expansion in times of conflict and climate crisis is that coal
623 supposedly allows for development, that is, for industrialization following the Western (and more
624 recently Chinese (Tyfield 2014)) blueprint, with coal (and the harnessing of energy it represents)
625 attracting investment and enabling much-needed better access to energy, especially in the shape
626 of electricity; and with mines and power plants and trickle-down effects into the economy
627 generating the employment the country desperately needs; in sum, with coal improving the
628 income and the lives of all Indians. This was, for example, the justification provided for the
629 auction of 41 coal blocks for private companies to mine in June 2020 (Ellis-Petersen 2020)

630 Whether or not such goals – lofty and basal – are truly what motivates decision-makers stands to
631 question. Either way, the reasoning or the narrative alone does not drive the observable change.
632 Based on our analysis of the Indian coal complex, we propose that what gives rise to the
633 unimpeded expansion of coal, in the face of local opposition and of the climate crisis, is the
634 constricted socio-metabolic corridor coupled with the diversity of coal economies coexisting in
635 the seemingly monolithic coal complex.

636

637 **5.1. An extraction imperative in the socio-metabolic corridor**

638 The continued expansion of coal extraction in India and the rising levels of imports, fueling a
639 fossil electricity system, fall into the ongoing build-up and cementation of a heavily centralized
640 material- and emission-intensive fossil energy system (Schaffartzik and Fischer-Kowalski 2018).
641 This system constricts the socio-metabolic corridor, that is, the present and future space within
642 which society's biophysical reproduction must take place. The changes to the local and global
643 environment caused by societal resource use range from irreversible forms of deforestation, soil
644 erosion, damages to human health, and loss of agricultural land, to the climate crisis with its far-

reaching effects on natural ecosystems and society-nature relations. Any and all future biophysical societal reproduction will have to occur within the confines of these changes. At the same time, the claims to land and other resources made in the name of industrialization and expansion of the fossil energy system preclude other forms of land and resource use. Coal extracted and burnt now will not be available in the future. To make land occupied now by coal mines or power plants viable again for other uses – agriculture, human settlement, and environmental protection – will take a substantial material and energetic effort and/or a very long time. As the expansion of the coal complex progresses, the metabolic corridor becomes gradually narrower. Within the smaller operating space, competing human activities are even more likely to come into conflict with another.

Worryingly, it is conceivable that the closing of the metabolic corridor will cease to be gradual and instead occur in an exponential manner. The reason for this change of pace is that the expansion of the coal complex prescribes the increasing use of coal. Within the capitalist economic system, mines and powerplants have expected active lifetimes that do not have to do with the useful services they deliver to society but with their return on investment. People who – in the course of extractive expansion – are dispossessed of their livelihood resources are forced to undergo a metabolic transition of their own (Scheidel and Schaffartzik 2019), thereby becoming dependent on the corresponding energy and material availability and access. They are coerced into engaging in wage labor to secure a market-based subsistence, changing their consumption patterns accordingly. The dependence on wages often gives workers no other choice but to put up with hazardous working conditions, with high risks of accidents.

5.2. Economic diversity and cumulative expansion

Behind the seemingly monolithic growth of India's coal complex are different, partially competing processes of expansion. Following Lahiri-Dutt (2016), we have referred to these as economies of coal (Sections 2 and 4.2) which differ in socio-metabolic and political-ecological terms. The coexistence, the differences but also the overlapping of these economies cumulatively enable the expansion of the coal complex. Indian coal can simultaneously be conceived of as a state-building and -upholding resource, an opportunity for capitalist growth, a regional development chance (for entrepreneurs and politicians), and the main source of household reproduction. Within Lahiri-Dutt's category of national coal, there is a market-based form of subsistence coal (or, it has been successfully established) in which people are or feel they are dependent on the coal complex for income and thus for their livelihood. This circumstance can easily lead people to develop a certain attachment to this resource and its use (or to their right to profit from the expansion of the coal complex). Conflicts over coal show that where coal is

extracted by state-held companies, law enforcement is at their beck and call, even to turn against the Indian population at large. Considering that – even though it is state-held – Coal India Limited is not an operation for the common good but a business required to make profit, this highlights the role of law enforcement in de facto protecting capitalist production imperatives. That the same law enforcement organs would then conceivably protect the interests of private companies (and neoliberal coal) is not much of a stretch and has already been demonstrated in practice.

6. Conclusions: Are the coal phase-out and renewable energy ingredients of transformation?

Given the problems attached to coal expansion in India, which we have demonstrated, the announced coal phase out (Central Electricity Authority 2018) is – in theory – an important countermeasure. A true coal phase-out, however, would have to involve two things that are absent from the current plan of the Indian government:

1) the decision to leave the "coal in the hole" and to halt extraction even while it is still considered 'economically viable'; Instead, the continued expansion of the coal complex makes it seem as though the coal phase-out will not be a concerted effort but rather the result of exhausted coal reserves in some areas and financially unviable 'stranded assets' in others. India's tryst with coal is far from over, although it may possibly be slowing down (Vishwanathan, Garg, and Tiwari 2018) and might never reach Chinese dimensions. This is directly related to the unrealized second requirement of the coal phase-out:

2) a tremendous joint endeavor of people, government, and business to transform the energy system; not only from one based on fossil fuels and nuclear energy to one based on renewables but also from a heavily capitalized, centralized system to locally controllable decentralized energy provisioning.

Neither the lip service of the Indian government to renewable energy nor the actual investments and installed capacities break the mold of the fossil system, which is neither sustainable nor just. In fact, many renewable energy projects have raised similar problems as the coal complex expansion, including the dispossession of the local population from their livelihood resources and the sustained lack of access to electricity, even the vicinity of new projects. One example is the 113 MW Andhra Lake wind power project, promoted by the multi-national Enercon, on the outskirts of Bhimashankar Wildlife Sanctuary in the Western Ghats of Maharashtra. Here, the villagers who live next to the project site don't have access to electricity while the project threatens their livelihoods and the rich biodiversity of the region (Lakhanpal 2019). This pattern is followed in different parts of the global south, where land is always a contested commodity

(Avila 2018). It is studied globally as 'extractivism of renewables' in which renewables such as hydropower often replicate similar patterns of violence as have been observed in the extraction of fossil and metal minerals (Del Bene, Scheidel, and Temper 2018).

From a global, somewhat abstract perspective, the expansion of the Indian coal complex is troubling because of the present and expected contribution to the climate crisis. From a more concrete solidarity with those locally protesting this expansion, the threat to human livelihoods and human lives is devastating. The violence that is inherent to the observed conflicts over coal erupts not only over the rights to extraction or to electricity that are at stake but over the fundamental power relations and rights (all too often "rights" claimed without a legal basis) to resources. In this light, why actors go to such extremes to enforce one way of production becomes simultaneously more understandable and more deplorable; the conflicts aren't even about getting a service to the people who may need it. What is so violently enforced in all these cases is also the dominance of the interests of powerful actors over the local population.

This dominance, as the article shows, based on underlying power relations, is replicated in the different subnational economies of coal in India, in particular, and across different countries and commodities more generally. It must be further investigated to understand why coal continues to reign, across different scales, despite global concerns of climate crisis and local concerns of adverse impacts on health and environment.

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