Research Report for India China Institute

Assembling Coal as Fuel: Opening the Narmada to the Red Sea, 1837-1854

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[Dear Reader: This is a chapter from my MA thesis. The thesis asks how a history of capitalism which takes South Asia-Arabia as its point of departure provokes rethinking regarding how fuels as technopolitical things are made, dismantled, and re-made by focusing attention on unacknowledged forms of labor and work. The thesis is a work in progress due in May 2023, therefore the contours of this chapter are subject to some change. I conducted archival work at the Maharashtra State Archives (MSA) in Mumbai between June and July 2022. I plan to visit regional archives in Maharashtra and Gujarat for materials in non- English languages during the months of December and January, 2022-2023]

Introduction

> *"Upon its waters the products of the valley of the Nurbudda [Narmada], rich in mineral and vegetable resources, would be borne to a market, and available for adding incalculably to the national wealth" --A. Shakespear, Assistant Secretary to Government N.W.P (1844)*[1]

> *"I believe it is impossible to overrate the beneficial consequence that the Nerbudda [Narmada] mineral district is calculated to produce in the industrial development of India, if properly dealt with." -- Lieutenant Colonel Kennedy, Managing Director and Engineer-in chief of the Bombay, Baroda, and Central India Railway Company (1855)*[2]

Written eleven years apart, Shakespear and Kennedy's words sound eerily similar—both men apply emphasis on the "mineral districts" of the Narmada Valley, both agree on the "incalculability" of the resources that the British could extract from the Narmada, and crucially, both harbor fantasies of opening Narmada up to the market for the sake of "national wealth" as Shakespear would have it, and for the "industrial development of India" in the words of Kennedy. The context of their colonial-developmentalism around minerals, specifically coal, was the Bombay Presidency's "great desideratum to render Bombay independent of England in respect to coal, both in point of time, cost, and quantity."[3] Colonial officials in Bombay worried that their dependence on European coal merchants and the international market for coal was rendering their hold over the Red Sea precarious.

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[1] Note on the Navigation of the River Nurbudda by Mr. A. Shakespear (1844), 1
[2] Kennedy writing to the Directors of the Directors of the Company Bombay, Baroda, and Central India Railway Company (1844), 133.
[3] Descriptive Detail of the Mineral Resources of the Nerbudda Valley (1855), 19.

Constantly being short-changed by European merchants is evident in the discrepancies between the weight of coal stated in the Bill of Lading and the coal actually deposited in Bombay and Aden. Coal sent from Europe would often deteriorate in the long journey across the Western Indian Ocean, reducing its potency to be assembled as good fuel for steamships. These circumstances motivated the British to begin mining for coal on the Indian Subcontinent, specifically in Eastern India and also increasingly in the early to mid-19th century, in Central India, particularly along the Narmada.[4] The economic and geological experimentation of the East India Company (EIC) in mining for minerals, initially for coal, but later for iron ore, lithographic limestone, statuary marble began in 1838, one year before Aden was captured by the EIC, and forced into the Bombay Presidency.[5]

The capture of Aden and the beginnings of mining in Narmada weren't coincidental. Both projects were overseen from the Bombay Presidency. Colonial initiatives in Aden and Narmada involved the authority and supposed expertise of engineers. But most importantly, coal was central to both how the British imagined and sought to administratively constitute Aden and Narmada. Aden was drawn as a coaling depot by the British so that the Indian Navy could better surveil and control the Red Sea in the context of French machinations in Egypt, Ottoman pressures in North Yemen, and political ambiguity in Berbera and South Yemen. Meanwhile, Narmada was meant to provide coal for Aden's role as a fueling station and military garrison.

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In the following pages, I show that the work of mining, and the nascent establishment of industrialized forms of mining in Narmada were processes of agrarian transformation based on which maritime and urban reconfigurations were made possible.[6]By examining multiple unfolding experiments conducted by the EIC around coal, I show that we err in seeing coal as a self-evident/stable category/object/commodity. Instead, I document how coal was assembled as fuel for steamships. This required multiple interventions around cartographic practices and recruitment of labor to make Narmada navigable. British colonial officials in Bombay

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[4] Most histories of coal mining in South Asia are focused from the late 19th century and center Eastern India. See: Ray, Indrajit, and Krishna Paul. "BEGINNINGS OF COAL INDUSTRY IN BENGAL." Proceedings of the Indian History Congress 61 (2000): 836–47. Matthew Shutzer, "Subterranean Properties: India's Political Ecology of Coal, 1870–1975," Comparative Studies in Society and History 63, no. 2 (April 2021): 400–432. This is because mining for coal is seen as essential for the laying of railway infrastructure in the subcontinent. There is insufficient historical attention on coal mining that resulted from economic and political pressures emerging out of the Western Indian Ocean which began in the early 19th century. Perhaps other than a passing reference of mining in Narmada in Pratik Chakrabarti, "Gondwana and the Politics of Deep Past," Past & Present 242, no. 1 (February 1, 2019): 119–53, no systematic historiographical study of nascent mining projects that began in Narmada in the early 19th century has been conducted. I see this chapter as a corrective to the aforementioned inattention. This chapter seeks to spatialize mining away from terra firma to maritime considerations. I argue that it is important to hold urban maritime spaces and rural agrarian spaces in the same analytical frame, following Neeladri Bhattacharya's call (2018) to historically question 'the agrarian' as the universalized rural. I apply this insight to 'the maritime' as well where the frame of reference is not bound by the Ocean and the coast but extends to 'the interior' into forests and mines.

[5] In 1854, Narmada was described as a "great iron country" by a colonial geologist employed to survey the region. Report on the. Iron and Coal Districts of the Nerbudda Valley, from Ponassa to Juhhulpore.

[6] Though there is a large corpus of literature on urban-rural interdependencies, there is relatively less work on maritime-rural, port-interior relations. One significant exception is Thomas F. McDow, Buying Time: Debt and Mobility in the Western Indian Ocean, New African Histories (Athens: Ohio University Press, 2018).

planned the employment of capital-intensive technologies in mining in an effort to transform *Adivasis* into industrial and mining labor tethered to wages. The EIC in Bombay also queried how mining rights could be acquired from *Adivasi* lands.[77] Hence, the assembling of coal as a fuel also entailed the remaking of indigenous cosmologies.

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The EIC's plan for mining coal in Narmada was to insulate themselves from European coal merchants. It is therefore unlikely that Narmada coal would have competed in the international market. This is important to note in the context of the EIC attempting to engineer geographically expansive grain markets stretching from Bombay in Western India to Sonadeh in Central India. The grain market, it was assumed, would reduce the cost of conveyance of mined coal to Bombay and Aden as it would make available a "return trade" pushing down the costs of renting vessels. Capital outlay in Central India was also planned in the context of assembling coal as a fuel "by [the] improvement of roads" so that it would be cheaper, take less time and labor for mined Narmada coal to reach Bombay.[8] The assembling of markets within colonial zones need to be re-read as not about competition in the "open market", but about the accumulation of surplus value by 'cheapening' human and non-human labor.[9]

This approach of infrastructural inter-relationality is also taken up by Timothy Mitchell in his classic book *Carbon Democracy* (2011) where he writes about how labor regimes as well as political systems are shaped by the materiality of coal and oil. Mitchell argues that the materiality and form of coal -- its very physicality -- lent weight and density to various forms of politicization and labor mobilization. Because coal would be worked in mines, dockyards, or railway stations it was conducive for mass mobilization and labor union politics – which fed into democratic mobilization.[10] However, there is arguably a particular formulaic way in which Mitchell describes why coal enabled more politicization than oil. It is because coal needed more workers per unit of energy output than oil that workers were more easily able to band together. Mitchell writes that the production of oil

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[7] Approximately one hundred and fifty years later, the post-colonial developmentalist Indian State and its federal units would plan large cascading infrastructures of dams for irrigation and hydroelectric purposes in the Narmada Valley. In the decades to come, the plan would result in the displacement and dispossession of innumerable Adivasi and farmer communities. However, since the 1980s, and continuing to the present day, these plans have been partially throttled by resistance and mobilization by Adivasis, farmer, and other groups. The literature on the Narmada Bachao Andolan (NBA) is vast. In this chapter, I cannot do justice to the political and historiographical stakes of the NBA, and the endurance and intransigence of colonial logics in post-colonial developmental projects, even as the movement was an incitement to much of this chapter. For a sample of work on the NBA, see: Amita Baviskar, In the Belly of the River: Tribal Conflicts over Development in the Narmada Valley, 2nd ed, Studies in Social Ecology and Environmental History (Delhi ; New York: Oxford University Press, 2004). Nandini Oza et al., The Struggle for Narmada: An Oral History of the Narmada Bachao Andolan, by Adivasi Leaders Keshavbhau and Kevalshingh Vasave, trans. Suhas Paranjape and Swatija Manorama (Hyderabad, Telangana, India: Orient BlackSwan, 2022).

[8] Memoir., 34

[9] Aaron Jakes, "Boom, Bugs, Bust: Egypt's Ecology of Interest, 1882-1914: Egypt's Ecology of Interest, 1882-1914," Antipode 49, no. 4 (September 2017): 1035–59, Jason W. Moore, Capitalism in the Web of Life: Ecology and the Accumulation of Capital, 1st Edition (New York: Verso, 2015). Nancy Fraser, "Behind Marx's Hidden Abode: For an Expanded Conception of Capitalism," in Critical Theory in Critical Times (Columbia University Press, 2017), 141–59.

[10] Timothy Mitchell, Carbon Democracy, 27

"required a smaller workforce than coal in relation to the quantity of energy produced."[11] This disproportion in labor was why coal enabled democratic movements, while oil limited curtailed labor mobilization. However, I argue for moving away from this deterministic quality of politics. By looking at fuels as technopolitical assemblages that need an immense amount of work, I point out the contingent, unpredictable, and emergent nature of politics.

Even though Mitchell wants to center coal's materiality -- he nonetheless abstracts coal *as* energy or as innate "supplies of energy."[12] For instance, Mitchell writes that "fossil fuels are forms of energy in which great quantities of space and time, as it were, have been compressed into a concentrated form."[13] This image of abstraction has remained a consistent feature in histories of energy. While On Barak wants to de-center 'energy' and the 'thermodynamic universal', he nonetheless assumes coal as naturally being a fuel.[14] In a similar vein, Matthew Shutzer writes about how the colonial state attempted to translate the "natural properties" of coal into "mobile abstractions."[15] A recent work by Victor Seow titled *Carbon Technocracy, which* was intended to be a counterpoint to Mitchell's *Carbon Democracy* in terms of the demands that coal imposed on the bodies of workers, nonetheless hones in on processes of abstraction. Seow writes that "[t]he coal mined at Fushan and at other sites of energy extraction around the globe catalyzed a distinctive sociotechnical apparatus that presented itself as the epitome of modernity – universal, scientific, inevitable."[16] This abstracted understanding of coal – I argue – has ramifications for how imperial capitalism is conceptualized.

In many historical works, coal is underspecified, by which I mean any one unit of coal is substitutable for another. As I will show later in the chapter, this sets up imperial capitalism as a totalizing and inexorable force.[17] The archives however are chock-full of incredibly detailed regional taxonomies of coal drawn along the lines of luster, brittleness, size, weight, the even way in which coal felt when held.[18] Therefore, in lieu of an emphasis on abstraction and its associated universality, I make a case for an understanding of imperial capitalism as being ramified, shaped by historically situated and contingent processes.

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[11] Timothy Mitchell, Carbon Democracy, 36
[12] Timothy Mitchell, Carbon Democracy, 14
[13] Timothy Mitchell, Carbon Democracy, 15
[14] For instance, On Barak in Powering Empire writes that "coal, water, and animal power animated one another" in the expansion of imperial capitalism (46). I differ from this by asking how coal, water, and animal power are co-constitutively assembled or indeed, even dismantled, each other as fuels.
[15] Matthew Shutzer, "Subterranean Properties: India's Political Ecology of Coal, 1870–1975," Comparative Studies in Society and History 63, no. 2 (April 2021): 400–432.
[16] Victor Seow, Carbon Technocracy: Energy Regimes in Modern East Asia, Studies of the Weatherhead East Asian Institute, Columbia University (Chicago ; London: The University of Chicago Press, 2021), 4
[17] For a significant complication of this view while still carrying coal as abstracted in the analysis, see Shutzer ""Subterranean Properties" where his point of inquiry is how do pre-existing social arrangements intersect with capitalist pressures? How are 'pre-capitalist' social relations co-opted, subsumed, incorporated into the production of capital which is always uneven? Shutzer's attention is on the legal ambiguity of subterranean things as property, whereas I ask how coal itself was ambiguous and possibly multifarious before it was considered as property or commodified for the marketplace.
[18] Steam Department, 1838, Vol. 21, Maharashtra State Archives (MSA), Mumbai, S-215 to S-217. One colonial official wrote that "handpicked coal is best adapted for steam purposes" and that great difficulty will be experienced in getting contracts for handpicked coal" , see Steam Department, 1837, Vol. 3, Maharashtra State Archives (MSA), Mumbai, S-20

This doesn't however mean that assemblages are not examined in histories of coal. Mitchell for instance writes about how *from* coal, a "political machine" was assembled by organized workers.[19] Seow writes about how the materiality of coal "gave form to particular assemblages of technology, labor, and the environment".[20] However, I argue that coal had to be assembled as fuel in the first place.[21]

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In this chapter, I attempt to show how various relations were rearranged to assemble coal as a fuel for steamships. These background conditions were focused on the reconfiguration of environments, labor relations, agrarian markets, systems of accounting, methods of calculating value, and modes of political rationality by the EIC. A large amount of preparatory work around interlocking infrastructures was necessary for assembling coal as a fossil fuel in the intensification of imperial capitalism. In this chapter, I seek to examine how coal is *assembled as* a fuel by combining the approach of ontological mutability in Gabrielle Hecht's *Being Nuclear* (2014), with a theory of assemblage in Tania Murray Li's *What is land? Assembling a resource for global investment* (2014).

As a way to historicize uranium, Hecht asks in what contexts does it serve as a "mineral or fuel?"[22] This theoretical position motivating Hecht's question about ontological instability also lends itself to coal. Hecht asks how such instability opens up a politics where uranium is different for different actors: it is toxic for miners, a commodity for countries that trade in uranium, it is fuel, or a possible explosive for others, it is even a diplomatic bargaining chip. Hecht writes that nuclear things/places/people (what she calls "nuclearity") do not exist independently in nature but are technopolitically constituted by administrative, epistemic, racist, and geopolitical interventions. Just as nuclearity is context dependent and historical, 'fuel' is similarly mutable. As Hecht demonstrates, uranium needn't necessarily *be* nuclear.

As Hecht shows us, colonially driven public health initiatives minimize the occupational hazard of mining work by (falsely) re-writing uranium as a relatively benign entity for the sake of pacifying laborers into work at these dangerous mines. In a somewhat similar way, I too argue that coal needn't necessarily be fuel. For South Asian coal miners and coolies it was, literally, a weight on their bodies. For *lascars* and coal stokers and trimmers, coal redirected their life and energy towards the movement of the ship. For *banjaras* who transported coal – coal wasn't exceptional; sacks of coal were hauled up and down carts like cotton, shattering it in the process. Coal could be assembled as fuel, or it could ignite as an explosive. The volatility of coal worried the EIC for which they attempted to establish regulations, infrastructures, and mechanisms to curtail coal's unpredictably to burst into flames damaging and destroying ships and

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[19] Timothy Mitchell, Carbon Democracy, 12

[20] Victor Seow, Carbon Technocracy, 3, f.n 7

[21] Through the concept of assemblage, I question the colonial management of metabolic relations as not external, but as being embedded within technopolitical production of fuels – whether they be for human or non-human animals, or for ships. By placing histories of racial hierarchization as wellsprings of accumulation in the assembling of coal as fuels – I also hope to contribute to the method of Actor-Network Theory that takes processes of racial ordering seriously.

[22] Gabrielle Hecht, Being Nuclear: Africans and the Global Uranium Trade (Cambridge, Mass: MIT Press, 2012), 56

warehouses.[23]

In a somewhat similar vein, though there are important departures, Li argues that Land is *produced* as a resource; just as other resources have to be “made-up”, she writes that "’natural resource’ is a provisional assemblage of heterogeneous elements including material substances, technologies, discourses, practices".[24] Following from Hecht and Li, I argue that fuel too is “provisionally assembled” within sociotechnical systems by multiple actors with often tenuous and conflicting agendas. Additionally drawing from Hecht (2014), I also ask how combining STS with labor histories in relation to fuels *from* formerly colonized inter regions can refresh our understanding of imperial capitalism.

Just as Land’s “uses and meaning are not stable”, I ask how taking the particularity and peculiarity, “materiality” and “the form” of coal seriously enables us to examine imperial capitalism as contingent and technopolitically negotiated.[25] What I mean by coal being assembled as fuel for steamships is the processes by which human and non-human work, colonially driven racial rearrangements and hierarchizations, environmental relations, metabolic dynamics, and political negotiations are reworked, improvised, and specified for assembling coal as fuel for steamships. Coal is not naturally a fuel, it has to be *worked into* a fuel. The hidden abode of imperial capitalism is played out where things and people are assembled as resources in technopolitically charged ways.[26]

Looking at fuels as assemblages allows me to argue that coal did not spark “global carbonization” or power empire.[27] Rather, the reframing of relations from capitalist pressures was necessary to convert fossils into fuels for the expansion of trade and commerce. Coal has been assembled as fuel since at least the Bronze Age[28], but paying attention to how coal was assembled for steamships in the 19th century Western Indian Ocean allows me to historically situate the distinctive and specific processes by which imperial capitalism was a technopolitical playing field comprising multiple players and things. This brings new focus on the entanglement of capitalist and colonial processes in the assembling of coal into fuel. Coal and oil did not by themselves drive colonialism or capitalism, rather coal and oil were remapped, and assembled into a fuel *for* steamships in service of imperial expansion.

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I argue that historians of capitalism, the environment and scholars of science and technology studies need to pay attention to the administrative, political, and itinerant labor that went into
assembling coal as a fuel. This approach helps us pose coal in relation to projects that either make it or break it as a fuel. In an effort to assemble coal as fuel for steamships,

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[23] Marine Department, 1847, Vol. 106, Maharashtra State Archives (MSA), Mumbai, S-107, S-224 to S 230
[24] Tania Murray Li, “What Is Land? Assembling a Resource for Global Investment,” 489.
[25] Gabrielle Hecht, Being Nuclear: Africans and the Global Uranium Trade (Cambridge, Mass: MIT Press, 2012). Tania Murray Li, “What Is Land? Assembling a Resource for Global Investment”
[26] Nancy Fraser, “Behind Marx’s Hidden Abode: For an Expanded Conception of Capitalism,” in Critical Theory in Critical Times (Columbia University Press, 2017), 141–59, Tania Murray Li, “What Is Land? Assembling a Resource for Global Investment,” 489. Gabrielle Hecht, Being Nuclear: Africans and the Global Uranium Trade (Cambridge, Mass: MIT Press, 2012).
[27] On Barak Powering Empire.
[28] John Dodson et al., “Use of Coal in the Bronze Age in China,” The Holocene 24, no. 5 (May 2014): 525–30

multiple experiments were carried out and folded into each other. Assembling coal as a fuel involved experiments around methods of accounting where the "comparative value" of different varieties of coal as fuel was recorded in terms of the weight of coal used to generate steam in a specific time.[29] When we begin paying attention to how coal was assembled as a fuel – we see how larger environments and social formations were reordered in the service of making coal fuel, shedding new light on the messy process of imperial capitalism.

Colonial Metabolism and the Ecology of Equilibrium

As the British attempted to draw a logistical channel that would connect Europe and the Indian Subcontinent through the Red Sea, from the mid-19th century onwards, steamships with raw cotton and jute would leave the Bombay dockyard and enter the Arabian Sea on their way to Lancashire, Liverpool, and Manchester. Beginning in 1839 they called port at Aden, where refueling would occur and repairs would be made, including the stocking for provisions to the journey to Suez. From Suez, until 1868 before the opening of the canal, raw cotton and jute would be loaded onto camels to be taken to Alexandria.[30] From Alexandria another steamship would be loaded and launched into the Mediterranean, through the Straits of Gibraltar landing at their final destination, Europe. For such an enterprise, large amounts of coal had to be assembled as fuel.

Historians of coal and the British Empire write about how coal held this imperial geography together. The argument being that since the British were the primary exporters of coal to coaling depots in the Red Sea, as well to Bombay – coal operated as "makeweight".[31] This scholarship reveals how coal as fuel was sometimes not as important as coal as weight. It is argued that coal helpfully weighed down ships leaving Europe, this was important because when steamships consumed coal for fuel, the vessels would lose weight because of which it would rise. This would disturb the specific balance that was intended by engineers between the hull of the ship and the amount of the hull that was necessary to be below the waterline for the steamer to move in a straight-line. Put simply, a very light ship was both inefficient and costly.

This balancing act was necessary, argues On Barak since bulky raw materials from South Asia would be exported to Britain. In turn, the British exported finished goods which were lighter and occupied less space. To equalize this incongruence in terms of space and weight, the British used coal to weigh the ship down to a level where it could travel in a straight-line. Jevons in 1865 argued that the weight of coal served the shipowners because other than the weight of coal offsetting the imbalance between import and export, it could also help in establishing a return trade – the export of British coal – which they assumed would further push down the costs of Britain importing raw cotton and jute from Bombay.

This may have been the intention; but it rarely worked in practice. I problematize this stable equilibrium by examining the intellectual history of this argument as a product of a particular moment of thinking in political economy. Jevons' *Coal Question* (1865) which

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[29] Captain Turner, Mint Engineer, Bombay writes to the Marine Department, 12th June 1839, Selections from the Records of the Bombay Government (1838-1851), relating to The Nerbudda River, and the Mineral districts of the Nerbudda Valley. The notion of "comparative value" is worth paying attention to as it depicts how coal is assembled as a fuel.

[30] R. J. Gavin, Aden under British Rule, 1839-1967 (1975)

[31] On Barak Powering Empire., 9, 12, 30, 107, 118

historians of coal and empire have come to use uncritically, needs to be placed in an imperial context, alongside Jevons' call for political economy to be scientific. This also opens up a new way into the colonial history of economic thought by situating the mathematization of economic questions – and the allure of equilibrium – within colonial administrative practices.[32]

Jevons in *The Coal Question* wrote that "[o]ur empire and race already comprise one-fifth of the world's population; and by our plantation of new states, by our guardianship of the seas, by our penetrating commerce, by the example of our just laws and firm constitution, and above all by the dissemination of our new arts, we stimulate the progress of mankind in a degree not to be measured." One year after these words, he published a clarion call to political economists in his paper titled a "Brief Account of a General Mathematical Theory of Political Economy" (1866) where he argued for political economy to become an exact science.

For Jevons, exactness was made tangible in the form of weight particularly the weight of coal as stable, easily abstracted, perfectly and mathematically commensurable entity – this assumption of coal as durable was necessary for Jevons about how a state of equilibrium in a colonial context *should be* favorable to the British. While undoubtedly Britain was in fact a major exporter of coal, and that coal did play makeweight, I believe Jevons' purified story of equilibrium obscures the mess and anxieties of the British Empire and the many ways in which it was contested and negotiated.

For instance, the leaky ship punctures the myth of an equilibrium which supervenes on an understanding of coal and its weight as inherently stable. Cracks in the ship, or heavy rains, large swells in the sea would often drench the coal adding significantly to its weight, as well as dampening its affordance as fuel for steamships.[33] What was evaluated as good quality coal in London would often be declared as bad quality in Bombay. This disjuncture of the same coal being evaluated differently in two places separated by the sea generated intense conflict between EIC officials in Bombay and European coal merchants. The weight of coal, like coal itself – was mutable and shifting. The weight of coal that left London would not be the same weight of coal that would reach Aden or Bombay. In 1847, Captain Haines, the political resident at Aden – who in 1839 led South Asian troops from Bombay to capture Aden in the hopes of establishing the site as a coaling depo—wrote in frustration to his bosses in Bombay about possible methods to measure the weight of coal that lands in Aden from Europe or Bombay in a conclusive manner. Of central concern were two questions: What monetary calculations ought to be made if there is a deficit or surplus of coal that arrives in Aden which diverges from the weight of coal recorded in the Bill of Lading? And who should bear the cost of coal that is difficult to be molded into a good fuel? In clarifying the stakes of these questions, Captain Haines included a statement documenting alleged fraud on the part of European coal merchants, "Statement showing the quantity of coals as per bills of Lading

[32] Unlike J.S Mill and J.M Keynes, W.S. Jevons has seldom been read as a political economist in service of the British Empire. For exceptions see: Kent Klitgaard, Jevons' Paradoxes: William Stanley Jevons and the Roots of Biophysical and Neoclassical Economics (2022) and David L. Blaney, "Provincializing Economics: Jevons, Marshall and the Colonial Imaginaries of Free Trade," Review of International Political Economy 28, no. 6 (November 2, 2021): 1533–54

[33] Marine Department, 1847, vol. 106, Maharashtra State Archives (MSA), Mumbai, S-39 and S-70

and the Quantity actually received into the Coal Depot at Aden" signing his name to it.[34]

Rather than spotless equations, Captain Haines' statement was an account of recurrent discrepancies and mismatches. Even though at the end of his statement, the discrepancy between the actual coal landed and the Bill of Lading was just two tons in deficit, the frequency at which there was a mismatch was a significant source of frustration for Captain Haines in Aden. This became a site of contestation between the EIC and European coal merchants. The EIC would officiate "protests" against the European coal merchants by not paying them fully or delaying payments.[353]These aggravations with the European coal market drove the EIC to begin mining in the Narmada River and Valley. This, they forecasted, would allow the firm to become "independent"[3636] of European coal merchants, and insulated from the vagaries and variations in price that characterized the international coal market.

Remaking Landscapes, Remaking People

In 1838, the British began to mine for small amounts of coal in the Narmada River and Valley on an experimental basis to test its affordance as fuel for steamships. This proved to be a logistical challenge for the British. In 1847, a small quantity of coal from present day Narmadapuram was brought overland to Bombay, a journey of approximately 500 miles, to be tested by a chemistry professor from the local medical college. After studying the chemical composition of coal, the chemistry professor concluded that Narmada coal "affords so unfavourable an estimation of the coal that I was induced to make several repitions [sic] of the analysis."[37]

The quality of the coal as a potential source of fuel was assessed as a function of the proportion of solid carbon that that the coal contains—higher the proportion of solid carbon the better the quality of this coal as a potential source of fuel. The chemistry professor observed that the Narmada coal, compared to coal from Newcastle and Liverpool, had the least amount of solid carbon and the most ash, a residue. The chemistry professor also wrote that the Narmada coal did not burn fully, meaning a certain weight of coal—which could be assembled as fuel for steamships – was wasted.

Unsatisfied by this conclusion, EIC officials directed engineers from the Steam Factory to test the Narmada coal as a source of fuel.[38] In 1847, the engineers studied how fast a specific weight of Nerbudda coal could produce steam from a particular volume of water compared to 'European' coal.[39] They concluded that "Nerbudda coal is very good for general steam purposes" and when burnt it produces "a clear flame, leaving scarcely any clinker on the bars."[40] This discrepancy in the experiments is important to note as various layers of racialized forms of expropriation would be

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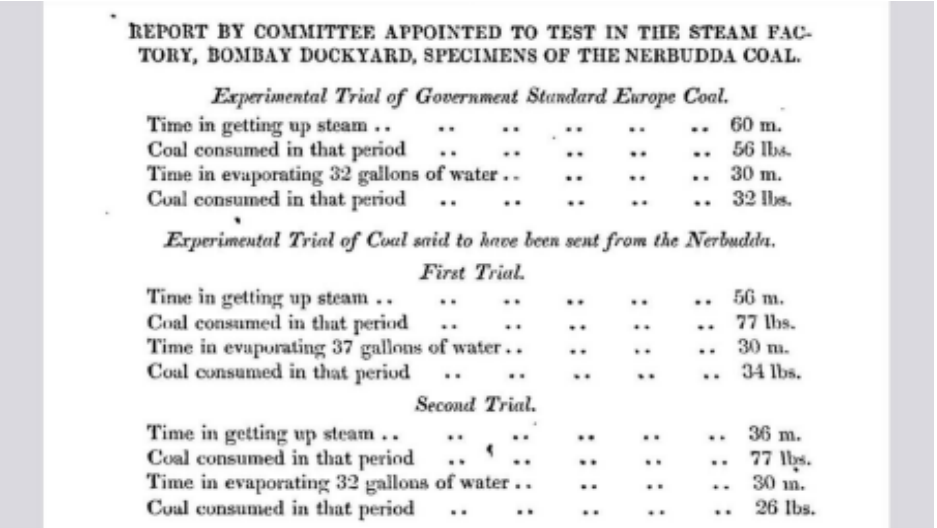
[34] Marine Department, 1847, vol. 106, Maharashtra State Archives (MSA), Mumbai, S-39 to S-45. The "Statement" is also instructive in terms of showing the weight of coal that landed in Aden between 1842 and 1847, and where the coal was brought from. Interestingly, there is no column for the price of coal in Captain Haines' "Statement".
[35] Marine Department, 1847, vol. 106, Maharashtra State Archives (MSA), Mumbai, S-107
[36] See *Descriptive Detail of the Mineral Resources of the Nerbudda Valley* (1855): The EIC officials in Bombay argued to be "independent" from "fluctuation in freight" of coal., 21
[37] Marine Department, 1847, vol. 106, Maharashtra State Archives (MSA), Mumbai, p. S-237
[38] Marine Department, 1847, vol. 106, Maharashtra State Archives (MSA), Mumbai, see p. S-241
[39] It is worth noting that coal from Newcastle, Wales, Glasgow, and Edinburgh would sometimes all get abstracted as 'European' coal.
[40] Marine Department, 1847, vol. 106, Maharashtra State Archives (MSA), Mumbai, see p. S-243

constituted for assembling coal as a fuel for steamships even as its quality was often suspect. The results of the experiments of the engineers in the Steam Factory were recorded as such[41] :



REPORT BY COMMITTEE APPOINTED TO TEST IN THE STEAM FACTORY, BOMBAY DOCKYARD, SPECIMENS OF THE NERBUDDA COAL.

Experimental Trial of Government Standard Europe Coal.

Time in getting up steam	60 m.
Coal consumed in that period	56 lbs.
Time in evaporating 32 gallons of water	30 m.
Coal consumed in that period	32 lbs.

Experimental Trial of Coal said to have been sent from the Nerbudda.

First Trial.

Time in getting up steam	56 m.
Coal consumed in that period	77 lbs.
Time in evaporating 37 gallons of water	30 m.
Coal consumed in that period	34 lbs.

Second Trial.

Time in getting up steam	36 m.
Coal consumed in that period	77 lbs.
Time in evaporating 32 gallons of water	30 m.
Coal consumed in that period	26 lbs.

It is worth going into some detail about the experiment conducted by the Dock engineers as it illustrates how fuels are technopolitical systems needed to be assembled through the re arrangement of various material and ecological relations–both human and non-human.

Because of the distance that the coal was carried, the engineer complained that the coal had “broken into very small pieces, -- indeed a good deal of it is literally dust”.[42] The engineer was careful to mention in his recording of the experiment that, when the Narmadapuram coal was burnt – the dust was not separated from the coal, and therefore the weight of “the coal expended” in the experiments was an admixture of “dust and all”.[43] The engineer experimented with the dusty Narmadapuram coal in the Ocean, unlike the chemistry professor who likely studied it in the confines of his laboratory in the medical college.

To record the nature of the experiment, the engineer not only gave a description of the vessel but also of the nature of the boiler and the engine—its size, the collective horsepower, the dimensions of the machine and the boiler-maker, the state of the fire-place whether it was cleaned or not, whether the boiler or the steam-pipe had been covered by non-conducting material, and of course, the nature of the wind, tide and swell of the sea. But all of these variables were controlled by conducting the comparative experiments at the same time, in the same vessel, with the same conditions – except that the boilers used were separate and independent from each other. Geological experimentation and lab-work were thus put in service of imperial capitalism.

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[41] *Memoir,* 49

[42] Selections from the Records of the Bombay Government (1838-1851, relating to The Nerbudda River, and the Mineral districts of the Nerbudda Valley), 42

[43] *ibid*

Even though the engineer was satisfied by the performance of the Narmada coal as fuel, he also assessed the quality of the coal as a fuel by the effects that burning this coal had on the ship and machinery. He wrote that even though the Narmada coal when burnt for the production of steam produces very little residue (which was in sharp contrast to the chemistry professor's assessment), the coal nonetheless "forms a good deal of scoria or clinker on the fire-bars."[44]

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Coal which burnt well sometimes could not be a fuel for steamships in the early-mid 19th C. Welsh coal which powered cotton and textile mills in Lancashire and Liverpool were regarded as an extremely good quality coal for the generation of steam – but when used in steamships in the Western Indian Ocean, the Welsh coal ended up damaging the inside of boilers due to its "extreme friability".[45] Hence Welsh coal burnt so clean that it was not just an ineffective fuel for steamers in the early-mid 19th century, but was actually destructive. Indeed, the EIC engineer wrote that "Welsh coal even of the very best quality" was "absolutely useless as a fuel" for steamships in the Western Indian Ocean.[46]

While Welsh coal was valorized in Europe, British colonial engineers in the Western Indian Ocean circuit complained that the reputation of Welsh coal turned to dust when made to transit to the Arabian Peninsula as it would break into small pieces or get drenched: one EIC official in Egypt complained that, in the 300 tons of coal that was deposited at Suez from Europe, a "quarter was sand, dust and dirt" because of which it was hard to produce steam.[47]

The cost of the bad quality coal devolved to coal stokers who had to work in increasingly grudgingly hot conditions, where temperatures could reach 120 to 140 degree Fahrenheit where they were made to quickly shovel larger quantities of heavy, wet and dusty coal into the fireplace so that it could be made into fuel.[48] They did this with very low wages and with little food. Colonial officials calculated that it would cost the Company Rs. 140 more per man per annum to employ Europeans (whites) to assemble the coal as fuel in the ship than it would if it employed Non-Europeans (non-whites).[49] It shouldn't have been surprising therefore, when desertions among coal trimmers were commonplace.[50] Coal stokers described their work as "killing", and even attempted suicide.[51] One coal stoker jumped into the sea, an act which the ship captain, with feigned sympathy, described as done so in a "fit of madness or exhaustion from [the

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[44] *Coal beds in the Vicinity of the Nerbudda*, 27
[45] Steam Department, 1838, vol. 17, Maharashtra State Archives (MSA), Mumbai, S-65
[46] Ibid, S-63 and S-64
[47] Ibid S-28 and S-30. Additionally, the EIC proposed having "English weighing machines be allowed to the [coal] agents at Suez" see Ibid., S-48, so that weights could be standardized in accordance with English machines so that coal could be assembled as fuel.
[48] Steam Department, 1837, vol. 3, Maharashtra State Archives (MSA), Mumbai, S-8, and S-25: colonial officials wrote that the "government suffer[s] loss[es] by receiving coals by weight in the monsoon" since the rain would soak the coal thereby increasing its weight. Questions were also asked whether coal could be assessed by a system of measurement, other than weight, that was more consistent. See also, Steam Department, 1838, vol. 17, Maharashtra State Archives (MSA), Mumbai, S-229 and S-231.
[49] Steam Department, 1837, Vol. 2, Maharashtra State Archives (MSA), Mumbai, S-12
[50] See James Scott's *Weapons of the Weak* on how desertion was a form of everyday resistance.
[51] Steam Department, 1837, Vol. 3, Maharashtra State Archives (MSA), Mumbai, S-9

coal] dust and the heat."[52] [52] The racially conditioned "metabolic rift" would be used as a point of further accumulation and the maintenance for the equilibrium of the ship.[53]

Moreover, the EIC admitted that "The native provisions being far too poor for such exhausting duties".[54][54] And they dealt with this in classic British colonial justice: Non Europeans employed as coal stokers or for trimming coal on EIC steamships would now get a meager half a pound of rice a day which was increased from a measly one-quarter pound of rice a day.[55] The EIC discussed, but abandoned the prospect of providing meat and alcohol to coal trimmers which was normally provided to European marine workers.[56] This racially structured and hierarchized metabolic management of the ship relied upon siphoning the life away from laborers for the purpose of assembling coal as a fuel.[57]

The ship was leaky and unstable and was mediated by "half starved" coal trimmers.[58] The equilibrium of the ship was predicated on the expropriation of non-white marine workers.[59] The relationship between coal and ships on an Ocean was not one of natural equilibrium; ships weren't timeless passive carriers – nor was 'the Ocean' an abstract and flat entity. Rather, ships in the Western Indian Ocean were reworked, re-adjusted and manipulated to cater to the specificities of the Western Indian Ocean so that a given quantity of coal could be assembled as good fuel. The EIC engineers repeatedly investigated and experimented with how – given a unit of coal -- ships could be fabricated so that the unit of coal could be better made to power the ship. The concerns were regarding how ships could be re-made to increase speed, maximize tonnage, and minimize the damage from the often-devastating Southwest monsoons.[60]

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[52] *ibid*

[53] The use of "metabolic rift" was popularized by John Bellamy Foster in his landmark paper "Marx's Theory of Metabolic Rift: Classical Foundations for Environmental Sociology," *American Journal of Sociology* 105, no. 2 (1999): 366–405. He develops the concept of metabolic rift by thinking along with Marx on how industrialized processes of agriculture depleted the fertility of soil, a rift being created between the urban and rural in that nutrients were being disproportionately accumulating in cities at the cost of the fertility of soil in rural areas. However, in this chapter, as I have tried to spatialize 'land' as well as forms of interdependencies which *exceed* the urban and rural – I try to argue how metabolic rifts play out on the ship by zooming in on a gulf in the distribution of food (a *potential* 'fuel') along the lines of race and rank, as well as the asymmetry in the expulsion of energy within the ship amongst seamen – coal stokers, heavers, and trimmers expending the most managing coal so that the ship is equilibrated and moves in a straight-line.

[54] Steam Department, 1837, Vol. 3, Maharashtra State Archives (MSA), Mumbai, S-10

[55] *ibid*,S-178

[56] Steam Department, 1837, Vol. 2, Maharashtra State Archives (MSA), Mumbai, S-11

[57] Raj Patel and Jason W. Moore, *A History of the World in Seven Cheap Things: A Guide to Capitalism, Nature, and the Future of the Planet*, Paperback edition (London New York: Verso, 2020).

[58] Steam Department, 1837, Vol. 3, Maharashtra State Archives (MSA), Mumbai, S-9

[59] On Barak in *Powering Empire* writes that "the 1840s saw the development of a thermodynamic model of the worker's body, understood as a "human motor," and eventually the appearance of an elaborate "science of labor" meant to curtail fatigue and energy depletion in order to make the interface between man and machine ever smoother." I argue against this 'thermodynamic' view of labor, by drawing on the work of Nancy Fraser, "Expropriation and Exploitation in Racialized Capitalism: A Reply to Michael Dawson," *Critical Historical Studies* 3, no. 1 (March 2016): 163–78. And also, Emma Park, "'Human ATMs': M-Pesa and the Expropriation of Affective Work in Safaricom's Kenya," *Africa* 90, no. 5 (November 2020): 914–33.

[60] For instances of how monsoons interfere with the calculation for the weight of coal also see Steam Department, 1837, Vol. 3, Maharashtra State Archives (MSA), Mumbai, S-25 to S-28. For historical work on how monsoons have shaped South Asian history, see: Sunil S. Amrith, *Unruly Waters: How Mountain Rivers and Monsoons Have Shaped South Asia's History* (2020) and Sarah Carson, "Anticipating the Monsoon: The Necessity and Impossibility of the Seasonal Weather Forecast for South Asia, 1886–1953," *The British Journal for the History of Science* 54, no. 3 (September 2021): 305–25

In 1837, for example, EIC engineers estimated that “cutting off the bow” and increasing the length of the vessels allowed for the “lengthening” the ship “forward”.[61] This alteration was deemed necessary because of the difficult conditions of the Red Sea, especially during the monsoon months, where the efficacy of the coal as fuel was dampened by strong surges, high tides and “a sharp head sea.”[62] Engineers in Bombay recommended that the ship should be altered in such a way that the tonnage of the ship could be increased in relation to power that was generated by burning a specific weight of coal. This was how speed could be maximized given a variety of shifting constraints: weight of the coal and stormy, unpredictable changes in weather. Therefore, the architecture of the ship was assembled and reassembled in an effort to increase the efficacy of coal as fuel. The value of coal as fuel was measured against buoyancy, speed, and storage.[63] To enable the reconstitution of the ship’s architecture so that coal could be made into a good fuel – cheap sources of iron, copper, and timber became a concern for the British in Bombay.[64]

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In this section of the chapter, I show how new ecological and labor arrangements had to be enacted so that coal could be assembled as fuel for steamships. As mentioned earlier, the British had begun to mine for coal in the Narmada River and Valley, as an effort to become “independent” from European coal markets. To achieve this, the British attempted to reformat and reorder the Narmada River and Valley so that coal could be made into a fuel in the foundry, dockyard, mint, and steamship. The EIC saw mining for coal in the Narmada as an opportunity to also, simultaneously, “excite” trade in Central India which required the taming of people and environments.[65]

When the EIC began to mine in the Narmada, they described the *Adivasi* lands and settlements as a thick jungle “infested by wild tribes of Gonds and Bheels.”[66] This colonial anthropology shaped how the British sought to assemble mined coal as fuel by attempting, but ultimately failing to tame the ‘wildness’ of Narmada or its people.[67] However, the EIC was not successful in recruiting Gonds for large-scale mining work.

In 1848 when the experiment to mine coal for Narmada and in making it navigable for the transmission of coal moved forward, the EIC found it very difficult to find labor.[68] The British were looking to industrialize the process of mining. The valley already had a

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[61] Steam Department, 1837, vol. 1, Maharashtra State Archives (MSA), Mumbai, S-61
[62] *ibid.,* pages: S-63, S-72, and S-85
[63] *ibid* S-73
[64] *ibid.,* S-111 to S-115
[65] Memoir, 8
[66] *“Memoir on the Physical Character of the Nerbudda River and Valley; with remarks on the practicability, or otherwise, of this river being rendered a navigable stream*”, 8.
[67] See the classic paper by Crispin Bates, “Race, Caste, and Tribe in Central India: The Early Origins of Indian Anthropometry,” in *The Concept of Race in South Asia* (Oxford University Press, 1995). Bates demonstrates the discursive construction of racial types as morally laden in relation to recursive anthropometric conclusions based on surveys that the British began to conduct in the 19th century. Bates’ approach suggests that morally charged racial typologies have endured in post-postcolonial and industrializing India. The implicit assumption being that developmentalism ought to have dealt colonial classifications a major blow. However, by looking at the beginnings of industrial mining in the early 19th century, I point to the ways in which the colonial administration’s epistemic-racial classification were enumerated in the very *process* of economic extraction and not solely as a result of ‘prior’ anthropological or anthropometric surveys.
[68] *Memoir*, 55-57

rich history of artisanal miners before the British arrived, which EIC British engineers and geologists derided as ineffectual and wasteful.[69]

The British looked to industrialize the process of mining by hoping to introduce steam machines to dig deeper shafts underground. But even before the capital investment necessary to introduce steam-powered methods of extracting coal was introduced, the British had industrialized the process of mining by intensifying labor in the manual digging of deeper shafts. The British began gathering statistics on the possible productivity of each worker based on the unit of weight that they would be able to dig up in a given time period. Quantitative-industrial standards with respect to time and wages were designed on the basis of these findings.[70] The EIC engineer for instance calculated that: "one man can dig 13 maunds per day with ease" and as "they are paid at the rate of 2 annas per day,"[71] Therefore the cost of digging in terms of the cost of labor per day would be 2 annas/13 maunds.[72] Non-European bodies would be broken in this imperial pursuit for more coal. In one case, as a native miner was "working the seam", he fell into the pit and "was buried under a large rock" because of which he had "severe contusions on the legs, and bruises on the body". The grievously injured miner was criticized by the British engineer apathetically saying that the worker was "ignorant".[73]

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[69] Ibid, p.35 on a brief description of "Native method of extraction"

[70] E. P. Thompson, "Time, Work-Discipline, and Industrial Capitalism," *Past & Present*, no. 38 (1967): 56–97. Histories of the 19th century Indian Subcontinent have attended to rural transformations by looking at colonially driven and elite-enforced agricultural transitions around subsumption of labor in the context of changes in the relations of agrarian production and concentration of land holdings. For understandable reasons, the relationship between agrarian land, labor, and markets have been the chief focus. See: Jairus Banaji, "Capitalist Domination and the Small Peasantry: Deccan Districts in the Late Nineteenth Century," *Economic and Political Weekly* 12, no. 33/34 (1977): 1375–1404. Dharma Kumar, *Land and Caste in South India: Agricultural Labour in the Madras Presidency during the Nineteenth Century* (Cambridge: Cambridge University Press, 2013). D. A. Washbrook, "Law, State and Agrarian Society in Colonial India," *Modern Asian Studies* 15, no. 3 (July 1981): 649–721. But this attention has contributed to an understanding of industrial capitalism 'beginning' in the Indian Subcontinent only therefore begins only in the latter part of the 19th century. See: Rajnarayan Chandavarkar, *The Origins of Industrial Capitalism in India: Business Strategies and the Working Classes in Bombay, 1900-1940*, ed, Cambridge South Asian Studies 51 (Cambridge: Cambridge University Press, 2002). However in this chapter, I argue that if we place South Asia-Arabia as out point of departure and examine maritime work with the increased use of steamers in the Indian Ocean, as well as beginning of mining in India in the early decades of the 19th century, we start to see a concomitant entrenchment of industrial-capitalist logics occurring *at approximately the same time* in parts of South Asia and the Arabian Peninsula as they were in Liverpool and Manchester. Andrew B. Liu in *Tea War: A History of Capitalism in China and India*, Studies of the Weatherhead East Asian Institute, Columbia University (New Haven ; London: Yale University Press, 2020) argues that in tea producing regions in China and India in late 19th century, intensification of labor was organized by strategies of labor management to accentuate accumulation. In this context, mechanized processes of production are not reduced to the use (or absence) of 'machines', but foreground the recording, calculation, and management of time with respect to output. This, Liu argues, is a technical industrializing intervention, where labor's relationship to time and output become a site of sociotechnical auditing and measurement.

[71] *Memoir*, p. 59. Also see Marine Department, 1847, Vol. 106, Maharashtra State Archives (MSA), Mumbai, S-328 to S-333 where the EIC Engineer writes about how the "real value" of the Narmada can be increased in they "make a good road" allowing them to use bullocks. The EIC engineer also observed that "there is a great difficulty with labor" which could partly be overcome if the price of grain could fall as "the works were carried on a large scale." The EIC engineer also reiterates the advantages of large-scale, capital intensive, industrial mining which he thinks would reduce the cost of mining and transportation of coal, as well as the price of grain as Sonadeh would become closer to grain markets in Western India. The EIC engineer wrote that grain "sells here about 30 percent higher" than at Bombay – the presupposition and expectation being that by extending the grain market from the coast to the valley, prices would decrease perhaps by processes of arbitrage and speculation, if not actual supply.

[72] 1 ton is roughly 28 maunds, *ibid.,*60.

[73] *Memoir*, 56

While traversing the Narmada River and encountering falls, the South Asian crew would be made to "take off" loads of coal from the boats so that it could be "carried on coolies' heads", while the boats would be eased down "with drag-ropes".[74] Therefore, coolies' bodies were used to compensate for the river's apparent unreliability for the conveyance of coal. Once again, human labor was arranged to balance intransigent uneven materialities of non-human things. This is analogous with how coal trimmers aboard ships were used to equilibrate the ship in the context of large swells of the sea and the density of coal by having to labor on manipulating the weight and quantity of coal in the hold so that the relationship between the unpredictability of the Ocean and the materiality of coal could be managed. Therefore, coal was not "make-weight"[75], rather non-European coal trimmers were commanded to constantly steady the weight of the ship in an often-inconsistent Ocean. Many of these South Asian, African, and Arab men's labor was expropriated so that colonizers could equilibrate a whole range of landscapes and topographies.

"Tricking" the British Engineer: Kinesthetic Resistance

Once mined, the EIC attempted "to get the coal moved…by contract".[76] For this, they surveyed the possible employment of carts to transport the coal from the coalfields of Sonadeh to the banks of the Narmada. The use of bullock carts was predicated on the existence of suitable roads, or the construction of new ones. The EIC engineer sent to survey Narmada speculated that a capital "outlay of four or five thousand rupees would make a good road."[77] This entailed the clearing of forests, flattening *Adivasi* land, and paving a path through *Adivasi* settlements. Yet again, a variety of interlocking infrastructures was necessitated for making the Narmada Valley and forests *navigable* for the transport of coal by bullock carts.

In this region, the bullock cart was a 'new' mode of transportation linked to imperial capitalistic pressures felt from the Ocean. This is evident when the British write that *Gonds* and *Korkus* in the Valley do not use bullock carts, and how new arrangements could be made so as induce them "to take up a new trade".[78] In the early to mid-19th century however, the British didn't succeed in hiring a significant number of people from the tribal groups to take up this "new trade" of industrial mining.[79] The EIC instead contracted with *banjaras*, a nomadic social group, to transport coal from the site of mining in the dense forests of the valley to the banks of the river from where they

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[74] *ibid*, 11
[75] On Barak, *Powering Empire*, 13
[76] *Memoir*, 54
[77] Ibid, 59
[78] Ibid, 62. Also see, Marine Department, 1847, vol. 106, Maharashtra State Archives (MSA), Mumbai, S 340 where the EIC engineer writes about "some of the difficulties" that they have had "to overcome in getting the natives to take up a new trade"
[79] Memoir, 56-59

planned to float coal down the Narmada River to the Arabian Sea.[80] To ensure that coal could be made into a good fuel, the British sought to discipline the ways in which *banjaras* loaded and unloaded coal onto bullock carts. The colonial authorities wanted the *banjaras* to carefully load and unload the freshly mined coal so that the coal would not break into small pieces and accumulate dust. However, the *banjaras* refused to do so, and simply hurled the coal up and down the carts – shattering the coal in the process, making it less amenable to be a good fuel. This was intensely frustrating to the EIC engineers. An incident is worth quoting in detail, the EIC official at Sonadeh wrote from the site of mining that:

> *The Bunjaras [sic] …..on seeing the coal at once refused unconditionally to take it up….declaring that their bullocks would be destroyed by the pricking of the sharp points of the large pieces [of coal]", and when sacks of coal "were placed on the backs of the bullocks, two of them laid down, and all threw their load off…… however, imagining it to be a trick of the Bunjaras, I insisted on the performance of their engagement and after an altercation of the whole day towards the weight they consented to take about 300 maunds with a view of loading their bullocks with less than 2 maunds each, when they started another impediment, that they would not, under any consideration, agree to unload in the manner I pointed out, -- that is, by lifting the sacks from the backs of the cattle, and placing them carefully on the ground, so as to prevent the pieces of coal from breaking, turning almost into powder by being roughly thrown down, according to the usual practice with grain, cotton, &c. This objection on their part I have not been able to overcome.*[81]

The EIC were ultimately not successful in controlling the mechanics of work of the *banjaras.* Much to the chagrin of the EIC, the *banjaras* successfully negotiated the terms of their labor in two ways: one, that they would not compromise on hurling the coal and would therefore continue to expend minimal effort in transporting coal. This was a form of kinesthetic resistance by the *banjaras,* which reduced the affordance of the Narmada coal to be assembled as a good fuel for steamships. To rub salt in the wounded pride of the British, the *banjaras* also bargained for a significant increase in wages.[82]

In attempting to produce the Narmada as "navigable" in relation to making the Narmada coal a good fuel, the British also relied heavily on the expertise of local boatmen to maneuver the river which, at significant parts, they found to be, in the words

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[80] *Banjara* is an imprecise nomenclature that has been used to describe nomadic transporters. Indeed, there is rich historiographical work which has used the social ambiguity of the term '*banjaras'* as a point of entry to examine colonial anthropological practices of naming and classing people in legible, and governable hierarchies. See Robert Gabriel Varady, "North Indian Banjaras: Their Evolution as Transporters," *South Asia: Journal of South Asian Studies* 2, no. 1–2 (March 1979): 1–18, This colonial anthropological project dovetailed into a variety of punitive measures that the British colonial officials -- in alliance with conservative religious leaders -- undertook to coercively mold various cultural and economic practices of the *banjaras*. Many of these violent pedagogical and 'reformist' policies, however, failed but nonetheless contributed to widespread devastation of the *banjara* community when Central India and the Deccan were wracked by famines in the mid to late-19 century. See: Laxman D. Satya, "Colonial Sedentarisation and Subjugation: The Case of the Banjaras of Berar 1850–1900," *The Journal of Peasant Studies* 24, no. 4 (July 1997): 314–36. For the many ways by which the *banjaras* were criminalized by the British, see: Radhika Singha, "'Providential' Circumstances: The Thuggee Campaign of the 1830s and Legal Innovation," *Modern Asian Studies* 27, no. 1 (February 1993): 83–146.

[81] Marine Department, 1847, vol. 106, Maharashtra State Archives (MSA), Mumbai, S-354 to S-356

[82] The *banjaras* were charging the British Rs. 13/ton. Whereas according to the British the contract price was supposed to be Rs. 3.5/ton. See: Marine Department, 1847, vol. 106, Maharashtra State Archives (MSA), Mumbai, S-355 and *Memoir*., 57

of Captain Fenwick -- who was responsible for transporting the coal to Bombay – as "*Very very bad".*[83] This dependence of the British on local expertise so that mined coal could be made into a fuel, enabled the boatmen to bargain for increased wages, just as the *banjaras* had earlier done.[84]

Therefore, the production of the Narmada as "navigable" was to also make the river and its people *calculable*—uniform and steady. In Captain Fenwick's journal there is recursive tendency to describe the Narmada as being "never uniform or steady"[85] This discursive production of the river as impracticable for floating coal resulted in the boats often being emptied "and the coal carried on coolies' heads".[86] Therefore, the bodies of coolies were used to compensate for the river's apparent unreliability for the conveyance of coal. Labor was extracted for the sake of balance. In addition to this, commuting coal from the site of mining to the banks of the river, and through the river to the sea, was epistemological work. The *logistical* process of floating the coal from "depot to depot" was at once an *epistemic* project of gathering statistics of the characteristics of the Narmada.

Image 1: an EIC engineer's model of the Narmada Valley foregrounding geological value and the mechanized ways in which minerals and coal could be extracted.[87]

This technopolitical project coincided with the possibility of mining coal in the Narmada River and Valley. The EIC decided that "the danger, risk, and uncertainty which are inseparable from the navigation of the Nerbudda [sic] at present, are all incompatible with the steadiness which should attend a branch of industry and trade which, more than all others, needs a certain and speedy mode of delivery to ensure success."[88] When the experiment to industrialize mining

[83] Captain Fenwick's Journal in *Nerbudda River and the Mineral Resources of the Nerbudda Valley* (1848), 93
[84] Captain Fenwick wrote that the boatmen were "refusing to serve for less than one rupee per diem each", *Memoir*, 90-91. To put this into perspective: an industrial miner was being paid Rs. 4/ month, whereas the boatmen were bargaining for Rs. 30/ month for each individual boatman.
[85] *Memoir*, 5
[86] *Memoir,* 11
[87] Marine Department, 1847, Vol. 107, Maharashtra State Archives (MSA), Mumbai, S-352
[88] *Memoir*, 12. Timothy Mitchell in Carbon Democracy argues that because coal was a concentrated form of energy – its inability to flow like oil, was more amenable to be disrupted by those who transported it. This is one of the ways in which the materiality of coal engendered progressive political movements favoring labor. However, as I have

in Narmada intensified, and as more capital was mobilized for investment to increase the scale of production, the EIC became nervous about the increased price of grain at the site of mining near Sonadeh which caused "a great deal of discontentment among the workmen."[89] To deal with inflation, the EIC planned a return cargo of grain from Western India to the site of mining in Central India. Doing so, the EIC speculated, would reduce the price of grain as well as cheapen and ease the transportation of coal.

It was also argued that the planned road would make it difficult for *banjaras* to renegotiate contracts. A good road, the EIC speculated, would enable them to introduce more bullocks and carts, therefore becoming "independent" from the *banjaras* whom the EIC engineer described as "troublesome".[90] The Bombay Government also instructed the surveyors "to consider the proprietorship of the soil where the coals are found" – where the experiment for industrial mining was imbricated with questions around subterranean property regime, reconfiguring agrarian, and forest relations.[91]

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Once the coal was brought to the banks it had to be floated to Bharuch from where a small steamer could be brought in to pick up the Narmada coal and ferry it to Bombay for testing. Captain Fenwick maintained a diary during the course of attempting to navigate the Narmada.[92] Captain Fenwick's journal is essentially a map detailing the material vagaries of the Narmada guided by his central preoccupation: the conveyance of carrying coal which required, among other things, keeping it in good shape so that it could serve as a fuel in the dockyards. Captain Fenwick recorded the presence of *Ghats*, the occurrence of rapids, whirlpools, sunken rocks, shallow waters, where parts of the forest needed to be cut down, how food could be procured, and importantly, what the disposition of boatmen was in the process of working the Narmada.

Traversing the Narmada was also an exercise in gathering intelligence from the 'Natives' so that the Captain could acquire "an accurate knowledge of the river in all its bearings and peculiarities" wherein assessments and calculations could be made about how the Narmada could be made navigable for the transport of coal that could be assembled as a good fuel for steamships plying in the Red Sea.[93] The Captain also recorded whether they were passing through a jungle or settled agriculture – which fed into reigning assumptions about supposed proximity to civilization based on how much the geography had been "improved" upon. The journey was extremely trying for the

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shown in the introduction, even though coal's form is taken seriously by Mitchell – it still gets essentialized and abstracted as energy. Rather I wish to focus on how coal is assembled (and not abstracted) as fuel for steamships. This also points to the often-bloody encounter where coal – in the process of being assembled as fuel – drains the life of laborers.

[89] *Memoir,* 59

[90] Marine Department, 1847, Vol. 106, Maharashtra State Archives (MSA), Mumbai, S-366. It is also worth noting here the flow of dependence and need for "independence" by the colonizer from the colonized. In this case, the EIC seeks to be emancipated from the way in which the *banjaras* worked.

[91] Ibid, 68. See, Robyn d'Avignon, *A Ritual Geology: Gold and Subterranean Knowledge in Savanna West Africa* (Durham: Duke University Press, 2022), and Matthew Shutzer, "Subterranean Properties: India's Political Ecology of Coal, 1870–1975," *Comparative Studies in Society and History* 63, no. 2 (April 2021): 400–432.

[92] *Captain Fenwick's Journal 1848, Nerbudda River and the Mineral Resources of the Nerbudda Valley in Memoir*, 93-110

[93] *ibid*., 81 and *Memoir.*, 68. Also see. Marine Department, 1847, Vol. 107, Maharashtra State Archives (MSA), Mumbai, S-290, where an EIC officer from Central India writes to the EIC leadership in Bombay about how the exploration at Narmada can also serve as a purpose of gathering intelligence.

British Captain.

On 9th August 1848, he wrote that the crew "met another serious accident," and reported to the Resident at Indore that "there is not a single boat of the fleet that has not at one time or another been in danger, by being carried on rocks, or nearly swamped in the rapids, waves, or whirlpools."[94] Less than a week before this accident, on the 3rd of August, the Captain's life was saved by Bholoo, a boatman whom Fenwick described as showing "great energy and presence of mind, and expertness on the occasion."[95] By the time the fleet reached Bharuch, they had lost "90 bags of coal."[96] And by the time the remaining Narmada coal reached the dockyards of Bombay, it was described as "very dirty."[97] Therefore coal was not inert: *mined* coal was not the same as *traveled* coal. Traveled Coal was a remainder, what could be salvaged from the journey because of which it was quantitatively less but weightier[98] and 'dirtier' than mined coal. The circumstances of the journey – and the labor which went into conveying coal – congealed and embodied in the very form of coal that would eventually have consequences for its assembly as fuel for steamships.

The Narmada coal's affordance as fuel for steamships was tested in the Arabian Sea aboard the *Medusa.* The engineer described the coal as containing "large amount[s] of earthy particles… [which rendered it] incombustible," and lamented the presence of "leaves [and] a large quantity of clinker and dirt."[99] The arduousness of the journey was embedded in the very form of the coal that reached Bombay. The kinesthetic resistance of the *banjaras* seemed to have materialized in the insufficient capacity of the coal to burn—the hauling and throwing of the coal to the ground took the form of clinker (solid residue as a result of burning coal) that would have accreted in the boiler, and if used in large quantities would damage the boiler and reduced the potency of the ship. The sometimes corrosive effects of coal on the ship would, in turn, have implications for labor down the line where coal stokers would be made to work even more intensely to maintain the speed and balance of the ship. Even though the coal burned well at the site of mining[100] – it turned out to be unconducive for use in a steam vessel. It was only when the Narmada coal was sieved and purified from its logistical past—and the histories of labor that were its condition of possibility—that the coal

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[94] *ibid*., 90

[95] *ibid*., 99. It should also be noted that the boatmen or any other subaltern group only appear in Captain Fenwick's journal in moments when the group is either protesting or when the group demonstrates "great expertness", or compliance. It is therefore imperative, as James Scott reminds us in his *Weapons of the Weak* (1985), that historians pay careful attention to the demonstrative logics of archives that often cater to 'the state's' epistemic and administrative demands. In the case of Captain Fenwick's journal, the cartographic markers in his writing have to do with – whether, and how – the Narmada could be *made* navigable. For this – Captain Fenwick becomes the primary observer of the river; the chief adjudicator on the river's worth and *value* -- the Narmada that is written about is a product of his colonial epistemic positionality. The boatmen are reduced to appendages to the larger experiment; their "expertness" is only mentioned when the life of the captain or the mission is at stake.

[96] *ibid*, 91-92

[97] *Memoir*, 107

[98] If floated over the Narmada, the EIC feared that "the coal would be very much deteriorated if it were exposed to the wet" see Ibid, p. 46. The weight of the coal would also increase if it got wet, see Marine Department, 1847, vol. 106, Maharashtra State Archives (MSA), Mumbai, S-25 to S-39

[99] *Memoir*, 107

[100] Mr. Johnstone, an engineer in the Bombay Dockyard was dispatched to Sonadeh to test and survey the coal at Narmada. For his description of the experiment, *ibid*., 56

burned well comparatively well.[101]

Ultimately, on the 8th of November 1848, The Court of Directors wrote from London that even though there is future promise of the Narmada to afford a great quantity of coal -- "for the present it will be advisable to suspend operations".[102] It wouldn't be until the 1850s that a renewed interest in the coalfields of Narmada would begin[103][103]– as the expansion of railway lines in the Indian Subcontinent was presumed to make geography more navigable for the transport of coal so that it could be assembled as a fuel. However, this history is beyond the scope of this chapter.

Conclusion

A historically specific argument of this chapter relates to how the expansion of British imperial capitalism in the 19th century relied on assembling coal as fuel for steamships, wherein various webs of relation were angled for the production and maintenance of such an assemblage. This was a contentious, exhausting, tenuous, and highly politically charged process at multiple sites. I have placed my chapter as a counterpoint to narratives about abstraction and rationalization that continue to inform histories of imperial capitalism. In this chapter, I have also attempted to detail the technopolitical processes by which the assembling of fuels involves a significant amount of work by humans and non-humans, which necessitates colonially driven *attempts* at the transformations of people, landscapes, things, and networks.

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[101] *ibid*., 109
[102] *ibid*., 104
[103] See *Selections from the Records of the Government of India, Home Department: on the Coal of the Nerbudda Valley (1856)*

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