

**Buried in Sand: Understanding Precarity in the
Context of the Political and Criminal Economy in India**

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Abstract:

As the world population grows and countries become more urbanized, the demand for sand is more prominent than ever. However, this seemingly infinite resource is being exhausted beyond its natural rate of renewal; we are running out of sand. The limited supply of sand has resulted in illicit sand trading globally, spawning gangs and mafias in a lethal black market. Through the nexus of politics, business and crime, India has demonstrated to be the most extreme manifestation of the global sand crisis. This paper will offer insight into the under-researched area of precarity surrounding the sand trade in the context of political criminality in India. By adopting an integrative approach to precarity, the analysis will review the direct and indirect impacts on livelihoods and local communities. The findings highlight how the collusive relations between the sand mafia and state authorities perpetuate a cycle of precarious labour and social-ecological conditions. To conclude, I will explore recommendations on how to address the implications of sand mining as a global community.

1.0 Introduction

Sand is a fundamental component in modern society. Minuscule, and in some instances almost invisible, sand is one of the most important solid substances on earth (Beiser, 2018a). Historically, it was used as a form of verbal art that incorporated language, culture and expression through drawings. Eventually, the use of sand evolved into a material that was ‘malleable and durable, strong and fireproof,’ (Mars, 2019). Entering the industrial era, people began to harness the potential of the material and extended its use to produce concrete, glass and digital technologies. In those examples alone, we see that sand is the literal foundation of modern civilization and is used on a colossal scale. Behind air and water, sand is the most utilized natural commodity in the world (Beiser, 2018a; Delestrac, 2013; Marschke et al., 2020).

Every year more and more people migrate to urban cities which instigates a series of infrastructure projects that rely on sand. Since 1950, the urban population has grown from 750 million to 4.2 billion people in 2018, which is approximately 55 percent of the world’s population (United Nations, 2018). This number is only expected to increase moving forward. According to the United Nations, the overall growth of the world’s population could add 2.5 billion people to urban centres by 2050 (United Nations, 2018). This is about 65 million people annually, equating to six New York cities added to the planet every year (Beiser, 2018a). Building cities requires concrete, land infill, asphalt and glass, which all require sand. Currently, the demand for sand is between 40 billion and 50 billion tonnes annually (UNEP, 2019). To accommodate the rise in human population, countries are continuing to invest in infrastructure projects, fueling sand exploitation.

Urban infrastructure projects are adopted by countries worldwide to support urbanization. One approach is vertical urbanism, where verticality becomes a crucial strategy of a city (Lin, 2017). Vertical urbanism enables a city to address design challenges of highly populated areas by building up, rather than out. With the urban population density exceeding 400 people per acre (equivalent to 0.004 km²), Hong Kong, New York, Shanghai, Tokyo and Seoul are a few cities that have adopted this approach in their urban planning (Lin, 2017). When land becomes scarce and densely populated, countries turn to land reclamation projects. Land reclamation projects use sand as infill for wetlands and state territorial expansion (Marschke et al., forthcoming). Singapore is well known for its’ land reclamation projects. Since independence in 1965, Singapore’s population grew 33 percent making it the second greatest population density in the world (Lamb et al., 2019). Within the same period, the country increased its land area from 581km² to 719km² by 2019 (Lamb et al., 2019). These projects transform the coastlines and, in some instances, are purposely created to attract tourism (Velegrinis & Katodrytis, 2015). Other examples

of this typology are The Palm Jumeirah islands and other artificial islands in Dubai, where developers expanded its coastal land from 45 to over 1,500 kilometers (Velegrinis & Katodrytis, 2015).

In addition to buildings and land expansion, highways and roads are being constructed everyday in new development areas. The demand for cars is linked to the development of roads and highways. Beiser (2019) suggests that the more vehicles that are bought, the more roads that are wanted by the people. The more paved roads that are built, the more people want cars (Beiser, 2018a, p. 56). Additionally, roads are what connect urbanized centres together. As urbanization continues to grow, more roads are needed to ensure new development areas are accessible. The road-making industry has been critical to modern society in the last century. As more and more vehicles are purchased, roads and highways are mandatory for the everyday convenience of travel. It is global urbanization that is fueling the extensive need for the resource being used at unsustainable rates, contributing in the global sand crisis.

As these construction projects continue to escalate, the need for sand becomes acute. Visibility, we do not see sand as the primary material used in these developments, however, sand is found in one of the most important humanmade materials ever invented; concrete (Beiser, 2018b). It is billions of tons of sand and gravel that are unearthed every year to form shopping malls, freeways, dams and airports (Beiser, 2018a). Sand is critical in the development of these projects supporting urbanization. Roughly 32 billion to 50 billion tonnes of sand is used globally each year, mainly for making concrete, glass and electronics (Bendixen et al., 2019). In one of Dubai's artificial land projects named "The World," developers used 405 million tons of sand (Peduzzi, 2014, p. 210). Despite being surrounded by deserts and beaches, the country imported the sand from Australia (Delestrac, 2013). Contributing to the crisis is the unique sand grains required in the industry. For humans to make use of the substance, it is necessary for the grains to be angular, rather than rounded. Vince Beiser (2018) describes it as "stacking up marbles," compared to "a bunch of blocks" (p. 10). Therefore, sand found in rivers, along coastal beaches and in oceans are more favourable for construction purposes versus desert sand. Desert sand is eroded by wind, making it too smooth and rounded to build together to create concrete (Beiser, 2018). All around the world, beaches and riverbeds are becoming sand mining sites to fulfil the demand for sand, exceeding rates beyond natural replenishment. Sand is important in today's modern world, despite this, there is little attention on the limited supply of the solid substance; we are running out of sand.

This seemingly infinite resource is being exhausted beyond its natural rate of renewal, and inevitably it is affecting livelihoods and the natural world (Bendixen et al., 2019). Recently, researchers have focused on the industry in Asia, specifically in the Mekong delta region (Lamb et al., 2019; Marschke, 2014; Marschke et al., 2020; Van Arragon, forthcoming). Within their research, scholars bring attention to the direct and indirect impacts of sand mining, specifically focusing on precarious employment in the sand trade, as well as the environmental consequences of the intense extraction of sand mining in riverbeds and coastal beaches. The local workforce, often poor and uneducated, can be co-opted into sand mining activities as a result of limited livelihood options. Sand work requires muscle power and heavy machinery to extract large amounts of sand. These activities are not only dangerous, but also physically exhausting for sand labourers. Sand mining and upstream damming-driven sediment intakes trigger coastal, riverbank and delta erosion, affecting ecology, infrastructures and livelihoods across the globe (Bendixen et al., 2019; Marschke et al., forthcoming; Marschke et al., 2020). Researchers found that the erosion processes driven by human activities, including damming and extensive sand extraction, on the Mekong River has consequently contributed to local houses collapsing into the water from sand instability (Marschke et al., forthcoming). The Vietnamese government predicts that over 500,000 people will need to move away from riverbanks as a result of collapsing banks due to extensive sand mining in

the river channel (Bendixen et al., 2019). Additionally, the elimination of coral reefs, marine habitats and production of sand plumes (Beiser, 2018a) has disrupted water ecosystems which compromise many livelihoods that rely on fish and crop production. As a result of this destruction, food supply and employment has deteriorated in some fishing communities and agricultural areas. Research and media reports have casted a light on challenges around sand mining, specifically in the South Asian context. However, there is still research and data that need to be collected to better understand the multifaceted impacts of sand activities affecting ecosystems, communities and livelihoods across the globe.

The limited supply of sand has resulted in illicit sand trading globally, spawning gangs and mafias in a lethal black market. Global Witness (2010) suggests that illegality in the sand trade heightened in Southeast Asia when Indonesia restricted sand exports to Singapore in 2007. In Singapore, scholars found that data discrepancies between sand imports and exports are rife, and most likely subject to rampant illegal extraction and trade (Global Witness, 2010; Lamb et al., 2019). According to Beiser (2019) illegal sand mining is widespread in 70 countries. As the sand market booms, entrepreneurs, organized crime and other groups cash in to benefit from the power and riches that emerges from sand through the exploitation of the natural resources and the labourers in the industry. Adnan (2014) describes the repertoire of such crime involves practices of primitive and capitalist accumulation. Harris-White et al. (2019) explains:

The former [primitive accumulation] requires resource seizure (not only land, but water, energy sources and minerals) together with labour displacement and eviction. The latter [capitalist accumulation] includes the elimination of competition (between market and state, sectors, scales, regions, castes, etc.), the protection of monopoly rents, preferential allocations of resources (through subsidies, physical infrastructure, learning rents, etc.), under-pricing of resources (especially of wage labour), the use of force and threat, tax evasion and capital flight, the sabotage, capture and distortion of policy, and the evasion of (enforcement of) regulations (for commodity and financial transactions, for environmental and labour protection, for the control of licences). It also includes control over means of redistribution. Practices include relations of clientelism, direct entry to politics, politicised organisation of election logistics, bribery, fraud, coercion and physical violence (p. 29).

In the past decade, hundreds of people, including police officers, government officials, sand miners, journalists and local citizens have been killed over sand (Beiser, 2018a). Recently, authors and journalists have brought attention to the collusive relations between politics and crime in the sand trade in India (Beiser, 2018a; Harriss-White & Michelutti, 2019; Hawley, 2017; Lamb et al., 2019; Mahadevan, 2019). Harriss-White (2019) describes this connection as *intreccio*, the intertwining of political powers and criminal groups, in the illegal exploitation of natural resources. In the nexus of politics, business and crime, the labourers and local communities are the primary victims of primitive and capital accumulation in the sand mining industry.

One country where criminality in the sand industry is rife, is India. India is a global leader in the construction industry and has seen a tripling of demand for sand in the last decade (Mahadevan, 2019). Inevitably, the construction boom and continuous rising population has led the country to a massive shortage of licit sand, leading the country into illicit methods of extracting sand. India has also gained a reputable status of criminal violence and corruption involving the sand mafia and political elites. Currently, there has been limited attention on this nexus of crime and politics in the sand trade, as well as the direct and indirect impacts on livelihoods, communities and the environment. Additionally, the concept of precarity and sand mining has never been applied before in India. Drawing on the social and

ecological approaches to precarity, this paper aims to demonstrate how the political-criminal economy of sand mining drives livelihood precarity in India for both sand labourers and local communities.

To address the objectives of this major research paper, I begin by reviewing my methods and theoretical framework, and follow with the research context. Next, I turn to a discussion and analysis. Here the focus is on sand labourers and local communities, through examining working conditions, vulnerabilities, risks and the role of ecological and biophysical change on livelihoods. To conclude, I will provide recommendations to address the environmental impacts and precarious conditions amongst varying groups and individuals resulting from sand mining in India.

1.0 Methods and Theoretical Framework

This paper draws on secondary research to examine the political and criminal economy of India's sand industry. Four main categories of sources were used: media reports, academic literature, published books, and documentary films. Academic Search Complete and ProQuest Collection were used to identify research-based information that probe the key concerns surrounding the sand industry, political and criminal economies and its impacts on local livelihoods in India. Media reports were also drawn from these databases to encapsulate local perspectives of India and the country's experiences associated with sand mining. The challenge with utilizing media sources including films and news articles is the reliability and quality of the publications. To overcome this, I highlight key consistencies across sources. As an additional resource, this paper utilizes the research of the Sand Lab, a Faculty of Social Sciences group that my Supervisor is part of. Collectively, this group manages a Zotero folder related to sand in various regions and across subjects related to sand mining, trade and extraction.

Due to the political-criminal climate in India, reporting and collecting data is a challenge for researchers, journalists, and reporters. Investigating the sand mining industry in India can be dangerous, even life-threatening when confronted by the sand mafia. Therefore, there is limited academic research that explores this group and its political relationships with state authorities. Harriss-White et al. (2019), Mahadeven (2019) and Rege (2015) are a few authors that studied and investigated this nexus in the Indian-context. Accordingly, their work will be highly leaned on to explore this matter.

To assess precarity in the context of livelihoods in sand mining in India, I will adopt the adapted Rodgers and Rodgers (1989) framework by Marschke et al. (2020) in Figure 1. The original framework produced by Rodgers and Rodgers (1989) examines four dimensions that contribute to workers' varying degrees of exposure to employment and socio-economic precarity (1) temporal (2) organization (3) protection and (4) economic. Marschke et al. (2020) add two additional components to expand the sustainability of commodity-based livelihoods, ecology and biophysical change and adds a spatial component to the temporal dimension to illustrate additional insecurities that induce precarity. This framework is structured to address labourers and their exposure to employment and socio-economic precarity. Furthermore, this paper will extend the analysis of precarity beyond the working conditions of sand miners to include the implications of sand mining to those living in regions where sand mining is active. Due to the political-criminal structure of the sand trade, the perspective of the paper will review how this entanglement contributes to the dimensions of precarity for workers and surrounding communities. Therefore, the framework will be used as a general guide to approach the research topic (the concept of precarity is further developed in section 3.4).

Temporal & Spatial Effects	Organizational Context	Level of Labour Protection	Economic Conditions	Ecological & Biophysical Change
Indian Sand Mining Context				

Figure 1: A social–ecological framework for precarity analysis. Adapted from Rodgers and Rodgers (1989) and Marschke et al. (2020).

3.0 Research Context and Theoretical Background

3.1 Sand Mining in India

In the next decade, India is predicted to surpass China in becoming the most populous country in the world (Ritchie, 2019). The acceleration in population growth has led to rapid urbanization across India resulting in nearly half the population living in towns and cities (Sivakumar, 2011). Since the 2000s, India has experienced an increase in demand in housing and construction of new real estate in order to support the growing population. Searle (2016) terms this era as “a spectacular real estate boom” (p. 5). By 2022, the state government pledges that housing will be available to all citizens, this means that 110 million housing units will have to be built in the coming years (Mahadevan, 2019). Developers have built new shopping malls, five-star hotels, office and education complexes and high-rise apartment buildings in India’s major cities and continue to buy hundreds of thousands of acres of farmland in order to maintain



Source:
<https://www.nationsonline.org/maps/India-States-Map.jpg>

the construction frenzy (Sissener, 2019).

Geographical limitations and political restrictions impede the ability of developers to access land for continuous building, consequently fueling demand of real estate within a limited supply of space. These dynamics enable developers to increase prices, “while encouraging land speculators to push values even higher as they bid for parcels” (Jeyaranjan, 2019 p. 215). India has the third largest construction industry in the world, which accounts for nine per cent of its two trillion-dollar economy and employs more than 35 million people across the country (Mahadevan, 2019). With construction booming in India, the industry has led to a race to profits and a battle for sand.

With a promise to build an equivalent of a new Chicago every year by Prime Minister Narendra Modi, India needs a colossal amount of sand (Bliss, 2017, Delestrac, 2013). For 2020, India’s demand for sand is estimated to be 1.43 billion tons (Mahadevan, 2019). In order to meet this demand, sand mining operations have been exhausting rivers and coastal beaches all over the country. Outside the city of Kochi in the state of Kerala, the rate of sand extraction from one river has been 40 times the replenishment rate

(Mahadevan, 2019). Across sources, authors also observe that sand mining sites are generally located close to urbanized areas (Bliss, 2017; Delestrac, 2013; Mahadevan, 2019). This strategy is used to contain operating costs by minimizing transport distances to the market. One example is the “Sand Mining Belt,” found in Figure 2. Currently, there are over 100 trucks being loaded with sand from Thane and ten other nearby locations along Thane Creek that are transported to the Mumbai daily (Bliss, 2017). India has responded to extensive sand mining practices by banning extraction activities in many rivers across the country— however, these local regulations are often unenforced (Klemetti, 2020). Through its many rivers and rural and remote locations, India hides hundreds, if not thousands of illegal sand mines across the country (Beiser, 2018a). Although this phenomenon occurs across the world, India has demonstrated the most extreme manifestation of the global sand crisis.

Prior to the immense growth in the twenty-first century, the level of urbanization and demand for building materials was lower, enabling construction companies to draw sand from local sources. Sand mining provided a small-scale livelihood for poor owners of a cart and bullocks who live in or near a town (Jeyaranjan, 2019). Through interviews, Jeyaranjan (2019) describes the manual process of sand mining in Chennai, Tamil Nadu during the 1980s:

Sand was manually loaded onto bullock carts from the nearest riverbed. A paltry fee was collected for the sand by the local panchayats. Effectively, sand was available as a free good that could be appropriated for an insignificant fee by cart owners. Sand was transported whenever the carts that were habitually rented out remained idle, meaning that the capacity utilisation of the carts was enhanced. Most of the cost of sand covered labour and transport... There were no regulations governing the local extraction of sand from riverbeds. In cities like Chennai, small lorries (known as half-body lorries) were hired to bring sand from nearby sources. Sand mining was undertaken using manual labour; few engaged in the activity and it fell beneath the politicians’ radar - Jeyaranjan (2019) p.96

Today, sand mining provides an alternative livelihood source for marginalized populations across India and neighbouring countries. India is the largest and most extensive informal economy in the world, representing approximately 60 per cent of the GDP and over 90 per cent of livelihoods (Harriss-White & Michelutti, 2019). Food and agriculture remain as the dominant occupations and repositories of poverty in India (Jeyaranjan, 2019). However, climate change and human activities have compromised crop-production, placing many farmer’s employment in jeopardy. In fact, an average of 2,035 farmers per day switch to another occupation (Mahadevan, 2019). These circumstances have left some individuals to seek alternative livelihoods in the criminal economy. For instance, in Jharkhand, the illegal coal mining industry accounts for approximately 300,000 livelihoods across eight districts, of which 100,000 are children (N. Singh & Harriss-White, 2019). Driven by the construction industry, the demand of sand opens employment opportunities in the black market, drawing individuals who are impoverished, uneducated and have few livelihood options available to them.

3.2 Environmental Impacts of Sand Mining

Globally, sand is mined at a rate that exceeds natural replenishment causing stress on natural processes of river systems. The formation of sand is the result of the breakdown and erosion of rock (US Department of Commerce, n.d.). In the natural replenishment cycle, the grain reaches a small stream and then a large river, eventually meeting the ocean (Delestrac, 2013). It can take thousands or even millions of years for a grain of sand to reach the sea (Delestrac, 2013). In addition to low monsoonal supply and the construction of dams, sand mining disrupts the natural process in India by decreasing sediment delivery from rivers and many coastal areas, leading to reduced deposits in river deltas (Ramkumar et al.,

2015). The elimination of sand impacts the environmental balance that is dependent on the “unified system” of water and sediment (Ramkumar et al., 2015, p. 284). One natural system cannot operate without the other.

Sand is the primary link to underwater food, when sand is removed it threatens the survival of all aquatic species (Delestrac, 2014). The mechanical stress generated by the heavy equipment and removal of sand can cause various chemical and physical pressures, such as noise and siltation, that changes the state of the biological and physiochemical components of the marine ecosystem (Kaikkonen et al., 2018). The altered marine state could result in loss or behavioural changes of fauna, modifications in seabed morphology, a decrease in primary production, in addition to promoting physiological change (Kaikkonen et al., 2018). These changes can directly impose threat on the biological communities thriving in river environments (Haritha, 2019; Salopek, 2019; Sreebha & Padmalal, 2011).

Sand mining contributes to the declination of species and hydrology that affects fisheries, agriculture, communities, infrastructures and wildlife, contributing to precarious livelihoods. Sand mining practices have evolved into large-scale extraction, exposing sand workers and local communities to severe risks. The use of heavy equipment is now integrated into mining activities, along with physical manual labour, forcing the divers to plunge deeper and deeper into the already exploited waters. These conditions expose sand labourers to dangerous risks, threatening their lives daily. Intense sand mining extraction has eroded river deltas, exposing communities to severe land loss, destroying habitats and stripping rivers of their sand, which may contribute to millions of people facing water shortages (Salopek, 2019). In response to the environmental crime phenomenon, Indian state governments inserted bans and restrictions on sand mining activity. However, as long as the construction demand remains, profits will continue to be at the forefront of the sand mining industry. As a result, licit sand becomes scarce, forcing entrepreneurs and criminal organizations to emerge as a prominent illegal supplier of sand in India.

3.3 The Political Economy of Crime in India

The combination of high demand and insufficient supply of legitimate sand has led to illicit procurement of the resource across the country. In India, sand is a lucrative commodity drawing in criminal organizations, political elites and communities into the lethal and destructive world of sand mining. Under India’s federal system, the provinces have jurisdiction for managing natural resources and the enforcement of public law. Therefore, the federal government can contribute little to these two policy areas, enabling provincial governments to dictate the allocation of mining licensing, as well as how thorough investigators will probe illegal activities (Mahadevan, 2019). According to Mahadeven (2019), 23 out of 29 provinces in India have been identified with high levels of illicit sand mining activity, the province of Maharashtra reporting the highest numbers of illegal mining cases. It is estimated that the illicit sand trade industry is worth approximately \$2.3 billion USD a year in India (Beiser, 2019). Evidently, there is money to be had in the industry. In one case in Haryana, Mahadeven (2019) learns that illegal miners were making approximately \$7,370 USD per day. It assumed that this daily wage is made by higher level employees. Rege (2015) finds that India’s sand mafia generates approximately \$17 million USD per month. The Indian sand mafia is responsible for producing “the blackest of the world’s black markets” (Beiser, 2018a, p. 19), using violence, intimidation and their sophisticated partnerships to move ahead in the lucrative sand mining industry.

In the Asian context, there has been little scholarship surrounding sand-related “mafias,” or organized crime groups. Rather historians, social anthropologists and economists have commonly focused on “informality” and corruption emerging from the entanglement of criminal groups, business and politics (Harriss-White & Michelutti, 2019; Rege, 2015). According to Armao (2015), a mafia is created when there is an organized and permanent group of individuals that uses violence to make profit through

criminal activities to “meet politics” (p. 6). Harriss-White et al. (2019) describes mafias in India as “deeply politically institutionalized and socially embedded,” making it difficult to distinguish between mafia members from businessmen and politicians who connive with criminal groups (p. 7). Mahadeven (2019) finds that the Indian sand mafia features a mixture of self-organized entrepreneurship by villagers, infused with hierarchically structured criminal actors that can assume violent characteristics. There is no overarching definition or structure of the sand mafia, however, the consensus across authors lead to the sand mafia being described “as one of the most prominent, violent and impenetrable organized crime groups in India” (Rege, 2015, p. 101).

Investors, developers, consultants, and government officials are transforming Indian land from a local resource for agricultural or industrial production into an international goldmine (Searle, 2016). Gaining the mining rights and support from authority figures to secure investors and partners’ ongoing provision of building materials has proven to be a simple task. State politicians have a genuine interest in public infrastructure projects as these construction projects can translate into major sources of revenues through rent-seeking (Cheng et al., 2019). In India, criminal violence and collusion with the state – with bureaucrats, public sector managers, the police and politicians at all levels – are crucial for furthering accumulation. Some Indian politicians have been associated with restricting the number of mining permits to legitimate traders in order to push-up sand prices and increase the profits of illegal and extra-legal mining (Mahadevan, 2019). Interestingly, India has no shortage of regulatory law. Rather, the country suffers from a lack of enforcement capacities that is displaced by authority vested in criminal practices.

According to Jha (2013), the criminalization of politics is traced back to the constitutional flaw of omitting the means to meet the costs of running a democracy. These activities does not only include the costs of the election campaigns, but also the ongoing fixed costs of democratic politics (Harriss-White & Michelutti, 2019). Furthermore, the 1969 decision by Indira Gandhi to prohibit company donations to political parties has forced political parties to search ‘underground’ for funding opportunities. The high costs of election campaigns and ongoing fixed costs of democratic politics in India has forced politicians to turn to criminal organizations to assist in funding their campaigns, saturating black money and votes into political processes across the country. Jeyaranjan (2019) exposes the predatory forms of politics through the unravelling of the illegal sand mining industry in Tamil Nadu. He demonstrates how the intertwining of criminality and politics manipulates the general population by injecting industry profits into the electoral process where it is employed to fund vote buying. In his article, Aiyar (2013) adds that politicians who were once funded by businesses were now being funded by the sand mafia. Cheng et al. (2019) find that criminal candidates across India are not an unfamiliar phenomenon. Scholars identify that criminal political clients and leaders of criminal organizations are directly participating in party politics (Cheng & Urpelainen, 2019; Harriss-White & Michelutti, 2019; Tummala, 2006). As seen in Figure 3, Cheng et al. (2019) reveals that many criminal politicians are concentrated in less-developed

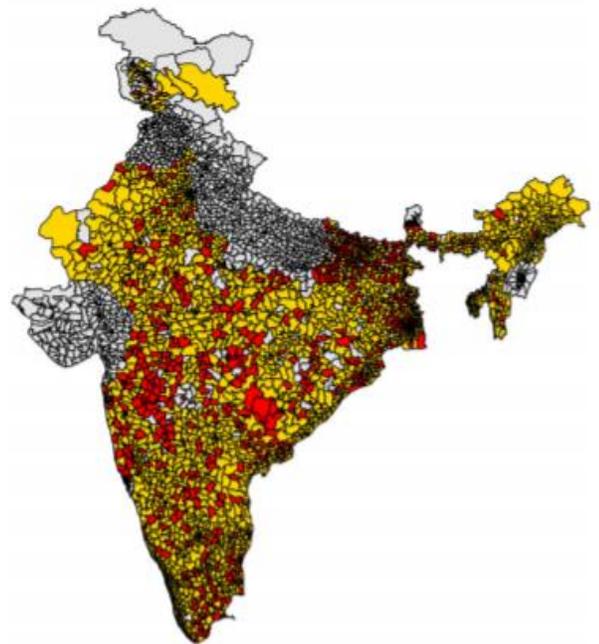


Figure 3: “After 2008”: The distribution of politicians in India. Areas marked in red refer to assembly constituencies where criminal politicians won.

Source: Cheng, C.-Y., & Urpelainen, J. (2019). Criminal Politicians and Socioeconomic Development: Evidence from Rural India. *Studies in Comparative International Development*, 54(4), 501–527.

areas in northern India. Most notably, Bihar, Maharashtra, and Uttar Pradesh. Together, the political and economic logistics capture the sand trade wealth and power, while using manipulation, violence and exploitation as tools to spawn precarity across India.

3.4 Understanding Precarity

Understanding precarity is important when applying the adapted Rodgers and Rodgers (1989) framework to sand livelihoods. It provides a more thorough analysis drawing on the varying perspectives within the precarity discourse. For years, scholars have explored the different dimensions of precarity. In one view, scholars associate precarity with the instabilities and vulnerabilities within labour conditions. This is the most common definition. Another perspective relates to precarity being associated with structures of feelings and experience existential conditions of social life. The following review of precarity will provide more nuance to the research paper analysis of the dimensions of precarity in sand livelihoods.

Precarity has been most useful in unpacking working conditions, specifically in the context of employment protection and social rights. Kalleberg and Hewison (2013) describe precarity as “uncertain, unstable, insecure work whereby employees bear all the risks associated with work – rather than a business or government – and receive limited social benefits and statutory entitlements” (p. 271). Many authors see precarity as a result of processes associated with neo-liberalism (Cruz-Del Rosario & Rigg, 2019; Kalleberg & Hewison, 2013; Waite, 2009), arguing that capitalists economies are leading to more precarious work characterized by instability, lack of protection, insecurity and social or economic vulnerability (Rodgers & Rodgers, 1989; Waite, 2009). The proliferation of precarious work has transformed into a global phenomenon that enables multinational businesses to take advantage of culture, lax regulation, management and vulnerable workforces.

Precarity is often associated with the informal economy. Cruz-Del Rosario & Rigg (2019) draw attention to how contemporary processes have contributed to an emerging informal economy in Asia. The authors identify informality to the work existing outside of the realm of regulation – “it is unrecognized, unregistered, unprotected and unaccounted for” (p. 519). According to Chen (2016) the informal economy represents as much as 82 per cent of nonagricultural employment. Many informal workers are reduced to marginal activities that provide income and a safety net in times of crisis. In developing countries across Asia, precarious employment is seen as the norm where the common working experience is being locked into precarious work with little opportunity for better and more secure employment (Kalleberg & Hewison, 2013).

Recently, scholars have applied an environmental perspective to labour precarity. Marschke et al. (2020) focuses on the changing conditions of the ecosystem as a result of climate change or human interference. Within their research, the authors study the specific characteristics of fish work and the biophysical change in Jamaica that resulted in the unstable, insecure and dangerous work for the divers and fishers. In the era of globalization, most countries have adopted policies to oversee the market, trade, investments, deregulation and decentralization to promote ethical business practices. Despite this, states continue to modify these policies to ensure that fiscal discipline takes precedence over social policies (Puar, 2012). In other instances, states actively ratify regulatory law, however, it lacks the enforcement of these laws to provide adequate protections of its workforce, fueling precarious livelihoods globally.

Scholars extend the term precarity to structures of feelings and experiences emanating from existential conditions of social life (Allison, 2014; Puar, 2012; Waite, 2009). In this perspective, precarity focuses on the biopolitics and the structures of feelings and experiences emanating from transhistorical and social conditions (Kasmir, 2018). Unlike labour conditions, where precariousness generally affects only the most marginalized and poor, precarity as a human condition affects all socio-economic groups

(Butler, 2006). This can include vulnerabilities such as economic insecurity, injury and violence. Many scholars link this feeling of precarity with fear instigated by war and terror, where others identify it as a human condition and “not limited to a specific context in which precarity is imposed by global events or macrostructures” (Ettlinger, 2007; Waite, 2009). Under these definitions, we can identify the concept of precarity as multi-dimensional, both descriptive and analytical, and can be used as a tool to assist in examining how sand mining spawns precarity in India for sand labourers, local communities, journalists and reporters.

Through the flouting of laws and use of violence, the exploitation of sand induces precarity amongst livelihoods across India. In the nexus of politics, business and crime, illegal sand mining situates precarious livelihoods for those who are directly and indirectly involved in the industry. The extensive networks in sand mining involve both bonded wage labourers and small-scale self-employed workers as well as the political web of the police, state agencies, and politicians (Harriss-White & Michelutti, 2019). Outside the industry, local communities, journalists and activists are socially and physically threatened by the sand mafia. By understanding precarity, I can use the concept as a tool to approach each dimension in the adapted Rodgers and Rodgers (1989) model, capturing not only organizational vulnerabilities within labour conditions, but also insecurities induced by the environment and the sand mafia themselves. The following sections will highlight how the political-criminal nexus fails to address adequate enforcements to protect sand miners, the environment and the individuals who attempt to unveil illegal operations of the industry.

4.0 Impacts of Sand Mining in India

4.1 Sand Miners

Despite the dangerous nature of sand work, sand mining is an attractive industry that draws in impoverished populations across India and neighbouring countries. During peak season, post-monsoon, nearly 60,000 labourers from various districts and states travel to sand mining sites surrounding the growing center of Mumbai (Minhas, 2017). The demand for sand opens up vast employment opportunities for individuals who seek financial means and support for their families. Sand mining provides individuals more than the average country wage (Mahadevan, 2019). According to one miner, he earns ten times the amount in wages for mining sand, compared to his previous employment, painting in the village (Srivastava, 2017). Although increased wages are cited across several sources as a key motivator to participate in this work (Mahadevan, 2019; Srivastava, 2017), it is unclear whether or not this is a matter of perception due to the temporal nature of sand work. In Cambodia, the peak and low seasons resulted in inconsistent work for sand labourers, therefore the overall average of wages was determined to be relatively low for the year (Van Arragon, forthcoming). Unfortunately, there is no research indicating if there is economic precarity within the sand industry in India.

Participating in this type of illegal work does not seem uncommon across the country. As mentioned previously, in the state Jharkhand, the illegal coal mining industry accounts for approximately 300,000 livelihoods across eight districts (Singh & Harriss-White, 2019). It is assumed that individuals who are deprived of livelihood options can be drawn to money and opportunities where relative prosperity exceeds the risks involved in illegal employment. Alternatively, sand miners may be unaware of the illegal nature of their activities. In the case of Cambodia, Van Arragon (forthcoming) observes that some of the sand labourers were unaware that they were engaging in illegal activities, the workers just followed instructions of their bosses. Further research would be required to better understand the sand miner's knowledge of the illegality of their participation in sand work in India.

In addition to voluntarily entering the industry, Mahadeven (2019) indicates that the sand mafia recruits sand miners into their criminal organization. Recruiting efforts are aimed at members of marginalized lower-castes and tribal people (Mahadevan, 2019). Currently, there is minimal information on the recruiting methods of the sand mafia, however, it can be assumed that money entices these individuals to join the sand mafia. Through the manipulation of money, the sand mining industry in India acts as repository of poverty, perpetuating dangerous and unhealthy livelihoods, specifically in areas where there are few income opportunities available (Singh & Harriss-White, 2019).

The majority of sand labourers are found in the extractive phase of sand mining – the most vulnerable population of the sand industry. The extractors consist of villagers, fishers, as well as independent contractors and even, legitimate companies that exceed the terms of their licenses (Mahadevan, 2019). Consistent with other Southeast Asian countries, sand miners generally tend to be men, in part linked with the physically demanding nature of the work. In their study on sand mining in Cambodia, Marschke et al. (2020) note that the sand industry is a masculine space where men account for the majority of boat drivers, sand pumpers, and boat owners. Children have also been cited to be participants in the illegal sand trade (Nair, 2013). Nair (2013) observes children, as young as ten, load and unload sand into trucks at Thane Creek. There is limited discussion on the role of women within the sand mining industry, however it can be presumed that gender norms and sexism play a dominant role in the barriers to female entry (Lamb et al., 2017).

Labourers travel near and far distances to participate in sand work. Men will leave their families for three to four months at a time to engage in sand work during peak season and send remittances back to their families (Nair, 2013). Illegal immigrants from Bangladesh and Nepal have been mentioned to participate in sand mining (Mahadevan, 2019). Migrating for work is used as a livelihood strategy to seek higher paid employment opportunities in wealthier countries. However, migrant workers often represent the perfect workforce for a host country – ‘commodified and exploitable; flexible and expendable’ (Waila, 2007). The invisibility of illegal immigrants is more pronounced due to the illegal dimension of their activities. Generally, migrants tend to be identified as the most precarious of workers and exploited in relation to their race, nationality and wages (Kalleberg & Hewison, 2013), however the work is often regarded as positive in terms of economic value in relation to opportunities in their home country (Lamb et al., 2019). Many individuals see sand mining as physically demanding and dangerous, nevertheless, provides an economic opportunity to support their families. From a livelihood perspective, it is evident that individuals experience distress in sand work, however it appears to be offset by relative prosperity.

4.2 Working Conditions

Sand is mined from inland dunes and beaches, or can be dredged from ocean and river beds (Rege, 2015). Sand can be dredged using various tools and equipment, including drillers, stone crushers, and excavators. Within the sand trade, the preferred method is dredging sand using heavy machinery to scoop or suck sand from the bed of the river. A single mechanical excavator can extract several truckloads of the resource (Rege, 2015) exceeding mining permits. This level of exploitation of the sediment is illegal, forcing the sand mafia to operate at night when there are fewer witnesses (Mahadeven, 2019). Operating at night, can limit the sand miner’s visibility, increasing the risk of a worker to be injured.

Alternatively, sand extraction can be done manually. This process of extracting sand requires little technology or skill and can be done with the use of ploughs, sickles and shovels (Rege, 2015). Due to the physically demanding nature of the work, research and media reports have specifically focused on manual excavation by local villagers, fishers and migrants. Manual mining is legal; therefore, this activity can be disguised (if linked with illegal practices) and workers can be active during the day. At dawn, fishers will

sail on an iron boat to the middle of the local river, dive down and manually dig up the sand (Khan, 2015). The divers will descend 40 to 50 feet, gripping a metal rod for balance and propel themselves down to collect sand from the riverbed (Hawley, 2017; Rege, 2015). Divers will then use 'tug signals' to indicate to their boat companions to pull up the extracted sand and fill the boat (Vijapurkar, 2013). These dives can last up to 30 to 40 seconds and are done over 200 times in six hours with no safety apparatus to protect them from drowning (Hawley, 2017). The erosion of riverbeds resulting from previous mining activity have miners plunging deeper and deeper into the exploited waters to collect the mineral (Mahadevan, 2019). Some men dive up to 120 feet into the dark waters (Rege, 2015). Due to the high demand for sand, workers have a continuous work cycle which limits rest periods to include a few brief stops (Mohapatra, 2017). Hawley (2017) observes how the men are often drunk to calm their nerves to succeed in completing their shift. Workplace substance abuse may get workers through a shift, but also declines workers productivity, work efficiency, and exposes them to increased risks when mining sand (Mohapatra, 2017).

4.3 Health and Safety Risks

Manual sand dredging in particular poses real risks to labourers. It includes awkward postures, forceful movements, pain and discomfort and increases the workers risks for musculoskeletal fatigue (Mohapatra, 2017). According to Mohapatra (2017), these risk factors cause micro-trauma resulting in pain and inflammation, specifically in the low back, neck and shoulders. This may result in chronic pain. Sand labourers on the Vasai Creek, located in western India, were interviewed by the Thomson Reuters Foundation regarding the health impacts relating to manual sand mining. One miner describes his experience: "While I worked there, my head started hurting. Blood started coming out of my ear and nose. My chest started hurting. After coming out of the water, within 15-20 minutes on the boat in the sun, my head would spin" (Thomson Reuters Foundation, 2017, 01:58-02:12). This is not an unusual occurrence of a sand miner. Another miner explains that one of his ears bleeds constantly. Over the course of nine years, the miner paid 16,000 rupees (215 USD) for his ear treatment (Thomson Reuters Foundation, 2017). The sand mafia demonstrate little support in addressing the health concerns of their employees. Even during times of rest, employers will send a person with money to travel to the workers' home villages to bring them back to the creek. This danger pay can be up to 500-1,000 rupees (6.61-13.39 USD) (Srivastava, 2017). The continuous diving into deep waters further threatens health issues, which could result in death.

Workers have lost their lives in sand work. Diving into dark waters, the miners descend blindly holding a metal rod, using their legs as a guide until their feet touch the ground. However, if they lose their grip on the metal rod, they can lose their balance and drown. The uneven depths in creeks and rivers also pose dangers to the workers. At Vasai Creek, underwater dunes can measure up to 1.5 to 2 metres in height, and when sand is removed, it loosens these structures (Srivastava, 2017). Consequently, a miner could be buried if a sand dune falls and he is unable to control his balance. For the sand mafia, workers' lives are given the lowest priority and often individuals are not found until days later. One miner tells Thomson Reuter Foundation: 'I have seen people fall and drown. There is no count of the number of people who have died here,' (Srivastava, 2017). Currently, there is no data capturing the numbers of deaths of sand miners in the industry. Despite death being a common occurrence amongst miners, there is no discussion within political and economic organizations regarding the threat to human lives in the sand mining industry (Srivastava, 2017).

Illegal sand mining operations have heightened during the COVID-19 pandemic (Gupta, 2020). India has implemented strict social distancing policies that restricts individuals from leaving their homes. For the sand mafia, this is an opportunity to expediate operations. The sand mafia can operate during the day

without many witnesses out in the daylight, increasing production. Gupta (2020) reported that districts of Tiruvallur and Kancheepuram of Tamil Nadu were found smuggling sand in broad daylight, taking advantage of the COVID-19 situation. The pandemic brings more hours in the day, promoting more diving and manual work for the sand miners, heightening any health risks miners may be experiencing. Furthermore, it is assumed that the workers are close in proximity to one another on the boats, meaning that physical distancing is next to impossible, increasing the risk for viral spread. Sand workers in India do not have adequate access to labour protection and health rights, as seen elsewhere in Asia (Marschke et al., 2020). From research and media reports, it appears Indian sand workers experience little organizational control and limited social protections. In the case of India, no reports have cited the government's involvement in the labour regulation within the industry, nor of worker contracts, unionization or an ability to grieve unjust workplace situations.

4.4 Environmental Impacts on Local Ecologies

Extensive sand mining from rivers has contributed to the destruction of riparian vegetation which is basking and egg-laying habitats for many migratory birds, sea turtles and crocodiles in India (Salopek, 2019; Sreebha & Padmalal, 2011). This is particularly concerning for endangered animals such as the gharial crocodiles, with only around 200 adults left in northern India and Nepal (Bendixen et al., 2019). In recent years, researchers focused on sand mining and its continuing impacts on fish stocks (Gavriletea, 2017; Hwang et al., 2014; Marschke, 2014). Son et al. (2007) conduct a four-year study on the effects of sand mining on the marine ecology in Gyeonggi Bay, Korea, and found that more than 70 per cent of the total number of fish species declined in a sand-mining block (p. 1253). Habitat loss, physical disturbance, soil erosion and destroyed vegetation are few examples that contribute to the alternation of fish population (Gavriletea, 2017). Additionally, the mechanical disturbances such as noise and turbid waters are reported to deter fish species toward lower disturbance and less destructive areas, affecting migration routes (Hwang et al., 2014; Marschke, 2014). Consequently, fish stocks have declined year after year to relentless sand mining and subsequent habitat loss (Sreebha & Padmalal, 2011). As a result, fishers across rural India are deeply impacted by the increasing socio-economic inequalities contributed by sand mining.

The changes in the river diversity are felt by rural fisheries across India, as fishers experience the degraded marine resource base. For some villages in India, fishing is the primary source of income for locals. However, due to the depletion of fish stocks, many fishing communities have abandoned this livelihood. In one village in Kerala, activists estimate that more than 6,000 fishers have vacated over the years in response to limited fish availability, beach erosion and drinking water scarcity (Haritha, 2019). In an interview, Haritha (2019) speaks to a local fisher who explains how prawns, shells and various other small fish were available in Kerala in abundance and now fishers are forced to leave due to poverty. Fishers observe that the fish no longer come into shallow waters, often leaving them little or no catch for the day (Chavanker, 2008). The apparent concern of the fishers across media reports is lack of compensation for their loss of livelihood against mining activities. Instead, they are displaced with limited alternative options for a source of income (Minhas, 2017).

4.4.1 Sand Mining Impacts on Agriculture

Indiscriminate sand mining practices have resulted in early recession of rivers, low infiltration and river erosion affecting land fertility. In a study, Singh and Kumar (2017) examine the environmental impacts of sand mining on the floodplain zones in the Yamunanagar district of Haryana, India. The authors found that sand mining reduces the essential nutrients and organic matter content of the soil, which obstructs the proper “functioning of the soil and crop production system by affecting infiltration, water holding capacity, erosion resistance, runoff, soil crusting, porosity and ease of tillage” (Singh &

Kumar, 2018, p. 267). Depleting groundwater has resulted in drying up hundreds of acres of fertile land in many villages across India, notably in high sand mining areas. Sharma (2015) notes the observations of the farmers along the Suvarnavathi River in India:

“Although the Suvarnavathi reservoir has been filling up in recent years, the water released from it hardly flows for a kilometre as the water seeps into the large number of pits that have been dug to illegally extract sand. A farmer said: “Because of groundwater levels going down, coconut and arecanut plantations have dried up. A coconut tree hardly fetches Rs.100 [USD 1.35] in some of these areas.” – (Sharma, 2015, para. 3)

Agricultural activities are the primary livelihood source for 70 per cent of India’s population, in which 60 per cent of agricultural irrigation is dependent on groundwater (Ramkumar et al., 2015). The role of rivers across India is critical in supplying water for irrigation and domestic consumption (Selvakumar et al., 2008). However, the construction of dams, the monsoonal deficit and sand activities across the country are posing tremendous threat to farmers. The declining land fertility encourages the use of fertilizers amongst farmers in the Yamunanagar region (Singh & Kumar, 2018). Due to the declining fertility caused by sand mining, Singh and Kumar (2017) found that 76 per cent of respondents in their study increased their use of fertilizer by 10% after sand and gravel mining operations had ended. Selvakumar et al. (2008) find that investments by farmers in a sand mining block in Tamil Nadu have increased in all farm-size categories, both in their annual costs and unit cost of irrigation. The stress of eroding land fertility and increased costs for cultivation are two dominant factors contributing to farmers changing occupation. As noted at the beginning of the paper, 2,035 farmers per day are switching to another occupation (Mahadevan, 2019), where they can earn enough money to support their families. Beyond livelihoods, researchers fear that if activities such as sand mining continue to go unmonitored, the degree of damage to land resources will threaten the basic food security and food available to livestock (Singh & Kumar, 2018, p. 281). Authors emphasized the need to augment groundwater recharge, in addition to imposing great restrictions on indiscriminate mining across India (Kaikkonen et al., 2018; Singh & Kumar, 2018).

4.4.2 Other Local Impacts

Changes in the riverbed morphology due to human intervention undermines infrastructures and promotes flooding in surrounding areas. As extensive sand mining continues and sediments are removed, the water table lowers, and riverbanks become unstable. As a result, the foundations of bridges are exposed and unsupported. In 2016, indiscriminate sand mining has been cited as a contributor to the collapse of the bridge over the Savitri River, where 41 people had died (Sidiqqe, 2017). In 2017, the Minister for Public Works Department announced that there were 100 bridges in the state of Kerala that are in danger due to overexploitation of sand (*Business Standard News*, 2017). The phenomenon of collapsing bridges is not uncommon globally. According to one media source, sand mining caused a bridge to collapse in Taiwan in 2000, and another the following year in Portugal, as a bus was passing over it; 70 people were killed (Weyler, 2018). However, further research would be required to review other contributing factors of these tragedies.

Apart from threatening bridges, extensive sand mining can also impact the beach system, primarily through the rapid erosion of sand dunes. Sand dunes are essential for protecting coastal property from the destructive forces of heavy storms, tsunamis and floods (Pitchaiah, 2017). Through beach erosion, sand dunes disappear leaving the coastal population vulnerable to falling homes, endangered livelihoods, and contaminated drinking water. In one case in the state Kerala, Pitchaiah (2017) describes how low-lying areas near sand mining sites are waterlogged during monsoon season and mostly

inundated by seawater. This exposes nearby communities to the risk of water contamination as seawater intrusion would saturate the land and saline incursion will affect groundwater (Pitchaiah, 2017). In addition to sand mining, flooding in Kerala has also been cited to have caused extensive deforestation (Datta, 2018; Sandrp, 2019).

Sand mining poses extreme environmental challenges affecting river and coastal ecosystems, communities and livelihoods. Although sand extraction may not be the isolated cause of such environmental degradation, sand mining activity plays a significant role in perpetuating the damage. The sand mafia can provide gainful employment and community benefits such as affordable housing that overshadow the slow devastation in their communities. Furthermore, there is limited data to demonstrate the environmental toll caused by these activities, and minimal regulation by state authorities. This is one reason why India has become a thriving territory for corruption and impunity, leaving little opportunity for protestors to save livelihoods, the environment and local communities.

5.0 Protest and Governance Challenges

5.1 Protest and Violence

In the last two decades, the phenomenon of sand mining has gained local and international attention of NGOs, journalists and researchers. In India, individuals have come together in creative ways to protest the environmental degradation against their land and resources that are affecting communities and livelihoods. Individuals and groups have resorted to dnarnas (strikes), hunger strikes, roadblocks, petitions and other methods to get the attention of local authorities to recognize the social and ecological damage caused by indiscriminate sand mining (Jeyaranjan, 2019). Along the Ganges River, seers of the Matri Sadan have fasted and protested in response to illegal sand mining and proposed hydroelectric projects in the holy river (The Wire, 2020). Early in 2019, a 17-year old girl created a video that went viral describing the adverse impacts of sand extraction on coastal villages, specifically addressing her concerns within her own village in Kerala. In northern India, in the state of Karnataka, one report stated that there were an average of 16 cases registered daily by Karnataka's Department of Mines and Geology relating to the sand mafia and illegal operations between 2015 and 2017 (Yogesh, 2018). All actions described above were ignored by government officials. Violence and flouting laws work in parallel with the state for the smooth functioning of sand mining and transport. Those who interfere with sand mining operations are ignored or are confronted with violence by the sand mafia.

Violence and intimidation are used by the sand mafia against individuals who threaten their sand mining operations. Sumaira Abdulali is a prominent environmentalist in India leading the anti-sand mining campaigns since 2004 (Awaaz Foundation, n.d.). Abdulali's journey to protect coastal regions and beaches began when she witnessed her family's property, located South of Mumbai, eroding significantly over the years due to illicit sand mining (BNEF, 2020). After submitting a complaint to authorities, they advised her that she would have to catch the sand mafia in the act before authorities would be able to do anything. Abdulali and a group of fellow protestors stopped a sand mining truck driving out from the beach: "...They bashed up the car and broke everything. They hit all of us. They broke my teeth. I still have headaches after that... My hand got paralyzed and I had to be in the hospital for a bit..." (Journeyman Pictures, 2017, 06:43-06:56)

Violence in India may be a result of the increased presence of firearms at sand mining sites (Mahadevan, 2019). Mahadeven (2019) suggests that firearms are procured illegally or through bureaucratic connections into the sand mafia, enabling the group to bypass the laborious process of obtaining a firearms licence. Journalists are victims of the sand mafia, since they investigate and expose illegal operations. According to the Global Impunity Index 2020, India is ranked 12th for the murders of

journalists, with 35 murders since 2000 (CPJ, 2020). Among the murders is Sandeep Sharma, a local journalist, who was killed when a truck struck his motorcycle (Kamdar, 2018). Prior to the incident, Sharma received threats for publishing stories on illegal sand mining and police corruption in the state of Madhya Pradesh. It is suspected that his death is linked to the sand mafia. Sand mafias in Madhya Pradesh, as well as neighbouring Uttar Pradesh and Maharashtra, have been well-known to burn investigative reporters to death (Mahadevan, 2019).

Law enforcement officers are also at risk of being mobbed, beaten or murdered while enforcing sand mining laws in India. Between 2013 and 2018, members of the sand mafia fired on police approximately 150 times in the region of Chambal (Saxena, 2018). In India, policing is not militarized, therefore some provincial governments avoid equipping their policemen appropriately with firearms, leaving police officers defenseless when confronted by armed criminals (Mahadevan, 2019). Police enforcement officers, specifically those who are of a lower rank, lack the basics of self-protection and may be unaware of the political connections of the sand mafia. These tragedies are a direct result of corruption, weak institutions and lack of political will to pursue thorough investigations.

5.2 Governance

Although there is policy related to sand mining in India, enforcement remains a serious issue. For example, even as illicit sand mining has been addressed by various state governments through a series of regulations, a lack of enforcement enables corruption and illegal sand mining operations to continue. Unlike diamonds, gold and coal, sand is classified a “minor mineral,” under Indian law (Bliss, 2017). Therefore, sand falls under state rather than federal jurisdiction overseeing mining activities. This leads to inconsistent laws and monitoring of mining activities across the country. Unfortunately, the central government has little to say on the matter unless a state impinges on national security (Mahadevan, 2019). This system enables state governments to have full freedom to decide how they want to address sand mining issues and how far they want their police personnel to pursue investigations. In Tamil Nadu, the judiciary has implemented new regulations to address the social and ecological impacts of sand mining within the state. This includes banning sand mining in specific areas, as well as shifting authority from private contractors to the state government to oversee mining operations. Despite these seemingly proactive steps, Jeyaranjan (2019) notes that the judiciary has ignored the “massive corruption in sand” (p. 111). Jeyaranjan (2019) provides an example of the malfunctioning system:

The victims have knocked at the doors of the court on several occasions for verdicts and the court has, on some occasions, appointed its own fact-finding commissions. All the commissions have reported that there is no account of the quantity of sand mined but confirmed its blatant and indiscriminate extraction. The courts have suggested new methods of monitoring, but the government has never implemented any of them. Instead of scrutinising the failure of the state machinery and the bogus affidavits, the court keeps suggesting even more regulation (p. 111).

One of the key issues is that the regulatory consequences of illegal sand mining are minimal, therefore the sand mafia continues operations under illegal limits (Bliss, 2017). The sand mafia has also been known to find loopholes in the system that enables them to continue extraction. For instance, state authorities have banned heavy machinery equipment in order to prohibit industrial sand mining (Gupta, 2020; Rege, 2015). To limit vulnerability, the sand mafia transitioned their heavy machinery mining to night or in the outskirts of urban areas (Banerjee, 2018; Nair, 2013; Salopek, 2019). This illegal behaviour is well documented by journalists and villagers, however, the government has yet to take action. Mahadeven (2019) indicates that officials at a local level overlook the negative impacts of sand mining to promote development opportunities for poor villages. He explains that organized crime plays an important

social purpose in India. Sand mining provides a livelihood to marginalized populations within the informal economy. In a country with no welfare system, these opportunities can be described as a “financial lifeline” (Mahadevan, 2019, p. 1). Additionally, local officials view small-scale sand mining as a way of allowing poor villagers to build affordable housing (Mahadevan, 2019). Despite development opportunities at a local level, municipal, provincial and federal governments fail to address the consequences of indiscriminate sand mining on rural populations. With limited attention on the victims, the sand mafia continues to extensively extract sand, affecting the environment rural populations depend on.

Currently, there is insufficient data collected on the illicit sand mining economy. India has no records of the status of provincial sand sources or data of the demand or consumption of sand in India (Damayanti, 2018). In addition, there are no figures on the fatalities among sand miners, villagers, journalists, and police officers (Mahadevan, 2019). It is clear that the sand mafia in India cultivates under a political roof and enjoys immense profits from the industry. Politicians have been reluctant to collect data and implement policy across states. Despite sand mining exacerbating environmental conditions and inducing precarity amongst local poor populations, bribery, graft, and the facilitation of illegal sand mafias in the sand trade is more lucrative. Implementing policy would prohibit these financial and political opportunities for politicians.

6.0 Discussion

The nexus of politics, business and crime in India perpetuates precarious conditions in the sand mining industry. As the Indian population continues to rise, the need for development projects surges, which presents prosperous opportunities for mining companies, state authorities and Indian elites. The demand for sand is supported by the most powerful people in India and will continue to motivate illegal operations in order to ensure the flow of profits. This cycle creates precarious dynamics for sand workers in India. The adapted Rodger and Rodgers (1989) model is helpful in identifying the various dimensions precariousness within sand work (see Table 1). The framework reveals that there is a need for further research in sand work, specifically in the context of political criminality in India. I unpack each dimension in turn.

Sand Mining in India				
Temporal & Spatial Effects	Organizational Context	Level of Labour Protection	Economic Conditions	Ecological & Biophysical Change
Peak and low seasons Mining routine shifts, depending on location, and can include night work	Limited organizational control and social rights No union & no contract Limited employment opportunities	No safety equipment No labour regulation Limited visibility for sand miners working at night Workplace substance abuse	Increased wages compared to other livelihood options Provides employment opportunity But remains an overall precarious job	Sand miners plunge deeper into exploited waters Risk of drowning

Table 1: Precarity findings using the adapted Rodgers and Rodgers (1989)

There is a lack of information in terms of the temporal and spatial effects of sand mining. Sand mining occurs in peak season, post-monsoon, which typically lasts from October to December (Sadhuram & Maneesha, 2016). However, there is no indication of sand mining operations occurring beyond these months and whether the temporal nature of sand work impacts the financial outcome for the workers (although this seems to be likely). Additionally, sand work attracts miners within and outside the country, travelling far distances to reach sand mining sites (Mahadevan, 2019; Srivastava, 2017). Many sand workers are identified as internal migrants; however, other migrants have been cited from Bangladesh and Nepal (Mahadeven, 2019). Across the literature, there is no information on where the miners sleep and spend their time outside of sand mining, or if they had any time to do other activities at all. Sand miners work in various environments. It appears that the dynamics of operations differ between illegal and legal sand mining. Unlawful extraction occurs at night to avoid being caught by law enforcement and eyewitnesses. Working at night and extracting on land, exposes sand miners to different risks than the working conditions faced on the boats during the day. It is assumed that their vision is limited, increasing their risk to injury when using extraction equipment such as drillers, stone crushers, and excavators. In contrast, manual sand mining which occurs on boats and operates during the day. Unfortunately, there is no information on the spatial dimension on the boats, however it is assumed that workers are close in proximity. In light of a global pandemic, this can be problematic as workers cannot physical distance themselves and avoid exposure to the virus. In order progress the knowledge on the temporal and spatial conditions of sand miners in India, more research should be conducted.

In the context of Asia, sand miners experience limited organizational control and social protections in the sand mining industry (Mahadevan, 2019; Marschke et al., forthcoming; Robertson et al., 2016; Srivastava, 2017; Van Arragon, forthcoming). Precarious employment is seen as the norm, and sand miners have little opportunity for better and more secure employment (Kalleberg & Hewison, 2013). Firstly, employment and financial opportunities are limited across India. Although agriculture remains the dominant occupation, climate change and human interference force farmers to switch occupations. Sand mining provides an alternative livelihood source, as well as enables a worker to make more than the country's average wage. With this mind, the sand mafia has the bargaining power to withdraw organizational control and social protections from the labourers. Media reports and interviews suggest that the sand labourers do not have contracts or an established union to protect them from labour exploitation. Therefore, in exchange for the opportunity to work, the sand miner gives up their organizational control and social protections to pursue employment in sand mining. These actions are deliberate measures taken by the sand mafia to weaken and disorganize sand labour through money and opportunity.

Sand miners experience poor labour protection in the sand industry. With no safety equipment, miners are exposed to health risks such as bleeding ears and headaches, as well as drowning. Workers have complained that the sand mafia provides no compensation for medical treatment or time off. Under these conditions, workers continue dive to ensure they will be paid. Divers will plunge up to 120 feet for 30 to 40 seconds at a time in the water, over 200 times a day, filling buckets of sand from the riverbed floor. The continuous diving at these depths put miners at risk for musculoskeletal fatigue, muscle pains and other health issues. To cope with these unhealthy conditions, some miners participate workplace substance abuse during their shift. This limits the workers' awareness and balance when diving for sand, increasing their risk of injury and drowning. Perhaps this is an indication of mental health issues amongst the workers, however, this matter would have to be further explored through interviews with the miners. Currently, there is no data on the fatalities amongst sand miners, nor is there any indication that addressing these dangers are a priority for the state to protect these individuals. More research is required to explore further details of the labour conditions and protections (or lack thereof) on the boats. In

addition, there is limited information on the miners who work at night. Therefore, further research should be conducted on the labour protections of the miners who work illegally at night with heavy equipment.

The ecological and biophysical change dimension is an important component of the precarity analysis. As sand continues to be extracted at unprecedented rates, divers plunge deeper and deeper into exploited waters. From an economic perspective, sand miners will spend more time underwater to fill up the boats with sand. Ultimately, for some miners who are paid by the boat load, it will affect their pay. Additionally, the more time spent underwater increases the miner's risk to drowning. As sand is removed, underwater structures such as sand dunes are loosened. As a result, some miners are in danger of being buried in sand.

There are other impacts of sand mining that have affected livelihoods and local conditions across India. Indiscriminate sand mining, along with other human activities, disrupt and change river ecologies and agricultural systems. Erosion, destroyed vegetation, depleting groundwater and elimination of soil nutrients are the few contributors that cause the declination of fish stocks, destruction of egg-laying habitats, and disruption of a proper functioning crop system. As a result, many fishers and agricultural farmers have lost their livelihoods, and are displaced or forced to find alternative financial means to support their families. Beyond livelihoods, living conditions can be affected by extensive sand mining. Beach erosion can lead to collapsing homes and contaminated drinking water. Although some state governments have banned sand mining in areas to minimize environmental damage, the lack of enforcement and ignorance to these conditions by state authorities is quite revealing.

Exposing the nexus of politicians and the sand mafia is precarious. Journalists, investigators, and activists who attempted to face the challenges of entangling the political-criminal web have often experienced threats, violence, or even, death. Undoubtedly more research needs to be done to further investigate India's sand mafias. As a global community, we need to reinforce these efforts and ensure the proper protections are in place to retrieve information and data on this industry. Specifically, more attention should be on how corruption and undermining the rule of law has induced precarious livelihoods across India.

7.0 Conclusion: Mobilizing the Sand Agenda

Organizations and individuals across the globe continue to seek answers on addressing the worldwide phenomenon of sand mining. Despite sand being one of the largest materials extracted and traded globally, there is very low general awareness on the widespread impacts of sand mining (UNEP, 2019). With limited emphasis on the sand crisis globally, sand mafias, private companies and corrupt governments can thrive as the demand for sand continues. Below I will outline several recommendations to address the implications of sand mining as an international community.

Firstly, we need to change how our cities are being built. This begins with educating individuals across the globe about the social and ecological impacts of sand mining that is driven by consumption and infrastructure development. The role of education is to encourage the development of "green concrete" (Marschke, 2019) and make more conscious decisions to minimize the demand in sand. Recyclable glass, for example, is in abundance and possesses all the same characteristics of sand when broken down (Delestrac, 2013). Glass Beach, located in north San Francisco, has proven that this material can be used to replenish beaches. Many beaches in surrounding areas have mimicked this strategy and found it is safe, uncontaminated and has demonstrated to be an egg-laying habitat for turtles (Delestrac, 2013). Additionally, researchers from the Deakin School of Engineering in Australia have discovered that recycled glass can be a substitute for sand when making polymer concrete (Braniff, 2019). This type of concrete is ideal in the construction industry. It seems that glass and other alternatives such as bio-

concrete would be a promising solution to tackle the problem. However, sand substitutes are expensive in comparison to natural sand, and the industry cannot compete with 'free'. As the global community becomes more educated on these matters, we hope that governments, organizations and individuals can influence new strategies in approaching how we manage infrastructure projects, construction projects and land-based planning.

Secondly, we need to improve our knowledge and understanding of the sand industry. In India, transparency of the impacts is often hampered and concealed from the public eye, most likely to hide corrupt practices. From a global perspective, there remains to be a knowledge gap in terms of the magnitude of sand production, transport processes and shortcomings in global sand reporting (Lamb et al., 2019; UNEP, 2019). This is specifically highlighted by Lamb et al. (2019) through their analysis of global production networks and patterns of production and consumption of sand in Southeast Asia. The authors emphasize how the lack of data "hides some of the egregious livelihood outcomes that are tied to such processes of accumulation" (Lamb et al., 2019, p. 1524). Without an international regulatory system or governance mechanism for sand, India will not be held accountable for perpetuating unhealthy livelihoods and ecological damage to local communities. Understanding that there are many obstacles in collecting data, especially in a political climate that deters investigation of illicit activities, the international community can play an important role in challenging political criminality in India within the sand industry.

Collecting data on the environmental change in sand mining areas will assist in understanding the ecological impacts of sand mining. However, a key challenge is the lack of baseline data on the ecological impacts of sand mining (Lamb et al., 2019). The lack of adequate information of these activities is a major problem that challenges regulatory efforts in many developing countries (Sreebha & Padmalal, 2011). Although baseline data may be nonexistent in some countries, we must find creative ways to better understand the effects of sand mining on rivers and coastal beaches. Some scholars have assessed these impacts through environment impacts assessments (EIA) (Hwang et al., 2014; Padmalal et al., 2008; Sreebha & Padmalal, 2011) and qualitative analysis through interviews with the local villagers (Marschke et al., forthcoming; Van Arragon, forthcoming). Global monitoring programs and reporting tools are stated to be a promising method to track environment changes, specifically remote sensing technologies which can reveal sediment discharge rates in rivers and oceans as well as monitor for extensive mining (Bendixen et al., 2019). In addition, Mahadeven (2019) suggests setting up a website hosted by legitimate sources such as Indian think-tanks or global agencies to trace illicit sand mining activities across India. Tracking these illicit activities would be beneficial to understand which areas are being discriminated and ultimately at risk. As illustrated previously, the impact on the environment plays a large role in the lives of sand miners, fishers, farmers and local communities. Therefore, data collection and study of the ecological changes of rivers and coastal beaches are pertinent to understanding the implications of the sand trade.

There is much attention focused on the direct impacts of sand mining, and perhaps not enough of the indirect impacts caused by these activities in India. From a social perspective, there is a need to study and unpack labour regimes, as well as educate and mobilize local communities to better understand the consequences of sand mining. Since many political members in India are cited as active partners in the illicit industry (Beiser, 2019; Cheng & Urpelainen, 2019), it would be more beneficial to build community resilience from the bottom up. This may begin with ethnographic research of community members to better understand livelihood precarity and strategies of adaption. Perhaps if we better understand the implications of sand mining at a micro level, organizations can assist in creating strategies to respond to challenges caused by extensive sand mining. For instance, community housing and social

service programs may be an area NGOs and other organizations can provide assistance to help communities to adapt and cope with the environmental changes. Research and travel grants could be accorded to researchers or investigative journalists to unpack social gaps within high sand mining areas. Additionally, providing education to the communities on the consequences of sand mining could promote advocacy for better working conditions and environmental rights for local communities.

Finally, we need to find a way to untangle the illicit networks within the sand industry. In India, finding solutions is challenging due to the nexus of politics, business and crime that prohibits compliance to sand mining regulations and political action. Currently, there is very limited research focusing on the illicit networks of the sand trade in India. Conducting research and mapping the pattern of illegal activities and their relation to politics is not an easy task. As previously described, journalists and investigative reporters are at risk of violence, perhaps even death, when confronted by the sand mafia. Collecting data on corrupt institutions and the sand mafia requires “innovative, flexible methodology” that may include various methods that infuse anthropology, ethnography, economics and politics (Harriss-White & Michelutti, 2019, p. 16). Rege (2015) proposes that research should further examine the physical, physiological, economical and societal harms of the sand mafia, specifically addressing how corruption and undermining the rule of law has negatively impact the society. In order to promote this work, reporters would need access to necessary sources of protection in order to conduct their work in a safe environment. Ideally, their work would cover the current state of affairs regarding illicit sand extraction, as well as longitudinal studies over a period of time (Mahadevan, 2019). By exposing political figures and tracking financial flows of the sand mafia, perhaps there would be enough evidential weight to trigger a judicial investigation.

Advocacy for change in the sand mining industry begins with good governance and leadership. However, as this paper illustrates, this is unlikely in India. It is up to the international community to bring attention to the sand crisis and assist those who are victims of the political-criminal nexus of corruption and impunity. Individuals can educate and advocate change on an international platform, minimizing the demand in sand and promoting new alternatives for the material. Organizations and researchers should continue to strategize on the various methods to research, study and call attention to not only the direct impacts, but also the indirect impacts on livelihoods and communities. Perhaps through more information, the international community can institute top-down pressure to introduce reforms and improve oversight within the sand mining industry in India.

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