

Darkness Under the Light: Amplifying the Lived Experiences of Riverine Stone Quarry Workers along the Mahananda River in Panchagarh, Bangladesh

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Abstract

Stone quarrying along the Mahananda River in Panchagarh, Bangladesh, is a distinctive yet understudied form of informal extractive labour. This study aimed to explore the lived experiences of riverine stone quarry workers, with particular attention to their labour practices, occupational vulnerabilities, livelihood struggles, and survival strategies. Using a qualitative approach, in-depth interviews in the form of *testimonio* were conducted with thirteen stone quarry workers and the collected data were analysed inductively through thematic analysis. The findings show that irregular access to work, dependence on stone traders, declining earnings, untreated injuries, and restrictions imposed within a militarised border zone combine to produce a condition of organised precarity. Workers described themselves as living in a “sandwich graveyard,” caught between the Bangladesh Border Guard and the Indian Border Security Force, while remaining dependent on quarrying for survival. Interpreted through precarious labour theory and neoliberal political economy, these experiences reveal how the risks of extraction are transferred to workers even as their labour supports national infrastructure. The study highlights the need for inclusive labour governance, occupational protection, healthcare access, and recognition of riverine quarry workers within development policy.

Background of the Study

The labor market in Bangladesh is largely dominated by various forms of informal employment, making it a defining feature of the country’s development trajectory (Islam, 2017). The Bangladesh Bureau of Statistics in its recent Labor Force Survey reports that, the informal sector employs more than 85% of the national workforce (BBS, 2023). It ranges from engaging and securing very basic livelihood activities to the complex industrial production and is widely found across all regions, including people of all genders (Rahman & Biswas, 2023). Despite contributing significantly to the GDP and acting as a buffer against unemployment, these large pool of labor force of the nation operates outside legal social protection and regulatory structures (Hossain, 2021). Although the country’s informal sector spans diverse fields such as agriculture, construction, and transportation, it remains largely characterized by the absence of written contracts, job security, social protection, health insurance, and enforceable labour rights, leaving workers vulnerable to unstable incomes, hazardous working conditions, and limited bargaining power (Maligalig et al., 2009). Existing literature consistently highlights that informal workers in Bangladesh experience greater exposure to occupational dangers, excessive working hours, economic insecurity, income volatility, and labour unrest (Caleo et al., 2025; Mallik, 2025; Alam et al., 2021). In this broader context of informality and precarity, extractive industries particularly stone quarrying from the country’s multiple river and water bodies occupies a uniquely fragile and hazardous position.

The term quarrying refers to the process of extracting stones, rocks, sand, gravel, and other minerals from natural sources for construction and various industrial purposes (Institute of Quarrying, 2020). The stone quarrying industry, concentrated primarily in regions such as Sylhet, Sunamganj, Panchagarh, and the Chittagong Hill Tracts, where abundant natural stone deposits and river systems facilitate extraction, supplies essential raw materials widely used for constructing roads, embankments, bridges, housing,

and other major infrastructure projects across Bangladesh. Therefore, the sector has a direct link to the broader economy and national development. Stone quarry workers constitute a significant occupational community due to the rapid expansion of stone quarrying activities across the country (Seddiky, 2014). The absence of official government registries and reliable labour statistics on stone quarrying workers compels reliance on newspaper-based estimates, a limitation that itself underscores the institutional invisibility, marginalization, and persistent vulnerability of this workforce within national labour governance systems. Although existing studies have primarily focused on the broader Sylhet region, they reveal that quarry workers often live and work in unsafe and unhygienic conditions while facing routine exploitation and harassment from quarry owners, local authorities, and influential groups. These workers also remain deeply marginalized in terms of wages, income security, and access to basic social amenities (Seddiky, 2014; Hoque & Aktar, 2022; Chowdhury, 2018). Stone quarry workers have also been marked to a range of serious health problems including skin diseases and respiratory illnesses, arising from prolonged exposure to hazardous working conditions and physically demanding labour (Khan, 2016; Rahman et al., 2025).

Panchagarh, the northernmost district of Bangladesh, has emerged as one of the country's major stone-producing regions, largely owing to the rich riverbed stone deposits found along the Mahananda River. Originating in India and flowing into Bangladesh, the Mahananda River carries large deposits of commercially important stones, facilitating widespread quarrying and extraction activities in nearby areas. Local estimates indicate that nearly 40,000 people are directly involved in stone quarrying activities in this region (Alam & Pradhan, 2022). Although the stones extracted from the Mahananda River, like those from other stone-rich areas of the country, play a vital role in national development, the workers involved continue to be deprived of its benefits, reflecting a broader global pattern in extractive industries where labour drives economic growth but remains unprotected and unrecognized (Geenen & Gleiberman, 2021). River-based stone quarrying along the Mahananda River in Panchagarh constitutes a unique form of informal extractive labour, deeply influenced by the region's human geography, seasonal dynamics, and survival-oriented livelihoods. Workers are primarily involved in activities such as extracting stones from riverbeds, carrying and sorting materials, operating crushing machines, and loading stones onto transport vehicles (Alam & Pradhan, 2022). Several newspaper reports have highlighted the long-term environmental consequences of stone quarrying in this region, persistent gender-based wage discrimination, the everyday struggles and hardships of stone workers, and the tensions and insecurities emerging from the bordering nature of quarrying regions (The Daily Star, 2023; Lisa et al., 2024; Syed, 2024). As work in this sector is heavily dependent on river flow, weather patterns, and market demand, employment opportunities and income remain highly seasonal and uncertain throughout the year. Nevertheless, despite the economic and social significance of stone quarrying in Panchagarh, there remains a substantial lack of empirical research examining the dynamics of quarrying practices and the lived realities, vulnerabilities, and everyday struggles of the workers engaged in this sector. Little is known about how workers themselves perceive and navigate their work, manage their everyday labour practices, and sustain their livelihoods amid such precarious and uncertain conditions. Thus, this study aims to explore the lived experiences of riverine stone quarry workers along the

Mahananda River in Panchagarh, with particular attention to their labour practices, occupational vulnerabilities, livelihood struggles, and survival strategies within the broader context of informal extractive labour in Bangladesh. By foregrounding workers' lived experiences within a particular informal extractive setting, the study intends to offer a deeper understanding of the realities of informal labour and the everyday challenges and survival mechanisms that define work in river-based quarrying environments.

Theoretical framework

This study draws on precarious labour theory and neoliberal political economy to interpret the working and living conditions of riverine stone quarry workers along the Mahananda River in Panchagarh, Bangladesh. Precarious labour theory helps explain how insecurity is experienced in everyday working life, while neoliberal political economy directs attention to the institutional and market arrangements through which that insecurity is produced and sustained. Bringing these perspectives together is particularly useful in an informal extractive setting where workers contribute to infrastructure development but remain weakly protected by labour institutions and highly exposed to market, environmental, occupational, and territorial risks.

Precarious Labour

Precarious work refers to employment that is uncertain, unpredictable, and risky from the worker's perspective, particularly where access to contracts, legal protection, social security, and employment benefits is limited or absent (Kalleberg, 2009). Standing (2011) similarly associates precarity with continuing insecurity, restricted rights, and social exclusion. Precarity, therefore, extends beyond unstable employment. It can affect household security, health, social participation, and workers' ability to plan for the future. In informal economies, such conditions should not necessarily be understood as temporary arrangements that will eventually be replaced by formal employment. Research on labour in the Global South shows that informal and insecure work often operates as a durable part of economic organisation, enabling production to continue through low-cost and weakly protected labour (Hillenkamp et al., 2013; Breman & van der Linden, 2014; Mezzadri, 2017). Rather than treating the workers examined in this study as members of a fixed or universal social class, the concept of precarity is used here to understand the conditions under which their labour is organised and their livelihoods are maintained. For this study, the perspective draws attention to several interconnected dimensions of quarry work: irregular access to employment, unstable earnings, limited bargaining power, the absence of formal protection, and continuing exposure to occupational harm. It also helps explain how dependence on stone traders and the lack of collective organisation can restrict workers' ability to negotiate prices or challenge unfavourable working arrangements. Precarity thus provides a lens for examining how insecurity extends from the workplace into workers' health, family responsibilities, social relationships, and expectations for the future.

Neoliberal Political Economy

Although precarious labour theory describes how insecurity is experienced, neoliberal political economy helps explain the broader arrangements through which such insecurity is produced and distributed. Neoliberalism is commonly associated with the expansion of market-based organisation, labour flexibility, deregulation, and the prioritisation of economic efficiency over collective welfare and labour protection (Harvey, 2005; Peck, 2010). It does not simply involve the withdrawal of the state. Rather, it can involve a selective reorganisation of state responsibility in which markets and private actors are enabled to organise production while workers and households are left to manage the consequences of unstable income, injury, and economic disruption. This perspective is particularly relevant to informal extractive labour. Quarrying generates materials of considerable value for construction and infrastructure, yet the costs associated with dangerous work, illness, interrupted employment, and medical treatment are often transferred to workers and their families. Value moves through traders and wider markets, while occupational and livelihood risks remain concentrated among those undertaking the physically demanding work of extraction (Lahiri-Dutt, 2008; Mezzadri, 2017). The riverine border setting adds an important dimension to this political-economic relationship. Along the Mahananda River, limited labour regulation and social protection coexist with a visible state presence through border surveillance and territorial control. This distinction allows the study to examine how workers may remain institutionally unrecognised as labouring citizens while being closely monitored and restricted as people working within a sensitive border space. Neoliberal political economy therefore helps explain not only the dominance of market intermediaries but also the uneven ways in which regulation, protection, and coercive authority are exercised.

Integrated Analytical Lens

Together, precarious labour theory and neoliberal political economy connect workers' everyday experiences with the wider structures organising riverine quarrying. The combined framework directs attention to how employment uncertainty, unequal market relationships, occupational harm, and border restrictions reinforce one another. It also makes visible a central contradiction: workers provide essential materials for national development, yet the economic, bodily, and social risks involved in producing those materials are largely borne by the workers themselves. Within this study, precarious labour is therefore understood as the lived condition of insecurity, while neoliberal political economy explains how responsibility for work-related risks is shifted away from markets and institutions and onto workers and their households. The framework further enables border regulation to be examined as part of labour governance because restrictions on time, movement, and access to the river directly shape the availability and organisation of work. These theoretical perspectives were not used as predetermined coding categories. The codes and themes were developed inductively from participants' testimonios, and the framework was subsequently applied to interpret how the experiences described by workers were connected to broader market, institutional, and political conditions.

Methodology

Study Design

This study adopted a qualitative research design to explore how riverine stone quarry workers along the Mahananda River in Panchagarh, Bangladesh, experience their work and navigate the struggles associated with it. A qualitative approach was considered appropriate because the study sought detailed and context-specific experiences shaped by a particular social, economic, and geographical setting (Hay, 2010; Creswell, 2017). It also enabled participants to describe labour, health, and survival in their own terms, allowing the analysis to move beyond experiences that can be captured through quantitative indicators alone (Denzin & Lincoln, 1994).

The study was methodologically informed by *testimonio*, a narrative approach that enables members of socially marginalised and excluded communities to recount their experiences of inequality, injustice, and often overlooked forms of suffering through first-person accounts (Delgado Bernal et al., 2012). Rather than treating participants simply as sources of data, *testimonio* recognises them as knowledge holders whose experiences provide important insights into the realities of informal labour. This approach was particularly relevant because riverine stone quarry workers remain largely absent from official labour statistics, policy discussions, and academic research. Providing space for workers to narrate their experiences in their own ways helped reveal how livelihood insecurity, occupational health risks, and survival strategies are intertwined in everyday life (Huber & Cueva, 2012).

The research was also guided by an insurgent research orientation, which challenges extractive forms of knowledge production and recognises community knowledge, oral accounts, and lived experience as legitimate sources of understanding (Gaudry, 2011). This orientation informed the researchers' efforts to engage participants respectfully, encourage meaningful participation, and interpret their narratives in relation to the wider structural and institutional conditions shaping informal labour.

Study Area, Participants, and Sampling

The study was conducted in Tetulia Union of Panchagarh, the northernmost district of Bangladesh. It was particularly carried out along the Mahananda River. River-based stone quarrying provides an important source of livelihood for a large number of informal workers in this area. The Mahananda is a transboundary river that flows from India into Bangladesh, carrying riverbed stones that are manually extracted and supplied for construction and infrastructure development. Work in this setting is influenced by seasonal changes in river flow, the physically demanding nature of extraction, and informal labour arrangements, all of which contribute to workers' continuing exposure to occupational risk and livelihood insecurity.

Participants were male workers directly involved in riverine stone extraction and related activities at least for one year along the Mahananda River. As no official registry or labour database was available for this informal workforce, participants were initially approached through local contacts, worker networks, and

community leaders. Purposive sampling was used to recruit workers from different age groups and with varying lengths of work experience, allowing the study to capture a range of perspectives on labour conditions, occupational vulnerability, and livelihood challenges. Snowball sampling was subsequently used to identify additional participants through referrals from workers who had already taken part in the study. This strategy was particularly useful for reaching members of an informal and marginalised occupational group who might otherwise have been difficult to access (Nolin, 2006). Each participant was informed about the purpose of the study before the interview, and verbal consent was obtained prior to participation. A total of 13 in-depth interviews were completed (Table 1). Recruitment continued until the interviews no longer produced substantially new insights relevant to the developing themes, indicating that sufficient thematic depth had been reached. This approach is consistent with qualitative research, which emphasises contextual richness and depth of understanding rather than statistical representativeness (Creswell, 1998). The demographic characteristics of the study participants are presented in Table 1.

Table 1
Characteristics of the study participants

No.	Participant Name (pseudonyms)	Age	Education	Work Experience (Years)
1	Abdul Halim	28	Class 8	12
2	Faruk	34	Class 8	20
3	Abdul Motaleb	27	Class 10	12
4	Tanvir Ahmed Akash	28	Class 9	14
5	Jamal Uddin	56	Class 5	40
6	Monir Hossain	40	Class 12 (Madrasha)	6
7	Zakir Hossain	40	Class 7	15
8	Ali Hossain	35	Class 5	17
9	Liton Mia	45	Class 6	25
10	Hamid	20	Class 7	10
11	Tuhin Mia	42	Class 8	16
12	Shairul	30	Class 9	18
13	Sirajul Islam	50	Class 4	30

Data Collection

Data were collected through in-depth, semi-structured interviews designed to capture workers' narratives of their everyday labour and livelihood struggles. This interview format was consistent with the testimonio approach, which centres the voices of marginalised communities and understands personal narratives as accounts that may also reflect wider collective experiences of inequality and exclusion (Haig-Brown, 2003; Delgado Bernal et al., 2012). The researchers relied on an interview guide that allowed participants to shape the direction and emphasis of each conversation. Each interview began with an open invitation for the participant to share his experience of working in stone quarrying. Follow-up prompts were used to encourage clarification or further reflection on issues introduced during the conversation. These prompts covered areas such as daily work routines, occupational injuries, health problems, access to healthcare, livelihood pressures, and interactions with border security forces. However, their use depended on the course of each participant's account, and they were not administered as a standardised set of questions. The interview process was also informed by an insurgent research orientation, which seeks to challenge extractive forms of research and recognise workers' lived and experiential knowledge as a legitimate basis for understanding their social realities (Gaudry, 2011). Particular care was taken not to introduce assumptions about institutional neglect, border violence, fear, or psychological distress. Experiences involving Border Guard Bangladesh (BGB), India's Border Security Force (BSF), or other sensitive matters were discussed only when participants raised them or indicated a willingness to elaborate. This participant-led approach was intended to respect workers' agency and reduce pressure to disclose experiences they did not wish to discuss. All interviews were conducted in the participants' local language and audio-recorded with their consent. The recordings were subsequently transcribed verbatim. Field notes were also prepared to document relevant contextual observations, circumstances surrounding the interviews, and the researchers' reflections during data collection (Creswell, 1998; Denzin & Lincoln, 1994). The fieldwork timeline was March, 2025. Throughout data collection, the researchers remained reflexively attentive to how their positionality, assumptions, and interactions with participants might influence the interview process and the narratives being produced.

Data Analysis

The interview data were analysed manually using Braun and Clarke's (2006) six-phase framework for thematic analysis. The analysis was entirely inductive, with codes and themes developed from close engagement with the participants' testimonios rather than from predetermined theoretical categories or an existing coding framework. The process began with repeated readings of the transcripts to develop a detailed familiarity with the dataset. During this stage, the researchers made written notes on recurring ideas, emotionally significant accounts, silences, contradictions, and expressions that appeared particularly meaningful within participants' narratives. The transcripts were then examined line by line, and initial codes were assigned manually to relevant words, statements, metaphors, and descriptions of participants' experiences. Particular attention was given to accounts of uncertainty, economic hardship, bodily pain, loss, resistance, and survival. The initial codes were subsequently reviewed and compared across the interviews. Codes that expressed similar or related experiences were brought together into

preliminary thematic clusters. These clusters were refined through repeated movement between individual coded extracts and the complete transcripts, allowing the researchers to assess whether they accurately represented both the specific accounts from which they were developed and the broader patterns evident across the dataset. The researchers then developed and defined higher-order themes that captured shared dimensions of workers' lived experiences. Theme development remained grounded in the interview data, while attention was given to preserving the context and meaning of individual testimonios. Reflexive discussions among the researchers were held constantly throughout the analysis. These discussions helped maintain consistency with the study's testimonio approach and insurgent research orientation. The analysis ultimately produced five interconnected themes. Representative participant quotations were selected to illustrate each theme and retain the depth and immediacy of workers' accounts. The themes were subsequently interpreted in relation to the wider social and institutional conditions surrounding informal riverine stone quarrying in Bangladesh.

Findings

The lived experiences of riverine stone quarry workers along the banks of the Mahananda River are presented in this section, through detailed interviews to render possible layered vulnerabilities embedded together as informal extractive labour. Five interconnected themes are identified: (1) Everyday Uncertainty, (2) Economic Insecurity, (3) Health Impacts, (4) Border Violence, and (5) Erosion of Social and Cultural Life. The analysis moves from the structural conditions of work to their material and social effects, showing how each dimension cements together with the others in constructing a regime of organized precarity.

Everyday Uncertainty

Everyday life for riverine stone quarrying workers along the Mahananda River is structured by uncertainty rather than stability. Although stone extraction in this area has been practised for generations, workers no longer experience their work as continuous or assured. Access to work is irregular, conditional, and constantly threatened by factors beyond workers' control. The absence of formal employment arrangements, combined with dependence on river conditions and external permissions, means that workers cannot predict from one day to the next whether work will be available. One respondent, Halim, explained the absence of formal protection and collective organisation among quarry workers:

"We workers don't have any labour law, regulation, or organization. But the stone traders (mahajans) have all of these. The traders fix the stone price through their own union. We cannot sell stones to anyone else except them. They strictly control the stone price and deprive us of what our labour is worth."

This account shows how everyday uncertainty is institutionalized through limited coverage under Labour Law, reduced presence of worker organizations, and lack of institutional recognition. The quarry workers remain excluded from any system of protection or collective voice, while traders function within organized structures that regulate prices and market access. Consequently, their work is incessantly

riddled with uncertainty, dependent on others, and lacking structural supports that could lend them stability or security.

Several workers emphasized that quarrying is not a newly created or temporary occupation but a long-established livelihood that has recently become unstable. Faruk explained this historical continuity alongside present disruption:

"My father and grandfather worked here. The stone has been extracted here for over 100–150 years without problem, but now the Subedar [Lieutenant Colonel of the Bangladesh Border Guard] does not allow proper work. We believe he is coordinating with the Indian BSF [Border Security Force] to stop the work."

This statement highlights how a profession, once accustomed to regular and predictable patterns of production, has suddenly become restricted, inducing a new feeling that long-standing work practices can be interrupted at any moment. Abdul Motaleb further described how work stoppages occur without warning and how even temporary permissions offer no assurance for the future:

"A few days ago, they completely stopped our work. We then shared our problem with a local political leader, and he negotiated to let us work between 6 a.m. and 11 a.m. Every day we spend is now surrounded by uncertainty. I think I will wake up tomorrow morning and hear that the work has been completely stopped. Now, we are all unemployed."

Environmental and seasonal conditions further intensify this unpredictability. Faruk described how river dynamics and broader disruptions create prolonged periods of irregular work:

"During the monsoon, when the river water is high, work stops for about a month or a month and a half. During that time, we may only get to work one or two days a week. Sometimes, the country's political issues and border tensions cause a shutdown of work, for two, three, seven, or even one to four months. This time is very difficult for us. We take loans from NGOs because we are unemployed. Now, I think the government will permanently shut down the work, and we will become permanently unemployed. I want to migrate to Dhaka because there will be no work here soon."

The uncertainty is also felt in relation to the future. Tanvir Ahmed Akash linked work instability directly to fears about generational continuity: "When I think about my children's future, I feel hopeless. If the work has been stopped, I cannot educate my child. His future will be shrouded in darkness." Together, these accounts demonstrate that everyday uncertainty is not incidental but is embedded in the organization of riverine stone quarrying, shaping not only workers' present circumstances but their capacity to imagine any stable future.

Economic Insecurity

Economic life, for riverine stone quarry workers, is marked by unending uncertainty and the struggle to cover the basic needs of a household. From irregular jobs, arbitrary time restrictions imposed by border

forces, falling wage levels, and months without work to fall back on, survival has become a daily negotiation rather than an assured way of making a living.

At the core of workers' economic insecurity lies an uneven market structure in which stone traders (mahajans) essentially set prices and control the quantity to be purchased as well as access to buyers. Jamal Uddin elucidated this imbalance of structure:

"The traders [mahajans] buy a truckload of stone from us at 4,300 taka, which means we receive about 43 taka per CFT basket. They sell the same truck for around 12,000 taka. Even accounting for their costs, they still make nearly three times more profit than us. We protested against their arbitrariness, but if we protest, they stop buying stones from us. We depend on daily earnings, if they stop buying, we are finished. Mahajans have an organization. They collectively fix the price they are willing to pay. If they stop buying, we are left helpless. We have no organization of our own, so we cannot mount an effective protest."

This account illustrates how economic insecurity is produced not only by low wages but by workers' structural dependence on traders who monopolise the stone market. Monir Hossain described the dramatic decline in earnings and its consequences for family responsibilities:

"Now I earn around 100 to 180 taka per day. Previously, I used to earn as much as 600–700 taka per day. But even during the entire month of Ramadan, I could not earn more than 1,500 taka. I cannot even afford my youngest son's madrasa expenses. Life is extremely difficult now."

Zakir Hossain explained how income insecurity extends beyond simply material deprivation to affect family relationships as well as psychological well-being:

"I cannot cover basic family needs. I cannot afford my children's education or proper medical treatment if someone falls ill. When I cannot meet the family's needs, arguments happen. Sometimes it even turns into physical violence. To avoid arguments and meet basic needs, I buy goods on credit. I survived by taking loans. Now I have fallen into a debt cycle. I do not know how to repay it. I feel constant stress from the debt."

His narrative shows how economic insecurity drives households to informal credit market systems, where debt cycles get deeper, and vulnerability is actually reinforced instead of eased. Festivals are often seen as moments of social inclusion; they instead amplify economic exclusion. Ali Hossain said,

"During Ramadan, I cannot buy proper food for Iftar. If I buy groceries, I cannot buy Iftar items. Eid is coming, and my children ask for new clothes. I have to tell them I cannot. It breaks my heart. There are no festivals in our lives. We work every day, even on Eid, but we still have nothing."

Together, these narratives illustrate how economic insecurity drives every household choice, education, healthcare, food consumption, and social affiliation, reinforcing the fragile circumstances of these workers.

Sacrificing Health for Survival

For riverine stone quarry workers, bodily injury and declining health are not unintended side effects of work but central conditions of survival. In the absence of occupational safety provisions, medical protection, or viable income alternatives, workers are compelled to continue physically destructive labour even after severe illness or explicit medical advice to stop. Health, in this context, is continually traded off against the immediate necessity of sustaining family livelihoods. Liton Mia explained this dilemma with clarity:

"I went to a doctor in Panchagarh, and my treatment cost 28,000 taka. The doctor advised me to stop working in stone extraction forever. I stopped my work for eight months. After that, I began working again for my family. Another time, during the monsoon when the water level was high, I dived deep into the river to extract stones and ruptured my eardrum. I had to travel to Rangpur for treatment, which cost 22,000 taka. I still suffer from that condition. Now I can no longer dive into the water."

When asked why he continued working despite the doctor's restriction, Liton Mia responded: "The well-being of my family comes before my own life." This testimony shows how health choices are made less by volition than by structural necessity. Once there is no alternative for employment, remuneration, or another social safety net, it is nearly impossible to follow through with medical advice not to mine stone anymore. The costs of treatment themselves intensify financial pressure, pushing injured workers back into the same hazardous conditions that caused their harm. The long-term and intergenerational consequences of such labour were emphasised by Abdul Motaleb, who reflected on his father's condition:

"My father also worked in stone extraction, but now he is old and has spinal damage. He cannot even stand properly. I see my future condition in him."

This observation also reveals a kind of fatalistic awareness among workers, for whom bodily deterioration is not an unprecedented tragedy but rather a foreseen result of quarry labour.

Daily physical suffering further characterises this labour. Abdul Halim noted lasting injuries and fatigue from heavy, continuous work:

"The skin on our hands and feet becomes wound. Regularly applying medicine helps, but the damage continues. We do heavy work, so we need strength. We need to eat well to maintain that strength, but that is difficult because of our limited income. We cannot afford nutritious food for ourselves or our families."

Ali Hossain similarly described how pain becomes normalized:

"We keep working with pain in our bodies. I know many others suffer from dust, pain, hot water in summer, cold water in winter, and cuts and bruises. But if we rest, we cannot eat. So we keep working until our bodies give up."

A Sandwich Graveyard: Border Violence

For stone quarry workers along the Mahananda River, violence is not episodic but embedded in the everyday geography of work. Their labour is enacted within a militarized border zone where survival depends on navigating constant threats, surveillance, and fear wrought by state and cross-border military forces. Hamid explained how conditions worsened following recent political unrest:

"Some days ago [before the Anti-Discrimination Student Movement of 2024], we could work the whole day. After the movement, restrictions became stricter day by day. If we go too close to the border, the BSF becomes aggressive, even crosses over, and takes our tools such as shovels and nets."

According to workers, they are caught in a violent "sandwich" between two forces: the militarized control of the Bangladesh Border Guard (BGB) on one side and the Indian Border Security Force (BSF) on the other. Tanvir Ahmed Akash articulated this condition powerfully:

"Sometimes we feel that we are criminals in our own land, just for doing this work. Our working hours have been restricted by the BGB and BSF. Now, we can only work from 6 a.m. to a maximum of 10 a.m. If we go slightly too far, the BSF shouts and aims guns at our bodies. If we do not leave immediately, they verbally abuse us and sometimes physically assault us. It feels like we are trapped in a graveyard where our future is already dead."

It describes a testimony of violence as one that is felt not just with physical force, but through humiliation, criminalization, and degradation of dignity. The insecurity is compounded by physical violence and by the destruction of tools to earn a living. Abdul Halim described the consequences of being caught while working:

"If they can catch us, they destroy our tools and equipment. A few days ago [before February 2025], the BSF caught one worker, beat him severely, broke his arm, and then sent him back."

The destruction of tools effectively extends violence beyond the body to the means of survival itself. Fear is further amplified by workers' collective memory of lethal violence at the border. Tuhin Mia reflected:

"They usually warn us and we stop working and leave. Many years ago, they opened fire in Banglabandha and killed two people, although nothing like that happens now unless someone tries to smuggle."

Although such killings are described as historical, they continue to discipline present-day behaviour, limiting how, when, and where workers can operate. This history of lethal border violence became painfully concrete through the testimony of Shairul Islam, whose family was directly devastated by such an incident. Shairul lives in Jharuyapara, Banglabandha; his father, Liyakat Ali, and elder brother, Shahalom Mia, were killed by the BSF during stone quarrying at the Mahananda River in 2001. Recalling the incident, Shairul stated:

"My father and elder brother went to stone quarrying in the river, but suddenly the BSF soldiers fired on my father and killed him. My brother saw it and was afraid. He ran to my father and tried to rescue him, but the

BSF soldiers fired again and killed my brother also. This happened in 2001, when I was a child. I have forgotten my father's and my elder brother's faces. I think I have never truly seen them. They were killed at work. They did not only kill my father and brother but also killed my family. My mother raised us by working in people's homes. We could not eat every day and could not study. We lost our normal life. My mother is traumatised to this day. We can never forget our days of suffering."

The loss of two primary earners plunged the family into long-term poverty, food insecurity, and educational deprivation. Border killings thus function as collective warnings, embedding fear across generations and reinforcing workers' sense that their lives are expendable within the border economy.

Erosion of Social and Cultural Life

Beyond physical and economic hardship, workers' testimonies consistently revealed the erosion of social and cultural participation as an additional dimension of their marginalisation. Economic scarcity and the relentless demand to prioritise survival over social engagement have progressively stripped quarry workers of the communal rituals and festivities that typically anchor social belonging and collective identity. Workers described how religious festivals, occasions of celebration and community solidarity for most Bangladeshi households, have instead become sources of shame and exclusion. Ali Hossain explained:

"During Ramadan, I cannot buy proper food for Iftar. If I buy groceries, I cannot buy Iftar items. Eid is coming, and my children ask for new clothes. I have to tell them I cannot. It breaks my heart. There are no festivals in our lives."

Liton Mia similarly described the fragile calculations that govern even modest gestures of social participation:

"I bought a few gifts for my daughter and son-in-law. I saved a little from my daily income for that. I have not bought anything for ourselves yet. I am worried that if work stops for a few days, I will not even be able to buy basic items like vermicelli or sugar."

Those narratives show how poverty- and precariousness-mediated informal extractive labour leads to the gradual erasure of workers from the social and cultural life of their communities, turning communal events of joy into signs of alienation and loss.

Discussion

The study explored a labour-oriented field research on livelihood experiences of river-based stone quarry workers along the banks of the Mahananda River in Panchagarh, Bangladesh, to understand organisation, experience, and endurance of everyday work in an informal extractive economy (Seddiky, 2014; Hoque & Aktar, 2022). These findings show that workers live in the intersection of different uncertainties, economic deprivation, bodily sacrifice, and violence, all of which are not incidental but structurally produced (Lahiri-Dutt, 2008; Hillenkamp et al., 2013). Taken together, the themes illustrate an

essential development-supporting sector that relies on labour arrangements which systematically strip workers of security, safety, and dignity, in contravention of international and national commitments to decent work and labour rights (ILO 1999; United Nations, 2015).

Normatively, work is seen as a basic human right (ILO, 1999; Sen, 1999). Globally, the Decent Work Agenda affirms the right to safe and secure work with dignity underwritten by the International Labour Organization (ILO), whilst national governments are required to regulate minimum labour rights, occupational health and safety, and social security (ILO 2008; ILO 2021). Likewise, the Sustainable Development Goals (SDGs), most notably SDG 8 (Decent Work and Economic Growth), SDG 3 (Good Health and Well-being), and SDG 10 (Reduced Inequalities), overtly connect development with protecting workers' rights and welfare (United Nations, 2015). However, the results of this study reveal a huge gap between these normative promises and the real worlds of informal extractive labour (Standing, 2011; Mezzadri, 2017). Mahananda River quarry workers live a fragile existence through survival work, not as a right, threatened at all times by environmental, institutional and political forces (Lahiri-Dutt 2008, Seddiky 2014).

Therefore, the findings reference a common uncertainty that shows the centrality of precarity as an organising principle of the riverine stone quarry (Standing, 2011; Kalleberg, 2009). Workers' access to labour is irregular, permission-based, and contingent on river conditions, border restrictions, and the discretionary decisions of authorities and traders (Hoque & Aktar, 2022). Importantly, however, this uncertainty remains embedded within a long-practiced occupation across generations, showing informality here to be not transient but rather structurally determining (Mezzadri 2017). This contributes to a body of scholarship highlighting how informal labour in the Global South is enabled not simply by regulatory absence but by deliberate governance strategies that utilise precarious, unprotected labour regimes to contain costs and optimise extraction (Hillenkamp et al., 2013; Davis, 2006). So, it follows that uncertainty is not just a state of being which workers suffer but a tool through which labour remains disciplined, replaceable and obedient (Standing 2011).

Economic insecurity illustrates how informality is expressed in the material deprivation of workers despite their centrality to development (Bremner & van der Linden, 2014). These findings reveal how quarry workers remain entangled in unequal market relations, where organised stone traders monopolise price-setting as well as purchasing and transactions with buyers (Ming'ate & Mohamed, 2016). The workers, who depend upon daily wages and therefore have no collective bargaining or legal recourse, must accept terms of exploitation under constant threat of exclusion (Kalleberg, 2009). It follows broader patterns found in informal extractive economies more generally, with value being captured by intermediaries and risk retained by producers (Lahiri-Dutt, 2008). What this study adds is a concrete account of how such economic arrangements infiltrate the everyday; disrupting food security, education, healthcare, and social engagement while driving families deeper into debtor cycles that compound rather than relieve vulnerability (Rahman & Biswas, 2023).

Health impacts findings show how bodily harm gets normalised in labour, which is survival-focused (Lohe & Ghosh, 2022; Manzoor & Mir, 2025). Despite severe injuries, chronic pain, and medical advice to stop working, it remains economically unviable for quarry workers to withdraw from labour (Kitole et al., 2025; Khan et al., 2026). Health, in this sense, is not protected or restored but systematically sacrificed (Lahiri-Dutt, 2008). This supports existing evidence that informal quarrying is associated with high rates of injury and long-term disability (Seddiky, 2014), while extending the analysis to show how illness becomes absorbed into labour rather than interrupting it (Hillenkamp et al., 2013). Workers' bodies effectively function as shock absorbers for an extractive economy, externalising health costs away from employers, traders, and the state (Mezzadri, 2017).

Most importantly, our findings highlight the fact that violence is a structural condition of labour and not an exceptional event. As quarry workers located inside a militarised border zone, their work is surveilled, limited to certain hours of the day, and they are constantly at risk of harassment, tools being destroyed, and physical violence from security forces. Workers articulate a concept known as being caught in a "sandwich graveyard," a metaphor for how labour manifests itself in concert with fear, criminalization, and disposability. Though much of the quarrying literature examines environmental degradation and occupational hazards, this study illustrates that violence operates as labour governance, controlling time, space, and bodily movement through intimidation and force (Lahiri-Dutt 2008). In this sense, militarization of the border engages informality to create a labour regime that expects workers to participate as vital bodies for the economy while simultaneously treating them as expendable.

Collectively, these results are echoes of critical political economy perspectives on neoliberal development (Harvey, 2005; Peck, 2010). In essence, neoliberal logics place employment-intensive sectors, above all in the informal and extractive lead, to act as a motor for growth, while routinely shifting responsibility for risk, injury, and survival onto workers themselves (Standing 2011; Mezzadri 2017). Stone quarry workers who engage along the bank of the Mahananda River support the national infrastructure and development goals directly, yet are still outside the ambit of labour protections, social security, healthcare, and legal recognition (ILO 2021; United Nations 2015). This paradox highlights how development relies materially on the labour of the least well off and serves to exacerbate, rather than mitigate, structural inequalities.

The findings also indicate serious policy and governance failures (ILO, 2019). In Bangladesh, Labour laws and social protection systems remain predominantly focused on formal employment, making informal river-based and border-embedded work almost invisible to governance frameworks (Rahman & Biswas, 2023). The absence of worker organizations also weakens the collective voice, and border security practices focus on solidifying borders at the expense of human security and livelihoods. These gaps will only be bridged through a paradigm shift in the way informal extractive labour is recognized and governed (ILO, 2021). Formal recognition of status as workers with labour rights, occupational safety and healthcare access, and compensation mechanisms must apply to stone quarry workers (ILO, 2008). If decent work and sustainable development commitments are to mean anything in practice, you need

context-sensitive labour regulation backed up by coordinated border governance which protects livelihoods rather than criminalizes them (United Nations, 2015).

In the absence of these interventions, the river stone-based development will continue to be built upon invisible labour, sacrificed bodies, and lives lived in eternal uncertainty (Lahiri-Dutt, 2008; Standing, 2011). Placing the lived experiences of workers at its core, this paper shows that the urgent need to change development discourse and redirect it toward the protection of labour rights, human dignity, and social protection (Sen 1999; ILO 2021).

Limitations

There are some limitations to this study. A sample of 13 was found adequate for qualitative research and sufficient to achieve thematic saturation; however, the generalizability of findings to other quarrying contexts is therefore limited. The exclusive focus on male workers reflects the gendered composition of the labour force at the study site, but future research should also explore women's roles in related informal activities. Furthermore, cross-border perspectives from the Indian side of the Mahananda were beyond the scope of this study and warrant separate investigation.

Conclusion

This study has explored the lived experiences of riverine stone quarry workers along the Mahananda River in Panchagarh, Bangladesh, through the lens of precarious labour theory and neoliberal political economy. Drawing on testimonio-based qualitative inquiry, the findings demonstrate that everyday uncertainty, structural economic exploitation, the normalization of occupational injury, militarized border violence, and the erosion of social and cultural life together constitute a regime of organized precarity that renders quarry workers simultaneously indispensable to national development and invisible within its protections.

This study adds to the literature in a number of ways. First, it provides empirical documentation of informal extractive labour in a riverine border context that has received limited scholarly attention. Second, by providing workers' own voice through the testimonio, it narrates how structural conditions are lived and experienced at the level of daily life in a way that renders precarity a more tangible experience, complementing macro-level analyses. Third, it reveals border militarization as a little-explored aspect of labour governance in the extractive sector and illustrates how state security practices interface with market exploitation to exacerbate workers' vulnerabilities.

This study has obvious policy implications. Labour governance frameworks in Bangladesh must be expanded to encompass informal and extractive workers, to be inclusive of informal and extractive workers, including legal recognition, mapping for occupational safety provisions, health coverage, and access to social protection. Border governance policies must be reviewed to ensure that security imperatives do not translate into the systematic violation of workers' livelihoods and human rights. Without such reforms, the material foundations of Bangladesh's infrastructure and development goals

will continue to be laid by workers whose own lives remain structurally unprotected and socially unrecognized.

Declarations

Ethics Approval and Consent to Participate

This study was approved by the Ethics Review Committee of the Institute of Research and Training (IRT), Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh, in February 2025. Verbal informed consent was obtained from all participants before the interviews. All procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki.

Competing Interests

The authors declare no competing interests.

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Author Contribution

Md Abdur Rashid, Harunor Rashid Shanto, and Most Suraiya Akter developed the research concept. Harunor Rashid Shanto, Most Suraiya Akter, Md Mridul Hossain, and Syed Hasanuzzaman Sagor conducted the data collection. Md Abdur Rashid, Md Mridul Hossain, and Most Suraiya Akter performed the data analysis and interpretation. Md Abdur Rashid supervised the study. All authors contributed to drafting and revising the manuscript, approved the final version, and agreed to be accountable for all aspects of the work.

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Data Availability

The data generated and analyzed during the current study are not publicly available due to confidentiality and ethical considerations.

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