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The dilemma of prioritizing conservation over livelihoods: Assessing the impact of fishing restriction to the fishermen of the Sundarbans

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ABSTRACT

Over two million people depend on the Sundarbans for direct or indirect subsistence. Most of the poor and resource-dependent populations rely significantly on fishing for their subsistence in the absence of alternative work and income possibilities. Various global conventions impact national policy, putting pressure on state forest officials to maintain the Sundarbans in order to protect the flagship faunal species, the Royal Bengal tiger, and the pristine ecology. This article examines how the limits imposed on the Sundarbans to protect its biodiversity have affected fishermen's access to forest resources, as well as how the locals have reacted to these constraints in order to maintain their way of life. Given the paucity of research on the subject, we anticipate that the findings of this study will be practical and beneficial to policymakers and practitioners alike. Interviews with key informants, stakeholder input in the form of focus group discussions, documentary research (news reports and government documents), and uncontrolled personal observation were the primary empirical data gathering methods using a semi-structured questionnaire. Inductive contentment analysis was used to examine data with NVivo 12 software. Consequently, the text is organized around four thematic focuses. It begins with a brief history of forest management from the viewpoint of fisheries to demonstrate how the state's intervention to limit local access to fisheries resources exacerbated the socioeconomic vulnerabilities of the local populace. The second piece explores conventional fishing activities in the Sundarbans, while the third section investigates the fishing community's response to the imposed restriction. We discovered that the restrictions imposed to ensure conservation had a severe impact on the livelihood of locals, resulting in unsustainable fishing in the Sundarbans through the adoption of a negotiated system between the forest department and fishermen, i.e., corruption. In Section 4, the article wraps up by discussing a few crucial ideas that can be used to address issues brought on by restrictions.

1. Introduction

Fortress (colonial) conservation and the trade-offs between biodiversity and livelihoods/human wellbeing in protected-area (PA) management have been contentious issues since the 1990s (more than 30 years) (Dowie 2009; Wilshusen et al. 2002). as the establishment of PAs still frequently imposes restrictions on subsistence-based livelihoods by enacting stricter management regulations (West et al. 2006). Strict conservation is inadequate and frequently lax (Phromma et al. 2019; McElwee 2010), since it has impacted the lives of numerous forest-dependent populations (Bennett and Dearden 2014; Liu 2010; Brockington 2003; McLean & Straede 2003) and increased the vulnerability of poor resource users (McSweeney 2005). Evidence shows that a failure to recognize people's rights frequently results in contentious incidents. Even due to the lack of sufficient village resource assets to offset forest use, noncompliance with conservation restrictions is even common (indeed, universal) (Robbins et al. 2009). Criminalizing traditional forest resource use opens the door to "corruption," or unofficial economic transactions (Corbridge and Kumar 2002; Jeffrey 2002; Robbins 2000), which has a negative impact on forest resource sustainability as well as local livelihoods. The situation is particularly dire in the developing world, where subsistence livelihoods are still insecure as a result of several problems, including a lack of viable options for employment, the corruption nexus, inadequate policy and decision-making procedures, and so forth (Liyana 2021; USAID 2019; Chechina et al. 2018; Dawson et al. 2017; Oldekop et al. 2016).

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Therefore, the global community is now seriously considering the role of conservation initiatives in upholding the rights of people all over the world (Shelton et al. 2010; Colchester 2007). The complexities of forest conservation and human rights raise the issue of functional balance, which leads to larger issues such as the nature of changing livelihood patterns of forest-dependent communities, compliance with national and international human rights frameworks, and so on. Furthermore, when developing conservation strategies, gender perspectives must be considered because different genders may be affected differently by conservation by dependent communities. After more than three decades of international conservation experience, initiatives that produce win-win outcomes in between these two aspects appear to be the exception rather than the norm (Miller et al. 2011; Sunderland et al. 2008; Redford and Fearn 2007; GEF 2005; McShane and Wells 2004; Christensen 2004; Songorwa 1999; Agrawal et al. 1997) and more often it has resulted in polarized positions and contentious debate (e.g., Chapin 2004; Oates 1999; Guha 2003). Therefore, creating a synergy between conservation and development in protected areas is a growing global concern (Persson et al. 2021), as there are inherent trade-offs in conservation and development interventions (Oldekop et al. 2016; Brockington and Wilkie 2015). The goal of the current study is to synthesize the paradox and respond to the research question, "How does the restriction affect the livelihoods of local fishermen and how do they cope with this?" with particular reference to the circumstances in the Sundarbans Mangrove Forest. It will help people understand the complicated and situation-specific links between poverty and conservation (Roe & Elliott 2005), which will help policymakers and conservationists make better decisions about the Sundarbans.

1.1. Setting the scene

The Sundarbans, the largest tidal halophytic mangrove forest in the world, is situated in the delta of the Ganges, Brahmaputra, and Meghna rivers between 21°30′ and 22°30′ N and 89°00′ and 89°55′ E (Islam and Gnauck 2008; Das and Siddiqi 1985). It is the lifeline of thousands of families who have lived there in harmony with nature for generations (Uddin 2019) and spans the international border between Bangladesh (6,017 km^2) and India (4,246 km^2) (Herring 1990). As part of a strategic conservation initiative, the Bangladesh part of the Sundarbans (hereafter the Sundarbans) was designated a "Ramsar site" in 1992 and a "World Heritage" site in 1997 (Mahmood et al. 2021). The Sundarbans is renowned not only as the largest single tract of mangrove forest in the world but also as the home of the cosmopolitan Royal Bengal Tiger (Banerjee 2014) which acts as a conservation rallying point (Jalais 2008). Besides tigers, it is also known for its wide variety of flora and fauna, including crocodiles, Irrawaddy dolphins, endangered Indian python species, and 100 different species of birds (Jamal et al. 2022).

More than 1.7 million people from eight “Upazilas”[1] (sub-districts) border the northern and eastern forest boundaries, and 76 villages are immediately adjacent to the forest boundary (Inskip et al. 2013). As people’s proximity to the Sundarbans increases, their dependence on its natural resources has increased substantially and around 78% of households within 0–2 km of the forest boundary relies on the Sundarbans’ for their livelihood (Murtaza 2001). Agriculture is not profitable in this region due to increased soil salinity, climate variability, and frequent river flow changes, and consequently, the main livelihoods of the locals are fishing (collecting prawn seed, fish, and crab), collecting thatching materials, and collecting honey (Mahmood et al. 2021; Sen 2017). The dependent community typically changes its reliance on the forest with the season because all types of resource collection from the Sundarbans are seasonal. Nevertheless, fishing has emerged as one of the prime sources of livelihood for the local forest-dwelling population.

Initially, the Sundarbans had no restrictions on resource extraction for the communities living in and around the Sundarbans. Fishermen were free from paying royalties while catching fish (Mahmood et al. 2021; Hunter 1970, mentioned in Chacraverti 2014). In 1878, the then-British regime declared the Bangladesh part of the Sundarbans (hereafter Sundarbans) as a "reserved forest" and gradually started limiting the access of locals to timber resources to monopolize the timber market (Jalais 2007). However, fishing continued unrestricted because the British government classified fishermen as a group of lower-class individuals who engage in fishing, as well as boatmen and woodcutters, as a secondary means of subsistence in addition to agriculture (Hossain and Rashid 2022; Chacraverti 2014). Prior to Bangladesh’s independence, fishermen could fish without any restrictions.

However, fishermen encountered their first restriction after Bangladesh’s independence in 1977 with the declaration of three wildlife sanctuaries. These sanctuaries cover about 23% of the Sundarbans and have been designated as no-fishing zones since 1999 (Mahmood et al. 2021; Hoq 2007). In addition, to hasten fish reproduction, 18 canals have been closed annually since 1989 (Chantarasri 1994) and small khals have been banned from fishing every other year (Hoq 2007). As a result, fishing grounds gradually reduced, putting fishermen’s livelihoods at a challenge, resulting in increased competition among fishermen and a decline in their subsistence options. In addition to that, neither the government nor any other organizations came forward to support the fishermen during this time of hardship (ibid). Recently, the sanctuary areas—which now cover 52% of the forest—were increased from 23% to help boost the biodiversity of the forest’s animals, particularly the tiger, and its trees (Dhaka Tribune, 2018).

In addition, fishermen have been subjected to a seasonal ban from 1 May to 30 June since 2000 due to declining trends in Sundarbans’ fish and crustacean species (Akhter 2012). Besides that, to encourage crab breeding, the entire Sundarbans were closed to crab fishing from December to February (Hoq 2007). The questionable long-term benefits of a seasonal fishing ban, such as an increase in fish catch (see Clarke et al. 2015; Arendse et al. 2007 for more information), are outweighed by the short-term negative effects, especially on income and livelihoods, which make coastal fishers and their communities more vulnerable (Napata et al. 2020; Brillo et al. 2019). Such strict imposement of a fishing ban without any substantial alternatives becomes detrimental to the socioeconomic well-being of forest-dependent communities (Ferraro et al. 2011; McElwee 2010; Cernea and Schmidt-Soltau 2006). Losing jobs and income makes fishermen and their families upset and angry, and puts their health at risk (Islam 2021; Islam et al. 2016; Momtaz and Gladstone 2008; Allen and Gough 2006). Many rely solely on high-interest loans from neighborhood moneylenders during the ban, which adds to their stress (Nahiduzzaman et al. 2018). Consequently, seasonal fishing bans cause an unsustainable "race to fish" (Colwell et al. 2019; Birkenbach et al. 2017; Novak and Axelrod 2016). This means fishermen will shoulder the bans’ financial burden (Infantina et al. 2020; Brillo et al. 2019; Aswathy et al. 2011).

We chose the Sundarbans as a suitable case study for conservation politics because its history is a microcosm of the identity politics and state-building that took place in South Asia during the nineteenth and twentieth centuries. Furthermore, despite ample evidence that such conservation efforts undermine the rights of dependent communities, very scant attention has been paid to dependent communities living in and around mangrove forests or aquatic forests (Siddiquee 2020). Its escalating conflicts with the state would have a lasting effect on regional conservation practices. It will help policymakers and conservation practitioners in Bangladesh, as well as other parts of the world having similar types of conservation practices like the Sundarbans, gain a thorough understanding of the synergies between livelihoods and biodiversity conservation, and to predict how this balance can be achieved best in human-dominated settings.

[1] Upzilla, formerly called Thana, *is an administrative region in Bangladesh, functioning as a sub-unit of a district. Each Upazila Administration is led by an Upazila Nirbahi Officer (UNO) who is responsible for administrative, judicial, and taxation duties. (See Zamil 2012 for more)*.

1.2. Conceptual Framework: linking conservation restrictions, livelihood, and corruption

Local communities have long-term social, economic, and cultural ties to forests, so conservation measures can help them realize their human rights, including their economic, social, and cultural rights. However, this realization calls for accountable behavior, openness, respect for and promotion of the rights of local communities, as well as facilitation of the exercise of those rights. Though the creation of protected areas has been built on the principles of effective biodiversity conservation and improved community welfare as "win-win" situations (Chechina et al. 2018; Cao et al. 2017; Karki 2013), rarely have initiatives produced results that show a reasonable balance between conservation measures and human rights (Miller et al. 2011; Wells and McShane 2004; Ferraro 2001; Wells et al. 1998; Redford and Richter 1999; Agrawal et al. 1997; Barrett and Arcese 1995). The conservation community has come under criticism for its insufficient efforts to uphold and revere human rights (Colchester 2007; Alcorn and Royo 2007; Chapin 2004) because the majority of global interventions tend to exacerbate the social-ecological issues that local people face by conflicting conservation goals with human rights for development (Southworth et al. 2006). As suggested by Escobar (2008) and Martinez-Reyes (2004), this is referred to as "coloniality of nature".

Human rights are intertwined with the environment, as stated by the 1972 Stockholm Conference on the Human-Environment, which stated that “both aspects of man’s environment, the natural and the man-made, are essential to his well-being and to the enjoyment of basic human rights- even the right to life itself" (UN Report 1972). The International Covenant on Civil and Political Rights (ICCPR) protects an individual’s rights to life, liberty, and culture from being violated by States Parties. The International Covenant on Economic, Social and Cultural Rights (ICESCR) sanctifies the right to decent work, freedom from hunger, the right to work, social rights and the right to a healthy life. The Convention on Biological Diversity (CBD) addresses indigenous and local community rights in the context of conservation (see 8j and 10c for more clarifications) (Springer et al. 2011). Enhancing benefits from the forest for those who depend on it was one of the six goals of the United Nations strategic plan for forests (UNSPF), a framework document for the implementation of pertinent laws and conventions (UN Forum on Forest 2017).

If a user’s basic requirements aren’t met, they may decide to breach the law, even though they are familiar with it and they understand its reasoning behind it (Thompson et al. 2016). As a result, almost all situations involving conservation limitations involve a lack of compliance (Robbins 2009). A complicated system of payments (sometimes known as "bribes") to lower-level foresters facilitates purposeful noncompliance, which in turn results in the unsustainable use of forest resources (Robbins 2000; 2009). A convoluted system of payments, also known as "bribes," is made to lower-level foresters in order to facilitate intentional disobedience. It is common practice for fishermen to engage in illegal fishing as well as illegal logging in order to recoup the costs of these additional expenses (Islam and Chuenpagdee 2013). This practice contributes to a vicious cycle of overexploitation and corruption that traps the local population in a cycle of poverty (Fig. 2).

The government of Bangladesh has enclosed vital measures in its Forest Investment Programme to safeguard the rights of forest-dependent communities. The primary goals of the Forest Investment Programme are to preserve biodiversity, shield the rights of dependent communities, combat poverty, and improve rural livelihoods. The Draft Forest Policy 2016 (Draft National Forest Policy 2016) mentions traditional rights, including social, economic, cultural, and spiritual values of forest-dependent folks. The Bangladesh National Conservation Strategy (2016-2031) acknowledges the need to expand the Payment for 5 of 18 Ecosystem Service (PES), develop alternative livelihoods, and draw attention to the community that relies on forests for survival. As Bangladesh placed a greater premium on conservation than on the sustenance of local livelihoods, it strictly regulated its conservation efforts (Subroto et al. 2016). These constraints contribute to the development of rule breaking and encourage the implementation of additional restrictions (Robbins et al. 2006). Therefore, emphasizing conservation rather than livelihoods could pose a risk to the achievement of our conservation goals, which would have a knock-on effect on the livelihoods of local communities.

2. Methodological considerations

The research was done in the Sundarbans-close villages of Chandpai union of Mongla Upazilla, Bagerhat districts, and Munshigonj union of Shyamnagar Upazila, Satkhira districts (Fig. 1). Almost everyone is reliant on the Sundarbans in some way. But not all resource users work in the same sector; some are opportunistic (e.g., during the fishing ban, they collect crabs or work as day laborers; and collect honey in season) (Table 1). However, very few people could manage alternative jobs at the time of the ban as it is a remote area. Because salt has an impact on crop and food production, only a few people own agricultural land and livestock. As a result, fishing is the primary occupation of these people (nearly 80% of them are fishermen), and nearly all of the population is subsistence-level.

The study applied qualitative research techniques to investigate the effects of increased wildlife sanctuaries and closed fishing season policies on the income and livelihoods of affected fishing workers and find ways of coping with the restriction rules (non-compliance with restriction rules). Our survey was facilitated by some reports from the daily newspaper in Bangladesh and government reports regarding control of fishing in the Sundarbans (e.g., IRMP 2010-2020; BFD documents regarding fisheries management of the Sundarbans; wildlife sanctuaries related documents, etc.). In the survey, fisheries workers are defined as individuals and families whose primary source of income comes from fishing and crab catching in the Sundarbans rivers. As a large number of women were observed participating in fishing with men, one-third of our interviewees are female. Key informant interviews (KIIs; $n = 24$; 12 per site) and focus group discussions (FGDs; $n = 6$; 3 per site) were used to collect primary data from November 2021 to March 2022. Focus groups were held where fishermen sold their catch to mohajons in order to hear the perspectives of both mohajons. At least one focus group at each location is made up exclusively of women so that participants can speak freely. The presence of multiple women undoubtedly helped the women feel less alone, assaulted, singled out, or degraded. Semi-structured interview schedules were used to collect primary data from the KIIs and FGDs. A purposeful selection technique was used to select participants in focus group discussions and key informant interviews (Atmadja and Sills 2016). Key informants (KIs) were chosen based on their knowledge and experience with fishing inside the Sundarbans. For 90 minutes, key informants were interviewed about their sociodemographic characteristics (age, educational qualifications, income); how restrictions affect their lifestyles; what they do to adapt to these restrictions; institutional support and its impact; and their perspectives on fisheries sector management. Following the KIIs, focus group talks were held to gain a better understanding of the indigenous community’s unique response to the implied ban. Additionally, information was gathered through personal communications with government and NGO officials, and informal community group discussions.

After collecting all the information, we sorted our qualitative data into manageable categories and identified overarching themes that could be explained by several different factors using the inductive content analysis method by NVivo 12 software (Elo & Kyngäs 2008). The interviewee’s original identity was left out of the story since it would put them at risk, so we used an anonymous name instead. The study also benefited from the author’s observations and insights as practicing managers and academics. As researchers, we served as both external evaluators (in the traditional-constructivist approach) and facilitators (in participatory evaluation).

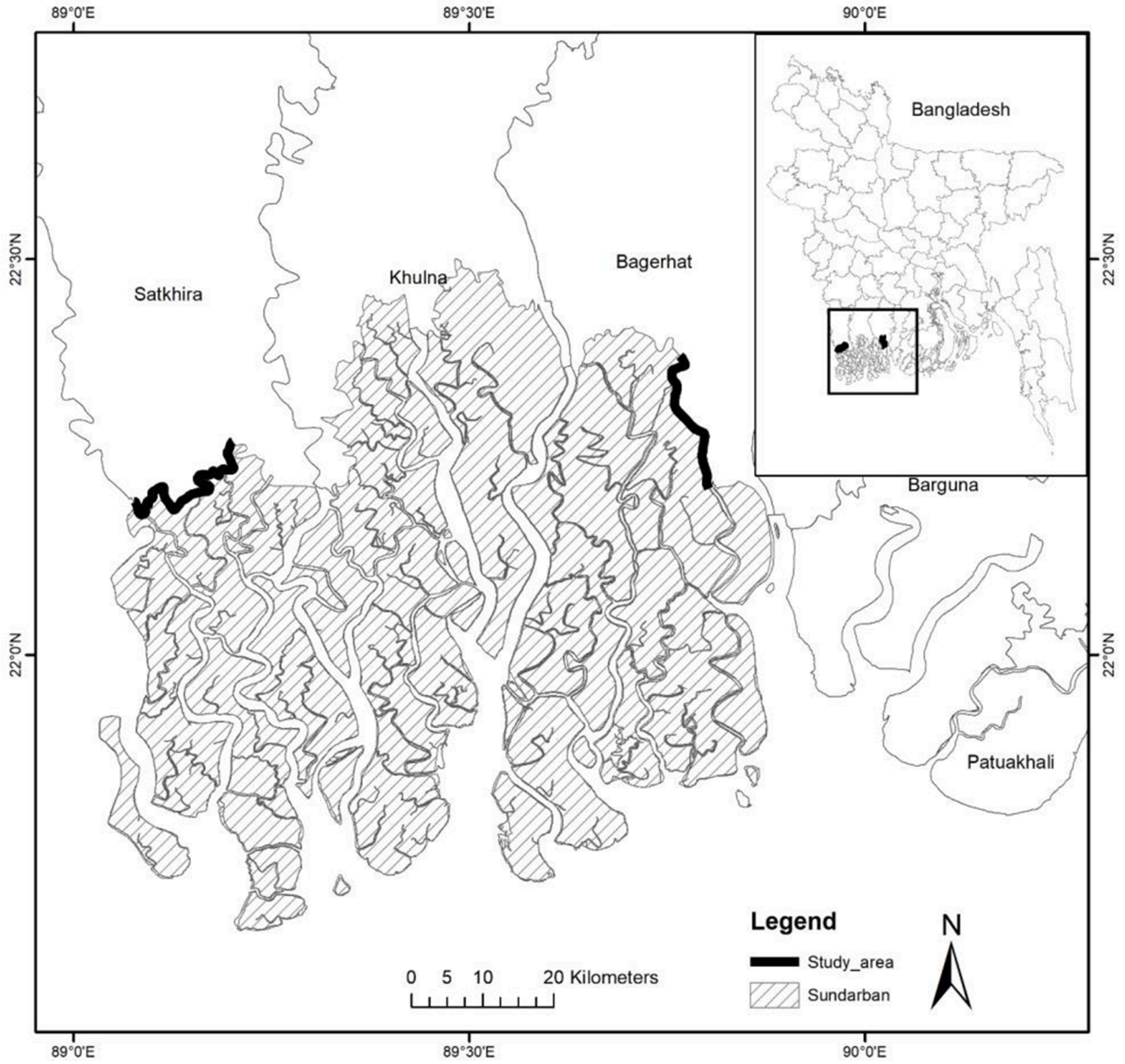

Fig. 1. Location of the study site adjacent to the Sundarbans, Bangladesh.

3. Key observations

3.1.1. Colonial control of the Sundarbans limits resources utilization

Prior to the British colonial period, the management, protection, and conservation of the Sundarbans mangrove forest were not given serious consideration. The local community cut down the jungle to expand agricultural land, used the wood to build their homes, and fished for their consumption. Nevertheless, the British had little concern for the environment (Mahmood et al. 2021). Initially, the Sundarbans was leased to landlords by the British government to generate revenue from agriculture (Chakrabarty 2021). The idea of protecting the Sundarbans arose when the British government discovered that using the Sundarbans as a sustainable source of timber, fuelwood, and revenue would be more profitable (Ghosh et al. 2015; Eaton 1990; Hunter 1875), as agricultural conversion appeared unprofitable due to the harsh environment and low soil productivity (Mahmood et al. 2021). In 1860, the British government created the Forest Department to regulate the taxation and flow of the Sundarbans' timber and to manage the Sundarbans (Bhattacharyya 2011) as proposed by Schlich (1875). However, Schlich's 1875 plan to limit forest tree extraction by raising taxes failed as illegal logging increased. Schlich's concern and Temple's policy in 1874 led to the formation of 4095 km^2 of the reserved forest in Bangladesh in 1890 (Bhattacharyya 2011; Presler 1991). Trafford's 1991 working plan (in effect from 1912-13 to 1931-32) was regarded as the Sundarbans' first genuine conservation effort, as it prohibited land leases and designated the entire forest as a Reserve Forest (Mahmood et al. 2021; Ghosh et al. 2015). In 1926, forest boundaries were established. Restricting timber harvesting by imposing a minimum diameter has reduced timber flow and harmed the livelihoods of dependent populations (Mahmood et al. 2021). Traditional Sundarbans users viewed the government's gradual imposition of user fees, permits, and

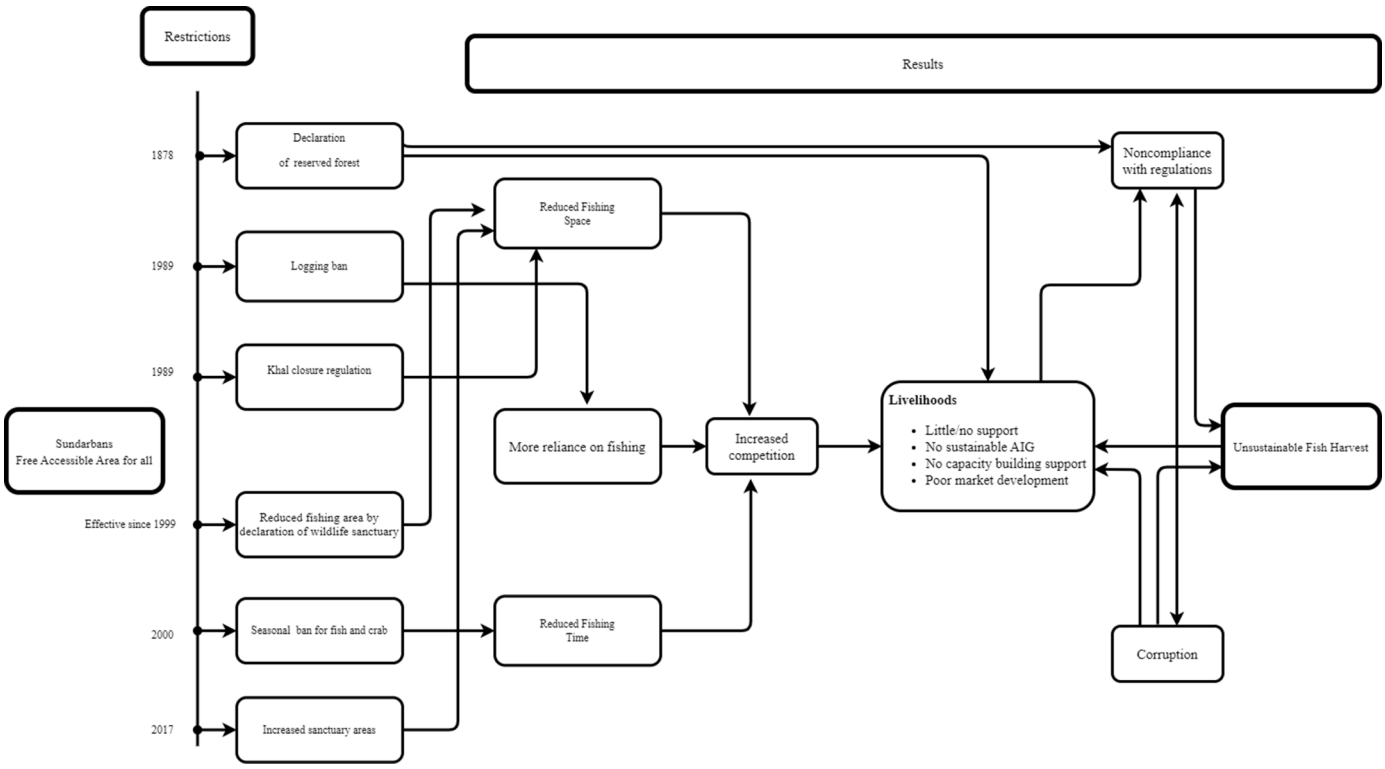

Fig. 2. A flowchart illustrating the links between conservation restrictions, livelihood, and corruption.

Table 1
Demographic and socioeconomic status of the respondents.

Area	Age	Family size	Education	Dependency on Sundarbans	Monthly Family Income	Occupation
Chandpai	Young/child (Less than 18): 22% Middle age (18-50): 46% Old (Above 50): 32%	Small (2-3): 22% Medium (4-6): 67% Large (more than 6): 21%	Primary: 56% Secondary: 44% Higher: 0	Full: 78% Partial: 14% None: 8%	Low (4000-6000): 27% Medium (6000-8000): 57% High (above 8,000): 16%	Fisherman only: 21% Opportunist*: 65% Others: 14%
Munshigonj	Young/child (Less than 18): 18% Middle age (18-50): 53% Old (Above 50): 29%	Small (2-3): 26% Medium (4-6): 58% Large (more than 6): 23%	Primary: 38% Secondary: 62% Higher: 0	Full: 63% Partial: 24% None: 13%	Low (4000-6000): 18% Medium (6000-8000): 70% High (above 8,000): 12%	Fisherman only: 18% Opportunist*: 63% Others: 19%

* Opportunist: Occupation depends on season.

tolls to conserve dwindling natural resources as state intrusions. The Pakistan regime (1947-71) also permitted massive resource extraction while denying local community rights (Mahmood et al. 2021).

3.1.2. *Nature is still colonized in independent Bangladesh*

Following its independence from Pakistan, the government of Bangladesh preceded colonial exploitation rules that restricted local people's access to the Sundarbans. It imposed additional restrictions by passing the Wildlife (Conservation) (Protection) Act in 1974 and by establishing three wildlife sanctuaries in the Sundarbans in 1977 (Mahmood et al. 2021). In 1989, the government of Bangladesh prohibited the harvesting of timber from the Sundarbans, thereby restricting people's access to the Sundarbans' timber resources and adding to the complexities and complications (Akhter 2012). People in the neighborhood contend that the forest needs to have many trees cut down. Otherwise, it will be dead in the next 2-3 years, rotten, and unused. Due to local communities' dependence on forests, deforestation and degradation continue at alarming rates despite logging bans (Sarker et al. 2011). A national task force regarded this as:

"[The] moratorium on extraction from government forests without making any alternative arrangements for the supply of forest produce for consumption … has resulted in a fast escalation of price and general shortage of wood in the country. This has also brought additional pressure on existing forest resources as illegal removals have become more profitable … (Task Force 1991:125 mentioned in Khan 2009)".

As part of strategic conservation initiatives, the Sundarbans was designated a "Ramsar site" in 1992 and a "World Heritage Site" in 1997 (Mahmood et al. 2021). From 2010 onwards, after taking a co-management approach, several projects were taken to enhance the socio-economic condition of the local people (ibid). However, alternative income generation activities (AIGAs) have failed (USAID 2019) as none of the projects considered the long-term aspects of livelihood interventions (Katikiro 2016). Moreover, Bangladesh is one of the thirteen countries where tigers still roam free, and consequently, it pledged a Tiger Summit at the St. Petersburg Tiger Summit in 2010 to increase the global tiger population by 2022 (BFD 2016). To protect the Sundarbans' natural resources, particularly the tiger and dolphin, the government, in 2017, increased the size of the three wildlife sanctuaries there by 52%, outlawing any activity that would seek to exploit the area's wild resources for profit. Communities in this region have survived for thousands of years by foraging for fish, honey, and other resources, but the

expanded sanctuary prohibited them doing so in more than half of the area. Despite using co-management to manage the Sundarbans sustainably, fishers were never involved in decision-making regarding the Sundarbans. An FD official stated that

"Since the government is the custodian of the forests, [we] do not need to consult with the local people because everything is done for [their] greater interest."

This means that the local community that depends on the Sundarbans will be affected by the restriction, but they have no say in matters that affect their ability to survive. In addition to sanctuary areas, canals less than 10 meters wide within 3 km of the FD camp office/patrol office are off-limits year-round. As a result, there is less space to fish in the Sundarbans, which has increased fishing-related competition. Without providing them with a suitable alternative source of income, their families are forced to endure difficult circumstances. Furthermore, the seasonal ban (typically from May 1 to June 30 for the entire SRF for fish and January-February for crabs) adds to the locals' misery. The ban shocked and dismayed small-scale fishing communities that rely solely on fishing for food. Small-scale fishermen protested the government's hasty decision to ban their fishing, as it abruptly ended their livelihoods. The ban left coastal towns in a "nightmare situation," The New York Times reported (2019). Despite protests and pledges from local fishermen, authorities blame them for overfishing and poisoning the waters, overlooking the need for alternative income sources for thousands of fishing families (Liyana 2021). A FGD participant expressed

Kidnapping and robbery have been reduced to zero since 2020. However, we face some additional challenges. There are some new organizations, namely Wild Team (an international non-governmental organization that works on conservation, biodiversity, and sustainable livelihood) and SMART petrol groups, who have created new rules and prohibited all mode of activities related to forests in the name of conservation.

3.2. Forest subsistence fishing with restrictions

3.2.1. Poor education increases dependence on the Sundarbans

The respondents provided a broad overview of the study areas. The majority of earning members are in the middle age bracket and are responsible for caring for a family of 4-6 people (Table 1). They have fewer options to engage in jobs other than fishing due to their lower levels of schooling. Because of this, they frequently struggle to cover their basic needs, especially when they are subjected to a moratorium.

Our research indicates that the average monthly income of local residents is between 6,000 and 8,000 taka, or one-third of the national per capita income (Table 1). As of May 30, 2022, the typical cost of basic food items for a four-member family in Dhaka city was estimated to be 21,358 taka (CPD 2022). As of May 30, 2022, the average monthly cost of food for a household of four people in Dhaka city was Tk 8,016, assuming they adhere to a "compromise diet" and never consume fish, lamb, beef, or chicken (ibid). Considering the country's corner, the cheapest price may not be less than 7000 taka. Therefore, fishermen's trials can be predicted based on the preceding data, as the majority of our family's households consist of four members. As X_1, a fisherman stated

If we have a good catch, we can sell each gon for approximately 10,000-12,000 taka. Almost two thousand taka are required to make the necessary preparations and meet our basic needs. You can imagine our monthly income with at least three people per boat. Again, not all gons produce a good catch. Sometimes you can just meet your expenses.

3.2.2. Restricted areas boost fisher competition

Because of the expansion of the wildlife sanctuaries' territory, fishermen now have access to roughly 1.89 hectares worth of forest areas, including land and rivers. If we consider 55 % of this area to be forest land, the fishing area for one individual fisherman will be nearly 0.85 hectares, down from 1.39 hectares just two decades ago. This includes large riverine areas where fishermen rarely catch fish and small canals less than 8 m in width where fishing cannot be done. Furthermore, some of the fishing areas are close to the industrial zone, making fishing unprofitable due to pollution of the river caused by industry. As a result, the actual fishing area will be no larger than 0.50 hectares. This implies increased competition among fishermen for fish and crabs due to the expansion of wildlife sanctuaries. The Financial Express, a national daily newspaper, reported that nearly 20,000 fishermen and woodcutters in the Sundarbans have lost their livelihoods due to the expansion of the sanctuary (The Financial Express, 2018). A fisherman X_2 stated:

Prior to the imposition of the newly restricted area, we used 1 canal for every 3-4 boats. This has now been increased to 10–12. We catch fewer fish as a result and get less profit per gon as the price of fish has not increased significantly (15 days based on the lunar cycle are considered as one gon and one cannot stay more than 7 days inside the forest). It becomes difficult to provide for our family's basic needs. We now eat low-quality food.

3.2.3. Intense competition results in violation of rules

Because of the shrinking fishing grounds, fishermen are forced to concentrate their efforts in a smaller region, which has resulted in a higher level of competitiveness. As a direct consequence of this, the catch fell short of satisfying their requirement for the most fundamental necessity. Unanticipated poor catches or harvest failure during a single peak fishing week has a devastating effect on the income of fishing households. When repeated poor harvests occur during multiple peak periods, the shock becomes severe.

Another fisherman, X_3 stated

To meet our costs, we sometimes use gillnets, make a full closure of the canal, catch undersized and berrying species, or even use synthetic poison (mainly insecticide) to extract the highest level of fish. Strong competition compels us to do so, even though we know it will permanently harm the fish in the Sundarbans. We must first feed our families and then consider the environment if our stomachs are full. Is it possible for a hungry man to think about the environment?

3.2.4. Restriction facilitates corruption

Fishermen are frequently confronted by forest officials or guards, even if they are found in the nearby buffer zone, as the guards suspect the fishermen are trying to escape restricted or core regions. Even if a fisherman fishes legally in the designated area, he must bribe the forest guard. If not, he will have to deal with several complications, including a case file and the confiscation of his boats, BLCs, catches, and fishing gear along with hefty fines. To circumvent fines and seizure, fishers employ a locally agreed set of fee-based access rules (i.e., bribery of lower forest officials), which are also enforced during fishing restrictions. This enables them to fish not only in the permitted zones but also in the restricted zones. As Fisherman X_4 stated,

As you are aware, we currently have fewer fishing spots. If you pay bribes to the forest guards, you can access the restricted sanctuary region even when a ban is in effect throughout the entire Sundarbans. Occasionally, FD rents a specific piece of land to a single wealthy fisherman within a no-fishing zone. Therefore, we fish in the entire Sundarbans all year utilizing a negotiated system. Or else, you will be tied up and your BLC (Boat License Certificate) will be confiscated. The restricted area is now where the FD receives the most illegal funds. Here, excessive restriction results in a higher rate than before.

The majority of participants in FGD raised the issue of authority not providing any benefits to the people in the absence of bribes. Simultaneously, there was no platform for people to complain about the malpractice. Many people approached local government representatives (UP Members) but received no resolution. People were threatened with removal from the list if they complained.

3.2.5. Climate change also affects fishermen's means of subsistence

In addition to this, climate change is also causing more turbulent

tides, making fishing dangerous and difficult. Frequently, rough seas and frequent cyclones force artisanal fishermen to stay at home or abandon their fishing trips (Giri 2018). Numerous deaths occur annually as a result of the disobedience of many fishermen who continue to fish despite being warned against it. For instance, during Cyclone Sidr in 2007, many fishermen disappeared since they disregarded weather warning signals (Islam 2011). According to fisherman X_5

Fishing can be done profitably in the Sundarbans for four to five months. Extreme weather also puts us idle at the optimum time. The rest of the year, fishing just can meet their basic needs. So, the fishermen cannot save enough to run on their families' basic needs during the ban period. We have to owe a large sum to the owner-Mahajan during the period of the ban. Debts were passed down from generation to generation.

3.2.6. *Lack of viable alternatives boosts fishermen's vulnerability*

According to national and international frameworks, one of the main rights-related issues in terms of conservation activities is the provision of alternative livelihood options. From that standpoint, since either they stopped visiting the forest or their access was limited, people in the studied community were supposed to be introduced to some kind of alternative livelihood options. Though some NGOs provide training and credit facilities, it not enough to run a business for longer time. even when support is necessary for a short time, the local people got nothing from government as well as from NGOs e.g., at the time of seasonal ban. According to a FGD participant fisherman X_6

You will see hundreds of NGOs working here for us. They give us training on a variety of techniques. But when credit is required to run our business, they either just provide us small amount which is not enough to start a business or demand mortgage. So, ultimately, we fail.

A closed fishing season incurs socio-economic costs because it affects fishing employees whose wages are directly tied to their employment. To cope with the restriction, fishermen have to catch fish illegally, even with poison. To skip the eye of the FD, they had to fish in the evening or at night to avoid FD's patrol or use pesticides to get a huge catch within a short period. Sometimes they even buy patrol route information from FD officials or their associates. Therefore, the seasonal ban is also seen as a way to increase FDs' illegal income by the fishermen.

A fisherwoman, X_7 stated

Most of us have to catch fish throughout the year, risking our lives. Some can manage to work as a daily laborer in the nearest city or agricultural field with a cheap wage. Everyone cannot manage to work daily, especially women. Therefore, those who can't manage to work have to fish in the river as we have fewer alternatives to generate income. Otherwise, our family will strive. The patrol frequency is increased during the banning time. To avoid their eyes, we have to catch fish quickly time. Therefore, we apply poison to the small canal and run away within a short time. If we are caught by the FD, then we manage to skip court cases by paying bribes.

A crab collector woman, X_8, aging over 70, stated

My life and livelihoods are entirely dependent on the Sundarbans as I am alone. I live on the polder and fish in the nearby river for crabs. Crab catching earns me no more than 200 taka per day. How can I survive if you restrain me from doing so? I have no option or any savings to sustain me during the days of the crisis. In this situation, you should not expect me to stop catching crabs without assuring me of alternative options or support. Such an effort will destroy me and the Sundarbans simultaneously. "You should" consider your options carefully before making such a (suicidal) decision. Should I die or illegally catch crabs (in your voice)? Is the Sundarbans worth more than my life to you?

3.2.7. *COVID-19 and the subsequently increased ban dashed fishermen's hopes of rejuvenation*

Bangladesh's small-scale marine fisherfolk have been severely impacted by the COVID-19 pandemic since early 2020, owing to pre-existing social vulnerabilities (Hossain et al. 2022; Bhowmik et al. 2021). The COVID-19 pandemic-related closure extended the total fishing ban from two to five and a half months (18 March-30 August 2020). As a result, the fishermen began losing money more than three months before the regular fishing ban, limiting their ability to provide for their families and meet their basic needs. Furthermore, they received no additional government assistance during the COVID-19 lockdown (Bhowmik et al. 2021). While the year 2022 is viewed as a means to revive their means of subsistence, the fishermen have been subjected to a one-month extension of the previous two-month ban. According to X_9, a fisherman

The Covid 19 has already placed a tremendous strain on our livelihoods. The fishing volume, along with the market price, is significantly lower than earlier. Due to the prolonged ban, we had to borrow money from our mohajons at a high-interest rate to survive during this critical period. We had hoped to be able to pay off the loans this year with the increase in income but were instead hit with the unexpected extension of the moratorium.

In a nutshell, the countrywide lockdown caused by the COVID-19 pandemic jolted the fishing community, and conservation-related fishing became a source of stress for two months afterward, undermining the stability of fishermen's lives and increasing their vulnerability.

3.2.8. *Blind foresight to see fishing as a major resource destroyer made it harder to subsist*

Even while industry in the territory of the Sundarbans poses an obvious existential threat to the forest, a boom is regularly visible in the nearby areas of the Sundarbans, which has pushed massive changes in both the environment and the population. Therefore, it would appear that the majority of those responsible for the destruction of the Sundarbans are the resource users, and not the industries, which are consequently subject to a great deal of control techniques. An old fisherwoman X_{10}, aged nearly 70 years, stated that

You're attempting to save the Sundarbans by limiting our access to what we have for an indefinite period. You claim that we, the local community, are destroying the Sundarbans. Have you ever seen the Sundarbans' industrialization? Are they causing any harm to the Sundarbans? What are your plans for dealing with them? Do you only see our activities, on which we survive hand to mouth?

Even, a lot of projects were brought by govt. and NGOs to conserve the tigers of the Sundarbans. It would appear that the concept of conserving the forests for tigers is a vision that gives little consideration to the day-to-day lives of those who live near it and work within it. A fisherman x_{11} stated

Both the government and non-governmental organizations have taken significant steps to protect tigers. Where are the projects that are supposed to be supporting and maintaining our lives? Tigers are valuable I agree. But are tigers more valuable than humans?

Most of the fishermen are now trying to leave their inherited profession and demand viable alternatives to run their families. From childhood, the children in this area became proficient in a variety of forest activities. Instead of attending school to learn, it is their destiny to go to the forest and follow in the footsteps of their father and grandfather.

4. Discussion

Due to their solitary lifestyles on the slender shorelines of rivers, Sundarban's fishermen are comparatively isolated. Their separation from land-based society while fishing adds to this relative isolation. Social exclusion may prevent them from receiving a formal education (Azad & Haque, 2003), which would limit their ability to obtain suitable employment, increasing their reliance on the Sundarbans. The Sundarbans' multi-species fisheries also provide job flexibility. Fishermen switch to other species when a ban on one is put in place (collection of crabs at fish ban times). The Sundarbans' multispecies fisheries also provide job flexibility. Fishermen go to other species when a ban on one

is put in place (collection of crabs at fish ban times). Most fishermen convert to mowals (honey collectors) during the honey season since it pays more than fishing. Consequently, as shown by Minnegal and Dwyer (2008), fishers use variety as a means of reducing hazards related to their ecological and economic surroundings.

Before colonial rule, the Sundarbans were a freely accessible resource utilized by indigenous people. The British government declared the area to be a "reserve forest," in 1878, intending to use it as a "permanent source of revenue" (Chakraborty, 2010, p. 45), denying the peasants' century-old customary rights to forest and forest products (Guha 1990). However, fishing in the Sundarbans continued unabated until Bangladesh gained independence. As environmental debates grew in the 1970s, Bangladesh issued the Bangladesh Wildlife (Preservation) Order in 1973 and established three wildlife sanctuaries in 1977 under the Bangladesh Wildlife (Preservation) (Amendment) Act, 1974, covering 23% of the Sundarbans (Mahmood et al. 2021). In the 1970s and 1980s, in response to international pressure, Bangladesh ratified nearly all forest, environment, and conservation conventions (Choudhury and Hossain 2011). The Bangladesh Forest Department recognized deforestation as the primary source of biodiversity loss as deforestation rose from 1% to 5% between 1980 and 1981–1990 (FAO 1993) and consequently prohibited logging in all reserve forests without providing any safeguards to resource users (Rasul 2007). As a result of the government's failure to consider the long-term viability of the general populace's means of subsistence by providing alternatives, many Sundarbans-dependent individuals lost their income-generating prospects and became increasingly reliant on fishing in the Sundarbans' rivers. This supports Karki's (2013) and Baird and Leslie's (2013) hypothesis that livelihoods in PAs are shaped by context-specific characteristics of resource access.

International pressure to meet the Aichi biodiversity targets by 2020 and double the number of tigers by 2022 compelled Bangladesh to expand its sanctuary area by 52% where all types of activities were prohibited. Consequently, fishermen have less fishing grounds, resulting in intense competition among the fishermen. Roe and Elliott (2004) discovered that in subsistence economies, the formation of a conservation area frequently restricts local populations from accessing easily accessible resources, forcing them to bear the majority of conservation costs. This restriction is handled through informal discussions, illicit extraction, and rule-bending (Laurance 2007; Nygren 2005; Robbins 2000; Klooster 1999) through a complex negotiated system of payments (i.e., "bribes") to lower-level foresters. The Sundarbans, like many other reserve areas in the world, is a place where forest use by locals has a long history, where limits are increasing, and where rule-breaking is evolving (Robbins et al. 2006). In order to afford these additional costs, impoverished fishermen in the Sundarbans engage in destructive fishing because they have no choice but to disregard the conservation policy in order to maximize harvest, despite knowing that doing so may eventually compromise the sustainability (Zhang et al. 2010; Castilla and Defeo 2005) of the Sundarbans, which feeds a vicious cycle of overuse and corruption, i.e., a "poverty trap" (Tallis et al. 2008).

Due to the seasonal ban, poor fishermen and laborers face employment and income difficulties as there are fewer opportunities for temporary labor near them, and not everyone can manage these jobs (Islam et al. 2018). Some fishermen were compelled to fish illegally in forests during the ban, using poison to catch fish swiftly and evade forest guards. A 4-person family's monthly cost on a compromised diet is 8000 taka per month, and in the current situation, one can only bear this cost at the high time of fishing. They are taken aback by the ban because they cannot accumulate enough savings through legal fishing to sustain their families for the duration of the ban. Consequently, fishermen were forced to fish. The ban was increased from two to three months this year as the COVID-19 situation improved across the nation and fishermen dreamed of improving their financial situations with a lucrative catch. Consequently, 59 people from forest-dependent communities were arrested in the first month of a three-month ban on entering the Sundarbans mangrove forest in Bangladesh (Mongabay 2022). Again, just after the ban, they are forced to absorb the entire impact of revenue loss during the imposed fishing ban (Brillo et al. 2019) which creates a fish race among the fishermen. As a result, the greatest threat to the long-term health of the Sundarbans emerges shortly after the moratorium is withdrawn, when fishermen fish extensively in their territorial territory in an unsustainable way, taking advantage of inadequate administration and relatively high post-ban catches due to the fishermen's need to meet their basic needs and repay money borrowed during the ban period. Sys et al. (2017) and Colwell et al. (2019) made similar observations, saying that a fishing restriction could lead to a post-ban fishing frenzy and detrimental ecological repercussions.

Restriction in the form of reduced area and time, combined with the lack of substantial alternative livelihood options, compelled the local people to engage in unsustainable activities, which may be referred to as "coloniality of nature" as proposed by (Escobar 2008: 120-121; Martinez-Reyes 2004). This conservation strategy heightened tensions between the government and the local population, who claimed that newly imposed conservation regulations and rules were to blame for their poverty. Siddiquee (2020), who studied the Sundarbans from the perspective of human rights, made a similar observation that two issues that appear to be in opposition to one another were present: stringent regulations pertaining to the conservation of the forest and community members' violations of those regulations. Though the government conducted some interventions with the assistance of non-governmental organizations (NGOs), the majority of the interventions provided only short-term benefits, ignoring the long-term aspects of livelihood interventions (Katikiro 2016; Robinson et al. 2014; Baker et al. 2004). It confirms the assertion made by Brockington et al. (2006) and Sanderson and Redford (2003) that one will take precedence over the other. Several researchers have identified uncertainty of livelihood as one of the main challenges of strict conservation efforts (Ferraro et al. 2011; McElwee 2009).

Core human rights indicators derived from these frameworks include social and economic factors, livelihood security, freedom to select one or more sources of income, the right to information, the right to participation, the right to consent-taking and the right to complaint, the right to take full advantage of the benefits of forests, and the right to avoid being exploited by ineffective or corrupt governance. However, there is ample evidence of rights violations against residents of protected areas like the Sundarbans Reserved Forest (Siddiquee 2020). Locals alleged that they were merely coerced into adhering to the laws and rules. Nobody from the government or an NGO ever visited them to raise awareness of the issue. In this case, the situation is worst for women because they are the ones most affected by the season ban, and no comprehensive measures were taken to ensure their rights.

One of the main strategies for protecting dependent communities from the negative effects of conservation and reducing local level threats to conservation concern is to provide alternative livelihood options for the affected people. Using this approach, we can optimize the balance between conservation, livelihood, and decent work (Roe et al. 2015; Levang et al. 2005; Adams et al. 2004). However, it is true that projects in coastal ecosystems such as the Sundarbans can provide rare viable alternative livelihood options, substantial evidence of their effectiveness has yet to emerge (Wright et al. 2016; Cinner 2014). The unilateral financial assistance provided by international organizations such as the EU, World Bank, USAID, the Worldwide Fund for Nature, and the International Union for Conservation of Nature for the conservation of Sundarbans forests has strengthened the accountability of state forestry authorities, allowing them to better regulate local access to resources (e.g., SMART team) (Dressler et al. 2010; Paul and Mitra 2020). A review study supported by the United Kingdom's Department for International Development (DFID) and USAID in 2014 found that only nine of 106 interventions had enough data to show that the alternative livelihoods activities were effective in either improving local attitudes to conservation, reducing environmentally-damaging behavior, or improving the

conservation status of a biodiversity target (Roe et al. 2015). Therefore, colonial conservation approaches were unable to escape the poverty trap because they placed a greater emphasis on conservation and overlooked the lives of the impacted residents (Beddington et al. 2007; Sachs and Reid 2006).

Bangladesh has taken numerous steps to preserve its natural landscapes and beauty in the pristine form to promote ecotourism using its national emblem, the Royal Bengal Tiger (BFD 2016). Most of the benefits of Sundarbans tourism are largely harnessed by the tour operators, particularly due to the absence of an appropriate benefit sharing mechanism (Dey et al. 2020; Iqball 2010). The promotion of ecotourism actually serves the interests of the urban elite (Bhagwat 2018). The project of preserving forests for tigers, on the other hand, appears to be a vision that largely disregards the subsistence needs of the dependent community (Chakraborty 2010). According to Annu Jalais, "the universally propagated ideas about tigers … perpetrates a coercive and unequal relationship between … those who partake of the cosmopolitan tiger versus those who "live" with tigers, real forest-living ones" (2008: 26). The dilemma of what sort of life matters—tigers or humans—constrains possibilities and defines the protected and the criminalized for individuals who live and work in the Sundarbans (Jalais 2010). The unilateral financial assistance comes from a wide variety of international organizations such as the EU, World Bank, USAID, the Worldwide Fund for Nature, and the International Union for Conservation of Nature for the conservation of Sundarbans forests to strengthen the accountability of state forestry authorities, allowing them to better regulate local access to resources (e.g., the SMART team) (Paul and Mitra 2020). Due to the lack of restrictions on industrialization in these places, the proliferation of new industrial projects that seriously impact the environment and its resources has even made these regions crucial chokepoints of the Anthropocene (Cons 2020). However, some rules are impeding resource users' ability to survive now and endangering their ability to survive in the future (particularly fishermen). This type of conservation is regarded as "neoliberal conservation," which focuses not only on the commodification of biodiversity, as mentioned above, but also on the marginalization of certain groups, the transformation of property rights, and the accountability of governance networks (Castree 2008; Lele et al. 2010).

5. Suggestions for improvement in future decisions

- Involve all stakeholders and the wider community of fishermen in the decision-making process so they feel a part of the conservation program. Participation of interested parties improves planning, conflict resolution, and policy/management decisions (Dutka-Gianelli et al. 2019; Pita et al. 2010; Sampedro et al. 2017). Make sure the conservation isn't meant to deceive them, but to secure their future livelihoods without harming their current means of subsistence.
- The rotational opening of all forest areas to users will reduce competition among them and ensure the sustainable harvesting of resources, as the users will also serve as a monitor of forest resources.
- Fishers must be included in mainstream development processes, their coping mechanisms must be acknowledged, and gender- and culture-sensitive risk management options must be outlined. This could be accomplished by educating the locals through a diverse educational program (e.g., adult schooling during free time, child education, etc.), as this would increase the receptivity of marginalized groups to livelihood diversification (Niehof 2004).
- Vocational training is vital for assisting artisanal fishermen. This could be accomplished through boat repair, fish processing, and value-added services such as pickling, fish masala, and dried fish (Aswathy et al. 2011; Colwell and Axelrod 2017; World Resource Institute 2005).
- Local income-generating activities should be diversified. Alternative livelihoods should consider gender and culture. It will reduce socio-vulnerable conditions and Sundarbans mangrove forest pressure. More credit-based capacity-building training such as Government microcredit for those with vocational training can diversify income and ensure basic education. The government must also give locals a portion of tourism revenue to improve their livelihoods.
- Taking into account the limited viability of private insurance schemes, public micro-insurance of all legal fishing practices can be an effective strategy. When fishing permits are issued, a small fee could be collected. This will also encourage fishermen to engage in legal fishing, thereby reducing illegal and excessive resource exploitation and acting as a buffer against sudden shocks.
- Given constrained means and resources, targeting assistance is likely the most effective solution (Dercon 2005). Following this policy, vulnerable fishing households must be enrolled in the existing Vulnerable Group Feeding program, which targets vulnerable members of society.
- Savings cum relief schemes or savings and credit groups have been proposed as a short-term mitigation measure during the closed season (Colwell and Axelrod, 2017; Aswathy et al. 2011; Aswathy and Sathiadhas 2006).
- During the ban, fishermen migrate to neighboring areas to find employment (Infantina et al. 2017). If they have vocational education and training, they will be guaranteed higher-paying temporary jobs.

6. Conclusion

Restriction in the form of reduced area and time is putting severe strain on Sundarbans residents as conservation practitioners are attempting to preserve it in its "pristine form" while providing no promising alternatives to support their way of life. Such measures demonstrate that the cost of the national and international organizations' mandate to enforce conservation falls on the local fishing community, implying "natural colonialism." There has not been a reliable evaluation of the impact of the reduced area and closed season, which aims to improve, sustain, and prudently manage mangrove fisheries, so it is fraught with uncertainty (Salim 2007). The adoption of conservation as a global ideology without regard for the local context has created new complexities that have alienated local communities, making future unknowns even more terrifying. In light of this, our findings support the GEF (Global Environment Facility) (GEF 2005) findings that the majority of GEF biodiversity projects entail some sort of restriction on current resource exploitation patterns, which typically results in the loss of opportunities for development and subsistence for at least some people or groups. As a result, our concluding remarks propose that, in order to create a win-win scenario, consult with stakeholders, i.e., fishermen, and take the necessary steps to ensure their livelihoods with suitable alternatives and the necessary support, as proposed by Cao et al. (2017) and Liyana (2021). By giving fishermen access to education, skills, healthcare, information, and credit, we can increase their chances of taking part in the production of societal wealth while also acknowledging their various coping mechanisms and involving them in the definition of risk management options (Dercon 2010; Takasaki et al. 2004).

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