

RESEARCH PAPER

ECONOMIC DEPENDENCY ON KBAS

An Exploratory Study on the Key Biodiversity Areas of Bangladesh

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Research Paper on

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AN EXPLORATORY STUDY ON THE KEY BIODIVERSITY AREAS OF
BANGLADESH

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Sammi Akter Bithy

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***M. Shahadat Hossain
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ABSTRACT

This qualitative study explores the reliance of individuals near Bangladesh's Key Biodiversity Areas (KBAs) on natural resources like forests, rivers, and Haors for sustenance and income. Participants stress the vital role of forest products such as wood, fruits, and fisheries in meeting basic needs and household finances. However, the study also reveals a concerning decline in biodiversity over the past decade, primarily due to human activities like deforestation and overfishing, compounded by climate change impacts. In response, the community advocates for a collaborative approach involving government agencies, NGOs, and locals in conservation efforts, alongside promoting alternative income sources and raising environmental awareness. Overall, the study emphasizes the urgency of collective action and policy measures to protect both livelihoods and biodiversity in these areas.

INTRODUCTION

One-third of the world's population is directly or indirectly dependent on forests and forest resources. In the case of Bangladesh, this rate is almost twice the global average. Bangladesh's entire forest area is around 2.53 million hectares (Jannat et al., 2020). About 35 million people, or 29% of the country's total population, reside in Bangladesh's coastal regions, and nearly half of these people (about 52%) rely directly on forest resources for their livelihoods (Shaikh et al., 2021). More comprehensively, about 64% of people in Bangladesh are dependent on forest resources (Tazvir and Safiquzzaman, 2022). The natural ecosystems of Bangladesh cover a wide range of habitats, from forests to freshwater wetlands, and from coastal to marine areas (Chemonics, 2021). Ecosystem goods and services are essential resources for sustaining life on Earth (Costanza et al., 1997). Because they, directly and indirectly, contribute to human well-being (Mangi, 2016). The ability to use land and other natural resources, transfer rights to the land, control the resources, and take advantage of other opportunities is referred to as access to land. The bulk of rural poor people have limited access to land, but their livelihoods are based on agriculture and related industries. Because of this, agriculture is a challenging road out of poverty for those with minimal resources and few other avenues for income generation (Raihan et al., 2009).

Estimating the value of ecosystem services is a difficult endeavor (Costanza et al., 1997). Total ecosystem services value can be defined as the sum of benefits that a particular ecosystem offers to humans including use and nonuse values (Wilson et al., 2005; Atkinson et al., 2006; Pearce et al., 2006; Grossmann, 2012). Generally, the assessment of ecosystem services involves determining their quality and quantity changes and their impact on human well-being. The effects of these changes on human welfare can be identified as costs or benefits in market or non-market systems (Mangi, 2016). Though the economic, social, and environmental importance of ecosystem services provided by KBAs is increasingly recognized globally, the methods for obtaining the necessary information are often so different for each service. Another thing is that nature is probably the most complex system we know.

It is seen that rarely any research has been conducted in Bangladesh so far in terms of numerically highlighting the contribution of such little-discovered issues and the issues of human society's dependence on it. Moreover, in the few that have been conducted, numerical perspectives have been preferred. Much of this research has missed the exploratory views of KBA-dependent people. In such a scenario, the present study will be a

benchmark not only to understand the level of dependence on KBA resources and the necessity of conserving biodiversity but also to encourage the government, private sector, and other stakeholders to work cooperatively in conserving biodiversity.

OBJECTIVES OF THE STUDY

The primary objectives of this study are to identify the dependency of individuals within key biodiversity areas (KBAs) on natural resources. This study also included some specific objectives, which are given below:

- **to** explore the extent to which local communities depend on KBAs for their livelihoods;
- **to** examine the perceived changes in the availability of natural resources in KBAs over the past decade and how it impacts the livelihood of KBA-dependent people;
- **to** investigate community perspectives on conservation measures.

LITERATURE REVIEW

The contribution of KBAs or ecosystems to human welfare cannot be denied and their demand is ever-present and priceless (Loomis et al., 2000, Perman et al., 2003, Grossmann; 2012). A study was conducted on the Key Biodiversity Areas (KBAs) of Bangladesh by Dnet (2023) under the USAID Ecosystem/Protibesh Activity Project implemented by Chemonics International revealed that more than 87% of households depend directly or indirectly on KBAs as their main source of income. Among the alternative income sources, about 63.7% were KBA-centric. Regarding the contribution of KBAs to household income, this study showed that on average more than 71% of total household income was earned from KBAs. It was also found that among the households that depended on KBAs for income, about 40% of these households were completely dependent on KBAs for their income. According to the seasonal calendar, the year-round engagement or involvement tendency of the local people in KBAs reflects their high level of reliance on KBAs. It was noticeable that more than 10% of respondents had to change their KBA-centric livelihoods mainly because of lower income from KBAs and the inadequacy of resources in KBAs.

With hundreds of different species of plants, animals, and honey, the Sundarbans, the biggest mangrove stretch in the world provide a livelihood for 0.6 million people in the surrounding areas (Prakash, 2022). More specifically, people from the Patharghata sub-district of Barishal district share of income from the Sundarban reserve forest to the total household income was only 19% while other earning sources provided 81% of income. People collect forest resources

primarily for cooking purposes with a share of 71% where 9% of forest resources are collected as fodder followed by 8% of forest resources collected for food and sheltering purposes (Shaikh et al., 2021).

Another study in Hakaluki Haor revealed that a major part of the household income of the local population comes from fishing, aquaculture, and fish trading. Most importantly, almost half of the households were involved in fishing. Most of the people of Shyamnagar in Satkhira district are poor and live below the poverty line; whose situation worsens during and after natural disasters (Islam et al., 2011). Natural capital, local economy, water, and natural disasters, among other factors, are more vulnerable factors in the region in terms of the Livelihood Vulnerability Index as people depend on the natural resources of the Sundarbans for livelihood (Didar-Ul Islam et al., 2015).

Tazvir and Safiquzzaman (2020) conducted a study on the Ratargul Swamp Forest, the only freshwater swamp forest in Bangladesh. They revealed two aspects; i.e. dependence of the local people on the Ratargul Swamp forest and the adverse effect of dependence on the KBA. This study also discovered that during the dry season, people empty water bodies entirely to catch fish. Furthermore, as a result, the locals may more easily reach these areas to gather various forest products such as fish, fuelwood, fodder, and medicinal plants. The majority of this forest's southern region has been turned into agricultural land. Not only is the amount of forest being lost, but also other plant and animal species are affected. The Ratargul Swamp Forest is home to over 94 different species of fish. 28 of them are threatened, with 10 being endangered, 4 highly endangered, and 14 being vulnerable

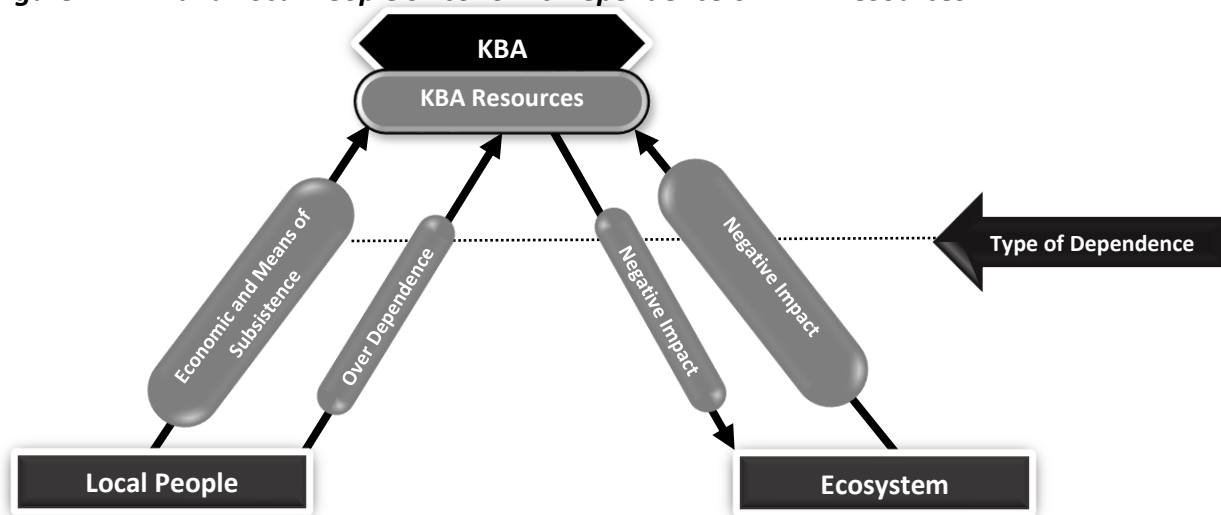
A study by Uddin et al. (2013) also revealed that in Bangladesh, the varied ecosystem is endangered due to the recent climate change, ever-rising population, habitat destructions, and other natural and human-induced causes (Uddin et al., 2013). As a consequence, the protected area is no longer large enough to assure the survival of numerous organisms. Furthermore, the local people have recently faced threats such as the loss of forests and wetlands, illegal wildlife hunting, environmental pollution, and an over-reliance on forests (Foster-Turley et al., 2016). For instance; the ecosystem of Hakaluki Haor is threatened by pollution and illegal fishing, resulting in an environmental crisis. Apart from swamp forest deforestation, destruction of wildlife habitat, agricultural expansion, and increased human settlement and habitation are the major threats to the productivity and ecological function of Hakaluki Haor, resulting in serious degradation of this rich and unique ecosystem of the country (Islam et al., 2011).

Ecosystems are considered to have no contribution in terms of quantifiable economic indicators (Loomis et al., 2000; Grossmann, 2012). As humans and the central agents to whom ecosystem goods and services are defined, continuing to enjoy natural capital without measuring its value will only compromise human life in the long run (Loomis et al., 2000). However, estimating the value of ecosystem services is a difficult endeavor (Costanza et al., 1997). Total ecosystem services value can be defined as the sum of benefits that a particular ecosystem offers to humans including use and nonuse values (Wilson et al., 2005, Pearce et al., 2006, Grossmann, 2012). Generally, the assessment of ecosystem services involves determining their quality and quantity changes and their impact on human well-being. The effects of these changes on human welfare can be identified as costs or benefits in the market or non-market systems (Mangi, 2016).

Though the economic, social, and environmental importance of ecosystem resources provided by KBAs is increasingly recognized globally, the methods for obtaining the necessary information are often different for each service.

The above literature review provides an interconnected natural system with KBA in every living organism, including human and ecological aspects. This interrelationship can be presented as below:

Figure 1: KBA and Local People's Economic Dependence on KBA Resources



Source: Developed by Researchers

Regarding KBAs and local people's economic dependence on KBA resources, two aspects can be underscored from the above literature review. Firstly the dependence of the local people on the KBA resources for their livelihood. In this case, biodiversity acts as insurance, offering a buffer against risks and shocks while also contributing to the smoothing of livelihoods and consumption patterns. Its presence provides resilience against unforeseen challenges and

supports sustainable living by stabilizing ecosystems and resource availability. Secondly, the over-dependence on the KBA breaks the interconnected natural system. It also negatively impacts the biodiversity situation and ecosystem pattern by damaging the ecological balance. Nature is probably the most complex system. It is seen that rarely any research has been conducted in Bangladesh so far in terms of highlighting the contribution of such little-discovered issues and the issues of human society's dependence on it.

METHODOLOGY

The present study was conducted from an exploratory perspective. This study sought to explore and understand the meanings or perspectives that KBA-dependent people identify with their dependence on KBA resources for their livelihoods. As this study was conducted from a qualitative perspective, so more focus was on cultural sensitivity and inclusion. To realize the objectives of this study and to design it to obtain more realistic information, it is also important to consider local practices, traditions, and formal and informal governance structures. In this sense, understanding the culture, cultural norms, and values of the local community was essential to carry out this research.

Why is it only about "culture"? Because Tylor (1889) made it clear that “*culture is a complex whole that includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society*”. It was mentioned earlier that this study focused on the dependence on regard to livelihood which is one of the important elements of human cultural life. Hence, there is a need to focus on culture as it relates to understanding KBA-dependent people's dependence on biodiversity and attitudes toward its conservation.

Keeping in mind the multidisciplinary settings and complex situational characteristics of the study area and study objectives, this study adopted qualitative research methods. As qualitative research is an important tool in the behavioral sciences, this approach helped to understand the meaning created by people, especially young people, that is, how they make sense of the world in their thinking about their dependency on KBAs. Based on the narrative or interpretive approach to dependence on the KBA and its contextual setting in their livelihood, the researchers of this study understood their experiences, perceptions, intentions, behaviors, and forms of economic dependence on the KBAs.

SAMPLING

Sandelowski (1995) recommended that a sample size of 10 suitable for qualitative studies of homogeneous humans would be sufficient. Crouch and McKenzie (2006) suggested that fewer

than 20 respondents could help researchers improve open analyzing large volumes of text data because it offers a more in-depth analysis and provides better data analysis (Devitt, 2003; Gibbs, 2004; Kumar and Singh, 2019). Considering the existing suggestions from various studies, the present study conducted a total of 10 case studies. For selecting the sample size, this study considered the principle of achieving the data saturation level.

Table 1: Respondent Distribution

Districts	KBAs	Number of Respondents
Satkhira	Sundarban	02
Moulovibazar	Hakaluki Haor	02
	Lawachara National Park	01
Sunamganj	Tanguar Haor	01
Sylhet	Ratargul Swamp Forest	01
Habigonj	Satchari National Park	03
Total	05	10

Source: The Present Study

The respondents were selected using a purposive sampling method. To understand the KBA-based variations, this study conducted 10 case studies from six KBAs. These KBAs included marshland, swamp forest, mangrove forest, and national park. This approach helped to measure the level and trend of dependency on the KBAs.

DATA COLLECTION TECHNIQUE

The best method of conducting research will depend on the goals of the project and the field of study. A qualitative approach is chosen due to the study’s nature and subject matter. Qualitative research investigates social interactions taking place in their natural habitats. Its variety and intensity indicate that many angles and methods can be utilized for social life exploration. As a result, the numerous viewpoints and practices indicated in the types of answers can be applied to explain the wide implications of the different interpretations of social reality (Coffey and Atkinson, 1996).

Considering that, the qualitative data was collected by conducting a case study with people from different backgrounds who live in different locations within the KBAs. Adopting a case study research methodology facilitates gaining deeper insight into the research objectives and a broader understanding of complex socio-economic situations. This data collection tool offered a comprehensive framework, enabling the exploration of variables in real-life settings that might otherwise pose challenges for investigation. Its utilization facilitated the examination of aspects that could be challenging to study through alternative research methods.

For collecting data, a comprehensive checklist was developed focusing on respondents' livelihood, economic activities, dependence on the natural environment, observed changes over the years, and what they thought about the conservation measures taken. To obtain a true picture of particular vulnerabilities associated with economic dependency on nature and, its impact on biodiversity, a total of ten case studies were carried out in this study. All the case studies were transcribed and translated and then prepared for analysis. The thematic analysis method was then used to find patterns and common themes across the case studies. In the final step, participant quotes and narratives were extracted for the report. Supporting the consent process, it was informed that the identity would be hidden from all the participants. Their names would not be revealed. The interviews take 25 to 30 minutes duration. All the interviews were recorded. In addition, some respondents were reluctant to record their voices. In this case, their interview was directly noted by the interviewers.

SELECTION OF THE STUDY AREAS

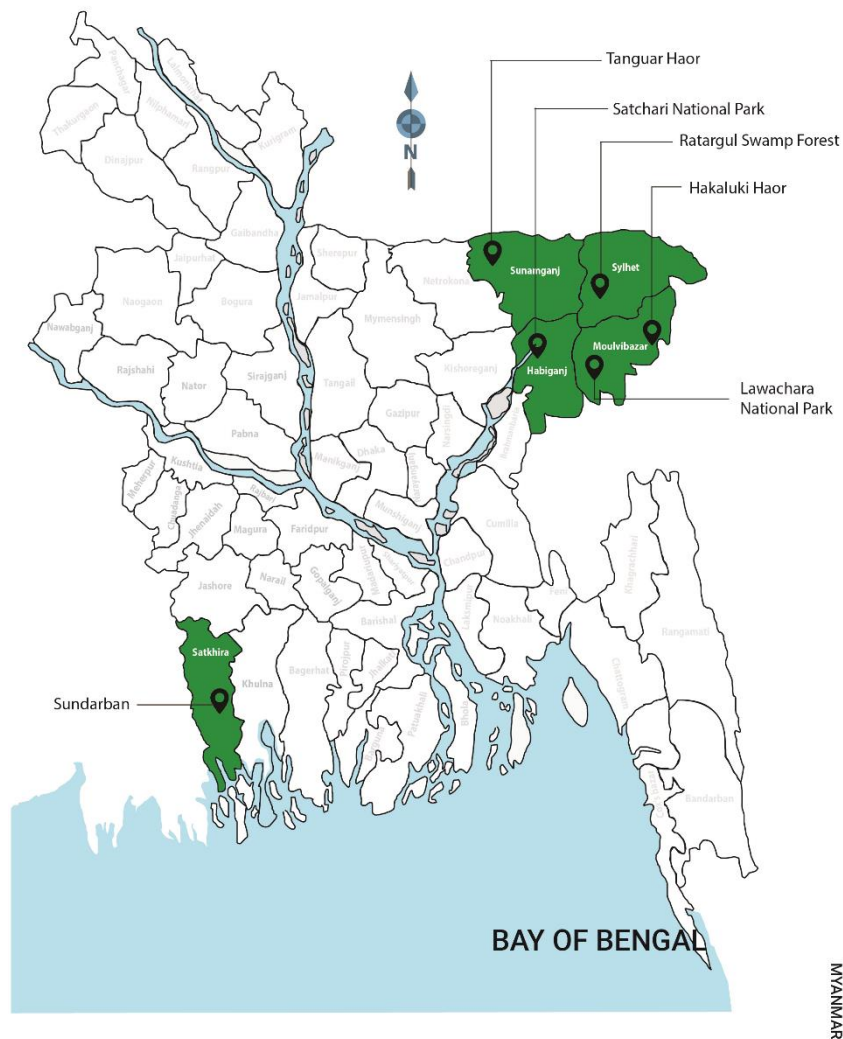
According to the Global Standard for the Identification of KBAs based on the World Database of Key Biodiversity Areas (WDKBA), there are 11 criteria that are clustered into five categories; such as threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and irreplaceability (SCBD and UNDP, 2021). Sites that meet one or more of these 11 criteria are regarded as KBAs. Considering these criteria, nearly 16,000 KBAs have been identified globally among which 20 KBAs are in Bangladesh (Ibid). Since 1999, Bangladesh has declared 13 biodiversity-rich areas as Ecologically Critical Areas (ECAs) under the Environment Conservation Act. Among these 13 biodiversity-rich areas, 8 sites are in the Sylhet division and 5 sites are in the Khulna division. For this study, six (6) KBAs have been selected where five (5) KBAs in the Sylhet division, and one (1) in the Khulna division.

Table 2. Study Areas and the Respected KBAs

District	KBA	Area Coverage (Square Kilometer)	Type of KBA
Satkhira	Sundarban	10277	(Mangrove) Forest
Moulovibazar	Hakaluki Haor	420.23	Marshland
	Lawachara National Park	12.5	Forest
Sunamganj	Tanguar Haor	100	Marshland
Sylhet	Ratargul Swamp Forest	13.46	(Swamp) Forest
Habigonj	Satchari National Park	2.43	Forest

Source: *The Present Study*

Map 1: Study Areas



Source: Developed by Researchers

The reason behind selecting the study areas was the focus on the diversity of the economic dependency in KBA, such as dependency on wetlands (Haor), forests (Sundarban, Swamp Forest), and national parks (Lawachara National Park). In total, the study engaged 10 participants from several communities in KBAs. By conducting case studies, the research aimed to uncover nuanced insights into the reliability of nature for economic purposes, and the challenges that emerge from this dependency on biodiversity. Through the interview and analysis of qualitative data, the study sought to address the gap in biodiversity conservation and promote alternative income sources among the people in KBA's adjacent locality.

DEMOGRAPHIC PROFILE

The checklist used in conducting the case study included some queries regarding the demographic information of the respondents. The demographic information included the

gender of the respondents, level of education, marital status, and number of household members.

Table 3: Gender Identity of the Respondents

Gender Identity	Frequency
Male	6
Female	4
Total	10

Source: The Present Study

Considering the male-dominated traditional culture of Bangladesh, most of the respondents were male. However, a recent study conducted by Dnet (2023) showed that a big portion of KBA-dependent people are females. Considering that the present study also included 04 female respondents. The demographic information also revealed that all of the respondents were married.

Table 4: Level of Education

Level of Education	Frequency
Primary	2
Secondary	7
Honors	1
Total	10

Source: The Present Study

Regarding the level of education of the respondents revealed that all the respondents were more or less educated. Seven (07) of them completed the secondary level education. It was also noticeable that three (03) of the respondents never attended college.

Table 5. Household Composition

Number of Household Members	Frequency
1 – 3	2
4 – 6	3
7 and above	5
Total	10

Source: The Present Study

According to the latest statistics, the average household size in Bangladesh is 4.2¹ (BBS, 2023). But in the present study, the average household size of the respondents was found to be 6.5 which was 54.8% higher than the national average. Family composition displayed that the number of household members was between 1-10. More specifically respondents had a higher proportion of households with 7 members or more.

¹ Average household size is 4.2 in rural areas and 4.1 in urban areas.

Table 6: Household Financial Affairs

Financial Affairs	Findings
Average household income	BDT 19,625
Average household expenditure	BDT 14,600
Average household earner	1.7

Source: The Present Study

Regarding household financial affairs, this study found that the average income for the household was BDT 19,625 and the average expenditure was BDT 14,600. This reflects that most households are likely to struggle to meet their essential expenses with their current income.

The average number of earners in the households was 1.7. More specifically, five (05) of the respondents had two earners in their households and four (04) of them had only one earner.

Regarding the sources of income, most of the households were dependent on cultivation and fishing as their primary source of income. It was also very significant that almost all of the households were more or less dependent on the KBA resources.

CASE STUDIES

Before focusing on the overall findings of this study, the researchers first concentrated on the case studies in brief. After understanding the views of the respondents, a detailed discussion of the result was presented.

Rumina (Pseudonym) (19) KBA: Satchari National Forest

Rumina's education ceased at the 5th standard, following which she was married off five years ago. Her household, consisting of three members, relies on her husband's occupation as a farmer, who serves as the family's primary provider. Wood collection and selling from the forest are customary for *Rumina's* community, with approximately 70% of the local populace engaging in this practice. She also remarks that while 25% of the collected resources suffice for personal use, the remainder is sold.

Notably, the forest, once inhabited by leopard cats, vultures, magpies, parrots, and mynah, has witnessed a stark decline in these species over the past decade, largely due to rampant hunting by residents. Forest officers play a crucial role in monitoring and safeguarding these endangered creatures. Thus, there is a pressing need for more effective measures from the forest department to ensure their protection. To restore the forest to its former biodiversity, extensive tree planting and cessation of wildlife hunting are imperative. With sustained efforts in this direction, it is plausible to envision the forest reclaiming its former glory within the next decade.

Shakil (Pseudonym) (25)
KBA: Satchari National Forest

Shakil, a resident of Chunarughat Upazila in the Sylhet district of Bangladesh, supports a family of 10 members as the sole breadwinner through his farming occupation. Despite passing his SSC exam, his monthly earnings of BDT 10,000 fall short of covering their monthly expenditure of BDT 20,000. Dependent on natural resources, particularly the forest, for domestic wood usage, Shakil has noticed a significant decline in biodiversity over the years. Fifteen years ago, the forest thrived with leopard cats, wild boar, and various bird species like *Mynah* (disambiguation) and oriental Magpie or *Doyel* (*Copsychus saularis*), but their sightings have drastically reduced. While some species like monkeys, squirrels, and leopard-cat still remain, others such as Rohu Carp or *Rui* fish, *Mayna*, and vultures have vanished from the area in the past two years. According to him, approximately 70% of the population in this area relies on the forest for their livelihood.

Shakil emphasizes the critical importance of conserving the forest to restore its biodiversity. He believes that with proper care and conservation efforts, the forest can recover within the next decade. He advocates for measures such as halting deforestation, increasing forest cover, and providing a peaceful environment for wildlife to thrive. He underscores the significance of planting more trees to safeguard biodiversity and mitigate environmental degradation. *Shakil's* observations underscore the urgent need for sustainable conservation practices to protect natural habitats and preserve biodiversity for future generations.

KBA: Sundarban
Supti (Pseudonym) (24)

Supti resides in the East Kazinagar area of Shyamnagar Upazila. She completed her SSC. Her husband, *Abul* who has completed HSC, works in the fishing industry. Their family of five, including *Supti's* mother-in-law and two children, relies on crab collection from the forest for additional income. They also utilize leaves from the Sundarbans as fuel. Like many in their community, they depend on the forest for sustenance and income, often using their earnings to cover household expenses and repay loans. During lean periods, they cultivate and sell vegetables for additional income. According to *Supti*, with 75% of the local population reliant on the Sundarbans for their livelihood, there has been a noticeable increase in tree numbers due to reduced tree cutting and deer hunting.

However, the extinction of vultures remains a concern. *Supti* attributes the disappearance of certain resources to climate change, overfishing, and poisoning. She believes that sustained conservation efforts can restore the ecosystem within two years. To mitigate resource depletion and preserve biodiversity, *Supti* advocates for community awareness through meetings and seminars, stressing the importance of responsible resource usage. Initially, raising awareness without resorting to legal measures is deemed the most effective approach.

Anukul, educated up to the eighth grade, and his wife *Asa*, educated up to the seventh, reside as sharecroppers. His family relies primarily on agriculture for income derived from Hakaluki Haor. Two additional family members contribute secondary income. As the family head of 10, including two students, *Anukul* manages a monthly income of BDT 70,000, primarily allocated to family expenses with minimal savings. In the Hakaluki area, where modern machinery is scarce, manual labor is the norm for agricultural activities, including *Anukul's* endeavors. *Anukul* observes a significant change in the Haor's condition, now notably drier than in previous years, adversely affecting agriculture and resulting in the disappearance of fish. He delineates the agricultural calendar, from *Boro* paddy (Marsh rice) planting in the Bengali months of *Kartik* (October - November) to *Agrahayan* (November - December) and subsequent *Baisakh* (April - May) harvest, along with mustard, radish, and winter vegetable cultivation in *Paush* (December - January) and *Magh* (January - February). According to *Anukul*, while the community once depended entirely on agriculture, now only 70% rely on it due to declining Haor fertility. Despite agricultural advancements, challenges such as dwindling fish populations persist.

Anukul recalls the abundant presence of large trees in the beel's edge area a decade ago. However, mass migration conflicts led to indiscriminate tree felling, severely depleting Haor resources. *Anukul* advocates for reforestation efforts, stressing the urgent need to restore fish, trees, and birds to their former abundance. He attributes the drastic fish population decline to widespread disregard for government fishing regulations, resulting in overfishing.

Anukul proposes a comprehensive approach involving government, NGOs, and the fisheries department to expedite recovery efforts, including stricter regulation enforcement, community education, and reforestation initiatives. He highlights past mismanagement, such as absentee watchmen and harmful fishing practices, contributing to bird species extinction in Hakaluki Haor. *Anukul* suggests effective conservation measures could restore trees to their former glory within a decade, with stakeholder cooperation expediting the process to five years. Additionally, leasing Haor lands per government regulations could curb corruption and restore the Haor within five years. *Anukul* underscores the importance of agricultural training and crop protection to rejuvenate the Haor, reminiscing about the once-vibrant bird population and cautioning against irresponsible fishing practices' detrimental impact on bird and fish populations.

Joy resides in Chunarughat Upazila within the Sylhet district. He completed his SSC and is a member of the Tripura indigenous community. *Joy* got married six years ago. Engaged in farming, he is the sole breadwinner for his family. He earns approximately BDT 4000 a month. But his expenses amount to BDT 6000.

While *Joy* refrains from excessive forest exploitation, according to him a significant 55% of his community relies on these woodlands for sustenance. Regrettably, over the past decade, notable wildlife such as Pangolin, wild boar, and pythons have dwindled in numbers. This decline is attributed to the diminishing forests, driven by the livelihood needs of the local populace. *Joy* emphasizes that with financial assistance, the community wouldn't resort to forest encroachment for survival. Offering vocational training in weaving could provide alternative income sources, thus curbing deforestation. *Joy* suggests that with proper forest management and afforestation efforts, there is hope to restore the ecosystem within a decade.

Juthika completed her education up to class 7, while her husband *Antu* completed his HSC degree. She married 15 years ago and currently has a family member with two school-going children. With three family members engaged in various income-generating activities, their primary livelihood stems from agriculture, supplemented by small-scale ventures. Despite a monthly income of BDT 15,000, their expenses exceed this figure. Their primary income source is derived from the fertile lands of Hakaluki Haor, where they cultivate paddy and mustard. Many in the Haor region also rear fish, practice agriculture, and raise ducks. Paddy cultivation occurs in the Bengali month of *Baisakh* (April - May), while vegetable farming takes place in the Bengali month of *Falgun* (February - March). According to *Juthika*, a significant 70% of the local populace relies on Haor for sustenance. Although three of *Juthika's* family members contribute to Haor-related endeavors, all the rice harvested is consumed domestically. However, there has been a noticeable decline in vegetable and paddy production over the past decade. Previously abundant Hijal trees (Indian Oak) provided shelter and sustenance for diverse wildlife, including fish and birds. The decline in mangrove trees has led to a decreased fish population, as these trees once hindered theft by trapping nets.

Furthermore, the diminishing tree cover has left birds without shelter, causing their disappearance. Sustainable management practices could arrest this decline. *Juthika's* family has been intricately linked to Haor agriculture for generations. With government and private sector intervention, including fish cultivation, tree planting, and halting bird hunting, Haor's ecosystem could potentially rebound within five years, restoring it to its former splendor of a decade ago.

Jovan resides in Kamalganj Upazila within the Sylhet Division. A graduate and a farmer by profession, he is supported by his wife *Rafia*, a homemaker. Their family, with *his* father, includes 14 members, with three earners. Primarily reliant on farming, they supplement their income by gathering fruits, firewood, timber, and bamboo from the forest, alongside collecting bananas, betel leaves, and bamboo shoots. They also source grass for their cows from forest areas and cultivate lemon trees in the hills. A modest monthly income of BDT 20,000 is often outstripped by expenses. The once-abundant forest resources have diminished, prompting occasional tree-planting efforts, but their community relies heavily on forest yields.

Jovan remarks that while about 60% of forest and hill resources cater to family needs, the remaining 40% is sold. In lean times, they turn to small businesses for sustenance. According to him, the wealth of their area has dwindled by nearly 80% over the past decade, even as 85% still rely on forest resources. Reduced demand for crops and disappearing wildlife, including forest snakes, pythons, monkeys, and deer, are attributed to rampant deforestation and exploitation. Some individuals exploit the forest by selling off valuable trees and wildlife for profit, further exacerbating the decline. Despite *Jovan's* lifelong involvement in agriculture, diminishing returns from forest and hill ventures have led him to pursue a small business. He advocates for immediate environmental restoration efforts, estimating a 20-year timeline for restoration to the state of a decade ago. Collaboration between government, NGOs, and heightened public awareness is crucial. Collective tree-planting initiatives offer a promising avenue for restoring the forest over the next two decades.

Sadiqun, a resident of Shyamnagar Upazila in Satkhira District, resides with her family of five members. Although she completed her SSC, her main occupation involves supporting her husband, who works as a fishmonger to sustain their household. Additionally, *Sadiqun* and her father-in-law intermittently venture into the Sundarbans to collect fish, essential for their livelihood. She remarks that in their locality, where 65% of the population relies on the Sundarbans for sustenance, fishing halts during December, January, and February. They gather fish, crabs, and dry fuel from the forest, supplementing their income by selling them. During lean periods, they engage in day labor to make ends meet. *Sadiqun* laments the significant decline in fish and deer populations over the past 5 to 10 years, attributing it to toxic saltwater intrusion during cyclones, which killed many trees. She believes that storm surges not only affect trees but also deplete fish stocks due to overfishing by residents. Furthermore, the disappearance of crows and vultures suggests a drastic decline in biodiversity.

Sadiqun advocates for providing alternative employment opportunities to forest-dependent communities to alleviate pressure on natural resources. She is optimistic that with continued conservation efforts, the Sundarbans can return to their former state within a few years. However, she emphasizes the need for strict regulations, including halting fishing and tree cutting, alongside offering alternative livelihood options for residents.

Mortuza, educated up to the grade 5, sustains his family by operating a tea shop, serving as the primary breadwinner for his eight-member family. Among his four sons and two daughters, two sons are currently pursuing education, while one remains unemployed. *Mortuza's* monthly earnings amount to BDT 15,000, supplemented by BDT 15,000 earned by one of his sons. According to him, more than 60% of his community people rely on natural resources for income. He also highlights the pressing issue of water scarcity in the Haor during the monsoon season. While stone quarrying, once a prevalent activity, has ceased, fishermen now struggle with low water levels during the dry season, impacting fish catch. Previously, 90% of locals depended on stone quarrying, but now face challenges as landowners turn to farming for sustenance, according to *Mortuza*. Despite these challenges, fishermen manage to catch some fish during the rainy season.

Mortuza reminisces about a time when abundant forests and water characterized the Haor, now giving way to cultivation and deforestation for agriculture. He attributes declining tree numbers partly to government decisions to clear roadside trees for road expansion, exacerbating heat due to reduced tree cover. He estimates a five-year timeline for restoring plants and forests to their former state, underscoring the need for government attention. Previously reliant on stone extraction from the Dholai River, the cessation of this activity has limited their family's mobility. *Mortuza* suggests that government job opportunities could significantly alleviate their hardships.

RESULT AND DISCUSSION

DEPENDENCY ON KBA RESOURCES FOR LIVELIHOOD

To understand the level of dependency on KBA resources for livelihood, this study concentrated on the views of the respondents.

Shakil, a resident near Satchari National Park, mentioned that-

“My family primarily depends on natural resources, particularly the forest for the wood which we use for our household work...”

Juthika, a resident near Hakaluki Haor, added that

“All of our household income comes from the Hakaluki Haor... We grow rice and mustard in Hakaluki Haor...We sell part of the cultivated rice and the rest is used to meet the food needs of our family....”

Like *Juthika*, another respondent, *Anukul*, also cultivates paddy on the banks of Hakaluki Haor, which is the only source of income for his family.

Jovan, a resident near Lawachara forest mentioned that –

“ We gather fruits, firewood, timber, and bamboo from the forest... Sometimes we also collect bananas, other fruits, and seasonal crops like betel leaves or bamboo shoots... Besides, we also collect grass for our domestic cows from the forest and grow lemon trees in the hills...”.

Sadiqun, a resident near the Sundarban mangrove forest, stated that -

“My husband works as a fisherman and he manages our family through this work... Apart from this, I along with my father-in-law sometimes go to the Sundarban to collect fish... We usually collect fish and crabs from the forest and earn money by selling them... Also, we also collect dry fuel and use it for cooking... Basically, our family is fully dependent on Sundarban for family income...”.

Supti, another respondent who lives near the Sundarban forest, mentioned that -

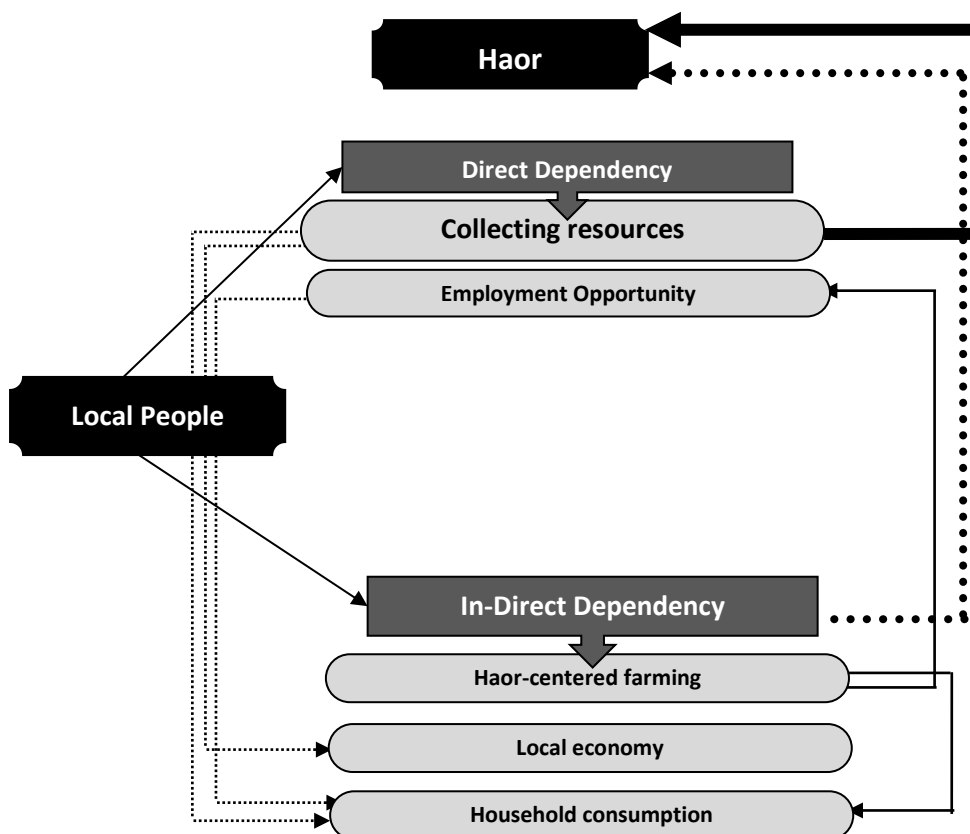
“I collect leaves and wood from the rivers of Sundarbans and use these as fuel... My husband also collects crabs and minnows from the Sundarban and sells them in the local market... Everyone in our locality depends on the forest... We usually use our earnings to run our household as well as repay the loan...”.

Atikur, a resident near the Tanguar Haor, stated that –

“Our family is fully dependent on Tanguar Haor directly and indirectly... I collect fishes from the Haor... My father cultivates paddy on the bank of Haor... I also help my father in this cultivation...”.

From the above discussion, a figure can be developed which is given below.

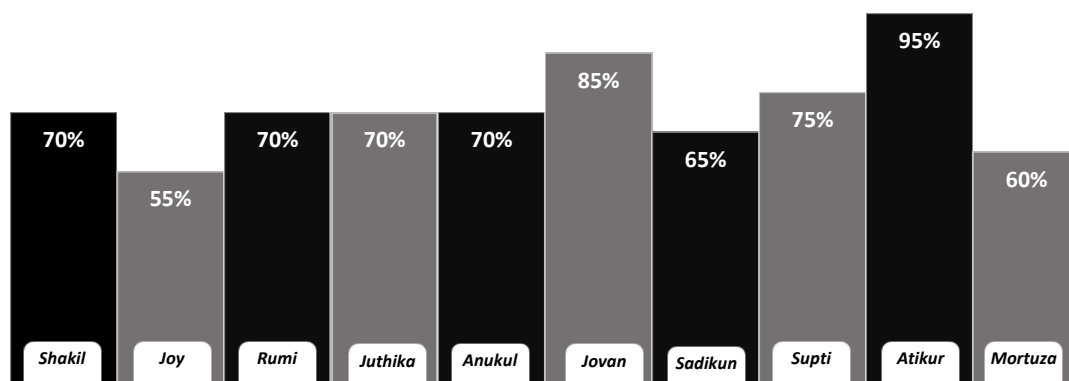
Figure 2: Taxonomy of KBA Dependency for Livelihood



Source: Developed by Researchers

The above classification of KBA dependency on KBA shows that all of the respondents living near the KBAs are dependent on the KBAs directly or/and indirectly. This can be understood numerically from the chart below:

Chart 1: The Ratio of Dependency on KBAs for Livelihood



The above chart shows that the dependency of the local people on the KBAs ranges from 55% to 95%. This indicates a high dependency for the local people on the KBAs. It is noted that this qualitative analysis may not be able to generalize all the communities within the KBAs.

Quantitative research could provide the dynamics of socio-economic dependency in a broader and exact equation.

However, such reliance on KBAs for livelihood is observed through farming, fishing, and collecting forest produce. The respondents along with their counterparts and their household members are engaged in these works. Resources collected from KBA are sold as well as used for household consumption. It was also noticeable that most of the respondents sold the collected resources from the KBAs in the local markets which fulfilled the needs of other households. Besides, it creates an interconnection between resource collectors, local markets, and consumers which plays a major part in the local economy and local market system. It is also mentionable that KBAs also play an important role in creating employment opportunities for the local people directly and indirectly. Such as some people directly collect resources from the KBAs. This study also found that some people are engaged in cultivating and fisheries in the Haor areas which also creates employment opportunities for their household and their communities.

PERCEIVED CHANGES IN KBAs AND IMPACT ON LIVELIHOOD OF KBA-DEPENDENT PEOPLE

One of the objectives of this study was to examine the perceived changes in the availability of natural resources in KBAs over the past decade and how it impacts the livelihood of KBA-dependent people. This objective includes two interrelated phenomenons; changes in KBAs in terms of availability of the natural resources and its impact on the KBA-dependent people.

Regarding changes in the Satchari National Park, *Shakil* mentioned that –

“I witnessed a significant decline in the natural resources in the forest... Fifteen years ago, the forest teemed with leopard cats, wild boar, and various bird species like Maynas and magpies... However, their sightings have drastically reduced... While some species like monkeys, squirrels, and leopard cats still exist, others such as Rohu Carp, Mayna, and vulture have disappeared from the area in the past two years...”

Rumina, and *Joy*’s views on changes in the Satchari National Forest also support *Shakil*’s views. She mentioned that –

“Even 10 years ago there were many tigers in this forest... Then many vultures, pigeons, magpies parrots, and myna were also seen, which are not seen anymore...”

- Rumina

“About 5 to 10 years ago there were pangolins, wild boars, and pythons in the forest, which are almost gone now... As more people depend on forests, the pressure on forest resources has also increased... As a result, the amount of these resources is slowly decreasing and many animals and plants are disappearing...”

- Joy

Jovan’s comments can represent the trend of changes in the Lawachara National Forest. Regarding that, he commented that –

“The forest, once abundant with fruits and timber, has become increasingly scarce over time. The number of snakes, pythons, monkeys, and deer has declined significantly, mainly due to massive deforestation... Some individuals are selling large trees for financial gain and resorting to poaching of forest deer, further exacerbating the problem... Additionally, the involvement of influential people in such activities has significantly contributed to the degradation of wildlife and natural resources in the area... Urgent measures are needed to counter these destructive practices and protect the biodiversity of forest ecosystems....”

Regarding the changes in the Haor areas, Juthika, Anukul, and Atiqur mentioned that

“Over the past decade, there has been a noticeable decline in the production of vegetables and paddy, particularly in areas like the Haor... This decline is indicative of broader environmental shifts, notably the disappearance of hijal trees, once abundant in the region... These trees not only provided habitats for various bird species but also served as a natural deterrent against fish theft... In the past, the dense mangrove forests in the water bodies of the Haor prevented illegal fishing activities, as nets would easily get entangled, making theft difficult... However, as the number of these plants declined, so did the number of fish... Consequently, the diminishing tree cover has left birds without shelter, leading to a stark reduction in their numbers as well... The lack of maintenance and conservation efforts has exacerbated these ecological challenges, underscoring the urgent need for proactive measures to restore balance to the Haor ecosystem...”

- Juthika

“The Haor region has undergone a dramatic transformation, marked by a notable increase in dryness compared to previous years... This change has had severe repercussions on agriculture, with crops suffering and fish vanishing entirely... The once-thriving ecosystem, characterized by towering trees such as Hijal, Barun, Kasut, and Balat along the Haor's edges, has experienced a sharp decline in their numbers... This reduction in the number of

trees covered has further exacerbated the region's aridity, exacerbating the challenges faced by both farmers and wildlife... Urgent action is imperative to address these environmental shifts and restore balance to the Haor's delicate ecosystem.”

- Anukul

“I recall a time when the Haor boasted expansive forest areas and plentiful water resources... However, this landscape has undergone significant changes, with much of it now being filled and converted for agricultural purposes... The resulting deforestation has led to a decline in the number of trees, exacerbating environmental issues... Part of this decrease can be attributed to government initiatives, such as tree felling along roadsides for widening projects, which has intensified heat levels by reducing tree cover... These alterations underscore the pressing need for sustainable land management practices to preserve the ecological integrity of the Haor region...”

- Mortuza

Regarding the changes in the Sundarbans forest, *Sadikun* and *Supti* mentioned that

“A decade ago, the Sundarb teemed with abundant fish and deer, a testament to its vibrant ecosystem... However, over the years, there has been a noticeable decline in both, with deer sightings becoming increasingly rare... This reduction is primarily attributed to human activities, particularly the widespread practice of fishing for livelihoods, which has significantly depleted fish stocks... Additionally, the disappearance of species like crows and vultures further underscores the ecological imbalance plaguing the area... The intrusion of toxic saltwater during cyclones like Aila has led to the demise of many large trees in the area, significantly impacting the ecosystem... Storm surges continue to bring saltwater into the territory, further contributing to the decline of trees and fish populations over time... These changes not only signal environmental degradation but also threaten the livelihoods of communities dependent on the Sundarban's resources... Urgent conservation efforts are imperative to reverse this trend and safeguard the biodiversity of the region for future generations....”

- Sadikun

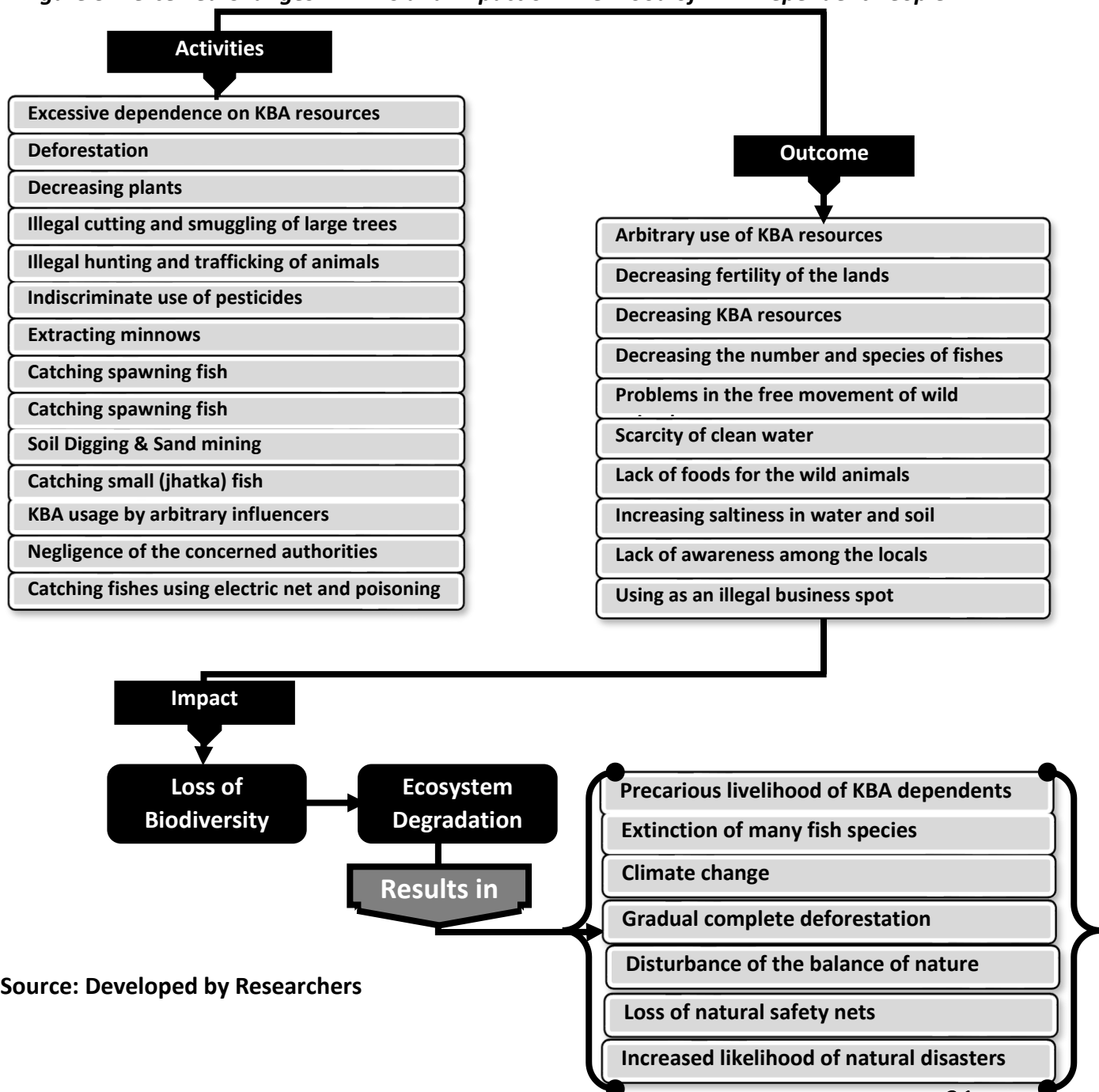
“The number of trees in the area has also decreased significantly, as have the number of fish and deer... Locals' interest in logging, fishing, and deer hunting can be attributed to this... The extinction of vultures from forests is a matter of concern... Efforts to conserve and protect the remaining wildlife, including the vulture, are crucial to restoring the ecological

balance of the region... Continued community involvement and conservation initiatives are essential to protect the biodiversity of the Sunarban... Fishermen face challenges in catching fish due to low water levels during the dry season ... I believe the types of resources that have disappeared are mainly due to climate change, human overfishing, and poisoning..."

- Supti

From the above discussion, some changes in the KBA areas can be identified. But unfortunately, all of these changes are negatively impacting the KBAs. These changes include results as well as responsible causes.

Figure 3: Perceived Changes in KBAs and Impact on Livelihood of KBA-Dependent People



Source: Developed by Researchers

The above figure was developed based on the discussion of the respondents. The study then carried out a thematic analysis and developed a pattern that reflected how and why changes in KBAs occurred and what the implications were in the larger sense. If it is concentrated on the outcomes, it can be found that most of the outcomes are due to several man-made reasons. For example: farmers in the Tanguar Haor region use various pesticides in their farming practices, leading to a decline in fish within the area. The use of these chemicals contributes to the reduction of fish stock in Tanguar Haor due to their detrimental effects on aquatic ecosystems.

Most of the reasons are associated with a number of root causes. Such as the tendency of excessive dependence on KBA resources by the local people is also related to some factors e.g. lack of alternative income opportunities, lack of skills and education, poverty, less local development etc. It was also found that a section of local influential people use the KBAs to make money in a quick time. Common people who depend solely on KBAs for their livelihood express their gratitude towards KBA but the powerful remain ungrateful.

However, these activities cause some negative outcomes such as decreasing KBA resources, influencing arbitrary use of KBA resources, decreasing fertility of the lands etc. Due to these outcomes, the KBAs lose valuable biodiversity which impacts ecosystem degradation. For example: the felling of large trees deprives nesting birds of safe habitats, prompting them to seek refuge elsewhere. Consequently, this results in the migration of birds to alternative areas where suitable nesting sites are available. However, the ecosystem degradation results in the precarious livelihood of KBA dependents, extinction of many fish species, climate change, gradual complete deforestation, disturbance of the balance of nature, loss of natural safety nets, and increased likelihood of natural disasters.

COMMUNITY PERSPECTIVES ON CONSERVATION MEASURES

In the previous discussion, it was found that the average dependency of the local people on the KBAs was 71.5%. From this understanding, it can be illustrated that if a certain KBA is conserved then more than 71% of their livelihood opportunities will be saved. So it is very necessary to take appropriate measures to conserve biodiversity. In this case, the conservation measures coming from the local people will be effective. For that, this study tried to understand the community perspectives on conservation measures.

Table 7: Community Perspectives on Conservation Measures

District	KBA	Type of KBA
<i>Rumina</i>	Satchari National Forest	- The forest department has to take more effective steps to protect the animals and birds
		- Need for government attention.
		- Creating alternative job opportunities for the local people, particularly for the youths.
<i>Mortuza</i>		- Creating alternative employment opportunities for all KBA-dependent people.
		- Provide vocational training.
<i>Joy</i>		- The forest department has to take more effective steps to protect the animals and birds
<i>Juthika</i>		- The government or various private institutions take appropriate measures
		- A comprehensive approach involving government, NGOs, and the fisheries department.
<i>Anukul</i>		- Stop deforestation and harmful fishing activities. - Strict enforcement of laws and regulations. - Community education and awareness. - Provide training on environment-friendly cultivation technology.
<i>Atiqur</i>		Tanguar Haor
<i>Jovan</i>	Lawachara National Forest	- Government and NGOs must work together. - Raising awareness among the local people.
<i>Supti</i>	Saundarban	- Arranging meetings, yard meetings, and seminars for the local people to raise their awareness.

Source: Developed by the Researchers

The table highlights five key stakeholders crucial for bolstering conservation efforts: the government, local communities, law enforcement agencies, NGOs, and private entities. Notably, respondents underscored the significance of a collaborative approach, particularly between the government and local inhabitants. Moreover, they emphasized the necessity of empowering local communities by providing capacity-building services. These services aim to

equip locals with the skills necessary for engaging in alternative income-generating activities, thus reducing dependence on environmentally harmful practices. Additionally, raising awareness among community members about biodiversity conservation emerged as a priority. The comprehensive strategy advocated by respondents integrates governmental support with grassroots involvement, recognizing the pivotal role of both in fostering sustainable conservation practices. Ultimately, the emphasis lies on fostering partnerships and empowering local actors to actively contribute to biodiversity preservation efforts.

CONCLUSION

This qualitative study delves into the dependency of individuals residing near the Key Biodiversity Areas (KBAs) in Bangladesh on natural resources. It sheds light on the direct reliance of these individuals on forests, rivers, and Haors for sustenance and income. The participants interviewed underscore the crucial role of wood, fruits, fisheries, and other forest by-products in meeting their basic needs and household financial requirements. However, the research also exposes the alarming decline in natural diversity over the past decade, attributed primarily to human activities such as deforestation, overfishing, and habitat destruction due to climate change. In response, the community emphasizes the need for a collaborative approach involving government agencies, NGOs, and themselves in conservation efforts. Alongside providing alternative income sources, they advocate for environmental regulations and heightened awareness campaigns among local residents. The study thus advocates for multifaceted solutions to address the complex challenges facing biodiversity conservation in these areas. It underscores the importance of collective action and policy interventions to mitigate the adverse impacts of human activities on natural ecosystems. Ultimately, it calls for concerted efforts to safeguard both livelihoods and biodiversity in the region.

RECOMMENDATIONS

Considering the research findings, this study also suggests some recommendations that are given below:

MANAGERIAL IMPLICATION

- i. Enforcement of existing environmental regulations should be strengthened to stop activities such as illegal logging, overfishing, and habitat destruction.
- ii. Government and NGOs should introduce skill development training especially vocational training for local people which can develop their skills and prepare them to earn income from any alternative source.

- iii. Create the opportunity for alternative income sources for the local people.
- iv. Community-led conservation plans should be implemented to accomplish this, including training programs for sustainable resource management and education on alternative income opportunities.
- v. Alliances or collaborations should be formed under the leadership of government agencies, NGOs, and academic institutions, among other stakeholders
- vi. The relevant government authorities engaged in youth development and women's development should take necessary measures to encourage the youth especially young girls to come forward to conserve biodiversity.
- vii. Legislation related to the extraction of assets from KBA should be strengthened as well as new laws should be formulated to suit the current times.

RESEARCH IMPLICATION

While this research provides valuable insights into the economic dependency on natural resources in the key biodiversity areas of Bangladesh adopting an explorative approach, it is important to gain a more complete picture than a standalone approach (quantitative or qualitative). Since it integrates the benefits of both methods, this study should use the quantitative approach side by side with the qualitative research method. Here, the quantitative type of data may be secondary to the qualitative data and may be used to validate the qualitative information. Moreover, the qualitative approach may provide the quantification of the dependence on the KBAs, e.g. monetary or economic values. To ensure the generalizability of all KBAs, further research using a mixed method approach, particularly the exploratory sequential research design could provide additional insights into the broader socio-economic dynamics and environmental challenges facing the area.

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Co-Founder & Executive Director, Dnet



M. Shahadat Hossain is a founder member of Dnet and has served in the governing body since 2018 and as the Executive Director Since 2021. He has 15 years of experience in academia and research. As an academic he has taught various marketing courses for 15 years in North America. Namely at; Sprott School of Business, Carleton University, Canada, State University of New York (SUNY) at Potsdam, USA, and as an Adjunct Professor at Clarkson University, NY, USA.

M. Shahadat Hossain began his professional career in 1991. He is a marketing expert as a practitioner and has worked for international and public limited companies both in the service and manufacturing industries as senior level management. His published work on service innovation has received the Outstanding Research Award from The Institute for Business and Finance Research, USA. He has also received a “Title III Grant” for research from the US Department of Education while teaching at SUNY, Potsdam. He has worked on a number of development projects as team lead or technical advisor. He has also been part of a number of research studies as a researcher or methodology expert.

Atanu Das

Head of Research & MEAL, Dnet



Atanu Das is a researcher and MEAL expert with almost 16 years of experience. He is currently pursuing his research career as a Doctoral Researcher in addition to serving as the Head of Research and MEAL in the Research and MEAL Division at Dnet. Earlier, he obtained BSS and MSS degrees in Anthropology from the University of Dhaka. He has authored and/or co-authored a number of research journal articles. A total of Seven (07) research books and research paper series have been published under his sole authorship and co-authorship.

In addition, several research reports have already been published under his sole authorship or co-authorship on various topics such as development, gender, microfinance, education, culture, environment, ethnicity, rights, health, poverty etc. His research interests also include social and economic inclusion and exclusion, biodiversity, food security, nutrition issues, urban and rural economy.

Furthermore, he is an expert in using various statistical software and qualitative data analysis software. He has contributed to several research projects funded by government agencies, NGOs, and INGOs as co-lead researcher and senior analyst.

Sammi Akter Bithy

Executive, Research & MEAL, Dnet



Sammi Akter Bithy completed her Bachelor's and Master's in Public Administration from Comilla University. She possesses extensive knowledge of qualitative and quantitative research, including research methods and data collection techniques, which makes her well prepared to manage research projects.

Throughout her academic career, she has volunteered with several organizations, which has enhanced her communication and leadership skills. Notably, she has a significant publication titled “Tale of Education Policy in Bangladesh: Development, Changes, and Adaptation Approach,” published in December 20

SELECTED RESEARCH PAPERS OF DNET

Business and Entrepreneurship

Bridging digital divide for rural youth: An experience from computer literacy programme in Bangladesh.

Computer learning for underprivileged rural youth: A critical reflection of Dnet's intervention.

Health and Nutrition

Situation Analysis of Palliative Care in Primary Healthcare Levels in Bangladesh-DGHS.

Consultancy on Developing Digital Intervention for Adolescent Health and Nutrition in Bangladesh- Nutrition national.

Climate and Environment

A guideline for environmentally and socially responsible business practices in the financial sector.

Measuring the willingness to pay for hazard-free e-waste management in Dhaka City, Bangladesh

Evaluation of incentives and barriers for youth to engage in conservation activities

Economic dependency on KBAs - an exploratory study on key biodiversity areas of Bangladesh

Governance and Society

Rethinking non-resident Bangladeshis' contribution to Bangladesh Economy.

ICTs and access to information: How to make it work for promoting human rights.