Chapter 2
Human-Nature Cooperation for Well-Being: Community Understanding on One Health Approach in the COVID-19 Era in the Sundarbans

Rashed Al Mahmud Titumir and Md. Shah Paran

Abstract This study attempts to explore the interdependent relationship between humans and nature, and to comprehend the community understanding of the "One Health" approach in the face of the COVID-19 pandemic in the Sundarbans in Bangladesh. It explores challenges in socio-ecological production landscapes and seascapes (SEPLS) management, response of indigenous peoples and local communities (IPLCs), and corresponding outcomes, and also examines factors affecting the ecosystem's balance. It particularly draws on the insights of traditional resource users (TRUs) in a part of the Sundarbans who are wood collectors (*Bawali*), fishermen (*Jele*), honey and wax collectors (*Mouali*), and crab collectors. The study adopts a multiple evidence base (MEB) approach in order to bring in the participatory insights of IPLCs, coupled with scientific knowledge and interdisciplinary heterodox perspectives. Based on the community conceptualisation of the One Health approach, this study demonstrates that the appropriation of nature (conservation, restoration, sustainable use, access, and benefit sharing) instead of expropriation (anthropogenic pressures) can serve as a yardstick to ensure a virtuous cycle in the ecosystem and a harmonious relationship between humans and nature. The study presents a modified One Health framework for the post-2020 period that calls for ensuring rights-oriented universal social entitlements, provision of livelihood security, and promotion of human-nature cooperation underwritten by customary sustainable practices and traditional knowledge in SEPLS management.

Keywords Human-nature cooperation · Well-being · One Health approach · COVID-19 · SEPLS · Sundarbans · Bangladesh

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1 Introduction

The study explores the interrelationship between human beings and nature that directly and indirectly affects both, and conjoins participatory research approaches to ascertain community understanding on the "One Health" approach that encompasses human, animal, and ecosystem health together in the COVID-19 era in the Sundarbans. It explores the challenges in socio-ecological production landscapes and seascapes (SEPLS) management and the responses of the traditional resource users (TRUs) and corresponding outcomes. Factors affecting the ecosystem's balance, and thus the well-being of the forest and its people, are also examined. It further examines the state of health and well-being of indigenous peoples and local communities (IPLCs) and TRUs in terms of universal access to health and social security programmes, as well as the state of ecosystem health in terms of biodiversity, anthropogenic pressures, resource management, and sustainable production and consumption in the face of COVID-19. Accordingly, the study categorises the human contribution to nature (biodiverse adaptation to climate change, nature-based community solutions for livelihood diversification, customary sustainable practices based on traditional knowledge) and nature's contribution to human beings in promoting One Health in the Sundarbans.

The Sundarbans, situated at the edge of the Bay of Bengal, is the largest neighbouring single-tract contiguous mangrove ecosystem in the world. It is a unique SEPLS with a composite ecosystem combining forest, marine, coastal, and wetland environments, located in the southwest corner of Bangladesh, between 21°30′ and 21°39′ N, 89°01′ and 89°52′ E (Fig. 2.1 and Table 2.1). It supports viviparous plant species with 334 species of trees, shrubs, herbs, and epiphytes and around 400 species of wild animals (Behera & Haider, 2012).

A significant number of people maintain their livelihoods by utilising the resources of the forest, and thus the area is a unique hotspot for biodiversity conservation and sustainable use and is identified as a SEPLS. The benefits from the Sundarbans appear in the form of multiple goods and services, which "contribute

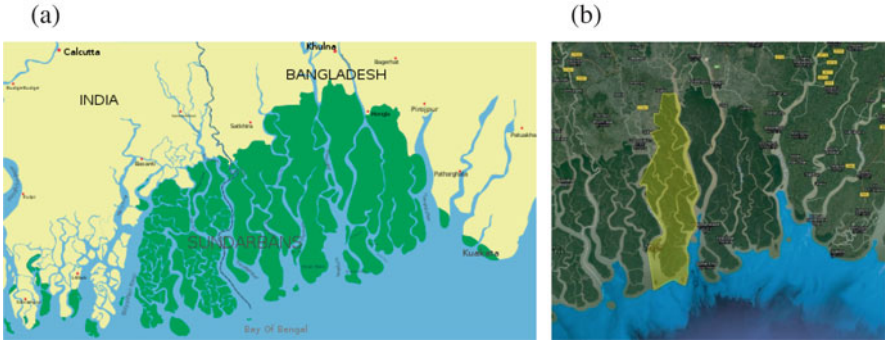

Fig. 2.1 (**a**) Map of the study site (source: Wikimedia Commons Contributor Nirvik12, 2015); (**b**) land cover map of case study site (source: Map data (c) Google, 2021)

Table 2.1 Basic Information of the study area

Country	Bangladesh
Province	n.a.
District	Khulna, Satkhira, and Bagerhat
Size of geographical area (hectare)	607,100
Number of direct beneficiaries (persons)	1300
Number of indirect beneficiaries (persons)	3.5 million
Dominant ethnicity(ies), if appropriate	Bangalee
Size of the case study/project area (hectare)	177,500
Geographic coordinates (latitude, longitude)	21°30′ and 21°39′ N, 89°01′ and 89°52′ E

to making human life both possible and worth living" (Díaz et al., 2006; Millennium Ecosystem Assessment, 2005; Layke et al., 2012; van Oudenhoven et al., 2012). However, the Sundarbans at present is an ecologically vulnerable area due to degradation of biodiversity resources. Over the years, it has experienced major ecological and physiographical changes and is losing its resources due to both human interventions and climatic changes (Titumir & Afrin, 2017). The area of the Bangladesh part of the Sundarbans was 17,000 km^2 in 1776, which has subsequently been reduced to almost half the size (Islam & Gnauck, 2009).

Moreover, the COVID-19 pandemic has posed unprecedented challenges to people's lives and livelihoods in the Sundarbans. For example, around 95% of TRUs in the Sundarbans lost the massive share of their income during the nationwide lockdown (Unnayan Onneshan, 2020c). On top of this, the coast of Bangladesh was struck by supercyclone *Amphan* on 16 May 2020, leaving crops, infrastructure, and coastal protection embankments damaged in 26 coastal districts, which further negatively affected the livelihood options of IPLCs in the Sundarbans (New Age, 2020). Moreover, due to the absence of universal social security programmes in the country, the economic fallout of the majority of the people was exacerbated (Unnayan Onneshan, 2020b). The ongoing health crisis and livelihood insecurity resulting from COVID-19 are marginalising the forest people and also creating a metabolic rift—a disruption in the ecosystem balance caused by a break in the producer, consumer, and decomposer cycle in the ecosystem. This imbalance in the ecosystem cycle has led to the increased ill-being of the forest and its people.

2 Methodology

The case study was conducted adopting a multiple evidence base (MEB) approach. It draws on indigenous and ecosystem-based solutions in SEPLS management, utilising the indigenous and local knowledge (ILK) collected from two cooperatives—*Koyra Bonojibi Bohumukhi Unnayan Samity* and *Munda Adivasi Bonojibi Bohumukhi Unnayan Samity*—in the Koyra Upazila of Khulna District in the southwestern region of Bangladesh, a part of the Sundarbans SEPLS.

Table 2.2 Data collection methods (targeting a total of 200 cooperative member households)

Name of study	Study dates	No. of studies	No. of respondents
FGDs	24/02/2020–12/03/2020	4 (one in each category of IPLCs: *Bawali, Mouali, Jele,* and crab collectors)	6 in each FGD
Survey	25/04/2021–05/05/2021	1	135 households (30 *Bawali*, 40 *Mouali*, 35 *Jele*, and 30 crab collectors)
PPGIS	25/08/2020–29/08/2020	1	6 from each category

Data was collected through participatory observations, focus group discussions (FGDs), a survey with a semi-structured questionnaire, and a public participation geographic information system (PPGIS) activity in two cooperatives. FGDs were conducted between 24 February and 12 March 2020 before the beginning of COVID-19 in Bangladesh. The PPGIS study was performed on 25–29 August 2020. Furthermore, the survey was conducted from 25 April to 5 May 2021 (Table 2.2). Data from the Unnayan Onneshan (UO), a Dhaka-based multidisciplinary think tank that has several biodiversity restoration and conservation programmes and has been carrying out research on the Sundarbans since 2010, was also utilised. The study therefore links numerous sources of scientific knowledge to bring forth a comprehensive and scientific understanding of ecosystem health, human health, and SEPLS management in the Sundarbans.

Members of the two cooperatives pursue their livelihoods as wood collectors (*Bawali*), fishermen (*Jele*), honey and wax collectors (*Mouali*), and crab collectors. The total number of households in the two cooperatives is 200, comprised of approximately 1500 household members. For FGDs and the survey, the households were categorised as wood collectors (*Bawali*), fishermen (*Jele*), crab collectors, and honey and wax collectors (*Mouali*). A total of four FGDs were conducted (one in each category) with six respondents in each of the FGDs. The number of households surveyed was 135 for the two cooperatives, with each participating household made up of TRUs registered as cooperative members who actively participate in SEPLS management (Table 2.2).

An area of 40 km in length and 30 km in width was selected for the PPGIS study. The region is located between 22°28′30″N and 22°1′0″N and 89°13′30″E to 89°30′0″E. This region is the part of the Khulna Range—one of the four administrative areas of the Sundarbans. Results from FGDs, the survey, and PPGIS activities have been cross-checked against supporting literature.

3 SEPLS Management: Challenges, Community Response, and Health Outcomes

The two cooperatives have been sustainably utilising and conserving the resources of the SEPLS, maintaining the well-being of both the Sundarbans and themselves. However, they have faced a plethora of challenges in managing the Sundarbans' SEPLS. In response, IPLCs have taken various actions to adapt to and mitigate these challenges (Fig. 2.1). These actions have led to (1) increased regenerative capacity of the Sundarbans and well-being of ecosystems and (2) increased income and standard of living, low-impact lifestyles, and sustainable production and consumption by IPLCs, which has contributed to positive health outcomes. On the one hand, the SEPLS remains healthy providing numerous services to the IPLCs, and on the other, IPLCs find natural solutions to the problems faced, i.e. disease and livelihood insecurity, and enjoy increased income and therefore increased expenditure on health (Fig. 2.2).

The challenges faced in SEPLS management include (a) siltation in the canals and rivers of the Sundarbans due to low flow of upstream water; (b) tidal management, water engineering, and embankments in upstream transborder waterbodies; (c) spread of invasive species; (d) climate change and salinity intrusion; (e) industrialisation and development projects near (or around) the SEPLS; (f) extracting of resources using harmful and unsustainable techniques (e.g. setting fire, poisoning water); (g) increasing habitation and illegal encroachment; (h) land shortage, land reclamation, and shrimp cultivation; (i) rent-seeking tendencies and extralegal management; (j) marginalisation of local and indigenous people and existence of poverty; (k) biodiversity degradation, frequent natural disasters, resource vulnerability, and livelihood insecurity; and (l) COVID-19.

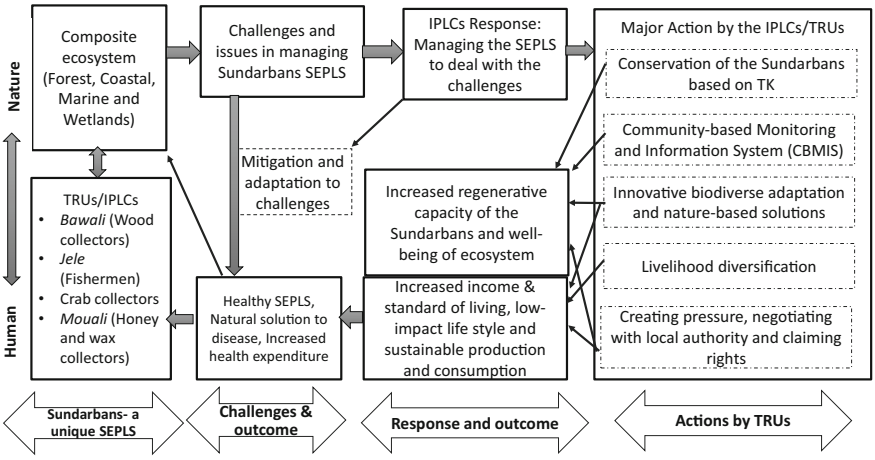

Fig. 2.2 SEPLS management: challenges, community responses, and health outcomes (source: prepared by authors)

IPLCs have adopted various innovative and participatory local approaches and actions to manage the SEPLS sustainably for ecosystem health, animal health, human health, and livelihood security. These are (a) mobilising themselves for claiming rights and protecting the SEPLS; (b) securing land through struggle; (c) negotiation with local government; (d) conservation practices based on TK; (e) community-based monitoring and information system (CBMIS); (f) community plantation; (g) homestead plantation; (h) innovative biodiverse adaptation and nature-based production, i.e. sustainable aquaculture (fish and crab culture) and sustainable forest product culture (*golpata* culture, honey and wax culture); and (i) working with local government and the forest department as a watchdog to stop illegal hunting and harvesting, cutting of trees, and usage of poison and harmful nets to catch fish. For example, the Munda Indigenous Forest People Multipurpose Development Cooperative, one of the two cooperatives, has been able to regain and restore some of its lost land amounting to 42 *bighas* (29 acres), from the powerful encroachers. The reclaimed land is located at 22°18′0″N and 89°18′10″ E (Fig. 2.3). On the other hand, the other cooperative targeted in this study, the Koyra Forest People Multipurpose Development Cooperative, has conducted community afforestation on 42.10% of 494 hectares of land along the embankment of the *Shakhbaria* River (*Rai* River) in Koyra Upazila. The area of this afforestation along the embankment is 206 hectares (Fig. 2.3). These activities enhance ecosystem health, animal health, and human health, forming a virtuous cycle. The healthy ecosystem provides more services to human beings, and thus helps promote and maintain human health.

The survey and FGDs revealed that before the onslaught of the COVID-19 pandemic, the IPLCs in these two cooperatives had been able to lead somewhat decent lives by their standards through utilising the resources of the SEPLS. They had been achieving positive outcomes from all of their actions in SEPLS management. However, the pandemic posed severe stresses on their lives and livelihoods, resulting in poor health. Cooperative members suffered a 26.16% income loss due to COVID-19 (Table 2.4). They argued that this loss of income and resulting distress in livelihoods and health were triggered by closure of economic activities and restriction of movement when the government imposed a nationwide lockdown from 23 March to 30 May 2020 due to the first wave of the pandemic. The second wave—which was supposedly deadlier—started in March 2021. All respondents argued that they were not able to go to markets to sell the resources collected from the Sundarbans. They also faced falling prices of the resources due to the pandemic. As a result, they incurred income loss. Nevertheless, they reported that during the lockdown they consumed mostly resources collected from the forest in order to cope with their livelihood hardships. The outcomes from SEPLS management have played a major role in saving lives and securing the health and livelihoods of the IPLCs in the two cooperatives. However, the COVID-19 pandemic has created new poverty, polarisation, and inequality in the society, though it has had no direct impact on the Sundarbans. The indirect impacts, however, have been significant (e.g. more harvesting to make up for loss of income).

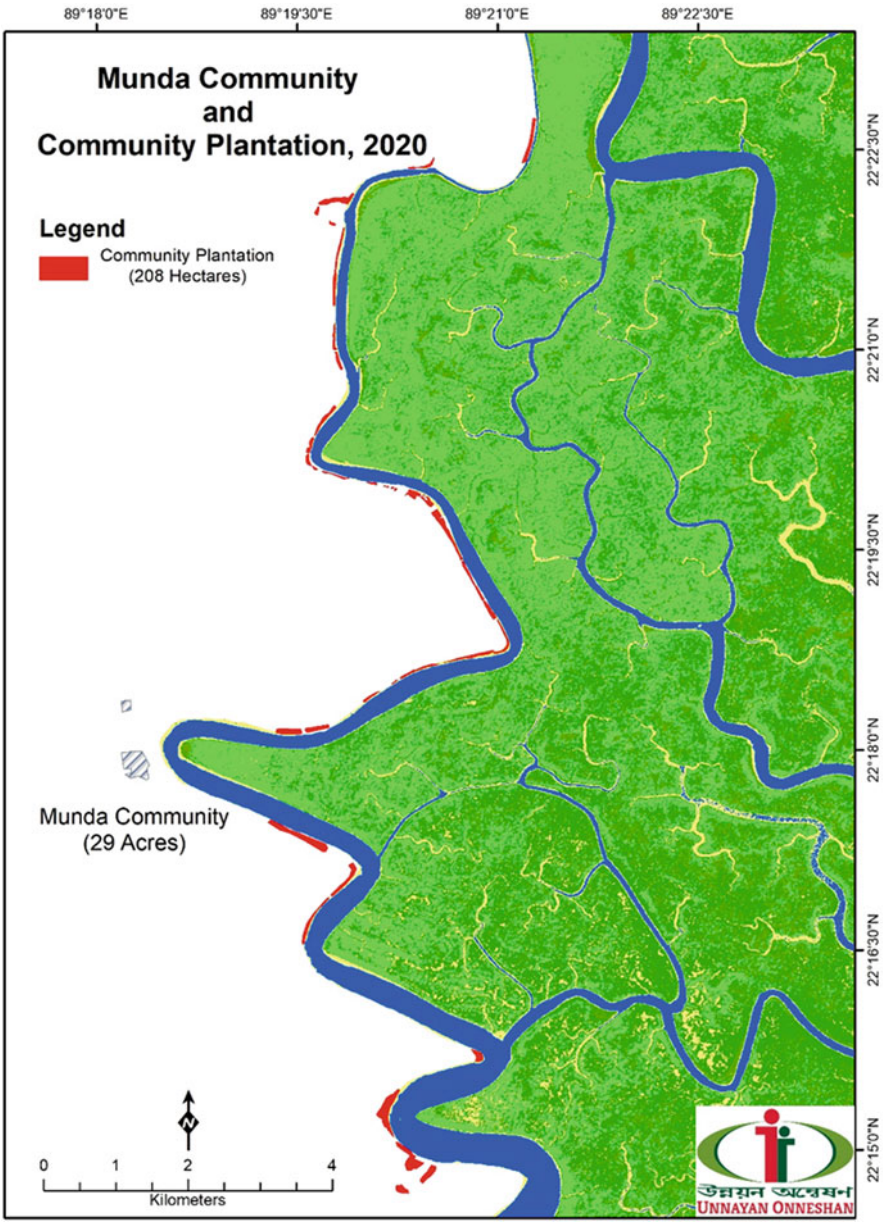

Fig. 2.3 Securing of land by Munda Cooperative and community plantation by Koyra Cooperative (source: Unnayan Onneshan, 2020a)

4 State of the Forest and Impacts of COVID-19 on TRUs

This globally acclaimed heritage site, including its sanctuaries and ecologically critical areas, which also acts as a natural wall to climatic variabilities (e.g. cyclones), is now ecologically vulnerable due to overexploitation of resources and ineffective institutions. The ill-being of the forest also negatively affects the lives and livelihoods of its people, who have suffered further hardships due to the impacts of COVID-19.

4.1 State of the Forest

Some studies have argued that even though the forest's boundary is almost unaffected, the quality of the woods is deteriorating (Hussain & Karim, 1994; Siddiqi, 2001; Iftekhar & Islam, 2004). The decadal changes in forest coverage in the part of the forest in the Khulna administrative range, drawn by PPGIS, indicate that the amount of trees is declining drastically (Fig. 2.4). As a result, the amount of fallow land is increasing. In two decades, the total area of dense forests in the case study site has halved. The coverage and density of the Sundarbans are declining.

The dark green parts in Fig. 2.4 correspond to areas of dense forest, light green parts correspond to areas of moderately dense forests, and areas where the forest is very thin are shown in white, indicating that these areas have become empty fallow lands. The white areas of fallow land have doubled in the last two decades from 4546 hectares in 2000 to 5678 hectares in 2010, and 10,501 hectares in 2020. In contrast,

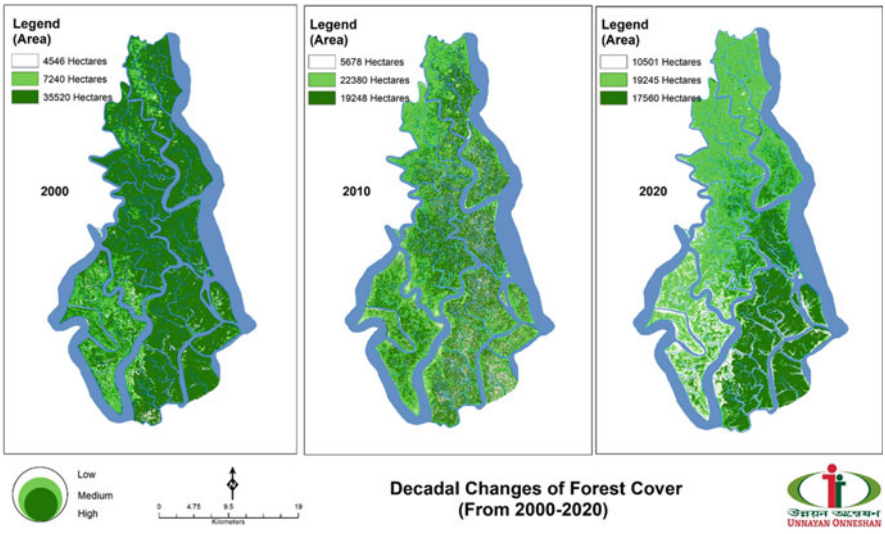

Fig. 2.4 Decadal changes of forest coverage (source: Unnayan Onneshan, 2020a)

the region of dense forests has declined sharply from 35,520 hectares in 2000 to 17,560 hectares in 2020. Similarly, there has also been a marked change in the area of moderately dense forest, increasing from 7240 hectares in 2000 to 22,380 hectares in 2010 (Fig. 2.4).

The main reasons behind the forest coverage and biodiversity loss are man-made pressures, climate change, and natural disasters (Titumir, 2021). First, illegal encroachment of forest land by powerful groups is increasing. There has been a gradual increase of human settlements around the forest. Though cutting of trees is banned, illegal tree felling is accelerating deforestation. Second, many development projects and commercial activities are being carried out, even around the ecologically critical area, therefore causing harm to the ecosystem (Titumir et al., 2020). Third, biodiversity and forest resources are being degraded as a result of over-extraction. Harmful methods of resource collection are one of the main culprits behind this loss. For example, people often use poison and harmful nets for catching fish (Titumir et al., 2019). Fourth, the frequent occurrence of catastrophic natural disasters is damaging the ecosystem and biodiversity. Fifth, climate change is negatively affecting many organic as well as inorganic components (e.g. salinity, rainfall, soil pH, mineral ingredients) of the forest (Titumir et al., 2022). Finally, existing forest law and management approaches do not recognise the traditional rights and traditional knowledge of the IPLCs. For example, TRUs need to collect a clearance certificate from the forest department to go to the forest for resource collection amounting to a certain amount of money. This system has often been accused of irregularities and corruption. These irregularities have forced TRUs to collect more resources than required to survive in order to meet extra costs (Titumir, 2021).

4.2 Impact of COVID-19 and Supercyclone Amphan on Traditional Resource Users (TRUs)

Members of the two cooperatives who depend on the forest for their livelihoods as traditional resource users have historically faced multiple pressures due to clientelist systems in forest use and management. In this context of existing hardships, the COVID-19 pandemic, nationwide lockdown, and the supercyclone *Amphan* wielded catastrophic impacts on the lives and livelihoods of many forest people. Survey results revealed that the number of households in two cooperatives suffering income loss was 103, or 76.3% of total households surveyed. The average monthly income loss was 48.98 USD (Table 2.3).

Khalil Dhali, a 53-year-old TRU and also the president of Koyra Forest People Cooperative, has been collecting resources from the forest for years. The supercyclone Amphan devastated the livelihoods of millions like Dhali, leaving wreckage in the forest:

> *Amphan destroyed the resources of the forest. It has swept away our home, damaged the embankments, inundated farmlands with salt water making them unfit for further cultivation.*

Table 2.3 Impacts on household income during the pandemic (source: author's survey)

Total no. of households	Average no. of household members	No. of households facing income loss during the pandemic	Average monthly expenditure of households	Average monthly income before COVID-19	Average monthly income during COVID-19	Average monthly income loss due to COVID-19
135	6.5	103	17,700 BDT (212.74 USD)	15,575 BDT (187.2 USD)	11,500 BDT (138.22 USD)	4075 BDT (48.98 USD)

Table 2.4 Different impacts of COVID-19 on households

Impact/item	No. of households	Percentage
Reduction in food expenditure	15	11.1
Reduction in health expenditure	4	3.0
Reduction in clothing and shelter expenditure	18	13.3
Income loss	35	26.0
Unemployed household members	35	26.0
Households supported under government's social safety net programmes	50	37.0
Households receiving immediate relief/cash assistance from the government during pandemic	72	53.3
Households facing income loss	103	76.3
Households taking loans to bear living expenses during COVID	132	98.0
Households bearing expense by using their savings	77	57.0

> *Water of ponds and tube wells has become saline too. We have nothing left. We cannot even collect resources as before. Many of us are starving. There is no option left for switching the occupation currently due to coronavirus.* —Khalil Dhali

The nationwide lockdown caused a severe fall in demand for the resources collected by TRUs in the Sundarbans. Accordingly, they got lower prices for their resources in the market. They could not even go to the markets for several months due to the lockdown and social distancing measures, which left most of them with no income at all. Amori Begum, a female TRU who usually goes to the forest to collect resources to contribute to her family, echoes her male counterpart:

> *We had to sit idle during the lockdown. We were not allowed to go to the forest and to the markets. We had no income for several months. Amphan caused another catastrophic blow on our livelihoods at the time. Even after the lockdown was relaxed, we are not getting proper prices for the resources in the market. People are less willing to buy than before.*— Amori Begun

The pandemic has resulted in reduced expenditure to meet the basic needs of households (Table 2.4). Reductions in food expenditure, health expenditure, and clothing and shelter expenditure were 11.35%, 3.0%, and 13.0%, respectively.

About 26% of household members are unemployed, while 98% of households have taken loans from multiple sources such as relatives, NGOs, or informal lenders during the COVID era. About 57% of households have used their savings to bear the family expenditure (Table 2.4).

4.3 Disruption in the Ecosystem

According to the TRUs, the expropriation of resources through over-harvesting and due to numerous anthropogenic pressures is creating disruptions in the ecosystem balance, resulting in massive biodiversity degradation in the forest (Fig. 2.5) (see causes in Sect. 4.1). As a consequence, there are emergences of new diseases, and the amount and quality of ecosystem services fall, leading to livelihood distress and ill-being for the TRUs in the forest. Furthermore, according to the TRUs, the policy regime is failing to secure the jobs, food, and social security of the people adequately. Hence, the existing socio-economic distress has become dire suffering for them, which also negatively affects the ecosystem posing further pressures (Fig. 2.5).

The expropriation of the forest continues, according to TRUs, when people extract resources unsustainably to get more money in the market. It can be said, therefore, that the commodification of resources—profit-making by selling in markets—is derived from the alienation of human beings from nature. Alienation from

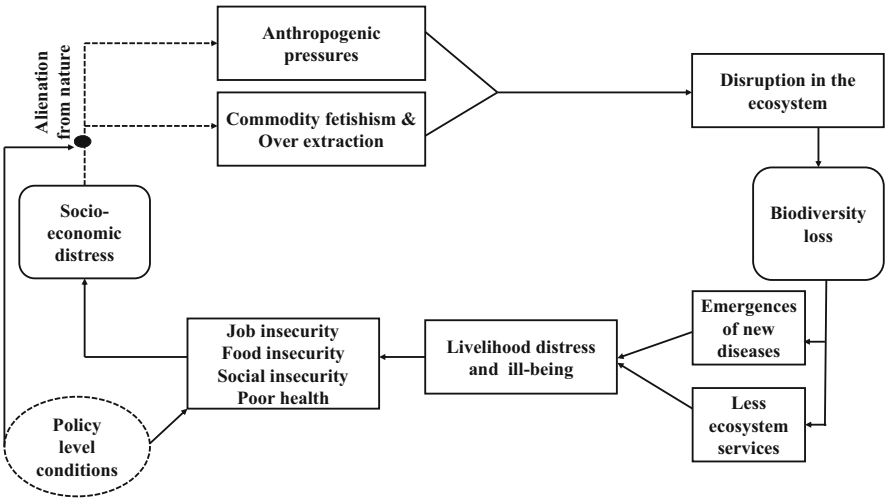

Fig. 2.5 State of the forest and its people: biodiversity loss and livelihood distress (source: prepared by authors)

nature heightens when people do not consider the true intrinsic value of nature, only monetary valuation (Titumir et al., 2019).

4.4 Policy Regime and Response to COVID Impacts

The current policy response in Bangladesh has been found inadequate to the needs of the majority of the people—informal sector workers, the poor, vulnerable, lower middle class, middle class, and other disadvantaged portions of society in face of the COVID-19. Overall, healthcare structures have been drowning in the burden of disease for months. Still now, the health sector comprises only 0.9% of GDP (Unnayan Onneshan, 2020b).

There is no provision of universal social security programmes in the country. The ongoing targeted approach—social safety net programmes—has not been able to curb the fallout from shocks, particularly for COVID-19. Existing social protection programmes are inadequate and fragmented. The selection of beneficiaries is also mired by exclusion and inclusion errors (Unnayan Onneshan, 2020b). The stimulus package announced as an immediate response to the COVID-19 pandemic has also been found ineffective for the majority of the people. The powerful and clientelist syndicate is grabbing the opportunities, while poor, vulnerable, and disadvantaged people are marginalised. The lack of an adequate and effective response from the government has heightened the suffering of IPLCs in the Sundarbans as well. Only 37% of households in the two cooperatives are covered under social safety net programmes (Table 2.4). On the other hand, only 53% of households have received immediate relief/cash assistance from the government during the pandemic (Table 2.4). Livelihood insecurity has plunged the forest people into unprecedented precarity.

5 Community Conceptualisation of the "One Health" Approach in the Sundarbans

The TRUs consider the Sundarbans to be their mind, which means they equate their lives and well-being with the life and well-being of the forest. Their thinking processes and ways of life, as well, revolve around the life and spirit of the forest. The forest contributes to the people's existence, livelihoods, breeding of their offspring, safety and security, and well-being. The IPLCs in the Sundarbans count on it. Their lives are influenced by the plethora of amenities offered by this forest, which combines numerous types of value and contributes to well-being. Well-being, as they understand it, is the health and security of both the forest and themselves, maintaining ecosystem balance. Therefore, the TRUs depend on both the biotic and

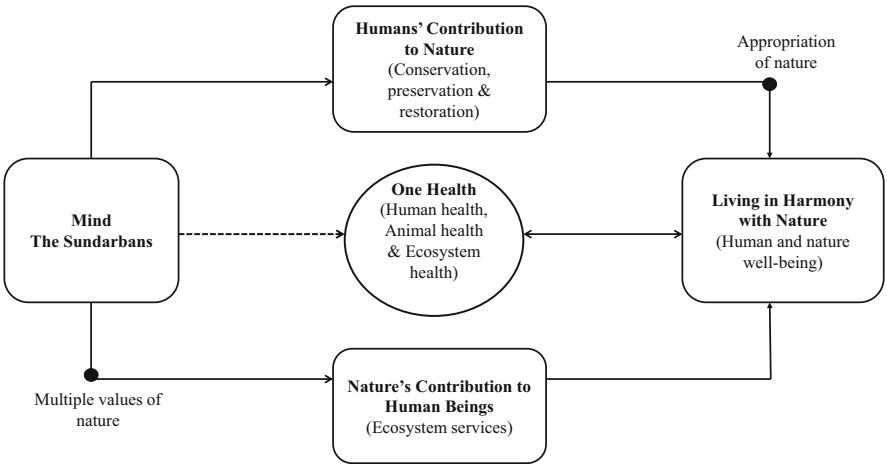

Fig. 2.6 Community conceptualisation of the "One Health" approach (source: prepared by authors)

abiotic features of the ecosystem to realise a good quality of life. Securing healthy lives for humans, animals, and the ecosystem simultaneously, as they signify, is the mainstay to realising well-being in the ecosystem. This understanding leads them to contribute to conservation, preservation, and restoration of nature, which leads to the well-being of the ecosystem (Fig. 2.6).

Therefore, the interdependent relationship between IPLCs and the Sundarbans amounts to living in harmony with nature (Fig. 2.6). In contrast, according to them, if alienation of human beings from nature prevails, commodification and thus massive extraction of resources result, leading to disruption of the ecosystem and biodiversity loss (Fig. 2.7). While IPLCs consider the Sundarbans as their life and count on the true intrinsic value of the nature, outsiders are alienated from the nature. Hence, outsiders (illegal encroachers and politically powerful business syndicates) seldom care about conserving nature.

The TRUs say that human beings often consider themselves to be "independent" or the "masters" of nature, in spite of being a part of the ecosystem. They argue that alienation from nature and treating nature as "mere matter" or as an "asset class" leads to over-extraction and destruction of nature in various ways. Therefore, human beings become separated from nature when they fail to understand the true value of it. They become unable to see themselves as part of the ecosystem and to recognise the association between humans and nature (Titumir et al., 2019). This alienation, as they suggest, results in the commodification of nature based on market-centric prices. In other words, valuation of nature becomes equal to market prices, which causes over-extraction, and thus destruction, of the natural resources (Fig. 2.7).

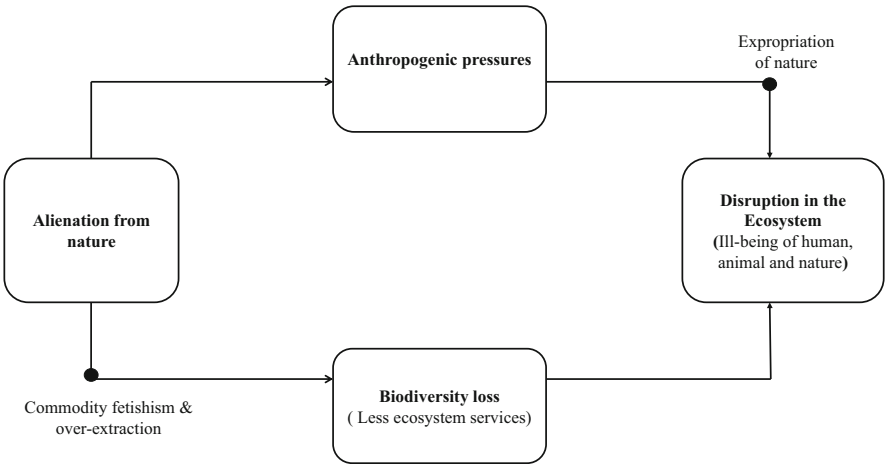

Fig. 2.7 Alienation from nature and biodiversity loss leading to ill-being (source: prepared by authors)

6 Human Contribution to Nature

In response to the continuous biodiversity loss that negatively affects the well-being and health of both the forest and its people, members of the cooperatives have adopted several innovative practices for biodiversity restoration and conservation. These practices enhance the ecosystem and animal health, which in turn promotes human health and well-being through the provision of multiple ecosystem services (Fig. 2.8).

6.1 Promotion of Customary Sustainable Practices and Traditional Knowledge

The members of the cooperatives have developed specific sustainable practices following traditional and customary knowledge. These practices are resilient and adaptive to climate change and can be promoted as innovative models for sustainable solutions for withstanding any shocks in the coastal, marine, and forest ecosystems. The communities have also developed course materials on each of the practices for training purposes and compiled an inventory on traditional knowledge (TK) with the help of UO. They apply their traditional knowledge and sustainable and customary practices for the conservation of biodiversity and nature. Further, they maintain a few specific rules and practices while harvesting resources, which are also based on traditional knowledge. They follow traditional customs and beliefs which are also consistent with resource conservation (Titumir et al., 2019). Moreover, they apply their knowledge to innovate newer techniques and methods.

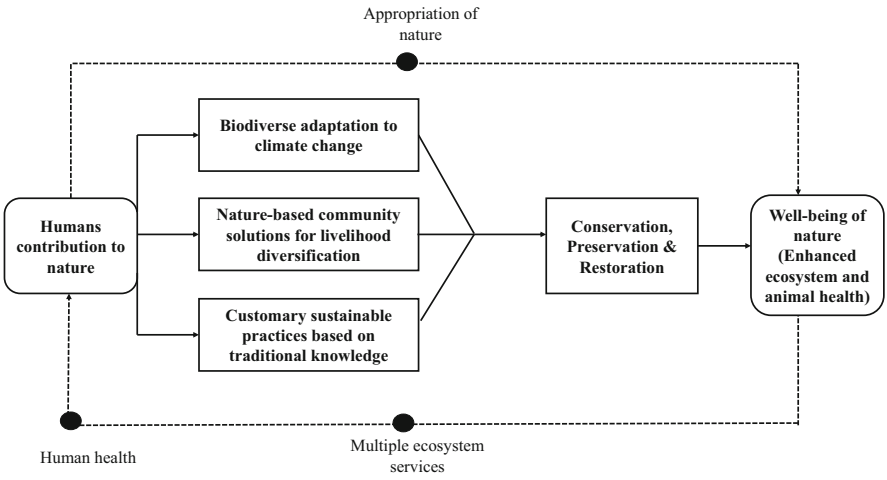

Fig. 2.8 Human contribution to nature (source: prepared by authors)

6.2 Innovations in Livelihood Options and Biodiverse Adaptation

The TRUs have diversified their livelihood choices by utilising their traditional knowledge and experiences. These practices reduce their dependence on the forest, and thus help conserve the biodiversity. Likewise, livelihood security results in good health. As alternative sources of livelihoods, they invented joint cultivation of crabs and ducks in one farmland. This practice has been found to be very profitable for the cultivators. They also developed an integrated cultivation practice for some mangrove faunal species like crabs, oyster, or fishes (e.g. *shrimps, bhetki [Latescal carifer]*) and floral species like golpata (*Nypa fruticans*), *keora* (*Sonneratia apetala*), and *goran* (*Ceriops decandra*) together in brackish water. This practice is known as community-based mangrove agro-aqua-silviculture (CMAAS) (Titumir et al., 2020). It serves as a substitute to commercial shrimp (CS) culture, and poses little or no negative impacts on the ecosystem (Titumir et al., 2020).

7 Modified "One Health" Approach: A Policy Perspective for the Post-2020 Biodiversity Framework

The society-wide approach to conservation and sustainable use of biodiversity through SEPLS management in the Sundarbans can ensure and enhance the "One Health" that encompasses human, animal, and ecosystem health. Promoting One Health, however, requires concerted actions. Firstly, ensuring rights-oriented social

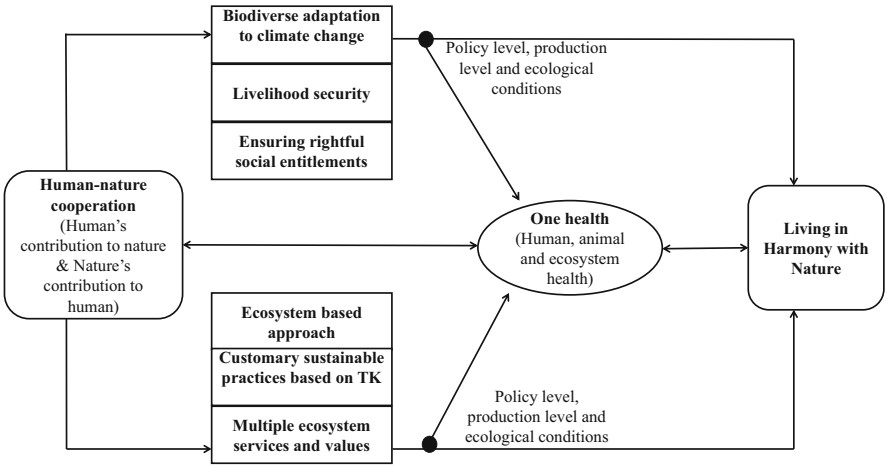

Fig. 2.9 Living in harmony with nature: modified One Health approach for post-2020 period (source: prepared by authors)

entitlement is required for everyone, such as universal access to education, healthcare, and social security programmes. Secondly, livelihood security that includes food security, job security, and social security is also essential. Thirdly, it is important to promote human-nature cooperation through green production systems such as clean and green energy, sustainable and ecosystem-based approaches to production and consumption, and biodiverse adaptation to climate change. Lastly, promotion of customary sustainable practices and traditional knowledge in SEPLS management are also required (Fig. 2.9).

These activities, however, depend on regional and global partnerships, and are also influenced at the policy level and production level and by ecological conditions. Policy-level conditions are indirect drivers of change in the ecosystem and include institutional and governance systems, power and class structures, property rights, and legal arrangements. The production level and ecological conditions are the direct drivers of change in the ecosystem. The production-level conditions include carbon emissions, pollution, over-extraction, degradation and exclusion, harvesting and fishing, reforestation, and innovative use, while the ecological factors are climate change, weather patterns, natural disasters, and other hazards. When the drivers of change (production, ecological, and political conditions) affect the ecosystem positively, the multiple services of the ecosystem contribute to human well-being. If the drivers negatively affect the ecosystem, the well-being of both humans and nature is disrupted. The appropriation of nature (conservation, restoration, sustainable use, access, and benefit sharing) ensures a harmonious relationship between humans and nature, transforming the quality of life of both. Human-nature cooperation encompasses both the human contribution to nature and nature's contribution to human beings, and contributes to maintaining a healthy ecosystem—"One Health"—leading to living in a harmony with nature (Fig. 2.9).

8 Conclusions

Exploring the interdependent relationship between humans and nature in the COVID-19 era in the Sundarbans, this case study revealed that the ecosystem in the Sundarbans is in disruption due to expropriation of nature. As a result, there has been massive degradation of biodiversity resources, which is also negatively affecting the lives and livelihoods of IPLCs. Forest coverage is decreasing, therefore negatively affecting the amount and quality of ecosystem services. The ongoing pandemic has further exacerbated the socio-economic distress of the forest people. The ill-being status of any feature in the ecosystem—biotic or abiotic—causes a metabolic rift in the ecosystem and therefore entraps the ecosystem health in a vicious cycle. The study also found that the policy response to curb the economic fallout from COVID-19 was inadequate. The absence of universal social security programmes in the midst of livelihood insecurity has heightened the suffering of the TRUs. The study also outlined that nature contributes to human well-being in multiple ways, and likewise, humans also contribute significantly to nature's well-being. Analysing the community understanding on the One Health approach demonstrated that humans and nature are dependent on each other and form a human-nature sociality in the ecosystem where they coexist. Therefore, the appropriation of nature (conservation, restoration, sustainable use, access, and benefit sharing) instead of expropriation (anthropogenic pressures) serves as a yardstick to ensure a virtuous cycle (good quality of life) in the ecosystem and the harmonious relationship between humans and nature. In this regard, a modified One Health framework for the post-2020 period was presented, which can promote a human transition to living in harmony with nature. The framework calls for ensuring rights-oriented universal social entitlements, provision of livelihood security, and promotion of human-nature cooperation through green production, ecosystem-based approaches, and biodiverse adaptation to climate change, underwritten by customary sustainable practices and traditional knowledge in SEPLS management.

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