



VULNERABILITY TO VIABILITY  
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# Transitioning from Vulnerability to Viability: Learnings from COVID-19 pandemic

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## V2V Working Paper Series

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# Transitioning from Vulnerability to Viability: Learnings from COVID-19 pandemic

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## Abstract

Chilika Lagoon, the largest brackish water lagoon in Asia, not only supports a congregation of migratory birds but is also a source of employment for the small-scale fishers living in the nearby villages. These small-scale fishers contribute to national as well as global food security and secure income throughout the year. However, the livelihood of small-scale fishers is marginalized due to several natural and anthropogenic drivers. While there has been considerable research on various drivers causing vulnerability in history, this working paper sheds light on the role of the recent pandemic, COVID-19, as a crucial driver leading to multiple vulnerabilities. Using Chilika Lagoon, India as a case study, this paper explains how the tenure of the COVID-19 pandemic, from the days of lockdown to non-isolation days, led small-scale fishers to new types of vulnerability in terms of social, economic and environmental dimensions. The era of the pandemic has also shown the adaptability of small-scale fishers at the short-term level and major role of governance in the long-term viability of small-scale fishers by considering COVID-19 as a lesson. First, this paper outlines the existing vulnerabilities and new vulnerabilities that emerged during the COVID-19 pandemic. Second, it analyzes the multilevel coping responses by fishers and the institutions. Third, it discusses the expectations of fishers in terms of better administration. Finally, the study concludes with a vision that it would be beneficial to ponder short-term coping responses of small-scale fishers along with good governance for the transition from vulnerability to long-term viability.

**Keywords** Small-scale fisheries • Pandemic • COVID-19 • Vulnerability • Viability • Chilika Lagoon

## 1. Introduction

This paper presents a view on existing vulnerabilities in small-scale fisheries (SSF), and the new vulnerabilities emerged due to a recent pandemic COVID-19 and what coping measures were taken to save the livelihood and wellbeing. Fisheries are considered as an important part of the food chain and essential diet. Fish and other aquatic foods in diets have a crucial role in nourishing nations and addressing food and nutrition security (Bennett et al., 2020). Fisheries provide food to more than three billion people worldwide, with trade volumes exceeding USD 160 billion per year (FAO 2020). Globally, there are an estimated 32 million people directly employed as small-scale fishers (SSF), an additional 76 million employed in post-harvest jobs, and 81% of catch is used for local human consumption (The World Bank, 2012).

Fishers live vulnerable lives and are susceptible to marginalisation due to various types of drivers causing vulnerabilities. The origins of these vulnerabilities, however, are often found outside the fishery itself, and are related to basic human needs such as access to drinking water, health facilities or schools for their children, or simply a need for political recognition. These vulnerabilities are caused due to multiple drivers which could be natural or anthropogenic. Vulnerabilities impact both physical and mental health of fisherfolk leading to economic instability.

Literature has brought our attention to the impacts of COVID-19 pandemic on small-scale fisheries. With the surge in COVID-19 cases, the world was preparing to combat the pandemic by applying various measures. The major immediate response adopted worldwide was strict lockdown. Consequently, the lockdown obstructed the global economy and made the marginalised (daily wagers, fishers) suffer. The challenging (pre-pandemic) livelihood of marginalised communities, including small-scale fishers deteriorated during the pandemic. The sudden rise in coronavirus pandemic added several new vulnerabilities which impacted the regular activities of fisherfolk. The fishing sector was already dealing with challenges such as environmental degradation, climatic uncertainties and impacts of large-scale development projects. These challenges were exacerbated due to the pandemic. According to Marschke et al. (2020), three key factors were found impacting SSF during the pandemic, i.e., employment disruptions due to seafood system instabilities, mobility restrictions due to COVID-19 management practices, and limits on access to services such as health care or social programs.

In the context of India, the sudden lockdown enforcement on 24<sup>th</sup> March 2020 forced millions of migrant workers to undergo an uncertain future without family, food, and job. Usually, more than 50 million people migrate from Assam, Bihar, Madhya Pradesh, Odisha, Punjab, Rajasthan, Uttar Pradesh, and West Bengal to Maharashtra and Delhi for work. Due to the lockdown, these people were forced to move out of these cities and return to their homes in the countryside (Ranscombe, 2020). In the absence of transport facilities, workers with infants, pregnant women, and the elderly were forced to travel on foot (Mukhra, 2020). Hence, India experienced the second-largest reverse mass in its history after the Partition of India in 1947. Prominent psychosocial issues were expected among migrants for COVID-19 pandemic and lockdown [MHFW, 2020; Choudhari, 2020)].

During this lockdown period, the educational institutions were closed which hampered the overall teaching-learning process and education system due to the unavailability of online and computer systems among all the students in rural India owing to the disparity of economic conditions. Medical facilities faced a critical time in India. Isolation, fear, uncertainty, economic turmoil were namely a few issues that caused psychological distress among humans due to COVID-19 (Kocchar, 2020). In India poverty, starvation, hunger is still an issue that escalated due to COVID-19. Mass unemployment creates frustration and drives people to chronic stress, anxiety, depression, alcohol dependence, and self-harm. From 19<sup>th</sup> March to 2nd May, 338 deaths were reported due to lockdown which included suicides arising due to fear of corona, self-isolation, starvation, and financial distress (The Economic Times, 2020; Dsouza, 2020). With poverty, mental and health issues, social and political issues, rights deprivation, financial instabilities, and other vulnerabilities, the small-scale fishers residing in Chilika lagoon, India suffered a traumatizing impact of COVID-19 pandemic, which is discussed in detail in this paper. The following three objectives guided this research:

### **Objective 1**

To understand the nature of vulnerabilities in fishing communities under the impact of the Covid-19 global driver

- 1) What are the existing vulnerabilities?
- 2) What are the new vulnerabilities emerged due to pandemic?

### **Objective 2**

To examine the various coping responses by the fishing communities to the impacts of the Covid-19 global driver

- 1) What are the coping measures adopted by SSF & coastal communities?
- 2) How other actors like government, NGOs, civil societies responded?

### **Objective 3**

To assess possible governance arrangements for ensuring viability of the SSF during and post Covid-19 pandemic

- 1) How is governance mechanism working for the viability of SSF coastal communities?
- 2) Are there any plans or policies that ensure viability after the pandemic?

Transitioning from vulnerability to viability (V2V) is a crucial area of study that requires further attention. The COVID-19 crisis is a new type of unfolding disaster, for which short-term relief measures and longer-term adaptation and rehabilitation are required. (Ranjan et al., 2021).

Vulnerability of small-scale fishing communities is linked to their high dependence on natural resources and strong attachment to coastal areas (Allison et al., 2006; Islam, 2011; Salas et al., 2011; Chuenpagdee et al., 2019). Multiple sources of vulnerability, such as disruption of marketing systems, fish declines, and bad climate conditions, affect both fishers and processors alike since post-harvest activities depend entirely on harvest activities (Tindall & Holvoet, 2008; Pedroza & Salas, 2011). Concerning small-scale fisheries, viability goes beyond economic benefits since being viable implies that good socio-economic conditions are always paired with achieving social wellbeing. Therefore, there are several benefits in engaging communities in determining both vulnerability and solutions for viability given that they can become real actors in working towards better livelihoods, as opposed to being seen only as a problem (Chuenpagdee, 2011).

It is important to understand the role of drivers causing vulnerabilities. Global change drivers affect all the various productive systems in the world and create problems that have no easy solution (Chuenpagdee, 2011). A combination of different drivers can also have similar impacts: an economic or ecological driver will not only have an impact on the economic or the biophysical components of the system, respectively. Thus, a global economic driver, such as globalization or international market shifts, can potentially influence other aspects of the system, including the ecosystem (Nayak & Armitage, 2018).

Viability is a state when the communities develop resiliency towards potential risks, obtain satisfactory livelihood capitals, and move forward to achieve social wellbeing by disregarding vulnerabilities and externalities. Vulnerability and viability are used as umbrella term that encompasses individual concepts of wellbeing, livelihood capitals and resilience. An adaptive response is the immediate response to a rising problem in a manner that alleviates or resolves the stressor (Nayak, 2017). Adaptive responses are the coping responses when practiced for a duration of time or general responses that have become the usual reaction for any problem (Nayak, 2017). These responses, when practiced following the appropriate guidelines, may become the pathways to viability from vulnerability.

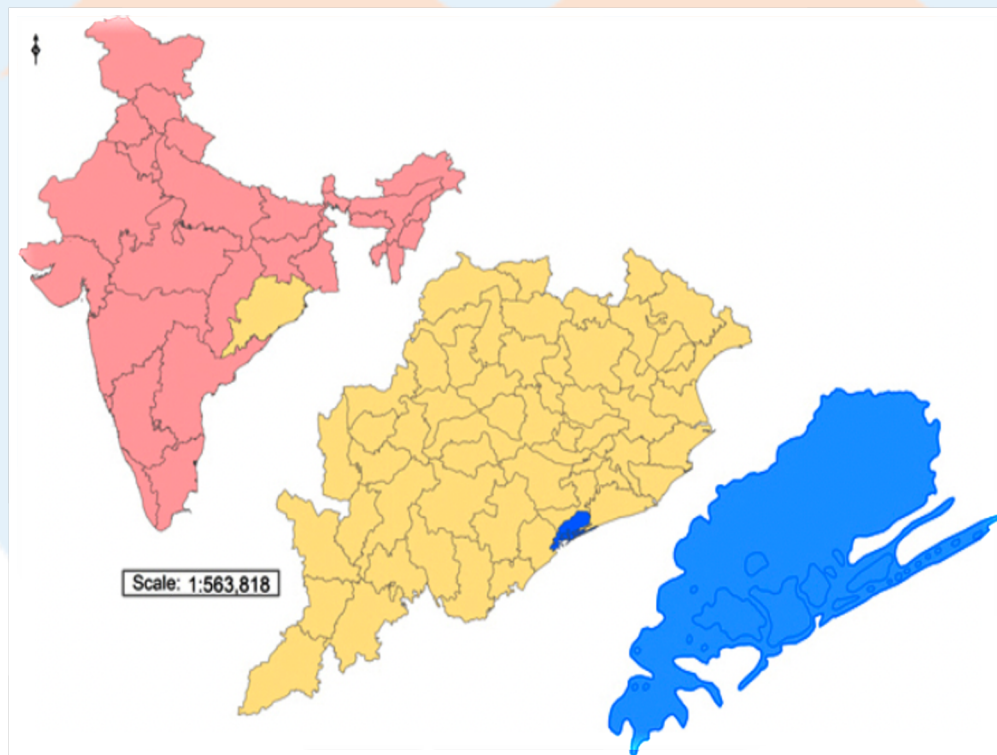
Governance is the process of interactions through the laws, norms, power or language of an organized society over a social system (family, tribe, formal or informal organization, a territory or across territories). It is performed by the government of a state, by a market, or by a network. Government agencies have an important role to play in advising the fishing communities during the pandemic and after the resumption of their economic activities (fishing and tourism) in a safe way, without neglecting sustainability. However, the general strategies for the new normal are needed to integrate environmental issues (e.g., adaptation to climate change, sustainable practices) and challenges arising from the pandemic (e.g., solid waste and contaminants, eco-crimes). Lastly, it will be important to consider the medium and long-term impacts of short-term responses. In the long run, cross-sectoral action will be needed to help rebuild the capacity and resilience of SSF and coastal fishing communities (Bennett, 2020).

## 2. Methodology and case study area

The case study for this research is Chilika lagoon, India. Chilika lagoon, also called Chilika Lake, is the largest lagoon in India and one of the largest in Asia, with an area of 1165 km<sup>2</sup>. It is in Odisha (Orissa) state on the east coast of India on the Bay of Bengal, south of Kolkata (Calcutta). Connected to the Bay of Bengal in the south, with the Eastern Ghats Mountain ranges forming most of its catchment in the north and the west, Chilika is a Ramsar Site of international conservation importance and a biodiversity hotspot (Figure 1). Some rare, vulnerable, and endangered species listed on the International Union for the Conservation of Nature's (IUCN) Red List of threatened animals inhabit the lagoon. It is the largest wintering ground for migratory waterfowl found anywhere on the Indian subcontinent and home to Irrawaddy dolphins (*Orcaella brevirostris*) (Nayak, 2014). It is a productive area with fish fauna adapted to a mix of freshwater and seawater that characterizes the ecosystems of lagoon (Nayak & Berkes, 2010). Its beauty attracts many bird watchers, tourists, and ecologists. Chilika's biodiversity is also an integral part of sustaining the culture and livelihoods of about 400,000 fishers and their families, who belong to specific caste groups and live in more than 150 villages (Nayak, 2014).

**Figure 1**

*Location of Chilika Lagoon, Odisha, India*



*Source: Nayak, 2014*

Chilika Lagoon provides the main livelihood to over 200,000 fishers across 150 fishing villages located around the lagoon (Nayak, 2014; Nayak & Berkes, 2010). Fishing has become the main livelihood for local community members in Chilika, with many locals changing their occupations to fish since it was a very profitable livelihood option (D'Lima 2014). Prior to 1980, fishing in Chilika was mainly based on capture fisheries, and traditional fishers were allowed to extract resources from the lagoon (Nayak, 2014). However, after 1980 due to the growth of the international tiger prawn market, fishing in the lagoon became even



more profitable, which led to the development of prawn aquaculture, and consequently, the fishing culture in Chilika shifted from capture to culture (D’Lima, 2014; Nayak, 2014). The encroachment of traditional fishing areas by non-traditional fishers was challenged by traditional fisher cooperatives, leading to the ban of shrimp aquaculture in 1997 (D’Lima, 2014). However, illegal shrimp aquaculture continues in Chilika and has led to the marginalization of traditional fishers as well as the “decommonisation” of Chilika Lagoon (D’Lima, 2014; Nayak, 2014; Nayak & Berkes, 2010).

A preliminary literature review was conducted to obtain a conceptual and theoretical understanding of previous research conducted on three fundamental areas of interest, namely small-scale fisheries communities or fisherfolk, drivers (COVID-19 as a global driver), and viability studies. The literature review deliberates scholarly articles, books, thesis dissertations, and other secondary sources relevant to the three areas of research. It allowed for a structured theoretical understanding, which allowed the researcher to practice gap spotting, and problematization to justify the need for further research. A literature review allowed for a thorough understanding of existing theories related to rapid change, its impacts, and its responses. The literature review for this study was conducted through various secondary sources of information such as Google Scholar, SCOPUS, JSTOR, and several other websites.

The data for this study was collected using a mixed method approach from the households residing in the villages of Chilika engaged with fishing activities. Surveys helped in understanding the livelihood and wellbeing of fisherfolk. Semi-structured, one-to-one interviews were conducted with respondents. Survey participants were sampled from SSF local community households using random sampling techniques. Snowball sampling was also used through fisher taking advantage of any connections with useful knowledge on vulnerabilities and coping responses. Criteria for survey participants included anyone having small-scale fisheries as their primary occupation. Participants selected have been fishing in the area for ten years or more (or have historical knowledge through other family members) as the purpose of this research is to investigate existing vulnerabilities in this occupation.

There were 23 questions (including both closed ended and open-ended questions) framed for the survey. The closed-ended questions asked in the questionnaire were followed by open-ended answers to understand the scenario in depth. The study targeted 50 fishers residing in the villages who were selected based on random and snowball sampling techniques. The number of participants who responded about demographic information was 50. The participants who showed further interest and actively participated in the survey were 48. Both closed and open-ended questions were used; however, notes were taken on more in-depth answers to collect both quantitative and qualitative data.

Survey data results were organized using a Microsoft Excel spreadsheet. In this study, a total of 50 participants were randomly selected residing in Chilika. The response rate was 100% for demographic questions as all respondents voluntarily participated in the questionnaire interview session, which consisted of male and female respondents (100%). For the questions based on research objectives, the rate of response was 96%, with voluntary participation of both male and female respondents. The representative ratio of gender is 80% male participants and 20% female participants. The focus of the study was to conduct a study on fisherfolk fishing at Chilika for more than 10 years despite of any gender, income level and education.

### **3. Vulnerabilities in the small-scale fisheries of Chilika Lagoon**

Changes occur due to a range of factors. These factors could be natural or anthropogenic. The most significant changes that have occurred in the fishing tenure of Chilika fishers during the past ten years have been negative in nature. Fisherfolk lost their livelihoods, wellbeing, and suffered financial and environmental crises. The following sections highlight the vulnerabilities which fisherfolk had been facing due to various drivers persisted in the Chilika lagoon.

### 3.1 Existing vulnerabilities

Table 1 explores the existing vulnerabilities of small-scale fisheries in Chilika Lagoon (in terms of social, environmental, and economic perspectives) based on the data collected through household surveys. The responses were analysed to determine changes and sensitivity to changes.

<b>Dimensions</b>	<b>Existing vulnerabilities</b>	<b>Respondent (%)</b>
Social	Livelihood mismanaged	100
	School drops out; exploitation of Children	96
	Children who were studying	2
Economic	Less fish rearing and harvesting	58
	No sell	18
	Unfair price if sold	81
Environmental	Eco-crime (hunting, killing dolphins)	15
	Natural disaster impacts	71
	Adverse impacts of prawn culture	56

*Note: Questions allowed for multiple responses*

#### 3.1.1 Social dimension

The livelihood of fishing communities was mismanaged. They were barely managing their livelihood. The parents were unable to afford school education of their children, hence dropped out the school, said 96% of fishers. Their children were helping them in fishing and other fisheries related work. This supported families of fishers economically. However, this practice also engaged the children who were below the age 10. Such types of engagements exploit the health, student life, education, mental and physical development, and growth of children. It had been noted that some of the families (around 2%) were able to make their children study despite their tough livelihood. The children enjoyed mid-day meals in the schools. The food is usually prepared considering the nutrition level, making it healthy for growing children. The children were physically and mentally healthy due to being with friends and away from the pressure of working outside and earning money. “They were very happy, studying, playing with friends, taking nutritious food in school” (Respondent 43).

#### 3.1.2 Economic dimension

The fish market had experienced fluctuating prices. “The market situation was not constant, if today price is INR 50 (USD 0.66) and tomorrow it could be INR .5 (USD 0.066)” (Respondent 24). Around 58% of respondents said that there was less fish rearing, harvesting, and selling which led to lower income. “Fish production was very less, but rate was not fair” (Respondent 25). The 18% respondents mentioned about high fish rearing, harvesting, and selling, ending in a good income just during high waves days, and this occurs rarely. “Generally, we had an income of INR.150 to 200 (USD 1.98- 2.64) per day and INR.500 (USD 6.61) during high wave” (Respondent 6). Fishing communities also suffered from the unfair price for

the sale, 81% respondents reported. Storage and, commuting issues were some of the reasons for less price. According to (Respondent 7), “There is no ice factory, fish traders did not come to purchase fish at a fair rate”. “Since there was a travel communication problem, we did not get fair price of fish” (Respondent 9). Table 2 shows the price in INR & USD of different varieties of species that were sold commonly.

Types of fish	Common names of fish	Price in INR (per kgs)	Price in USD (per kgs)
Khainga fish	Large scale mullet [Mugil cephalus (Big size)]	110 – 250	1.46 – 3.32
Kabala fish	Mugil cephalus (Small size)	100 - --20	1.33 - 1.59
Sorada fish	Liza borneensis	90	1.19
Panu fish	Kadal shrimp (Metapenaeus dobsoni)	60	0.8
Small prawn	Juvenile prawn	150	1.99
Bagada prawn	Giant tiger prawn (Penaeus s–p.)	250 - --00	3.32 - 6.64
Panu Marada prawn	Speckled shrimp (Metapenaeus monoceros)	6–80	0.8 - 1.06

### **3.1.3 Environmental dimension**

Fisherfolk were prone to various natural and anthropogenic disasters. Around 15% of respondents mentioned several types of eco-crimes such as hunting migratory birds, using zero mesh nets to catch prawn juveniles, killing dolphins, and other types of eco-crimes. Majorly, 71% respondents stated natural disasters as a big challenge. Natural disasters resulted in ecological changes affecting the fishing due to closure or opening of mouths, loss of shelter/property, loss or damage of fishing boats and gears, suspension of fishing activity, decreased availability of catch, and many more. A respondent (30) mentioned, “During Fani cyclone, we did fish prawn very less. Boats, nets of almost all people were damaged. Later, we, fishers bought these taking loan and did fishing again in Chilika.” Around 56% stated that currently growing prawn culture is a challenge for them. Prawn culture left numerous adverse impacts like contamination of lagoon water, blocking of natural flows, encroachment of capture fishery area, and many other negative effects. Thus, “fishers faced financial problems due to the increased distance in coastlines” (Respondent 27). Fishers were also aware about the benefits of having dolphins in the Lagoon. They do not kill Dolphins or birds, but rather worship (Respondent 13, 30). Respondent 47 said, “No one kills dolphin, small fishes in fear come into our net on the arrival of dolphins, now dolphin number has been decreased”. Another respondent (26) mentioned, “No one kills dolphin, dolphin is like Laxmi, it helps us fishing small fishes, tourists come to see dolphin, dolphin helps us in our income”.

### 3.2 Impact of COVID-19 on small-scale fisheries

Newspapers, television, radio, cellphones, and local groups have been the primary sources of the COVID-19 news among the fishing communities. A local respondent (27) mentioned, “In 2020, we came to know from TV and Newspaper’, government's announcements”. A female fisher (44) said, “In 2019, we came to know from TV, Newspapers, Mission Shakti, OLM, Mahila Mahasangha meeting”.

The conducted household surveys have shown that families of those fisherfolk participated in data collection were safe during COVID-19 pandemic. Nobody among their families tested positive for COVID-19. All of them were fully vaccinated (taken both the shots) and mentioned that the first dose was easily available to everyone. Most respondents, i.e., 81% cited that vaccination was not mandatory for them and other members of their family to go out on shores for livelihoods, such as fishing tourism and other recreational activities. However, 19% respondents said that full vaccination was compulsory for them to continue livelihood activities. It was interesting to note that around 2% respondents took the COVID-19 vaccine jab out of the fear of the pandemic. The worse impacts of the pandemic can be seen among the weaker sections of the society such as in small-scale fishers’ communities. It increased the vulnerabilities among those who were already suffering from susceptibilities (table 3).

<b>Dimensions</b>	<b>COVID-19 vulnerabilities</b>	<b>Respondents (%)</b>
Social	Difficulty in managing livelihood & wellbeing	73
	Not much problem; life & livelihood managed	2
	Limited regular activities & increased social gaps	8
	No school, no studies	98
	Online studies	2
	Impact on psychological wellbeing of children	44
	Accessible medical services	2
	Hard to access affordable medical services	98
	Meeting increased demand	2
Economic	Significantly decreased fish rearing, harvesting, and selling	50
	Sold at low price or did not sell	48
	Increased fish rearing, harvesting, and selling	2
Environmental	Eco- crime	10
	Natural disaster impacts	23
	Previous challenges minimized; lagoon environment has become clean & peaceful	75

*Note: Questions allowed for multiple responses*



### 3.2.1 Social dimension

From the beginning of lockdown (March 2020) and imposing restrictions, 73% of respondents felt difficulties managing their livelihood and wellbeing. For 8% of them, the pandemic was like an unexpected health crisis that limited the regular activities and increased the social gaps. “No one could go to anywhere; Government and villagers’ rules were being implemented strictly” (Respondent 48). Only 2% said that they did not face much problem and managed their livelihood somehow like before. Children’s education was negatively impacted; 98% respondents stated that schools were closed during pandemic and students also stopped studying. Only around 2% respondents could afford the online classes for their children, and the remaining 98% could not afford the online classes. They said, “Since we are poor people, our children did not have mobiles and we could not afford them to purchase a big mobile” (Respondent 24). Playing outside, gathering was restricted for children as well due to the pandemic impacts. This adversely affected their psychological wellbeing; 44% informants responded. “The children and village people were in fear” (Respondent 21). Medical challenges also persisted during this time; 98% of respondents cited that it was hard for them to access affordable medical services. “No pharmacy is in our area, it is 5km away from our village, doctors did not see the patients properly. They were not able to get medicines on time.” (Respondent 28). “There is no pharmacy near our village, so people did not get medicines in time” (Respondent 30). Around 2% of respondents stated accessible medical services were available for them. “We were given proper treatment” (Respondent 24). Nearly 2% of respondents mentioned that they saw fulfilling of increased demands of isolation rooms/centres required during the pandemic. “A quarantine center at school had been opened in support of villagers” (Respondent 46).

### 3.2.2 Economic dimension

The fish market changed drastically during the pandemic. There was a significant decrease in fish harvesting, and selling, reported 50% of respondents. Around 48% of respondents said that they faced challenges in selling the catch. Either they sold it at a low price or did not sell even after increase in fishing, said 2% respondents. A male respondent (5) mentioned, “The fish traders were purchasing fish at throw away price, due to Corona pandemic, we were forced to sell”. Overall, they faced more economic crises during the pandemic. (Table 4) shows the new price of fish market during pandemic. The prices during the pandemic were low and exploitative in nature. Also, due to the lack of transportation facilities, improper storage facilities and strict restrictions, fishers could not go out to sell the catch on their own in the market.

Types of fish	Common names of fish	Price (in USD) before COVID-19	Price (in USD) during COVID-19
Khainga fish	Large scale mullet [Mugil cephalus (Big size)]	1.46 - 3.32	1.86
Kabala fish	Mugil cephalus (small size)	1.33 - 1.59	1.33
Sorada fish	Liza borneensis	1.19	1.19
Panu fish	Kadal shrimp (Metapenaeus dobsoi)	0.8	0.40 - 0.53
Small prawn	Juvenile prawn	1.99	-

Bagada prawn	Giant tiger prawn ( <i>Penaeus</i> spp.)	3.32 - 6.64	1.33
Panu Marada prawn	Speckled shrimp ( <i>Metapenaeus monoceros</i> )	0.8 - 1.06	0.53

### 3.2.3 Environmental dimension

Most of the environmental and ecological issues continued during the pandemic, such as eco-crimes. The 10% respondents said that eco-crimes persisted during COVID-19 such as hunting migratory birds, using zero mesh nets to catch prawn juveniles, and killing dolphins. Most of the respondents mentioned about using zero mesh nets to catch juvenile prawns. It was found that 23% respondents felt natural disaster impacts worsened during the COVID-19 situation, especially during lockdown. A respondent said, “Before this pandemic (COVID-19), there was Fani cyclone, nets and boats were damaged, somehow, we were just managing that situation going through financial crisis, then pandemic arrived, we faced a vast hazardous situation. Family income was within INR 50 to 100 (USD 0.66-1.32)” (Respondent 42). “During pandemic, we did the fishing, but no fish trader came to purchase, did fasting for 5 days after taking food in a day. “Less fish in Chilika because of the cyclone, fish could not be sold for Corona pandemic” (Respondent 30). Some of the previous challenges were minimized during lockdown. The Lagoon environment had become clean & peaceful. Around 75% of informants reported that some previous challenges were minimized during the lockdown due to the absence of humans. A male respondent (28) mentioned, “During pandemic, tourists did not come, machine boat use were stopped, since fish remained unsold, people did not go for fishing. Chilika environment became peaceful and cleaned.” It was also noticed that during the surveys was that they took care of dolphins and birds in the lagoon area. The following information has been recorded from respondents during the survey) “No one kills birds, dolphins. People do have beliefs that ‘dolphin is 'Sadhab Ghar Bohu'<sup>1</sup>. 2) No one kills dolphins. The tourists do come to see dolphins, we get income from that and also dolphins help us in fishing small fishes.”

## 4. Analysing multi-level coping responses for viability

### 4.1 Response of fishers

Species adapt themselves to survive the situations. Likewise, when the COVID-19 pandemic spread, the fishing communities found out their own way to adapt themselves in that situation. With the onset of the pandemic in 2020, things came to an abrupt halt. People reduced gathering in due to lockdown orders. Fish markets were closed in Chilika. Thus, the domestic markets and tourism industry have also been directly affected by the restrictive health measures, for example, in India (Narasimhan, 2020). The closure of hotels, restaurants, cruise ships, and casinos, and the fall of tourism, further led to poor buy and sell volumes in the domestic markets for fish and fisheries products (Orlowski, 2020). Since most of the catch is sold at local fish markets, the impact of COVID-19 pandemic on income and livelihoods of fishers is considerable. With a decrease in overall demand for fish, and closure of market along with travel restrictions, the sale of fish dropped, affecting the fisherfolk economically. Without income fisherfolk faced various challenges to maintain their livelihood status like before the pandemic. Thus, to survive during pandemic times, fisherfolk adapted several measures which helped them survive physically and mentally. Table 5 explains the coping measures adopted by fisherfolk as a short-term response to the pandemic. With these they were able to survive the challenges of the pandemic. However, some of the short-term responses make them vulnerable for long term.

<sup>1</sup> Fisherman mentioned red velvet mites here. People in Chilika believe that red velvet mite is a rare species and similarly dolphin is.

<b>Dimensions</b>	<b>Coping responses</b>	<b>Respondents (%)</b>
Social	Maintained social harmony, peace & unity	77
	Food sharing & contribution	33
	No caring & sharing (negative response)	2
	Being aware of COVID-19 guidelines	87
	Cleanliness & hygiene of surroundings	42
	Support to institutions in arranging separate isolation rooms	2
Economic	Sold property & spent savings	15
	Loan from any source	100
Environmental	Clean shores or beaches & water	50
	Controlled pollution	29
	No specific activities (negative response)	25

*Note: Questions allowed for multiple responses*

About 77% respondents said that they maintained peace, social harmony and unity during the tough times. They cared about each other during the pandemic. Men and women all contributed to saving each other's lives. Women of Self-Help Groups (SHG) also played a main role in this. Some of them shared and distributed food among each other, stated 33% informants. As stated by a female fisher (28), "We women of SHG imposed lockdown in the village. We did not allow outsiders to enter our village and villagers to go outside. We also sanitized the village". Another local respondent (12) said, "We did rally to aware people on Corona virus pandemic, hand wash, distributed masks, provided rice, sugar to some people of the area" (Respondent 13). Only 2% respondents showed no care and food sharing during COVID-19. They maintained their health and wellness by keeping themselves aware of COVID-19 guidelines and protocols. A male fisher (31) said, "Imposing lock down, we did not allow outsiders to enter our village. We sanitized our village, educated people to use masks, collectively we fought against Corona virus." Around 42% said that they took care of cleanliness and hygiene of surroundings. A respondent said, "I did spray phenyl in surroundings of our house, clean with soap and sanitizers, handwash." Another local respondent (48) mentioned "Did three times hand wash per day, maintained social distance, did not go to any one's house in fear of virus". Villagers arranged separate isolation rooms for COVID-19 positives, 2% household informants cited. "Quarantine centre was arranged at the school for the people coming from outside" (Respondent 46).

To manage their financial crisis during the lockdown, they spent their savings, and sold their properties, and this was cited by 15% of household informants. Almost all the respondents (100%) took loans for their survival from relatives, neighbours, fish traders, government, and any other source they could get from. A local respondent (30) said, "We sold land in INR.70000 (USD 925.20), and the saving was INR.20000 (USD 264.34).I spent all of it for family livelihood, and received a loan in the amount of INR.15000 (USD 198.26) from SHG. So far, I have paid back INR.3000 (USD 39.65) for this loan". Another local respondent (28) mentioned, "Lock down was imposed on Saturday and Sunday, fishing was totally banned. We were selling our fish and prawn to fish traders between 7 am to 8 am, did loan of INR.30000 (USD 396.51)". Local respondent (44) mentioned, "Took loan of INR.50000 (USD660.86) from Panchayat Mahila

Mahasangha, made dry fish from prawn and fish”. Local respondent (30) cited, “Did loan of INR.10000 (USD 132.17) from relatives, INR.15000 (USD 198.26) from traders”. A respondent (26) said, “Did loan of INR.2 Lacs (USD 2631.71),’spent on son's health”. They could not opt the secondary source of income such as agriculture. A respondent (46) said, “Farming is damaged by jungle animals, loan is INR.80000 (USD127.37) (approx.), out of that INR.12000 to 15000 (USD 158.61-198.26) has been paid back”.

Communities also contributed to managing the environment. About 50% of informants said they cleaned shores or the beaches. The following are the types of contribution household informants listed during the survey:

- We cleaned the sea beach by setting fire on plastic bottles and polyethene collected from there (Respondent 28).
- We, 50 women from Mahila Samiti, Gan Kalyan Samiti (GKS) collectively cleaned pond, pondside, wastage, village surroundings putting bleach (Respondent 30).
- Did sea beach cleaning work, did polythene free area for two times. Particularly the village youths took these steps (Respondent 48).
- Women of SHG members organized meetings to aware the people about cleanliness and hygienic (Respondent 41). We cleaned near pond, tube-well surroundings from where people get drinking water, that cleaning work is still continued (Respondent 46). 29% of respondents cited that they focused on controlling the water pollution. Respondent 2 said, “I did control pollution using manual boat instead of motor operator boat that used for tourist”.

Around 25% of informants said that they did not do such specific activities. The possible reasons for not engaging could be: 1) they were not aware about what steps they can take; 2) afraid of connecting with people through any medium; 3) they had no interest in any activity; 4) maybe they were suffering from psychological consequences due to isolation. Various research described the psychological impacts of pandemic. Prolonged isolation can adversely affect physical and emotional health, altering sleep and nutritional rhythms, as well as reducing opportunities for movement (Cacioppo & Hawkey, 2003). As a result, the natural channels of human expression and pleasure become depressive, with attendant impacts on mood and subjective wellbeing (Nardone & Speciani, 2015). To date, more and more people are avoiding social relations, no longer by imposition, but as a choice.

## 4.2 Institutional response

During the pandemic, some local institutions and government supported the villagers for their survival during the pandemic. Table 6 shows the discussion on arrangements done by various local or national institutions for the fishing communities.

<b>Institutional responses during the pandemic</b>		<b>Respondents (%)</b>
Institutions involved	Fisherfolk society	2
	Government institutions	35
	Non-government institutions	67
Connected through	Social media	6
	Personal visits	77



	Telephonic contacts	18
Livelihood	Free/subsidized ration supply	8
	Supply of health care materials/ medical aid	79
	Nobody helped for medical services (negative response)	15
Respondents' awareness	Yes	100
<i>Note: Questions allowed for multiple responses</i>		

There were several institutions involved locally to support the villagers or the fisherfolk community during the pandemic. The 2% of respondents said they got some support from the Fisherman Society. 35% of respondents also mentioned that the Village Development Committee also provided sustenance to them. A major number of respondents i.e., 67% said that they received help from other non-government organizations (NGO) such as 'Save The Children, Bhubaneswar, RCDC, Reliance Foundation. The respondents described the types of help they got from different NGOs: 1) RCDC has provided ration to a few people. 2) With Save The Children, NGO, Bhubaneswar, we did roadblocks for people not to bring outsiders into our village. 3) We were provided masks and sanitizers. RCDC, NGO has helped some people. There were also some people who did not get any kind of support during pandemic, as reported by 4% of informants. Respondents were not provided any cash/money related support by these organizations.

Nowadays, social media is said to be a good way to keep people connected. Around 6% informants mentioned that institutions were connected through social media with them. A high number of informants i.e., 77%, said that they were connected through personal visits of the institution members such as with Save The Children, NGO, Bhubaneswar and other local organizations such as Jeevan Rekha Parishad also distributed masks. Some respondents (18%) said they were connected to institutions over telephone. These organizations collected information from fisherfolk through these mediums and further informed government during pandemic. Thus, government at state level stayed informed with COVID-19 situation in the Chilika and also supported them through required survival (livelihood) necessities.

For their livelihood survival, 8% respondents said they were given free/subsidized ration supply. Respondent 26 said, "RCDC has provided us a few packages". Institutions provided medical aid, added 79% of respondents. Following are the types of medical aid institutions provided: 1) Distribution of ration by RCDC, masks by Reliance Foundation, masks & handwash soap by Anganwadi center, masks and sanitizers by SHG. 2) Reliance company and OLM organization distributed masks. 3) Save The Children distributed sanitizers and masks. Around 15% of informants said that nobody helped them for medical services. They were not provided with any health care material.

### 4.3 Governmental response

Along with the institutions, state and national governments also supported the villagers through various services. The following table 7 shows the government's arrangements in responding to the essential needs of Chilika Lagoon villagers during the pandemic.

<b>Table 7</b>		
<i>Government's responses during the pandemic (N=48)</i>		
<b>Government arrangements during the pandemic</b>		<b>Respondents (%)</b>
Connected through	Social media	92

	Personal visits	2
	Telephonic contacts	2
Livelihood	Free/subsidized ration supply	100
	Cash support	96
	Supply of health care materials	6
	Free mobile testing & vaccination facilities	10
Respondents' awareness	Yes	100
<i>Note: Questions allowed for multiple responses</i>		

Around 92% respondents mentioned the government was connected to them primarily through social media. Fishers were restricted from the fishing operation during the pandemic. But their cooperatives were still active, and there were several other institutions like the panchayat office to communicate the government decision with them. The media and the administration had spread the awareness, and the fishers carried it forward in one way or the other through the help of institutions and organizations. Some (2%) said that they were in contact through personal visits such as ASHA workers. Telephonic contact was also a medium to stay connected with villagers, mentioned 2% of respondents. A local male fisher mentioned, “Government contacted us through Sarpanch and telephone” (Respondent 48). One major source to stay in contact with government was social media, as reported by 92% of informants. Only 2% said that they were being contacted through personal visits such as Panchayat members, and ASHA workers (explained in methods). Some of them (2%) were contacted through phones.

All the respondents (100%) said that they were provided with more free rations than normal days during the pandemic lockdown. This service was provided mainly during the first six months of the pandemic. 96% of informants also responded that they were also provided with cash INR 2000 (USD 26.43) per household during the lockdown. Respondents mentioned: 1) We received free ration of State and Central government and cash support of INR 2000 (USD 26.43) (Respondent 9). 2) We were given cash support of INR 2000 (USD 26.43), free ration for 6 months and women SHG had given 2 Nos. of masks each (Respondent 27). 3) The government provided free ration per card for 6 months, cash support of INR 2000 (USD 26.43) and Anganwadi centre distributed sanitizers and masks (Respondent 28). 4) We were provided cash support of INR 2000 (USD 26.43) and 5kg. ration of state and central government per head (Respondent 48). 5) We have received free ration, cash INR .2000 (USD 26.43), vaccines, and INR 1500 (USD 19.83) under Labor Card (Respondent 24). 6) We were given free ration for 6 months, cash support of INR.2000 (USD 26.43) (Respondent 50).

Fishers were not given free medical services during the early COVID-19 period. A respondent (44) mentioned, “Free mobile health service has not been done”. Though 6% respondents said that government supplied health care materials during the pandemic. All respondents responded (100%) yes for free vaccination facility. “Only the government has arranged free vaccination facilities,” said local respondent (1).

## 5. Expectations of fishers w.r.t administrative responses

Respondents were asked about their thoughts on the measures that should be or should have been taken by the authorities to minimize the adverse impacts of the pandemic on fishing communities. It was found that they suffered mainly in social and economic terms. Free ration, cash support, mask and sanitizers distribution were enough for their survival during lockdown period from March – August 2020. However, there was no solution for fishers after the lockdown period and fishers had to survive on their own. They spent all their savings, could not earn much due to the less selling of catch. The respondents mentioned some measures that could be taken to lessen the pandemic impacts on them (table 8).

Sustainability dimensions	Measures that could be taken	Respondents (%)
Social	Early vaccination	19
	Free ration	35
	Medical health	33
	Alternatives for safe livelihood	15
	Children education	6
Economic	More cash	66
	Facility for fish, prawn selling	15
	Government loan	25

*Note: Questions allowed for multiple responses*

### 5.1 Social dimension

According to respondents, government arranged almost everything for them, but still those arrangements could have been done in a better way. The government's scheme was not enough. During the lockdown period, government provided ration supply to each household, mentioned 19% respondents, nevertheless this was sufficient for them to survive during the initial days of pandemic. Villagers sought for more help after the lockdown period. Respondents informed that for their livelihood, they looked for more ration supply and other essential things from the governing bodies. A local male fisher 10 said, "It would have been beneficial for us if we could have been provided free rations for one year and implemented early vaccination programme by government". The government implemented some programs for their wellbeing as well such as free vaccination, mobile testing, and isolation facilities. Fishing communities understood that if the vaccination either was the solution to flatten the curve of pandemic and was also the solution for them to go out and continue their fishing activities. Thus, 19% of respondents said that vaccination should have been implemented at an early stage. It seems that they were suffering from psychological and behavioral impacts of COVID-19, mentioned 33% respondents. According to them, there should be hospitals opened in every block with COVID-19 diagnosis and treatment facilities. A local respondent (9) said, "It would have been beneficial, if the government officials could have taken initiatives to alert the villagers more on health issues".

Around 15% of fishers mentioned about alternatives for safe livelihood for them, as well as 6% of respondents mentioned that children's education should also be considered. Due to less income and natural disasters, respondents/fisherfolk were not able to afford house, clothes, and other essential things. They were seeking government help in this regard. A respondent said, "It would have been helpful to us, if the government would have given us loans and a house" (Respondent 15). Respondents sought help for the supply of nutritious food for the pregnant women and the mothers who just gave birth. Children were also the sufferers of pandemic. Their health and education suffered. They could not study online due to the unavailability of smartphones at home. Through a drive, government could have provided smartphones to continue their children's education. Respondent (44) mentioned, "If we could have been provided masks, ration with daily used items, more financial support, government support for selling fish in time, more importance to children's study and health, nutritious food for mother and child by the government that could have given us a better life to live". Respondent (43) said, "It would have been helpful to us if we could have been provided masks, more ration, more financial support for family management, facility for selling fish properly, mobile facility for children's online study by the government". Some respondents talked about their migration from Chilika. Migration has been related to the lower opportunities in Chilika for a better livelihood and wellbeing. People who migrated caught the COVID-19 infection. A male fisher (48) said, "If we could have been given work for our income generation here in Odisha by the government, our people would not have migrated to outside and be infected by the virus".

## **5.2 Economic dimension**

The fishing communities suffered from financial crisis before and during pandemic. During lockdown period, they were provided with cash by the government, but that support was not enough for those who were already in debt and were struggling to work more to pay off their debt. Due to COVID-19, they could not go for fishing or sell their catch and even if they did, fish was sold at low prices. This was not enough for their survival. They took a loan from different sources. Around 25% of respondents were seeking loan facilities from the government and not from other parties. Looking at the social perspective from the view of a respondent, "It would have been helpful to us if the government should have provided loans to fishers. The government does not take any initiative for fishers' promotion" (Respondent 11). It could be understood that in fishing communities there has been a custom going on till now that the son of a fisherman would be a fisherman. However, as per the data collected, respondents asked for their promotions and alternate income sources. They are not fisherfolk by choice, situations turned them to be.

## **6. Conclusions**

Identifying vulnerabilities and sources of vulnerabilities among fisherfolk prepares system managers for appropriate governance response to ongoing changes. Local responses revealed that lack of opportunities, social injustice, and unequal focus on managing the changes are the issues that make them vulnerable for long term. Moreover, the adaptive capacity of the local community was also assessed in research to provide practical recommendations for system managers.

Five attributes of local adaptive capacity explored during this study, were: response diversity, connectivity, collaborative capacity, reserves, and learning capacity. Each attribute revealed critical information to support local adaptive capacity. Response diversity was accomplished in different ways, with different resources available. For example, during the pandemic, everyone (fishermen, fisherwomen, children) dealt with the crisis as per their understanding. They paid more attention to social wellbeing by staying connected to each other through various mediums. Most of the fishers dealt with pandemic crises by being pessimist, thus maintaining their psychological wellbeing throughout the time. On the other hand, a few of them lost their hope of survival; they lived a fearful life, which affected their mental health, causing stress and depression.



Collaborative capacity includes the potential of system stakeholders such as local community members, community leaders, the village head and local government to work cooperatively to ensure system function. Fisherfolk' collaborative steps taken with institutions in spreading awareness and following the COVID-19 related guidelines not just helped fisherfolk in their survival but also helped in maintaining social harmony and peace in Chilika. Connectivity is measured by determining how readily resources and information can be exchanged to ensure continued functionality. Various institutions came forward to support Chilika fisherfolk. Institutions helped them follow the lockdown measures using the available sources, such as barricading the village entrance. Even to facilitate 14-day isolation mandate, schools were transformed into quarantine centres as there was the shortage of beds in health centres and also the health centres were far away from the village. Institutions helped them with immediate and required resources such as the distribution of food, money masks, and sanitizers to save their social and economic wellbeing.

Learning capacity is the ability to acquire, through training, experience, or observation, the knowledge, skills, and capabilities needed to ensure system functionality. During the pandemic, the way fisherfolk managed their survival within limited available resources shows that if they were empowered with skills and knowledge, their survival will become easy. They would be able to opt for more job opportunities and can stand for themselves. An increased need for local empowerment, monitoring of critical vulnerabilities, and continuous assessment was identified to foster resilience during the pandemic and the post-pandemic.

Based on the data collected it is concluded that there is a need to assess immediate and short-term responses taken against the vulnerabilities. Furthermore, integrating the responses and implementations of policies are required for their viability. During the pandemic, when survival was tough for fisherfolk, they adapted several coping measures for the survival of their livelihood and wellbeing. The other institutions and government also supported them in their survival. The short-term coping measures adapted could be considered as the "positive" responses looking at the need of the hour. The coping responses by fisherfolk included maintaining social harmony, caring for each other, sharing food, selling properties and valuables for money, and taking loans and collateral. Institutions and the government responded by providing them with necessities such as food, masks, and sanitizers. Government also supported them economically by providing some money during the lockdown period. The institutional and government responses continued until the first lockdown restrictions.

Change in livelihoods was witnessed as a prominent adaptive response to the ongoing vulnerabilities. However, it was noted that adaptive responses such as changes in livelihoods could possibly contribute to increased vulnerability of other components, such as selling properties, and taking loans and collateral will lead them towards economic crises in the long-term. Given the ways of interaction by fisherfolk, a need for a continuous process of reviewing and responding to system vulnerabilities was identified.

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## Vulnerability to Viability (V2V) Global Partnership

The Vulnerability to Viability (V2V) project is a transdisciplinary global partnership and knowledge network. Our aim is to support the transition of small-scale fisheries (SSF) from vulnerability to viability in Africa and Asia. Vulnerability is understood as a function of exposure, sensitivity and the capacity to respond to diverse drivers of change. We use the term viability not just in its economic sense but also to include its social, political, and ecological dimensions.

The V2V partnership brings together approximately 150 people and 70 organizations across six countries in Asia (Bangladesh, India, Indonesia, Japan, Malaysia, Thailand), six countries in Africa (Ghana, Malawi, Nigeria, Senegal, South Africa, Tanzania), Canada and globally. This unique initiative is characterized by diverse cultural and disciplinary perspectives, extensive capacity building and graduate student training activities, and grounded case studies from two regions of the world to show how and when SSF communities can proactively respond to challenges and creatively engage in solutions that build their viability. Further information on the V2V Partnership is available here: [www.v2vglobalpartnership.org](http://www.v2vglobalpartnership.org).

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