

Addressing Human Dimensions within the criteria for conservation and sustainable  
use of Ramsar Wetlands

by

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### **Author's Declaration**

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners. I understand that my thesis may be made electronically available to the public.

## **Abstract**

Wetlands are unique ecosystems that provide many direct and indirect services to the human population. Several policy frameworks have been developed and implemented at various levels of government worldwide to address the social, environmental and economic consequences of the loss of wetland services. These frameworks have varying degrees of flexibility to balance the need to protect remaining wetlands and pursue economic development. Therefore, this research addresses the importance of considering human dimension criteria on the International Conservation and Wetlands Ramsar Site to encourage local policy maker to understand the binding effect of decision-making and governance of wetlands in their countries on local coastal community and international socio-economy for sustainable wetland and increase of livelihood of dependence community.

This study highlights the importance of addressing the human dimension of the International Wetland Ramsar Site by examining wetland policies and governance on international and local bases considering the Chilika Lagoon case study as an example and the competing interests surrounding the decision-making of wetlands at the local level. This research highlights social-wellbeing associated with the small-scale fisheries of the Chilika Lagoon in India and the community role and adaption techniques in strengthening the social well-being of the communities concerning coastal marines and wetlands. The finding of this research addresses the importance of human relations with wetlands sustainability and community economic survival. It suggests the importance of considering the human dimension in the International Wetland Ramsar Site based on the findings in this research.

A literature review and conceptual framework were used to understand the problem surrounding the decision-making support tool to effectively assess outcomes of policies and wetland management concerning human and surrounding coastal communities. This research analyzes pathways of vulnerability resulting from mismanagement and the effect of policies and governance; in general, and the case study area of the Chilika Lagoon, the largest coastal Lagoon on the east coast of India and the lifeline of the state of Odisha as an example to show the importance of addressing human dimension and its effect on survival of local and international

wetland. This research examines and analyses the critical elements of the social well-being of coastal communities and reviews the ecosystem services of wetlands suggested on the Ramsar Site and other academic works of literature to make a linkage between the two elements and the direct and indirect impacts of natural and anthropogenic factors that have profoundly affected the vulnerable coastal community's socio-economy and wetland sustainability and survival.

Overall, the research addresses the sustainable management of coastal communities of SSFs by providing details on how fisher vulnerability may be closely linked to wetland management and governance and its related impacts. Further, the research provides some answers to how SSF viability can be achieved through coping and adaptive responses by small-scale fishing communities to the changes in local and international wetland management. The results of this thesis indicated that improving the social well-being of coastal communities could provide valuable insights to achieve improved control of food and fisheries resources. It can also help identify the present threat to small-scale fisheries communities in the Chilika Lagoon. In turn, it will bolster the community's social well-being and positive response to social-ecological changes. The result of this study will imply the importance of addressing Human Dimension criteria on the International Ramsar Site as one of the essential criteria next to the nine ecological base criteria on the Site to suggest more sustainable wetlands on the local and international level and improve the socio-economy of the costa community as they are connected.

### **Key Words**

Adaptation, Beliefs, Chilika, Cyclone, Drivers, Ecosystem services, Fishing Community, Governance, Livelihood, Marginalization, Millennium Ecosystem Assessment, Small Scale Fisheries, Social-Ecological Systems, Social Well-being, Values, Vulnerability

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## **List of Abbreviations**

CBA	Cost-Benefit Analysis
CDA	Chilika Development Authority
CWPRS	Central Water and Power Research Station
EIS	Environmental Impact Study
EPA	Environmental Protection Agency
ES	Ecosystem services
FAO	Food and Agriculture Organization
FOI	Freedom of Information
IMM	Integrated Marine Management
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resources Management
MCDA	Multi-Criteria Decision Analysis
MEA	Millennium Ecosystem Assessment
PES	Payments for Ecosystem Services
SDGs	Sustainable Development Goals
SES	Social-Ecological System
SMCE	Social Multi-Criteria Evaluation
SSF	Small-Scale Fishery
UNESCO	United Nations Educational, Scientific and Cultural Organization
WTA	Willingness to Accept
WTI	Wildlife Trust of India
WTP	Willingness to Pay

## **Chapter 1 Introduction**

### **1.1. Background**

Wetlands are particular ecosystems that benefit the human population by providing different direct and indirect services. Yet, Wetlands continue to be threatened globally with unsustainable loss rates resulting from economic development. Several policies and frameworks have been developed and implemented at various levels of governments to address the socio-economic and environmental consequences of wetlands services loss and degradation. This will have led to understanding of the importance of human action and discussion-making on wetland survival and sustainability.

The literature review conducted through reports provided on Ramsar Site and previous studies will demonstrate the threat to international wetlands and the need to protect them from further degradation, which is the primary concern in Ramsar Site and academic literature. However, little attention has been given to global wetlands survival by policymakers around the world, which is impacting local decision-making processes. This study explores the effect of human activities, such as different wetland management approaches, and their impact on socio-economic aspects locally and globally. Therefore, the Ramsar Site is considered a primary source to explore the importance of addressing human dimensions as a source that provides many reports and evidence according to updated reports provided to the Ramsar Site Secretariate every five years. A case study is used as an example based on one of the many sites on the International Wetland Ramsar site to highlight challenges to Chilika Lagoon's current system and identify the impact of management approaches on the community and related stakeholders. The study will ultimately serve as a communication platform for competing interests to inform policy challenges and the need to address human dimension criteria on the international wetland Ramsar Site.

#### **1.1.1. The Ramsar Site**

The Ramsar Site provides information on international wetlands and conservation services. Its mission is to protect wetlands' survival and discuss their ecological system locally and internationally (Ramsar Site Secretariat). The agreement to organize the Ramsar Convention Site was signed in February 1971 in Ramsar (one of the cities in Northern Iran) by attending representatives from 18 countries concerned about the dramatic loss of wetlands worldwide (Finlayson et al., 2011). There are 165 participant countries providing data and information on

wetland sustainability and degradation in their countries. This information will be updated every five years and are based on wetlands ecosystem, types, use and protection actions, policies, discussion around the characteristic of swamps, marshes and necessary maintenance actions for survival and protection of conservation and wetlands (Ramsar Site Secretariat).

The Convention Ramsar Site includes nine criteria based on supporting ecological aspects of wetlands, such as preventing wetlands from degradation and loss and protecting wildlife and fish species (Ramsar Secretariate, 2010). When a party join the Ramsar Convention, it commits to following wetland conservation planning and policy within international boundaries and to plan and act in a way that promotes the wise use of wetlands according to their rules following the characteristic of nine criteria (Finlayson et al., 2011). The nine criteria of the Ramsar Site have been explored in Chapter 2 of this research.

The Ramsar Convention approach to the wise use of wetlands clears connections between humans and the sustainable use of natural resources to encourage more community engagement and clear and transparent policies concerning trade-offs and equitable outcomes for conservation (Finlayson et al., 2011). It focuses on economic benefits, cultural values and natural heritage protection in decision-making processes and adapting a joint and multi-disciplinary approach to wetland management on an international level (Tolentino, 2013). The focus on the "wise use" definition needs a more in-depth guide on human values. It helps to identify threats tracing to various sources provided by wetlands, rather than focusing only on the ecological aspect and concluding the socio-economy point of view (Farrier and Tucker, 2000). Despite the economic benefits of wetlands developments, there is a growing need to protect and wisely use wetlands (Durigon et al., 2012; Peimer et al., 2017; Vaissière, Level & Pioch, 2017). According to Herath (2004), the critical element for successful wetland management is an in-depth understanding of stakeholders and ecological processes specific to the wetland environmental system and applying this knowledge to management strategies, which have been explored in this thesis.

### **1.1.2 The Chilika Lagoon Ramsar Site**

Chilika is Asia's most significant water lagoon, located on the East coast of India in the state of Odisha (Gupta, 2014). Chilika has been listed as a Wetland of International Importance Ramsar Site since 1981. It is a tremendous habitual system for migration birds in Winter and a rich base ground for fish and shellfish production; it meets nine major Ramsar Site ecological cafeterias provided by Ramsar Site Secretariate to be eligible to be a member (Kumar & Pattnaik, 2012). The

coastal Lagoon connects to rivers by pear-shaped wetlands, which allow water to act as a filter and are the habitat of diverse species. This salinity gradient enables the wetland to support a diverse range of wildlife while dependent communities benefit from its ecosystem services (Kumar & Pattnaik, 2012). The Lagoon has been divided into 6 Watersheds, 16 sub-watersheds, 56 mini-watersheds and 218 micro-watersheds (Kumar & Pattnaik, 2012). The artificial sea mouth, made in September 2001, connects the lagoon to the Bay of Bengal near Satapada. Earlier, the lagoon was connected by a 24 km long, narrow, curved channel to the coast, joined with the Bay of Bengal near Arakhakuda (Sarkar et al., 2012). The estimate of fish species in the lagoon is over 225. Also, it hosts over 350 species of nonaquatic plants, algae, and aquatic plants (Nayak, 2014). The high biodiversity and solid cultural values make the area a tourist attraction, attracting 300,000 domestic and foreign tourists each year (Kumar & Pattnaik, 2012). Also, there are about 800,000 non-fisher villages whose livelihood is supported by the Chilika lagoon watershed as a source of income (Nayak & Berkes, 2014).

Frequent changes in the hydrological interaction of the lagoon may have a dramatic effect on the area and increase climate change factors, which is a concern of local and national governments (Panigrahi et al., 2007). Conservation authorities implemented a new sea mouth and public education and awareness campaign to mitigate the dredging impact in the area (Panda et al., 2013; Sahu et al., 2014). The artificial sea mouth created by the government with the Bay of Bengal added another problem for the lagoon community in 2001. The sea mouth structure causes changes in water flow rates and disrupts the balance between salty water and fresh water, which affect the livelihood of fish species in the area (Nayak & Armitage, 2018). Some research shows that with changing balance and water flow in the lagoon area, fish production was reduced, impacted local fishers' livability, and made them more vulnerable (Nayak & Berkes, 2010; Jentoft, 2017). Also, shrinkage of water distribution due to changes in inflow and outflow caused shallow depth and decreased salinity, which caused biodiversity loss (Panda et al., 2010). One of the significant changes in the Chilika lagoon environment is biodiversity loss (Nayak, 2017). Changes in water system salinity caused a change in the livelihood of fish species in the lagoon environment. The biodiversity loss and change in the livelihood of fish species the Chilika Lagoon was removed from the Ramsar Site in 2002 (Panda et al., 2010). Due to new coping and adaption techniques practices the survival of the lagoon and fish species has been improved and the Lagoon earned

back their membership on the Ramsar Site (Kumar et al., 2020). Some of these coping mechanism and adaption techniques has been explore in Chapter 5 of this research.

### **1.1.3 The Ramsar Site Viability Approaches and Sustainable Development Goals**

Viability indicates that social and ecological well-being must accompany favourable economic conditions. Global approaches are studied in the research to supplement the viability approach. There are various advantages in involving communities to determine vulnerability and viability solutions, as they can become agents in working towards better livelihoods (Millán, 2019). The water environment at Chilika Lagoon reflects a complex assemblage of coastal, brackish, and freshwater habitats with estuarine characteristics. These valuable features granted Chilika Lagoon to be classified under the Ramsar Convention as a wetland of international significance. The management plan framework outlines the policies and actions needed to achieve the wise use of resources in the Chilika Lagoon and to advance the protection of its rich biodiversity. A thorough analysis of scientific evidence and consultations with stakeholders, especially local communities, were crucial to formulating the strategy (Behera et al., 2020). The Chilika Lagoon conservation area has followed the ecosystem approach towards a more sustainable ecosystem (Kumar & Kumar Pattnaik, 2013). The National Institute of Oceanography (NIO) and the Central Water and Power Research Station (CWPRS) also play a significant role by setting out strategies to save the body of water. The framework brings stakeholders, institutions, and communities together at all levels, considering their needs and desires while ensuring that the wetland environment within the river basin is maintained (Kumar & Kumar Pattnaik, 2013).

The Chilika Development Authority (CDA) adopted an ecosystem restoration approach, including opening the sea mouth for habitat conservation, avoiding the lagoon's deterioration, improving salinity levels, fish capture, and biodiversity, and strengthening the livelihoods of dependent fishing communities (Sarkar et al., 2012). The prestigious CDA "Ramsar Award" honoured the restoration effort as it successfully managed the ecological services in all aspects of biodiversity, hydrology, wetland ecology, and conservation (Finlayson et al., 2020). With the support of the Wildlife Trust of India (WTI) inside the Chilika lagoon, CDA has a bird rescue and rehabilitation centre for fishing cats, Irrawaddy dolphins, and otters to resolve habitat degradation and rehabilitate biodiversity (Behera et al., 2020).

The SSF Guidelines are tools for millions of people employed in the SSF sector to meet the Sustainable Development Goals (SDGs) and the 2030 Agenda for Sustainable Development. (FAO, 2017). The mutual correlation between the 17 goals impacts each other for the sustainability of the SSF. Maintaining water quality in SSFs is not only one of the leading players in lagoon governance. Still, it can also play an essential role in achieving reduced poverty (SDG1), food security (SDG2), community health and well-being (SDG3), quality education (SDG4), gender equality (SDG5), economic development (SDG8), industry, innovation and infrastructure (SDG9), reduced inequalities (SDG10), climate action (SDG13), life below water (SDG14), life on land (SDG15), peace, justice and strong institutions (SDG16), and partnership for goals (SDG17). Their dreams have close ties to SSF communities and are socially and culturally embedded in achieving viability (Finlayson et al., 2020).

The SSF Guidelines significantly improve the possibility of attaining viability in SSF. SDGs are wide in context without a requisite scope (Behera et al., 2020). The SSF Guidelines, on the other hand, are clear about how current governance structures can be strengthened and provide insight into how SDGs can be achieved and how they can help promote sustainability through governance. For instance, apart from defining marine biodiversity, SDG 14 also indicates the following aspects: lowering marine pollution, conserving marine habitats; minimising acidification in the seas; establishing and developing scientific capabilities associated with fisheries; improving the enforcement of international law for sustainable use of the oceans (Said & Chuenpagdee, 2019). Throughout the SSF Guidelines, solutions on how to accomplish other SDGs are available. This research adds value to the role and linkage between human dimensions and community empowerment through human interaction and effects on natural resources, considering and analysing various factors such as SDGs on the Chilika Lagoon communities as an example and how they benefit the community and how it will improve the social-ecological aspect of communities according to Ramsar Site approaches.



## **1.2 Research Gap**

Considering the Ramsar Site efforts to protect and sustain international wetlands, global wetlands loss continues to grow, bringing up some questions regarding the effectiveness of the Convention frameworks on an international level. The Convention's approach to wetland management claims a limited focus on socio-ecosystem and human relations with these lands. The focus on the 'wise use' definition needs a more in-depth guide on human values. It helps to identify threats tracing to various sources provided by wetlands, rather than focusing only on the ecological aspect and concluding the socio-economy point of view. However, the Ramsar Convention provide a definition related to wetland definition, procedures and the Convention site framework. There is some concern about understanding a wetland's hydrological and biological interaction with a larger ecosystem. Transparency policy and governance is one of the factors of wetland loss that supports ES to human well-being and the natural habitat of wildlife. Therefore, it is essential that the Ramsar Convention make sure individual countries around the globe have met the adaption of several mechanisms to mitigate wetlands loss globally and improve the socio-economy and well-being of related communities, as it is a significant gap. This gap has been addressed in the thesis through various qualitative analyses to pursue considering human dimension criteria as one of the criteria on the Ramsar Site.

## **1.3 Research Goal and Objectives**

This research assesses the linkages between wetlands protection and survival through different policy approaches on Ramsar Site and their relation and effect on human social well-being and biodiversity. It considers a case study in small-scale fishing communities and analyses the impact of multiple drivers on communities' socio-economic. The research aim is to address the importance of considering human dimension criteria on the Ramsar Site. The research objectives of this thesis are to:

1. To identify the significant effect of climate change on wetlands survival and its socio-economic impact on the local communities.

2. To better understand the importance of addressing human dimension criteria on the Ramsar Site by defining wetlands' social ecological effect on communities.
3. To Identify better incorporation of human interaction by adapting better decision making and wetland governance to meet the social well-being of local community and society.

The necessity of sustainable water management is one essential requirement for wetlands' wise use and livelihood. Sustainable water management is helpful to better understand social-ecological impacts on different communities, such as SSFs viability and livelihood (Kumar & Pattnaik, 2013). To inform the research objectives, a qualitative systematic and comprehensive literature review will explore the value of wetlands to humans and communities and discuss the sources that threaten wetlands globally. My research will examine the governance and policy tools mentioned on the Conservation Ramsar Site by different authorities and governments around the globe by using other policies directly or indirectly to address Command and control of governance approaches and their effects on wetland viability globally.

#### **1.4 Literature Review**

The literature review obtains a conceptual and theoretical understanding of various research and reports through academic literature or government reports on the International Ramsar Site. This literature review is based on conceptual and theoretical knowledge of previous research on the importance of water management and water governance, considering human dimensions and activities and their effect on wetlands' social-ecological systems. Also, the works of literature discuss the importance of sustainable water governance and its impact on wetlands resiliency and survival by offering different practical solutions to improve the socio-economy of this matter. The review will provide a theoretical baseline for my research, and a combination of varying literature will help identify the existing research gap. The understanding previous research methodology will help demonstrate and recognize the opening of addressing human dimension criteria in this specific research area.

The literature review was conducted with the help of Zotero reference management software, in which the bibliographic data of research materials was generated and organized into broad categories. The categories include policies and governance of wetlands, values and beliefs, social-ecological changes, well-being, methodology, study area, gender, and official reports. The same software program was also used to generate a list of references.

## **1.5 Research main questions**

1. How do Ramsar site criteria address the socio-ecological importance of wetlands?
2. How to better incorporate human dimensions criteria for adapting the governance of wetlands?
3. How has the effect of climate change and global warming on international wetlands survival been addressed on the Ramsar site?

## **1.6 Research Methodology**

The research methodology chosen for this study was primarily qualitative, justified for its rigour in describing the complex human perceptions and interactions with wetlands. This approach is defined by its “secondary data collection, systematic literature reviews, and collecting figures and data”, which will help analyze the issue. It can be argued that qualitative research for understanding the studies around this topic can be more suitable to determine how considering socio-ecological elements on the site could improve international connections and policies to govern the global wetlands commons. To inform research questions, a comprehensive literature review will focus on the values wetlands provide to humans and communities.

## **1.7 Thesis Organization**

Chapter one opens the thesis by introducing its theoretical background, the study’s objectives, and the significance of the issues it is trying to address. The chapter also provides a brief overview of the study area, research design and methodology. In Chapter Two, a review of relevant literature on wetlands definition and wetland services according to the International Wetland Ramsar Site is provided; also, I will explore and discuss the nine ecological criteria for Ramsar Site, which will include the conceptual framework that shapes this research is concluded at the end. Chapter Three is based on a different methodology that helped gather information for this research. Chapter Four of this thesis presents a case study of the Chilika Lagoon small-scale fisheries community by focusing on their connections with the social well-being, values and socio-economy impact of the Lagoon on the community by focusing on the critical findings of wetlands livability in the area and its relation with different policies and scoping results to address the importance of addressing human dimension criteria on the Ramsar Site. Chapter Five presents and analysis the linkage

between ecosystem services and social well-being and adaption techniques has been taken by the fisher community of the Chilika Lagoon and policymakers on local and nation-wide bases. Lastly, Chapter Six concludes the thesis by highlighting the key findings and discussions.

## Chapter 2 Introduction to Wetlands

### 2.1 Definition of Wetlands

There are several definitions of wetlands depending on different locations and institutions. Wetlands are commonly identified as the presence of water permanently or seasonally, located either on the surface or underground, with a unique type of soil conditions different from the ground surface and support vegetation adaption to such wet conditions (Verhoeven & Setter 2010). The most common definition came from the Ramsar Convention Site Secretariate in 1971, which defines wetlands as “areas of marsh, fen, peat-land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does exceed 6 m”. This definition seeks to include coastal and inland landscapes such as swamps, marshes, lakes, peatlands, mangroves, estuaries, deltas and coral reefs, artificial lands, fishponds and rice paddies (Millennium Ecosystem Assessment, 2005; Tolentino, 2013; Kim, 2010). The Ramsar Site definition remains the global standard, and it is broader than some definitions at the national level, which has been the source of debate between jurisdictions (Finlayson, Davidson, Pritchard, Milton & Mackay, 2011). The uncertainty of defining such landscape continues to be the source of a different perspective on manganin these lands and whether it is worth conserving such areas. As there is an urgent need to protect our wetlands across the globe, it is essential to enforce a robust and accountable policy to prevent further damage and loss of our wetlands.

Wetlands cover around 7-10 square kilometres worldwide, almost 5-8 per cent of the world’s total lands (Xu, Jiang, Tan, Costanza & Yang, 2018). Although, there is a problem with providing accurate data on remaining wetlands and inconsistent figures as a result of the lack of information, which is causing difficulties in estimating and addressing the significant values to humans as these lands provide a variety of services (Hu, Niu, Chen, Li & Zhang, 2017). It is essential to address the lack of understanding of wetlands loss and significant values as they provide natural services and products to humans and communities.

## **2.2 Wetland Sustainability and Protection**

Despite the economic benefits of wetlands developments, there is a growing need to protect and wisely use wetlands (Durigon et al., 2012; Peimer et al., 2017; Vaissière, Level & Pioch, 2017). According to Herath (2004), the critical element for successful wetland management is an in-depth understanding of stakeholders and ecological processes specific to the wetland environmental system and applying this knowledge to management strategies. The problem with current wetlands protection policies is they are often hidden within broader frameworks of wetlands and resource protections (Peimer et al., 2017). Generally, policy focuses can result in a weak protection act because wetlands-specific needs will be influenced by governments and policymakers (Ramsar Convention Secretariat, 2010). This is specifically true when the wetland-specific chapters are often framed in the Broder environmental protection context. Hence, specific policies related to wetlands help recognize and address the particular problems wetlands face (Ramsar Convention Secretariat, 2010).

## **2.3 The Ramsar Convention Site**

The Wetlands of International Importance Ramsar Convention Site is an intergovernmental environmental site to manage a collaborative framework and policy mechanisms that lead to the wise use of conservation wetlands and supporting ES around the world (Ramsar secretariate, 2010; Matthews, 1993; Finlayson, 2012; Peimer et al., 2017). The agreement to organize the Ramsar Convention Site was signed in February 1971 in Ramsar (one of the cities in Northern Iran) by attending representatives from 18 countries concerned about the dramatic loss of wetlands worldwide (Finlayson et al., 2011). The Ramsar Convention began its activities with the mission of protecting waterfowl by creating an international network of sanctuaries for migratory birds. Still, it leads to the conservation and wise use of global wetlands (Finlayson et al., 2011).

The Ramsar Convention Site relies on the collaboration of neighbouring countries to protect the international circulation of water and water system and support wildlife and fish species (Matthews, 1993). Its goal is to conserve wetlands important to each national government on an international level by encouraging adapting management and policies (Farrier & Tucker, 2000). According to the Ramsar Convention Site secretariat in February 2020, 170 contracting parties are

currently members, with 2,388 Ramsar Sites covering a total of 253,870,023 wetlands. The Convention Ramsar Site includes nine criteria based on supporting ecological aspects of wetlands, such as preventing wetlands from degradation and loss and protecting wildlife and fish species (Ramsar secretariate, 2010). When a party join the Ramsar Convention, it commits to following wetland conservation planning and policy within international boundaries and to plan and act in a way that promotes the wise use of wetlands according to their rules following the characteristic of nine criteria (Finlayson et al., 2011). Also, members commit to the designation of at least one wetland that meets the Ramsar Convention's nine criteria for site selection within its territory to apply the Convention's Strategic Framework and guidelines for further development of International Wetlands Importance to make sure of a functional and collaborative network of sites (Farrier and Tucker, 2000; Finlayson et al., 2011).

According to the Ramsar Convention secretariate, the 'wise use' principle was mentioned in the 1971 text, although a clear definition of this concept was not provided at the time. At the Third Conference (COP3, 1987), this concept was defined as "their sustainable utilization for the benefit of humankind in a way compatible with the maintenance of the natural properties of the ecosystem" (Finlayson et al., 2011, p. 183-184). Since then, the use of border language "sustainable utilization" instead of "ecological character" has been the topic of interest involving parties (Tolentino, 2013). Several definitions of 'wise use of wetlands' explain the need to maintain the ecological aspect of wetlands (Farrier and Tucker, 2000; MEA, 2005; Finlayson, 2012). These definitions are based on the interdependence of humans from the environment, and their main focus is on the essential need for the wetland's ecological character as the structure among biological, chemical, and physical interrelations systems resulting from particular processes, functions and values of wetlands ecosystem (Farrier and Tucker, 2000). This principle will ensure the adaption of a clear Framework and how direct and indirect drivers influence the ecosystem and its ability to deliver ES that supports human well-being (Finlayson et al., 2011).

The Ramsar Convention approach to the wise use of wetlands clears connections between humans and the sustainable use of natural resources to encourage more community engagement and clear and transparent policies concerning trade-offs and equitable outcomes for conservation (Finlayson et al., 2011). It focuses on economic benefits, cultural values and natural heritage protection in decision-making processes and adapting a joint and multi-disciplinary approach to

wetland management on an international level (Tolentino, 2013). Considering all the efforts raking by the Ramsar Convention to protect and sustain international wetlands, global wetlands loss continues to grow despite the growing number of wetland policies adopted, bringing up some questions regarding the effectiveness of the Convention frameworks on an international level (Farrier and Tucker, 2000; Finlayson, 2012; Tolentino, 2013). Hence, some criticized the Convention approach to wetland management, claiming the limited focus of this approach is on land and water rather than on socio-ecosystem and human relations with these lands (Farrier and Tucker, 2000). The focus on the 'wise use' definition needs a more in-depth guide on human values. It helps to identify threats tracing to various sources provided by wetlands, rather than focusing only on the ecological aspect and concluding the socio-economy point of view (Farrier and Tucker, 2000).

Another criticism of the Ramsar Convention Site is implementation policies are based on individual nations and wetland policy frameworks. However, the Ramsar Convention provide a definition related to wetland definition, procedures and the Convention site framework; countries are not required to adopt these definitions and policies, addition to the lack of a clear description of wetland in some countries' jurisdiction (Tolentino, 2013). There is some concern around the selection of countries on International Wetland's site. "Without an understanding of a wetland's hydrological and biological interaction among a larger ecosystem, the proper selection of 'important' wetlands may fall short" (Durigon et al., 2012). Each country selects the List, and there is no governance of the geospatial distribution on an international scale, which is one of the factors of wetlands loss that supports ES to human well-being and the natural habitat of wildlife (Durigon et al., 2012). The lack of transparency and clear guidelines on ecological conservation and balanced and sustainable use of environmental services are causing concerns regarding the Framework of the Ramsar Convention Site (Finlayson et al., 2011). Hence, the Ramsar Convention is pressuring to make sure individual countries around the globe have met the wise use of wetlands and the adaption of several mechanisms to mitigate wetlands loss globally. The movement will lead to more sustainable wetland management, which according to Kim (2010), is called the Era of Wetland Conservation concerning historical wetland policy management.

According to Kim (2010), the Era of Wetland Conservation was presented in the 1990s. Developed countries such as USA, Netherlands, Germany and UK were the leader in implanting



wetland policy across the globe with the goal of preserving wetland ecosystem functions and ES with the help of new technologies to achieve more sustainable and wise use of remaining international wetlands (Kim, 2010). The leadership and wetlands governance shift from privatization and commercialization to a more conservative nature with public involvement and less commercialized approaches (Kim, 2010). The new ecological focus paid more attention to cultural ES that had been previously ignored by policy and decision-making. It is important to realize not all countries have entered the Era. Under-developed countries with economic needs continued converting wetlands to favour industrial and land development (Kim, 2010). Although, developed countries that have more financial resources and advanced technology will continue implanting their progressive wetland conservation policies and move to the Era of Wetland Conservation (Kim, 2010).

Kim (2010) introduces three characteristics to realize if the country has entered this third era. First is the country's commitment to establishing a strict review system for permitting a wetland conversion if it is dangerous or harmful to surrounding communities, for example, rising sea levels. The second is if the national government requires strict replacement of wetland functions to restore ES if it has been lost. And third is public education and awareness to show the importance of appreciation for wetland ecosystem services to increase and encourage the interest in protecting the ecological system of wetlands which in the long term will have a positive impact on the socio-economy. The following section will focus on nine criteria of eligibility to join the Ramsar Site which is mainly based on ecological aspects of wetlands.

#### **2.4 Nine criteria of Eligibility to Join the International Wetland Ramsar Site**

Wetlands are unique parts of an ecosystem that directly or indirectly influence humans, the economy of the surrounding community, and each country. Yet these ecosystems are the most unsustainable biomes and have had the most considerable loss in the past decades (Finlayson et al., 2011). According to the COP2 report on the Ramsar Site, the representative of UNESCO and FAO and the director addressed the importance of ecological aspects of wetlands and the need for international cooperation on their approaches to planning strategies and legal rights and governance of their wetlands. (Ramsar Site Secretariat)

Some points have been addressed at the COP2 meeting to progress the survival of international wetlands and refine each member country's policies, such as:

- Preparation of standard and accurate data
- Elaboration of wetland types and classification
- The importance of evaluation of local wetlands and their effects and relation to international wetlands
- Developing the management strategy to enable the natural characteristic of wetlands

According to Ramsar Site Secretariates, there are nine criteria under two groups, group A and group B. Each country has to meet the requirement of these nine criteria on their specific wetland to be eligible to join the International Wetlands Ramsar Site. The first criteria, classified under group A, is mainly based on the ecological consideration of these lands. The Site has to include rare and unique wetlands with biogeographic and individual importance.

***"Group A of the Criteria. Sites containing representative, rare or unique wetland types;***

*Criterion 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region" (Ramsar Site Secretariate).*

The second, third, and fourth criteria fall under group B, which is based on biological diversity and considers different types of ecological communities, including three categories. Under the threat of extinction, other plants and animals, supporting their survival and livelihood by providing protected natural unhabitual through wetlands and land use, are to be considered under Group B criteria.

***"Group B of the Criteria. Sites of international importance for conserving biological diversity Criteria based on species and ecological communities;***

*Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.*

*Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.*

*Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions"* (Ramsar Site Secretariate).

The fifth and sixth criteria fall under group B specific criteria based on waterbirds' livelihood and consideration support from wetlands international regulation to protect at least 1% of waterbirds' viability and vitality.

***"Specific criteria based on waterbirds;***

*Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.*

*Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird" (Ramsar Site Secretariate).*

The seventh and eighth criteria under Group B are based on Fish's natural habits considering indigenous fish habits, their international values, history and populations. The wetland will be regarded as of international importance if providing food for Fish is their natural nursery environment and supports Fish's natural migration patterns.

***"Specific criteria based on Fish;***

*Criterion 7: A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.*

*Criterion 8: A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend" (Ramsar Site Secretariate).*

The last criteria (ninth) fall under supporting other taxa livelihood and survival supported by international wetlands to help expand their population and support the ecological system of specific species.

***"Specific criteria based on other taxa;***

*Criterion 9: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent nonvariant animal species" (Ramsar Site Secretariate).*

The Ramsar Site's mission and vision are mainly based on the ecological consideration of wetlands and wildlife and protecting them. One crucial aspect to consider is human interaction and its effect on these lands' survival and livelihood. Considering socio-ecological aspects of wise use

of wetlands locally and internationally plays an essential role in international wetland survival and mitigating wetlands losses. Many human activities such as agriculture, urbanization and new lifestyle speed up wetland degradation and pollution. Also, these activities affect global warming and speed up climate change processes, which is causing more flooding and cyclone around the world and affecting wetlands biodiversity and, ecological system, water quality which will harm surrounding communities that economically depends on wetlands sustainability and survival (Carpenter et al., 2009).

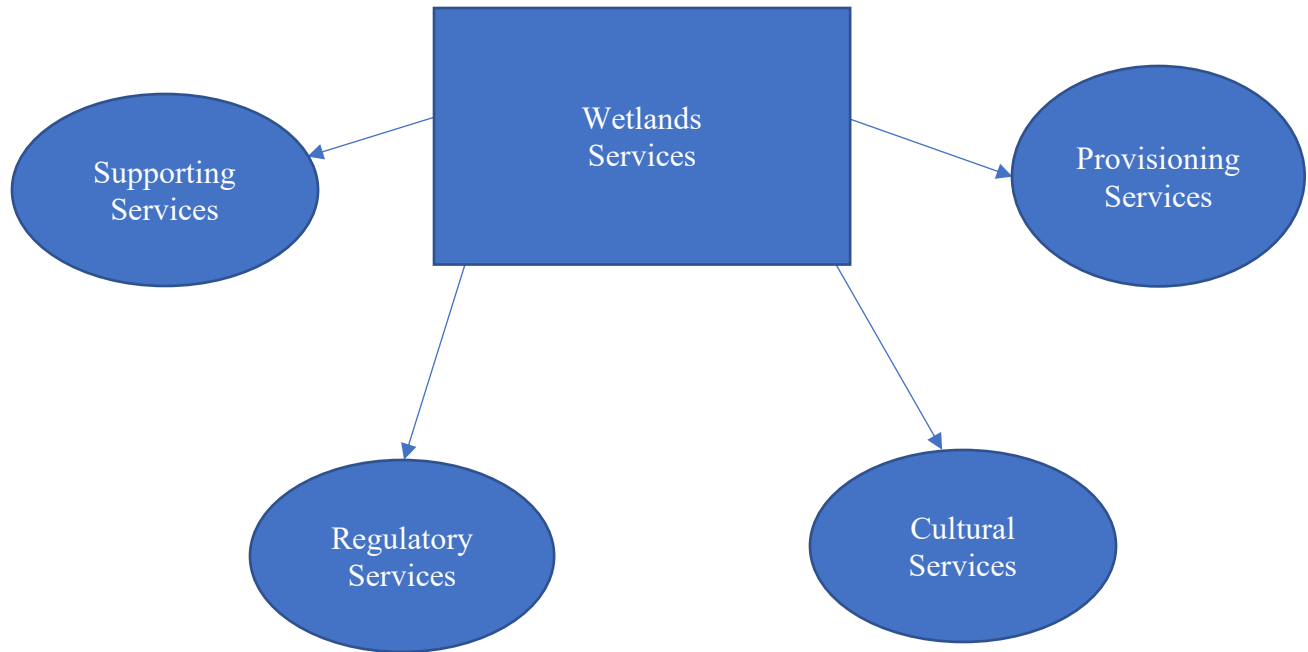
Many integrated conservation and development projects observation and ecological reports on wetlands have failed due to ignoring the economic and people's relationship with wetlands and conservations (Adhikari and Agrawal, 2013). When it comes to wetlands and watersheds management, there are different ecological and biodiversity aspects to consider, like soil erosion and water storage capacity maintenance of watersheds which are directly influenced by human activities, relations and demands in these areas (Adhikari and Agrawal, 2013). The nine primary criteria of the International Ramsar Site mainly focus on the geographic aspect of wetlands and sustainable environment for wildlife, such as rare birds and fish species, by focusing on the ecological part of specific wetlands locally and internationally (Verhoeven & Setter, 2010). This research focuses on addressing the gap of including the human dimension as one of the Ramsar Criteria by discussing existing on the Site and works of literature regarding the importance of considering different wetlands degradation causes and exploring and analyzing a variety of wetlands services and policy approaches in relation with society social well-being and values to address the critical effect of considering biodiversity and connection between human viability and wetland sustainability and survival.

## **2.5 Wetlands Services**

Wetlands provide various natural services to human beings that support the provision of products and services, biodiversity and natural life systems on the international and local levels. Understanding the importance of significant values and benefits that wetlands provide to humans is essential (Bond, Cox, Heberlein, Manning, Witty & Young, 1992). The global wetlands loss is concerning for natural resources management and biodiversity. There is a critical concern in the Ecosystem Approach to focus on delivering more transparent policy and managing these landscapes toward human well-being (Haines-Young & Potschin, 2010).

Wetlands services provide various benefits categorized into ecological, economic and social services. According to the Ramsar Site secretariate, nine criteria for international wetlands are mainly based on ecological services on these landscapes. As wetland services directly affect human life and the socio-economy of different communities worldwide, it is important to consider human dimension criteria on the Ramsar international wetland site. Ecosystem functions are habitat, biological and ecosystem procedures (Costanza et al., 1997). Ecosystem services are functions that often provide something helpful to people, like human well-being. Hence, there are debates around the definition between ecosystem functions, services, and benefits to human well-being. (Costanza et al., 1997; MEA 2005; Xu et al., 2018). Understanding the ecosystem functions, factors, geographical location, and societal choices and values are necessary for making policy decisions. According to Costanza et al., 1997, ecosystem services are not always based on one-to-one relationships. A single ES can produce more than one ecosystem function; hence understanding the links between functions and services is vital for policymakers. One of the ES provided by wetlands is to protect surrounding communities from flooding and storms (Verhoeven, Beltman, Bobbink & Whighman, 2006). Another example is coastal wetlands that support shorelines from degradation and flooding. Also improving the quality of drinking water for human use (Adekola, Whanda & Ogwu, 2012). Also, wetlands could be a rich source of tourist attractions and leisure activities, and individuals can find a spiritual connection with nature. (MEA 2005). In addition, wetlands supportive services include climate regulations, Oxygen production, and nutrient and soil formation, which benefit human well-being (Adekola et al., 2012).

There are four types of wetlands services supported by the Ramsar Convention Site Secretariate:



**Figure 2.1: Wetlands Services**

**Adapted and modified from Ramsar Convention Site Secretariate**

The significant natural effect of these four services on human well-being will be discussed, and the valuation method will explain the communication value of these services.

### **2.5.1 Provisioning Services**

The service refers to ecosystem products such as food, water, timber, fibre and genetic resources. The most important ones supporting human well-being are food (mainly fish and shellfish) and clean drinking water (Mitsch, Bernal & Hernandez, 2015; MEA, 2005). Inland wetlands produce a supply of fresh water, which is renewable. The sources of this freshwater are lakes, rivers, swamps and shallow groundwater. They can recharge the groundwater and filter

water for better quality and quantity of water (MEA, 2005; Verhoeven et al., 2006; Ramsar Convention Secretariat, 2007; Durigon, Hickey & Kosoy, 2012).

According to Verhoven et al. (2006), the production of clean water by groundwater resources provides drinking water to approximately 1.5- 3 billion people around the globe, which is used for 40 per cent of industrial use and 20 per cent for agriculture and irrigation. Hence, wetland services are becoming more valuable, even considering substantial losses. Wetlands support biodiversity, specifically waterfowl, fish, shellfish, and vegetation (Zedler & Kercher, 2005). The production of the fishery industry in coastal regions such as marshes, artificial wetlands and coral reefs estimating to be approximate \$34 billion in gross world production (MEA, 2005). Also, wetlands contribute to the country's domestic product (GDP) by providing natural goods and services and creating employment opportunities (Khan & Haque, 2010). Many employment opportunities rely on services provided by wetlands. One of the examples could be the fisheries sector which provided 60 per cent of food production to rural communities in Bangladesh and accounted for about 6 per cent of their GDP (Khan & Haque, 2010).

### **2.5.2 Supporting Services**

ES supporting services are based on nutrient cycling, soil formation and hydrological cycle information. These processes are primary and the foundation for other services and ecosystem livability functions, which benefits human well-being and wetlands survival (Mitsch et al., 2015; MEA, 2005). Wetlands provide various services and benefits for human well-being in addition to a natural environment. The rapid growth of the human population globally brings more demand for most ES services and resources (Carpenter et al., 2009). However, there is a concern regarding protecting these functions, preventing them from being destroyed, and ensuring their continued existence (Costanza et al., 1997; Carpenter et al., 2009; Adekola et al., 2012). There has been increased interest in protecting these services that provide nutrients to the growing population and protect people's needs and well-being, which has caused overzealous regulations and policies to support cultural services (MEA, 2005; Carpenter et al., 2009; Xu et al., 2018).

### **2.5.3 Cultural Services**

Cultural services support individuals' spiritual needs, recreation, and tourism industry, influencing education directly and indirectly, as well as cultural beliefs. Also, Wetlands are known as unique lands to provide a home for plants and animals, specifically migrant birds, to support their biodiversity (Verhoeven et al., 2006; Schulte-Hostedde & Schrubsole, 2003). The Ramsar Convention international agreement on wetlands, and the United Nations Convention of Biological Diversity (CBD), acknowledge the necessity and urgency to protect these natural areas, such as rivers, lakes and coastal wetlands, which are natural habitat environments for Fish reproduction, because of their significance to the environment (Verhoeven et al., 2006). They provide a tremendous recreational environment for fishing, which benefits countries' economies and financial stability (MEA, 2005).

### **2.5.4 Regulatory Services**

Regulation services refer to many indirect benefits of wetlands like air quality regulations, Water purification, disease regulation, climate regulation, pollution, pest regulation, and natural hazard regulation such as flooding (Mitsch et al., 2015; MEA, 2005). One crucial example is water purification, particularly in marshes, which significantly treats contaminated water (de Groot et al., 2012). Some wetlands have been acting as a source of nitrate deduction by more than 80 per cent; without this natural filtering system and its functions to purify the water supply, there would be a danger of an increase in disease globally (MEA, 2005).

The threat of disease due to water pollution could cause 1.7 million deaths worldwide and the loss of approximately 54 million health life annually (MEA, 2005). Some technological advancements replace these natural services, but they are not affordable or accessible worldwide. Hence, this natural ES is essential for developing countries and marginalized communities (de Groot et al., 2012).

Another concern would be a discussion about climate change's effect on wetlands, which is essential in regulating global climate by releasing carbon dioxide into the biosphere (Carpenter et al., 2009). Peatlands cover only 3-4 per cent of the world's land area, although they have been



estimated to store 540 gigatons of carbon, representing roughly 1.5 per cent of total global carbon storage (MEA, 2005). Additionally, coastal and inland communities' vulnerability will increase as sea levels rise. However, lakes, artificial wetlands and floodplains will provide a physical barrier against climate change impact (Turner et al., 2000; MEA, 2005). Nearly 2 billion people live in high-risk areas of flooding, which could be more severe by the continual degradation of wetlands (MEA, 2005). Hence, wetlands services are essential protection for a significant community that relies on them for daily life and survival.

## **2.6 Wetlands Degradation**

Wetlands are one of the most threatened ecosystems due to human impact (Verhoeven et al., 2006; Li, Deng & Huang, 2010). Approximately 50 per cent of the world's wetlands have been lost due to human activities (Daniels & Cumming, 2008; Finlayson, 2012; Hu et al., 2017). Some reports indicate an 87 per cent loss since the beginning of the 18<sup>th</sup> century. However, there is no accurate report of the total loss of wetlands due to a lack of precise data availability and a variety of definitions of wetlands (Davidson, 2014; Hu et al., 2017). There have been increased wetlands lost since the 1950s, in tropical regions, but the significant loss in the twentieth century belongs to northern countries. China has experienced a loss of 29 per cent of its wetlands due to human activities, which is the largest in Asia (Hu et al., 2017).

The most significant loss of wetlands has been reported in Europe, which is about 45 per cent, and South American and Asian countries have lost almost 32 and 27n per cent of their wetlands (Hu et al., 2017). The report on North American wetlands lost is uncertain due to a specific focus on the United States. Hu et al. (2017) report show an 8 per cent loss in North American wetlands compared with Davidson et al. (2014) report, which offers a 56 per cent loss in the same area.

Some causes of this significant loss are development, pollution, agricultural activities, and climate change. (MEA, 2005; Verhoeven et al., 2006; Li et al., 2010; Durigon et al., 2012; Adekola et al., 2012; Hu et al., 2017). These changes to the wetland ecosystem can have considerable consequences for the human population and harm wetland sustainability. The following section will discuss further details on the impact of each driver on wetlands survival.

### 2.6.1 Development Activities

Urban development is one of the significant causes of wetland degradation, which is caused by the growing population and increased demands. The Millennium Ecosystem Assessment (2005) bring to our attention that 80-98 per cent of global wetlands located in large urban areas have disappeared. Population growth results in urban development around the globe; an example could be China's urban population growth between 1978-2012 which increased from 17.9 per cent to 52.6 per cent (Mao et al., 2018). Population growth often results in the expansion of cities, putting surrounding wetlands at extreme risk of degradation due to rapid changes in infrastructure (Holland, Honae, Gwin & Kentula, 1995). The result will threaten wetlands ES, such as natural habitat, recreational activities, flood mitigation, and air and water quality. Watersheds near urban development are often subject to land use changes and infrastructure and landscape changes resulting from development activities (Holland et al., 1995).

The small wetland often disappears due to urban population growth and lack of attention to its services. As the number of small wetlands being destroyed increases, watersheds may soon reach the point which cannot provide ES to communities (Holland et al., 1995). Coastal wetlands are at risk caused by development practices. Almost half of the globe's major cities are within 50 kilometres of a coastline and typically are 2.6 times denser than inland cities (MEA, 2005). Mangrove wetlands around the coastal area are highly in danger due to the increasing population and demand for urbanization (MEA, 2005; Rojas, Munizaga, Rojas, Martinez & Pino, 2019). A shortage of suitable lands drives the disappearance of wetlands for agriculture and urbanization, which has been enforced by the lack of consideration of ES values provided to human society (Hu et al., 2017). Economic costs related to flood damage have been increasing significantly over the past 100 years due to agricultural and urban development (Zedler & Kercher, 2005).

Although, with a variety of existing research and recognition of the role of wetlands in flood mitigation, there has been increased interest in wetland restoration. With the increasing risk of flooding caused by climate change, it will be more important to protect our wetlands and value their ES despite the rising pressure for further development (Zedler & Kercher, 2005).

## **2.6.2 Pollution**

Research shows only a few places on earth remain free of contamination at present (Zedler & Kercher, 2005). This results from wetlands draining and the effect on the natural process of collecting substances, including pollutants. Urban and agricultural areas are the primary sources of pollution, such as nitrates and phosphorus, which directly stimulate algal growth (Zedler & Kercher, 2005). The decreasing levels of oxygen in the water will increase the risk of the death of fish and disruptions to the aquatic food chain (Zedler & Kercher, 2005). This will harm humans by impacting the fishing industry, therefore, sources of income and food supplies for many people. It will affect the wetland's recreational and leisure use and many ES that humans depend on. The existing literature strongly suggests the use of pesticides and their risk of runoff due to environmental hazards (Blankenberg, Haarstad & Baskerud, 2007).

Although, when fertilizer and pesticide use is reduced in agricultural lands, they will discharge more surface water runoff than undisturbed soils (Zedler, 2003). Rivers, lakes, creeks and ponds have a natural process of adsorption to organisms, biological degradation and sedimentation, and diffusion and dilution to reduce contaminants (Blankenberg, Haarstad & Baskerud, 2007). A high concentration of pollutants might impact the natural environments and their ability to provide clean water (MEA, 2005; Blankenberg, Haarstad & Baskerud, 2007).

## **2.6.3 Agriculture**

Agriculture is one of the main drivers of wetlands degradation. Increasing food production and housing demands due to the growing population will lead to agricultural development and urbanization (Hu et al., 2017). Most floodplain wetlands have been drained and changed to suitable lands for an agrarian mean (MEA, 2005; Zedler & Kercher, 2005; Tolentino, 2013).

According to MEA, 2005, around 56-65 per cent of inland and coastal lands had been drained in Europe and North America for agricultural purposes. This number on a global base is equal to 26 per cent, which is the large per cent of wetland loss globally (Zedler & Kercher, 2005). Most agricultural activities negatively impact and affect wetlands around the world due to the drainage of the land and entering pollution in the water (MEA, 2005; Verhoeven & Setter, 2010;

Hu et al., 2017). According to Verhoeven & Setter, 2010, around 70 per cent of global water is used for irrigation, causing nitrogen and phosphorus entrance to drinking water and affecting ES availability for clean water and fish. These elements, drainage, irrigation and soil alternations, destroyed wetlands ES (Verhoeven & Setter, 2010).

Although agricultural activities have widely impacted wetlands since the early 1990s, the effect of agricultural activities has decreased by around 20 per cent worldwide (Gutzwiller & Flather, 2011). Although the effect of wetlands loss due to urbanization is estimated at approximately 57 per cent, agricultural practices seem less damaging to our wetlands (Gutzwiller & Flather, 2011). Food industries are under pressure to increase their production due to the growing population around the world, specifically in the past 40 years, to meet people's needs and demands (MEA, 2005). Although the requests will increase by 50 per cent by 2030, agricultural activities will affect the biodiversity of wetlands and the community around them and also cause pollution and disturb the natural cycles, causing interruption and loss of ES as a result (Verhoeven & Setter, 2010; MEA, 2005).

#### **2.6.4 Climate Change**

Climate change has different effects globally, and the uncertainty around it makes it difficult to predict the exact result of the loss of its wetland, which will increase the threat to humans and affect ES services and biodiversity (MEA, 2005). Increasing temperature causes increasing drought and will change the precipitation patterns (Withey & van Kooten, 2011). On the other hand, some regions are facing increasing precipitation which will harm the ecosystem of their area (MEA, 2005).

Climate change is the centre of attention, particularly for coastal wetlands, because of rising sea levels and coastal edge degradation (Zedler & Kercher, 2005). The rising sea level and more flooding events cause more flood risk damage to surrounding communities, which is the specific result of human activities such as development practices that will increase the risk to coastal communities (Zedler & Kercher, 2005). Uncertainty and outdated figures and data on wetland loss cause more degradation and loss of international wetlands, which is caused by ignoring problems and allowing the continuation of wetland conservation disappearance (Gutzwiller & Flather,

2011). However, manufactured wetlands have increased in some areas in Europe and North America, like freshwater ponds to be the base for floodplains and wildlife; the primary loss of wetlands effect is mainly noticeable concerning the loss of ES (Zedler & Kercher, 2005).

The main concerns of provisioning services are to provide the growing population with enough food supplies and clean drinking water over the past century, which provides some services such as support and ecosystem (MEA, 2005; Carpenter et al., 2009; Xu et al., 2018). The decision-making over the land use is based on making trade-offs between ES for one service, which may be at the expense of another service (Jessop et al., 2015). These decisions have been made according to the needs of local communities that benefit from the local wetlands, which are insufficient, transparent, or accountable (MEA, 2005). The lack of transparency in decision-making causes the distribution of subsidies which will cause wetlands loss due to agricultural and development activities (MEA, 2005).

## **2.7 Wetland Valuation approach**

Ecosystem services provisioning raised concerns for some policymakers as they found the gap between different decision-makers on international bases (MEA, 2005). To address these differences and challenges in wetlands management, economists tried to find a solution to address the value of non-market ES effects on improving environmental and natural resources and make connections with decision-making processes (Carpenter et al., 2009; Hausknot, D., Grima, N., & Singh, S. J. 2017). As many ES are non-market services, it is difficult for policymakers and externalists to conduct cost-benefit analyses and realize how their decisions will affect wetlands' survival (MEA, 2005). The valuation approach will address the non-market values of ecosystem services such as biodiversity, recreational activities, public education activities and climate change regulations, which have a more significant positive impact in comparison with economic gain in the long term, rather than investing in agricultural and urbanization activities, that will threaten human population well-being in the long term (MEA, 2005). The valuation approach can highlight related trade-offs between different management approaches (Xu et al., 2018). According to MEA, 2005, freshwater marshes in Canada could be evaluated at \$5800/ ha compared to \$2400/ha when used for agricultural practices. Studies like this have been slowing down the processes of draining wetlands for other purposes and seeking more practical management approaches (Xu et al., 2018).

Also, analyzing ES in financial analysis can guide stakeholders' preferences to understand the situation better and make the right and reasonable decision (de Groot et al., 2012).

Although some research shows in some cases, the benefit of converting a wetland to be used for another purpose is more significant than reserving them at present and in the future (Costanza et al., 1997; Carpenter et al., 2009). Another point of view argues the importance of remaining wetlands since there has been a rise in wetlands loss in past decades (MEA, 2005). The valuation method will help to understand this issue in decision-making and better financial analysis when it comes to calculating the trade-offs (Carpenter et al., 2009). However, some argue that the valuation technique brings more complexity and misunderstanding to these processes and gives a vague image of ES production concerning finance (Gomez-Baggethun & Ruiz-Perez, 2011). However, some believe that valuation should only focus on goods and services provided by wetlands ES and the ecological structures that support them (Potschin & Haines-Young, 2011). This argument could be the contribution of various goods and services implied in an estimate and should be counted only once (MEA, 2005).

Other critics argue it is impossible to put monetary values on these resources when it comes to decision-making, things like human life or ecological and environmental benefits (Costanza et al., 1997). Some argue wetlands should be evaluated based on their moral services, not financial help, and we should consider the ethical reasons; therefore, wetlands should not be for sale (Costanza et al., 1997). There are some concerns about equity exploitation which results in turning accessibility ES publicly to privatizing them, which can only be accessibly by the buyer's party, and they can have the power and control over these lands (Gomez-Baggethun & Ruiz-Perez, 2011).

ES is often taken for granted and ignored due to its position outside the market, which could result in progressing development projects without the social and ecological consideration of these decisions (Costanza et al., 1997). According to de Groot (2012), considering the financial aspects of non-market ES values could be the way to convince politicians around the world to consider the importance of their decision-making and the effect of their protection and support on restoring wetlands and paying compensation to prevent further wetland loss and their services. This did not mean putting a price on such services or trading private markets and treated as personal commodities (de Groot et al., 2012). The valuation approach estimates the various

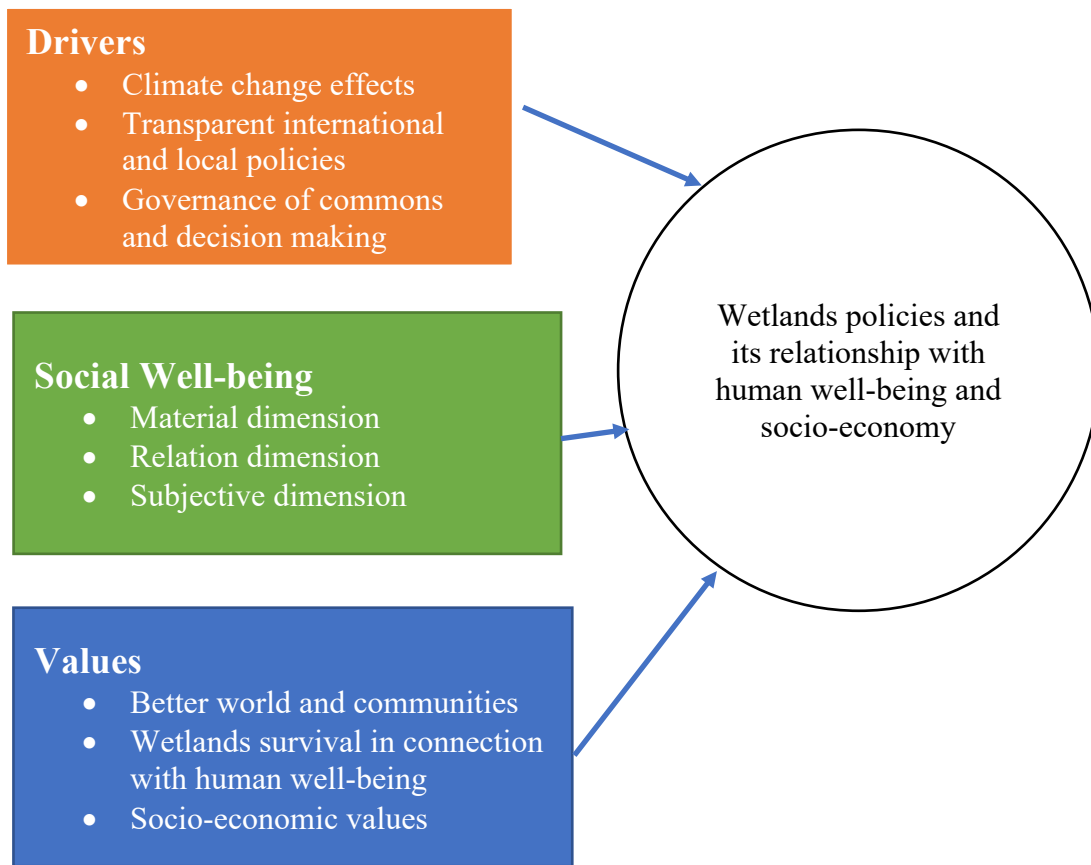
services provided by wetlands and their effects and benefits on human well-being and socio-economy, which will be lost by wetlands degradation or loss (de Groot et al., 2012).

According to Kim (2010), the value of non-market ES has been overlooked throughout history to explain the evaluation of wetland policy in developed countries. In the early civilizations 1960s, wetlands were drained for agricultural practices and embankment projects for coastal safety masseurs (Kim, 2010). Industrialization and urbanization practices are other reasons for wetland destruction and loss at this time (Kim, 2010). The result was the widespread loss of natural habitats, wetlands and ES due to massive development activities for economic gain (Kim, 2010). There was no consideration for the negative impact of the over-exploitation of natural resources by conservation practices (Kim, 2010). The environmental implications caused more attention by conservation authorities, and there was a shift from the economic aspect to the importance of ecological sustainability (Kim, 2010).

## **2.8 Conceptual Framework**

Conceptual framework application is helpful in any research as it is employed to determine what will or will not be included in the study. The conceptual Framework used for this research is in Figure 2.2, visualizing the research elements and their connections. The three research objectives are colour coded in the Framework, representing green, orange and blue. The main aim is to identify better incorporation of the human and social-ecological dimensions into the criteria for adopting the governance of wetlands. This objective tries to address different drivers and actors influencing the socio-economy of wetlands and related communities and their well-being. Environmental conflicts are typically uncertain and complex at multi-scale levels, which affect a variety of actors and drivers and require more flexible and transparent decision-making policies concerning stakeholders' values, knowledge and abilities (Reed, 2008).

The valuation techniques will help make informed decisions by communicating ES values and the result of ES being absent from the market (Carpenter et al., 2009).



**Figure 2.2: Conceptual Framework**

The connection between values and well-being is essential, as both concepts are deeply related (Deneulin & McGregor, 2010). One of the vulnerable sectors affected by uncertain wetlands policies and unsuitable discussion-making is the Fishing industry, specifically small-scale fisheries in a specific area. Because fisheries production is related to their geographic location, typically isolated, politically voiceless, economically deprived and culturally low-valued communities, it is essential to focus on these communities' well-being and vulnerability (Islam, 2011; Rahman et al., 2002). Another consideration is that pursuing a good life and living well is directly related to particular values and decision-making; therefore, the ability to live well depends on social recognition to achieve something valued (Johnson et al., 2018). It is essential to consider social discrepancies such as powerful stakeholder influences, lack of representation of qualitative research and separation of non-organized actors (Garmendia et al., 2010).



In conclusion the purpose of chapter 2 is to provide information regarding wetlands definition, major nine criteria on Ramsar Site, and wetland services gathered from other academic literature and the International Conservation Ramsar Site. Also, briefly provide information regarding the conceptual Framework for qualitative research, which will apply to the Chilika Lagoon socio-economic challenges case study as an example. It will begin with an in-depth problem analysis considering policy-making decisions, different stakeholders and drivers, and their roles and relations to the research topic. It will be followed by a discussion and interpretation of the result of the related wetland management approaches internationally and related to the case study. In the following chapter I will discuss the methodology I used for this research and data analysis.

## **Chapter 3 Research Methods and Methodology**

### **3.1. Introduction**

In this chapter, I describe the methodology and methods used to conduct this research, including limitations, my role as a researcher, and the strategies I used to address those limitations. A qualitative method research approach is used in the study to analyze the importance of considering the human dimension as one of the criteria for the International Wetlands Ramsar Site. For this reason, I used the case study of Chilika Lagoon, Odisha, India, to discuss the vitality and vulnerability of SSF communities concerning the wise use of the Wetlands. Strengths include exploring different points of view and revealing the connection between the dynamic layers of issues faced by small-scale fishing sectors. A qualitative research approach was used to assess the historical context and policy strategies related to the Wetlands' survival. A case study and comparative analysis have been applied to evaluate secondary data collection based on existing literature and government reports.

### **3.2. Methodology**

The qualitative methods used in this research have been exploring following elements:

1. Exploratory elements to generate data from works of literature and Ramsar site for future study on climate change effect on wetland survival and socio-economy services locally and globally.
2. Defining characteristics to explain how the ecosystem affects human activities and local communities surrounding wetlands on a local and international basis, according to Ramsar Site reports and existing literature.
3. Descriptive elements based on academic works of literature and Ramsar Site reports documenting how individuals and communities value ES and its effect on communities' social-wellbeing and policy approaches.

The research involved analysis of a variety of individuals, communities, and the current socio-economic system, also enclosing behaviours, values, emotions and beliefs of communities concerning ES and SSF, and last, identifying both fisher and their network relating to formal or

informal socio-ecological relationships on societal levels based on extracting data from existing reports and works of literature.

### **3.2.1. Case Study Approach**

A case study for research is considered where: 1) there are “why” and “how” questions; 2) the research issue is based on the present focus; and 3) the researcher is not in control of the behavioural event (Yin, 2009). This research is based on these conditions. First, the research question asks “how” the Ramsar International Wetland Site incorporates the human dimension and “why” it is essential to consider the human dimension concerning socio-ecological and wetlands worldwide and ES linkage with the socio-ecological and policy of wetlands around the world SSF viability and liveability. Second, this research will highlight particular relations with problems such as climate change and policy implantation on international wetlands and specific case studies (Jentoft & Chuenpagdee, 2009). The main challenges of the Chilika Lagoon case study are ongoing. Third, the socio-economy context of this situation cannot be manipulated for research purposes. The lack of implantation of suitable policies and experimental control leads to lower reliability and external validity (Table 3.1).

The finding of this research can contribute to the broader understanding of governance and policy implementation, specifically in small-scale fishing communities in Chilika Lagoon and international level. Although each case has unique and specific elements to focus on, and they are not similar to each other, this research offers rich and detailed information to analyze the problem of wetlands governance with a particular focus on small-scale fishery industry governance and policy implementation. This research is qualitative base research using deductive and inductive approaches based on secondary data collection. In general, qualitative research does not refer to control variables; instead, it’s a willingness to open up to listen (Strauss & Corbin, 1998). The social context of the study considers the fundamental understanding of the importance of human well-being and its relation with policies made by policymakers, as mentioned in the conceptual framework (Figure 2.2). A deductive approach is based on known factors mentioned in literature and reports. An inductive approach is based on uncertain factors mentioned in previous research and studies, a “theory derived from data systematically gathered and analyzed through the research process” (Strauss & Corbin, 1998, p. 13).

**Table 3.1: Overview of the limitations specific to the case study research**

<b>Limitation of Research and Case Study Methodology</b>	<b>Definition</b>	<b>Rationale</b>
Reproducibility	The primary interpretation of reliability refers to “the extent to which similar results can be reproduced in different times and locations and with different coders” (Jackson & Trochim, 2002, p. 327) or the consistency of measurement after a change in research conditions (Taylor & Kuyatt, 1994).	The socio-ecological conditions of a case study cannot be applied to different locations as they are specific to the environment, time and community. These elements of a case study cannot be manipulated. Further, methods may be tailored to a particular case study (e.g., some cultures may find specific questions offensive).
Repeatability	An aspect of repeatability refers to the consistency of a measurement using the same measurement procedure, same observer, and exact location over a short period (Taylor & Kuyatt, 1994).	Even in keeping the same procedure, observer, and location, case study results could vary over a short time for the reasons listed above.
Reliability	The consistency of measurement, for example, reproducibility, can be judged over time via test-retest operations (Gomm, 2009).	Case studies are highly contextual, and the researcher has no control over external conditions.
External validity	The research results are the extent to which to generalize (Gomm, 2009).	Each case study is specific, and the finding in one case study may or may not be generalizable for other cases. For example, governance outcomes may have broader applications, but ES may differ.

### 3.3. Data Collection Methods

In this study, systematic data collection methods have been used, followed by data related to socio-ecological factors and drivers on wetlands and precisely issues associated with the viability and vulnerability of SSF in Chilika Lagoon with governance. The descriptive focus of this qualitative research is mainly based on past studies and existing data which have been conducted in this research. As this research is based on secondary data collection through works of literature and existing reports, various data collection methods used by this research were not conducted based on semi-structured interviews, focus group discussions and participant observation. Instead, I used a systematic literature review as the primary method to gather data to address findings of a link between wetlands governance and policy issues and its effects on the socio-economy, specifically on small-scale fishing communities. The gap that has been discussed in this research shows the importance of considering the human dimension and relations with wetlands management and governance.

#### 3.3.1 Literature Review

Works of literature are academic writing like journal articles, books, government reports, peer-review on previous research and literature, and conference reports on a specific topic. To explain the conceptual interpretation used in this research, Figure 3.1 provides information on the elements generally involved in the literature review.

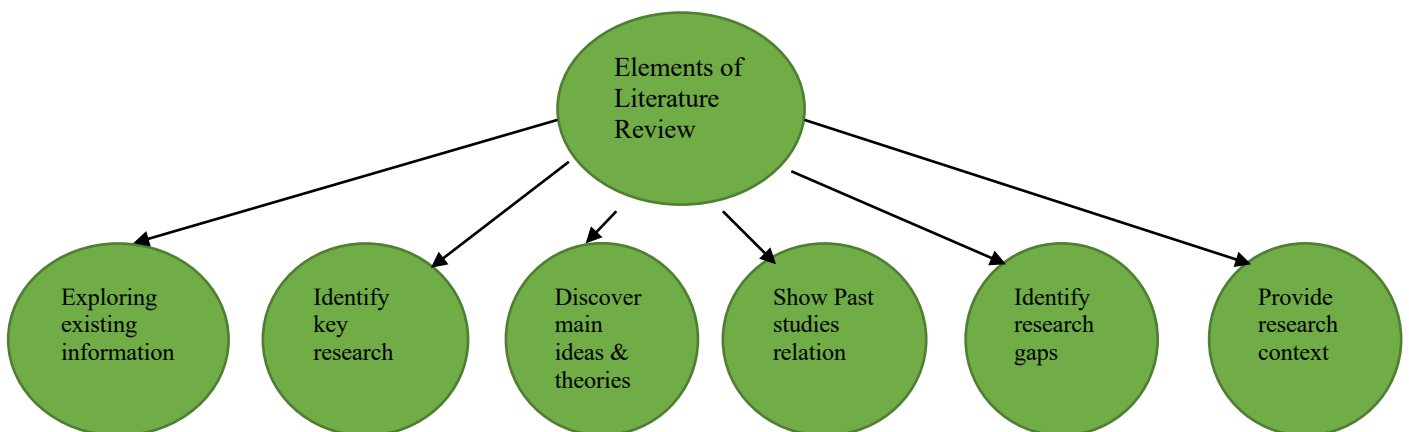


Figure 3.1: Literature Review Elements Adapted and modified from (Braun et al., 2009)

A systematic literature review is based on secondary data collection to classify, critically analyze and collect related primary studies information and findings on a specific topic. This aims to define, interpret and critique the existing literature to identify and discuss research gaps using evidence provided on theoretical and conceptual foundations for addressing them (Aveyard, 2014). It is essential to follow suitable measures to ensure the analysis is accurate, replicable and reliable (Snyder, 2019). In a systematic literature review, phases of the research process include defining a central research question, reviewing existing academic literature, recognizing relevant literature, data analysis, and interpreting the existing and new results. The necessity of further research and investigation will be addressed through research questions and by identifying gaps in existing academic research that will bring up the importance of more research studies around the specific topic. Figure 3.2, which has been adapted from Aveyard, 2014, will show the stages of the literature review, which includes four steps: 1) research question, which is the primary purpose of conducting the study, 2) research methods that show the evaluation and data analysis processes, 3) the result of the new study based on the research finding to address the research question and 4) recommendation to suggest further investigation and studies on research gap.



**Figure 3.2: Phases of the research process in a literature review Adapted and modified from (Aveyard 2014)**

### 3.3.2 Systematic Literature Review

A systematic literature review is a tool or process of critical evaluation and classification of relevant information by data collection from past studies and analyzing them accordingly. The main goal is to find all the empirical data concerning research objectives and answer the research questions or hypothesis of the study (Snyder, 2019). One of the main characteristics to consider while conducting a systematic literature review is the academic references, reliability and adoption of processes of the research to confirm that the review processes are clear and transparent by using straightforward methods to classify related data and objectively analyze the previous study and provided information to address research questions (Aveyard, 2018). Selecting reliable academic literature can be very important in the process of systematic literature reviews and managing research questions, and analyzing the research gap. The goal is to analyze the existing information and summarize them according to a specific subject rather than identifying a small portion of the research content (Aveyard, 2018). There are six steps in a literature review that I will explore in this section. The six steps are:

1. Framing Questions
2. Literature Identification
3. Screening and Inclusion
4. Assessing the Quality of Data
5. Extracting Results
6. Analyzing and Interpreting

#### *Framing Questions*

One of the essential steps in any research is clarifying the goals and objectives. To achieve this, the research question will help investigate the specific topic and the research's necessity. At this point, an initial search can be used to scope the areas of concern and issues. In my research, I tried to explore different wetland management approaches and governance by using Chilika Lagoon as a case study to help pin down various matters in the SSF communities due to the lack of proper management and control. The scoping helped with addressing research questions.

### ***Literature Identification***

The following step is to explore and collect the related literature that would be included in analyzing various aspects of the research. There are numerous research-related studies to my research topic, which I reviewed, including published or not published research and articles in a variety of papers, scientific journals and academic publishing sources related to the study area, topics and case study areas, such as papers based on conceptual or empirical studies and frameworks. I used the University of Waterloo and the University of Toronto library to access the academic research related to my research topic. Also, I selected google scholars to find reliable journal databases such as Science Direct, Research Gate, Scopus, Jstor and Oxford publishing.

### ***Screening and Inclusion***

At this stage, I focused on choosing materials that were related and applicable to my research topic by searching through various papers to determine and collect relevant documents. The screening and Inclusion step has been based on objectivity and minimizing errors. I excluded articles focusing on agriculture and urbanization broadly. I included papers that reflected wetland governance and climate change effects on wetlands sustainability by focusing on various studies in Chilika Lagoon related topics such as values and policies.

### ***Assessing the Quality of Data***

At this stage, the data quality needs to be investigated for empirical validity evaluation of different studies. The review will study the design and methods used in each research and the result of the research study. I used a variety of formal evaluations individually or with the help of our research group working on the same case study to exclude less related papers and include the research that is more related to my research objective and goals and interpret the results of my study.

### ***Extracting Results***

This stage is based on collecting and extracting related information from various studies. The primary data collection is based on existing qualitative data. However, some quantitative data has been dragged into helping better analyze human dimensions, values, and connections with wetlands. Various social-ecological aspects have been studied concerning the Chilika Lagoon case



study to address the vulnerability, viability and livelihood of SSF and their recognition during the research process.

### ***Analyzing and Interpreting***

At this stage, the relevant data are analyzed, evaluated, compared and arranged to help make a conclusion related to the study and systematic literature review. At this step, findings have been created on the SSF status of vulnerability and problems they face, specifically Chilika Lagoon, and researching related gaps and opportunities.

Although the steps mentioned above are in a specific order, they may be stepwise in the evaluation processes, which can create an introduction to various activities and be substantially refined during the later stage of the research study. Spotting works of literature related to my research topic verified the research gap discovered in my research concerning qualitative studies on SSF case studies in Chilika Lagoon.

### **3.3.3 Zotero as a Reference Management tool**

Zotero is used as a research tool to review and extract necessary data and analysis of previous works of literature and research, to be used for accurate referencing of previous studies carried out in the similar context of wetland governance and management, studies in relation with the environmental and social changes and their effects on livelihood, vulnerability and social well-being of SSF and coastal and marine policies and regulations of small-scale fisheries sector specifically in South-Asian countries, which helped to answer the research question. The citation and referencing of the systematic literature review have been done through Zotero management. I used Zotero as a digital research platform to gather and format bibliographic and authority sources.

Zotero helps to compile, organize, and distribute references for users as a comprehensive reference manager tool. It is compatible with Google Scholar, Science Direct and other internet browser databases and library tools, which helps users access frequent times to the resources and data extracted from previous studies (Winslow et al., 2016). Some other functions are offered by Zotero, such as the integration of web browsers and word processors in addition to in-text citations and bibliographies (Vanhecke, 2008). More than four hundred bibliographic data have been

extracted based on three central literature areas and the methodology of existing academic works of literature that have been added and arranged through Zotero.

I explored the various steps in collecting the research material and organizing them according to their specific topic and relations with my research area of interest, based on the importance of addressing the human dimension of the International Ramsar Site with a particular focus on various wetland governance approaches and case study of Chilika Lagoon small-scale fisheries.

### ***Creating Search Categories and Keywords***

The literature review search started by preparing and combining keywords related to the research study. This step is necessary to ensure the resources collected for the research paper are related and appropriate. Identifying various keywords and synonyms and providing their relativity to the research study is essential for secondary database collection. The scoping exercise will help formulate the best range of keywords related to the study findings. A combination of crucial keywords will support the effective use of these words and research analysis (Vanhecke, 2008). As shown in Table 3.2, the logical combination of keywords will help to narrow our research results and find a focus of our research. The indication of collecting different keywords and initially figuring out the best one for this research has been shown in Table 3.2.

The literature review was conducted from Scopus the indexing database which includes journals and academic publications and publications on Ramsar Site and others such as V2V publications. This combination was used as it captured a specific key stakeholder group of interest and there was a reasonable amount of publications found. Table 3.2 indicating the example of one main key articles related to the specific research keyword along with number of articles and literature have been reviewed.

**Table 3.2: Development of keywords for searching relevant works of literature (A-articles) (K.R.- key reference)**

<b>Objective 1</b>	<b># of A</b>	<b>Objective 2</b>	<b># of A</b>	<b>Objective 3</b>	<b># of A</b>
International Wetland (K.R. Finlayson et al., 2011)	20	Small Scale fisheries (K.R. Kumar et al., 2020)	40	Social well-being (K.R. Weeratunge et al., 2014)	25
Governance (K.R. Carpenter et al., 2009)	25	Social- ecology (K.R. Adhikari et al., 2013)	30	Adaptivity (K.R. Bell et al., 2018)	30
Commons (K.R. Nayak et al., 2012).	10	Coastal communities' Vulnerability (K.R. Kurien, J. 2015).	25	Marginalization (K.R. Nayak et al., 2010).	30
Ramsar Site (K.R. Ramsar Site secretariate)	25	Costal communities' livelihood (K.R. Salagrama et al., 2012)	30	Resilience (K.R. Himes-Cornell et al., 2015)	35
Wetlands policy approaches (K.R. Millennium Ecosystem Assessment, 2005).	15	Costal communities' Management (K.R. Kumar et al., 2012)	20	Coping system (K.R. Schuhbauer et al., 2016)	15
Wetland ecology (K.R. De Groot, 2012)	5	Wetlands' Infrastructure (K.R. Vaissière et al., 2017)	5	Adaption Techniques (K.R. Ojea et al., 2020)	30

### ***Collecting related Information and Databases***

I used various resources to check databases and related information to address research objectives and gaps. The familiar sources used in this research are ScienceDirect, ResearchGate, International Ramsar Site publications, V2V Global partnership publications and Google Scholar.

Table 3.3 shows the initial search percentage in databases and information with related keywords. The table above shows how various resources helped gather related databases and information for this research. I found International Ramsar Site, V2V publications and ScienceDirect as more discipline-specific databases, which strengthened the systematic literature review of my research. Google Scholar's features were helpful in terms of searching individual papers, government reports and citations. All collected material based on related databases and information was transferred to Zotero.

**Table 3.3: List of keyword search combinations used to obtain systematic works of literature review according to the percentage of finding in each source (RS- Ramsar Site, SD- ScienceDirect, GS- Google Scholar, V2V Global partnership and RG-Research Gate)**

Search Keywords Combination	RS	SD	GS	V2V	RG
Wetland Definition	50	20	10	0	20
Chilika Lagoon and Small-Scale Fisheries	0	10	10	80	0
Small-Scale fisheries Social Well-Being	5	35	10	50	0
Wetland Services	30	40	20	10	10
Provisioning, Supporting, Cultural, and Regulatory Services	30	60	10	0	0
Wetlands Degradation causes	20	40	30	5	5
Wetland Pollution Sources	25	45	20	0	10
Human activities and Small-Scale fisheries	5	25	25	45	0
Effect of Agriculture on Wetlands	20	40	20	0	0
Climate change impact on Wetlands	5	50	40	0	5
Water quality and Chilika Lagoon	0	50	30	0	0
Wetland policies and Small-Scale Fisheries	0	25	35	40	0

Wetland Sustainability and Chilika Lagoon	0	45	10	45	0
Governance and Commons and Small-Scale Fisheries	0	45	5	45	5
Governance and Commons and Chilika Lagoon	0	50	5	45	0
Small-Scale Fisheries Livelihood	0	40	10	50	0
Wetland Sustainability and Small-Scale Fisheries	15	45	10	30	0
Wetland protection and Sustainability	25	45	20	0	10
Small-Scale Fishers Marginalization in India	0	30	5	65	0
Wetland protection in Chilika Lagoon	0	50	10	40	0
Wetland protection and Vulnerability in Chilika Lagoon	0	30	0	60	10
Wetland protection and Socio-economy in Chilika Lagoon	0	45	15	40	0
Wetland protection and Drivers in Chilika Lagoon	0	55	25	20	0
Wetland Governance and Small-Scale Fisheries Drivers	0	60	20	20	0
Command and Control	0	70	10	10	10
Wetlands market- Based Approach, Biodiversity Offsetting and Payment for Ecosystem	20	70	20	0	0

### ***Assessing and categorizing relevant data and information***

Various folders have been created on Zotero based on the relevancy of materials and database with keyword combinations to help collect and analyse data processes. More than 800 articles and

reports were obtained and studied to find the exact connection between data and research objectives and gaps to have better data analysis according to this research area. Features such as taking notes and citations of that notes have been used in Zotero, which is very helpful in providing a bibliography and categorizing items accordingly. Managing items under specific groups and subgroups on Zotero is beneficial for classifying particular findings concerning the exact keywords used to conduct this research.

Organizing and narrowing down the materials has been achieved by chronically sorting them concerning Wetland sustainability and its relation with human activities, policy and governance and Small-Scale Fishers as a centre of focus. Specific data filtration can lead to focusing more on relevant information and studies, which are vital resources in research databases. The collected materials were based on the case study location and research objective to form a more substantial sample collection.

### ***Interpreting and Analysing Collected Data Results***

The selected resources aimed to develop the results to refine the research objectives. The comparative analysis and evaluation of the past studies match the research goal and objectives to identify and respond to the gap in my research study. Zotero is beneficial in creating a systematic literature review to address the research question and achieve the results. Zotero is integrated with Microsoft word and other computer formats making the research process very convenient (Winslow et al., 2016).

### **3.3.4 Data Analysis and Explication**

The qualitative data collection for this research is based on a systematic academic literature review and government reports based on wetland sustainability and governance concerning human activities with a particular focus on Chilika Lagoon as a case study to create different tables and figures accordingly. I used qualitative interpretation of the social-ecological and socio-economy of wetlands and Chilika Lagoon to analyze the collected data from previous and most recent studies (Hsieh & Shannon, 2005). Qualitative research analysis is one of many techniques to explain related content knowledge. Qualitative research analysis focuses on content and linguistic features as a resource connected to conceptual senses in a specific research area. One of the essential

processes is taking notes on related materials, which will improve data analysis. It will become progressive to set up updates on different phenomena, categories, and codes and find a connection between various materials. Investigating various facts on an essential subject using thematic analysis could help develop a process of qualitative research (Hsieh & Shannon, 2005).

### **3.4. Limitations**

There are some limitations associated with this research approach which I will explore in this section.

#### ***Limited access to reliable and updated data***

The process of efficient data collection depends on having access to reliable and updated materials. The variation of existing materials and the researcher's perception might integrate with qualitative data collection and may lead to misinterpretation (Johnson et al. 2007). Also, the reliability of qualitative studies might be another problem factor. For example, in the case of study approaches, the lack of reliable scientific sources and reliance on the general public with no basis for generalization of findings is another aspect to consider (Johnson et al. 2007).

#### ***Confidentiality issues***

Ethical issues are another concern associated with research based on government reports and updated data. As a result, the examinations that play a role as a community representative and government authority might affect different opinions to favour one side of related stakeholders and accessing accurate information and data might not be possible for the public or other researchers (Holkup et al., 2004). This is a significant issue when working across multicultural societies, which will influence qualitative research and limit data collection or not having access to accurate data.

#### ***Cultural and Social circumstances***

Working on a culture and area different from one's own is challenging, even though it might appear direct and consistent initially, especially regarding governance and policy discussion makers. Even within a specific culture or related governance within a particular area, not everyone acts and follows the same practices. Cultural characteristics can significantly impact the research process and credibility. Researchers need to be alert regarding cultural structure to understand

individual behaviour in a certain way better. Also, the researcher should be aware of their own biases, standards of conduct and social reasoning. In addition, it is imperative to understand different government administrations and approaches impact the culture, which potentially may influence the evaluation of any reports and academic research. Studying socially diverse communities requires fundamental understanding on various levels, which requires mindfulness and a skilful route (Holkup et al., 2004).

### ***Moderations***

Other obstacles, such as lack of social and cultural operations, lack of geographical awareness, and regular community activities, can lead to misinterpretation of collected data. There are many research studies on wetlands governance and sustainability in specific parts of the world, such as Europe and North America, and fewer studies on wetland livelihoods of particular communities are related to this research. The issues around the cultural-social of communities and conflict issues based on this matter make it difficult to extract accurate data and information through existing literature and report as they might have been as a matter of this issue. Time limitations will influence and limit exploring more relative materials, so the result might not be as complete and comprehensive as researchers hope.

### **3.5. Conclusion**

In this chapter, I described the methodology used in this research based on a systematic literature review and incorporating deductive reasoning. Then, I outlined the data collection and analysis processes and explained the potential limitation of my research processes. In this research, I used qualitative methods case study by focusing on descriptive dimensions. Data collected were analyzed through descriptive statistical analysis using Microsoft Excel. In chapter four, I will present synthesized data and discuss their significance, beginning with findings on the variety wetlands policy approaches and their effect on local and social communities.



## **Chapter 4 The Social Ecological changes in the Chilika Lagoon Ramsar Site and its effect on Social Well-being of the Lagoon SSF Communities**

### **4.1.Introduction**

Coastal Lagoons have unique biological, morphological and infrastructural characteristics. Coastal lagoons are the areas between inshore and open freshwaters, which gives them a unique ecological and infrastructural system. According to the Ramsar Site definition, lagoons act as an area which connects terrestrial, coastal, and aquatic environments. Lagoons can be considered areas of abrupt transition between ecological communities, ecosystems and ecological regions along an environmental gradient (Ramsar Site Secretariate). The rising human activities and population, along with recent climate change factors such as cyclones, in addition to not having proper management and incorrect governance practices, causing lagoon degradation and mitigation in recent years (Verhoeven et al., 2010).

Coastal lagoons are often polluted, affecting water quality and the ecosystem in the area in the long term. Understanding the effect of water movements and human activities on the surface and groundwater quality of the lagoon's ecosystem is essential (Withey et al., 2011). Wetlands' livelihood and survival are significant factors related to various issues of public welfare and vulnerability. Chilika Lagoon ecosystem is based on the sustainability of vegetation, birdlife, marine population and livelihood of SSF communities. Proper coastal and wetlands management play a principal role in increasing the productivity and well-being of the related community. (Khan et al., 2010). The human activities and existing policies will influence the water quality in the area, affecting the availability of fish, food abundance and nutrition, and causing economic complications, community livelihood, gender vulnerability and other socio-economic aspects related to the lagoon (Adhikari et al., 2013). In this chapter, I will focus on the linkage between wetland livelihood concerning human activities and related community values and its relation to SSF community problems and vulnerability and livelihood. I will explore how different drivers influence social-ecological changes in this area and affect exposure to SSF.

Existing academic works of literature on SSF values and beliefs and variation in wetlands policy and governance addresses community needs and development, the need to mitigate

biodiversity loss to protect the socio-economy and well-being of the community, and socio-ecological sustainability and resiliency and adaption in this specific case study. Yet, there are limitations around this discussion related to various sources of vulnerability in SSF, such as nutrition, economic fallout, marinization and poverty (Kurien, 2015). My goal is to address the importance of governance and decision-making variation and to analyze associated vulnerabilities facing SSF communities. Therefore, I will focus on all three objectives in this chapter, the importance of addressing human activities, including policies and decision-making, and how they affect the livelihood of wetlands and the community around them, which are closely related. The effect of climate change on wetlands and relatively on the SSF community and the role of values and beliefs on wetland ecological sustainability and livelihood will directly impact SSF communities.

#### **4.2. Case Study area of Chilika Lagoon in India**

Chilika is Asia's most significant water lagoon, located on the East coast of India in the state of Odisha (Gupta, 2014). Chilika has been listed as a Wetland of International Importance Ramsar Site since 1981. However, it lost its membership once due to bad governance practices, which caused it not to meet the nine criteria of the Ramsar Site, but it found its way back to the Ramsar Site quickly. Chilika Lagoon fluctuates between a cumulative monsoon of 1,165 km<sup>2</sup> and a minimum dry season of 906 km<sup>2</sup>. It is a pear-shaped wetland that stretches between 19°28'-19°54' N and 85°6'-85°35' S (Kumar & Pattnaik, 2012). The artificial sea mouth, made in September 2001, connects the lagoon to the Bay of Bengal near Satapada. Earlier, the lagoon was connected by a 24 km long, narrow, curved channel to the coast, joined with the Bay of Bengal near Arakhakuda (Sarkar et al., 2012). Chilika lagoon is built of shallow brackish, freshwater habitats and shallow marine (Kumar & Pattnaik, 2012). The central part of the lagoon is covered by water in the winter season, which prepares suitable habits for millions of migrant birds' species (Sarkar et al., 2012). The estimate of fish species in the lagoon is over 225. Also, it hosts over 350 species of nonaquatic plants, algae, and aquatic plants (Nayak, 2014).

Chilika lagoon is known for its fishing industry by local fishermen who live in approximately 150 villages around the area (Nayak & Berkes, 2014). The variety of fish and sea species provides a rich resource for local fishers. The existing species in the area include 73 types

of fish, prawns and crabs, which is an estimated annual 12,000 MT. Therefore, it plays an essential economic role in the community (Kumar et al., 2020). More than 140,000 fishing communities are living around the Chilika lagoon. The high biodiversity and solid cultural values make the area a tourist attraction, attracting 300,000 domestic and foreign tourists each year (Kumar & Pattnaik, 2012). Also, there are about 800,000 non-fisher villages whose livelihood is supported by the Chilika lagoon watershed as a source of income (Nayak & Berkes, 2014).

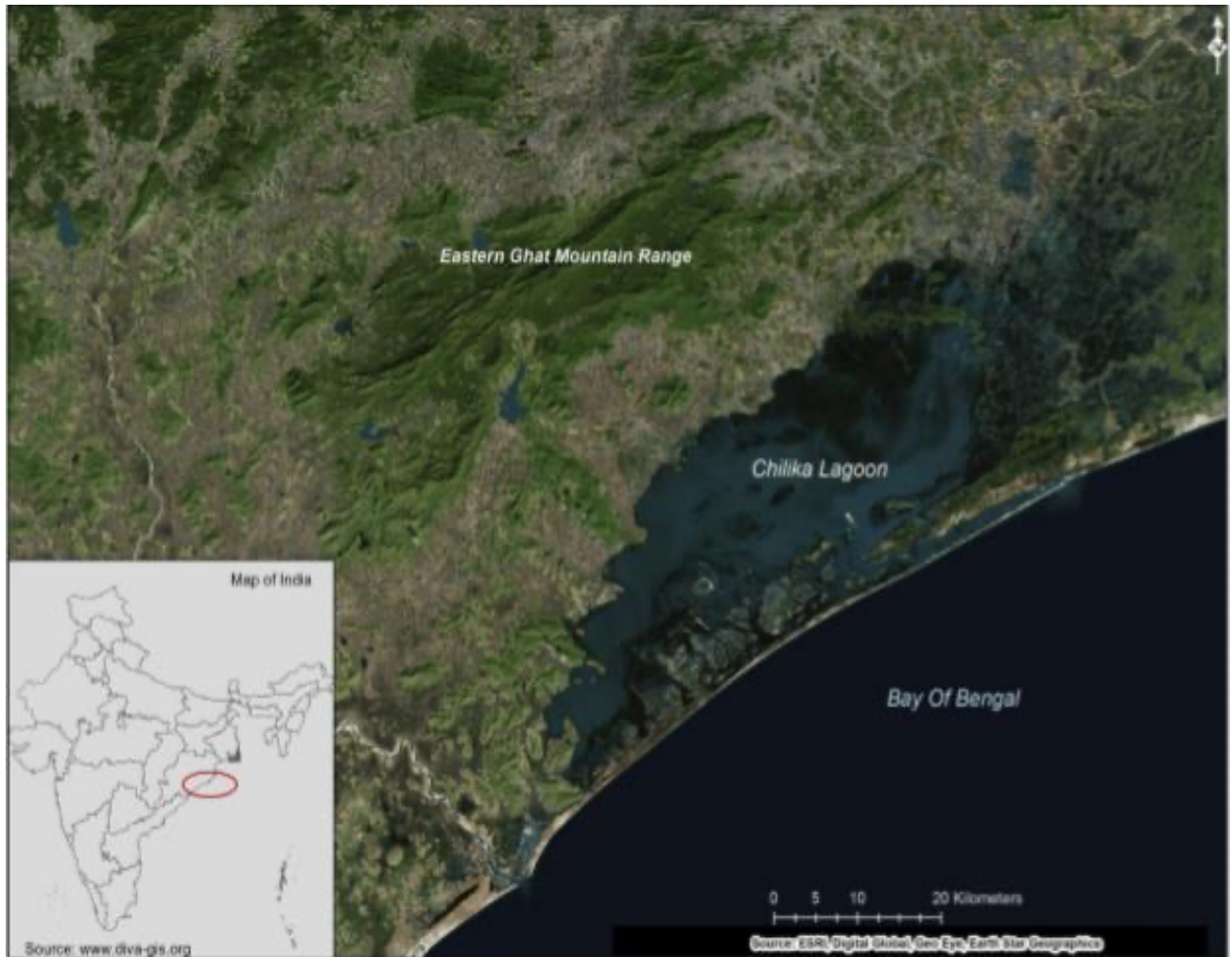
Various hydrological functions are happening in the lagoon, such as runoffs from unregulated basins on southern and western borders or freshwater discharges from Mahanadi River distributaries and lagoon water exchange function with Bengal Bay (Panda et al., 2013; Sarkar et al., 2012). Frequent changes in the hydrological interaction of the lagoon may have a dramatic effect on the area and increase climate change factors, which is a concern of local and national governments (Panigrahi et al., 2007). Conservation authorities implemented a new sea mouth and public education and awareness campaign to mitigate the dredging impact in the area (Panda et al., 2013; Sahu et al., 2014). Changing the focus from fishing to shrimp production along with an artificial sea mouth is one of the significant drivers in improving the lagoon community's social-ecological environment (Jentoft, 2017). The sudden rise in shrimp markets worldwide and the lower cost of exporting shrimp production have played an essential role in economic growth in the Chilika lagoon SSF communities (Nayak & Armitage, 2018). The commercial fishing practices in the lagoons area significantly affected local fishers adapting their practices to intensive shrimp production, which led to resource conflicts among commercial fishers and local fishers, causing marginalization and poverty in SSF community livelihoods (Nayak & Armitage, 2018).

The artificial sea mouth created by the government with the Bay of Bengal added another problem for the lagoon community in 2001. The sea mouth structure causes changes in water flow rates and disrupts the balance between salty water and fresh water, which affect the livelihood of fish species in the area (Nayak & Armitage, 2018).

Some research shows that with changing balance and water flow in the lagoon area, fish production was reduced, impacted local fishers' livability, and made them more vulnerable (Nayak & Berkes, 2010; Jentoft, 2017). Also, shrinkage of water distribution due to changes in inflow and outflow caused shallow depth and decreased salinity, which caused biodiversity loss (Panda et al.,

2010). Changing restrictions and fishing rights and changes in employment structures in the area caused the local people to migrate to cities in search of new job opportunities (Nayak & Berkes, 2010). The impact on the ecosystem and functional effect on the local fishery industry of the lagoon can be grouped under direct consequences such as socioeconomic issues and problems. In contrast, indirect impacts are accounted for as watershed and wetlands problems, shallowness of channels and changes in human settlements in the area (Panigrahi et al.,2007).

One of the significant changes in the Chilika lagoon environment is biodiversity loss (Nayak, 2017). Changes in water system salinity caused a change in the livelihood of fish species in the lagoon environment (Panda et al., 2010). Some estimates show illicit prawn growth increased by 60% in the Chilika lagoon area. The loss of fish species in the lagoon and the lower cost of shrimp production have become critical elements in fishery practices loss in the Chilika lagoon area (Nayak & Berkes, 2011). Changes in salinity variation and water flow interaction are essential ecological factors, driving large-scale changes in environmental and economic interpretation in the area. Some of the ecological changes include biodiversity loss, change in fish livelihood and variation and change in water quality, leading to loss or reduced income and fisheries' livelihood in the area. Other consequences are changes in institutional elements, for example, moving away from traditional leadership and fishing practices which will influence social complexity such as cultural conflicts and identity loss of fishing communities (Nayak & Armitage, 2018). Governmental policy solutions have failed to improve the livelihood of local SSF communities, and up to now, there are unresolved issues and uncertainties over the Chilika lagoon's future (Nayak & Armitage, 2018).



**Figure 4.1: Map indicating study region in Chilika Lagoon (Source: Nayak & Armitage, 2018)**

### **4.3.Small-scale fisheries communities**

Often, Small-scale fisheries (SSF) communities are vulnerable due to infrastructural situations, which cause isolation from other geographic locations in the same country or internationally, economic and political disadvantages, and culturally considered low-class citizens (Islam, 2011). Also, most academic researchers focus on financial aspects, and cultural and social aspects of SSF communities are understudied. Fisheries for SSF go beyond social and cultural values. It is a way of living that they are familiar with, so they choose to stay fishing not for economic reasons only but for multi-faceted reasons that lead to job creation and life satisfaction (Johnson et al., 2018; Onyango, 2011; Pollnac & Poggie, 2008). It is essential to focus on the social and cultural values of SSF to improve the management of fisheries resources and secure sustainable livelihoods of fishing communities (Johnson et al., 2018). It is essential to consider diverse values and beliefs hidden in small-scale fishery communities (SSF) and (DF) production. By comparing and studying divers' weights to SSF, we can understand the crucial relations and connection between what matters to the people in the community and what is desirable to the targeted society to address the importance of governance and policymaking discussion in the area of the liveability of the community.

SSFs' production accounts for more than half of the world's catch globally. Almost 120 million people are employed in the industry, and their survival depends on it. About 90 per cent of SSF employment belongs to developing countries, and the food security of millions of people depends on them (Kurien, 2015; Cohen et al., 2019). As mentioned before, the lack of infrastructural facilities and competition between SSF communities with commercial and industrial sectors, in addition to climate change risks and poor management, harm relative community livelihood and make them vulnerable (Kurien, 2015; Cohen et al., 2019). The tragedy of the commons is affecting the SSF community by overusing natural resources at the expense of others and making them vulnerable. As a result, there is pressure on resource availability to the SSF community, causing potential collapse and shortage in accessibility to resources to a marginalized community. Coastal ecosystems serve as religious, political and economic aspects of SSF communities (Nayak & Berkes, 2019).

There are few studies on SSF communities about water conservation and management, urbanization and poverty. The SSF fishery practices influence relevant communities and farming and non-farming activities through small trades (Macfadyen & Corcoran, 2002; Schuhbauer et al., 2017). Chilika lagoon is rich in biodiversity, which is an excellent location to attract tourists and migrants' birds. The lagoon is a critical location for over 400,000 people living in more than 150 villages, and their livelihood depends on it (Nayak, 2014). The change in social and ecological drivers of the lagoon cause issues such as pollution and shortage of natural resources. Also, local farming plays a vital role in salinity variation that pressures fisheries and communities that rely on fishery resources. Tourism, agriculture, urbanization and sea mouth opening cause local fishers to go further away from their traditional fishing location to be able to catch fish (Jentoft and Chuenpagdee, 2015).

The adjustment made by traditional fishers has created social conflicts over the right of access and influenced fisher's livelihood and communities. SSF communities are ignored by the government developing strategies that cause poverty and water resource control. There is a crucial need for more analysis to understand the connections between SSF values and wetland governance and its effect on community livelihood and survival (Chuenpagdee, 2019). However, recently, there has been more recognized research on food security related to SSF; there is a gap and limited study about the connection between SSF community livelihood following the governance of commons and wetlands in Chilika lagoon. Sustainable development should be the main target concerning local values, destruction costs, and effects on marginalized fishers' communities (Allison et al. 2009). Marginalization and insecurity are the main concepts to understand the SSF communities' poverty and vulnerability. The consideration of the close relationship between the small-scale fisheries community and the ecological requirements of the lagoon will lead to the socio-economic interest of SSF and economic developments in the community (Allison et al. 2009). Considering tradition and existing values in the community and having respect for the area they live brings up the necessity of focusing on recent changes in the lagoon's governance, which is followed by climate change and ecological changes impact the Chilika lagoon area, to understand better the relation between local people's livelihood and vulnerability with government decisions and policies (Jentoft and Chuenpagdee, 2015).

#### **4.4. The Chilika Lagoon Social-Ecological Changes**

Social-ecological changes are caused by various reasons, such as shrinkage in the area covered by water due to changes has been made by the government at the sea mouth, and causing changes in siltation of water due to out-water and in-water flow, and increasing pollution as a result of unstandardized industrial waste management practices and urban development projects (Finlayson et al., 2020). As a result, various global and national drivers have severely affected the lagoon's social, cultural and environmental problems. The habitat changes in the area involve human socio-economy needs, which depend on the Lagoon ecosystem's livelihood and survival (Finlayson et al., 2020). Climate change is another driver affecting the lagoon's various temporal scales, causing crucial habitat disruptions. Climate change influences the coastal ecosystem and can impact activities such as hydraulic concentration, aquaculture, erosion, runoff, and sedimentation. In addition, unexpected overfishing activities harm the ecological and economic aspects of the surrounding communities and the lagoon (Panigrahi et al., 2009). Increasing pressure on the lagoon ecosystem is caused by various drivers driving socio-economical vulnerability in the area, causing biodiversity to be lost and influencing the values of surrounding communities (Panda et al., 2010).

The rising international shrimp markets influenced the fishing market in the Chilika lagoon in the 1970s, and moved the fishing industry in the area to focus more on the intensive production of prawn in the 1980s, which caused changes in the traditional fishery industry in the area and has resulted in entitlement concerns of the commons. The rapid drop in fish production had infected the livelihood of fishing-based communities, and many people started migrating due to job loss. Also, the fluctuation of water flow has impacted the lagoon's biodiversity and changed the area's fish species (Nayak et al., 2016; Nayak & Armitage, 2018). The new sea mouth increased free water circulation between the sea and the lagoon, resulting in flood mitigation and fish and shellfish output. (Ghosh & Pattnaik, 2005; Sahu et. al, 2014). However, opening the sea mouth had some positive impact, but its negative influences severely impacted the SSF community's livelihood in the area. In 2013 and 2014, the lagoon was hit by two Cyclones in a row, “Phailin”, which happened on October 12, 2013, and “Hud Hud”, which occurred on October 12, 2014. Hud Hud caused severe flooding in the Chilika lagoon area and caused ecological changes in the lagoon system for a while (Sundaravadivelu et al., 2019).



In 1999, Orissa experienced a “Super Cyclone”, the most dramatic disastrous cyclone in a century, and impacted many lives in fishing communities (Iwasaki et al., 2009). The Phailin cyclone affected the water quality and biodiversity of the Chilika lagoon. Changes in nutrient dynamics caused high silicate and ammonia concentrations and damaged seagrass livelihood. The shift in the ecosystem caused lower food production and resulted in the vulnerability of fishing communities (Barik et al., 2017). The cyclone affected the uprooting of mangroves and Casuarina woods, exposing the lagoon to Bengal Bay and damaging the cultivation of local populations, causing water imbalance and a decline of fish species (Nayak & Armitage, 2018).

The latest intense cyclone happened on May 3<sup>rd</sup>, 2019, ” Fani”, which wreaked havoc on Chilika lagoon and surrounding areas with strong winds, heavy rains and flooding (Acharyya et al., 2020). Again, many lives have been lost, and it had a substantial economic impact by damaging fishing equipment and boats in the area. Natural events such as cyclones, droughts and floods are familiar realistic episodes in the Chilika lagoon area, affecting small-scale fishers' livelihood and making them more vulnerable (Sundaravadivelu et al. 2019). The lagoon ecosystem changes concerned local and national governments (Panigrahi et al., 2009). A quick adaptation of intensive shrimp production and getting away from traditional fishing practices led to more standard fishing practices by non-local fishers (Nayak et al., 2016; Nayak & Armitage, 2018). In addition, the artificial sea mouth and change in water flow rates caused a shift in the water balance and livelihood of shellfish and fish species in the area, which made the local fishers less viable (Nayak et al., 2016; Nayak & Armitage, 2018).

Previous research and studies in the lagoon area emphasise these impacts on the reducing lagoon dept due to changes in PH or siltation and shrinkage of water distribution, reduction in fish production and traditional fishing practices, restrictions in access to customary fishing grounds and limitation in suitable fishing activities, and increase in local community migration to seek a job elsewhere (Finlayson et al., 2020; Panda et al., 2010; Panigrahi et al., 2007; Nayak & Berkes, 2014). The impacts on the lagoon ecosystem have resulted in socio-economic issues, physical alterations, over-exploitation, and community marginalisation (Panigrahi et al.,2009). The drastic changes in local culture, beliefs, ethnicity and religion have influenced the social system of the lagoon community. Also, the loss of access to political rights and ownership, and the availability of resources to the local community, has caused job loss and out-migrating fishers, which caused

collapsing fisheries management structure in the area and causing conflicts (Nayak et al., 2016; Nayak & Armitage, 2018).

#### **4.5.Social Well-Being**

The social well-being concepts are built based on social and cultural interaction and are related to a particular place or time (Atkinson et al., 2012). Hence, it is crucial to understand the universal approach to social well-being, considering how people in a specific community will understand it based on their life and education situation (White & Blackmore, 2016). According to Coulthard et al., 2011, using natural resources will influence people's beliefs as they try to understand what it means to have a better life in a specific social-ecological situation. Additionally, the ability to live well depends on the degree of achievement to meet the material, relational, and subjective values and beliefs (Johnson et al., 2018). This is essential to determine what the Chilika Lagoon SSF communities mean by their well-being. Understanding the relationship between the social well-being aspect and the community concept of values and beliefs is vital to show how it will affect the community's livelihood and viability.

In this chapter, I discussed different dimensions of the social well-being framework concerning the Chilika Lagoon SSF communities' beliefs that are considered to have a positive or negative impact on the quality of life in the community. These dimensions will explain what people think contributes to the quality of life and how to achieve them. The social well-being dimensions are: (1) material well-being, like economic situation and the environment, (2) relational well-being, such as social and political interaction within community and society, (3) subjective well-being, such as psychological situation, cultural values and beliefs and ideologies (White, 2010). The living well concept is helpful to better understand the three social well-being dimensions (Armitage et al., 2012). According to past studies, asking questions regarding the SSF community's well-being in Chilika lagoon allowed the community to reveal their understanding of the concept of good life and well-being. The studies are around what they have now, and what they are willing to achieve in future to fulfil their livelihood and happiness in their lives.

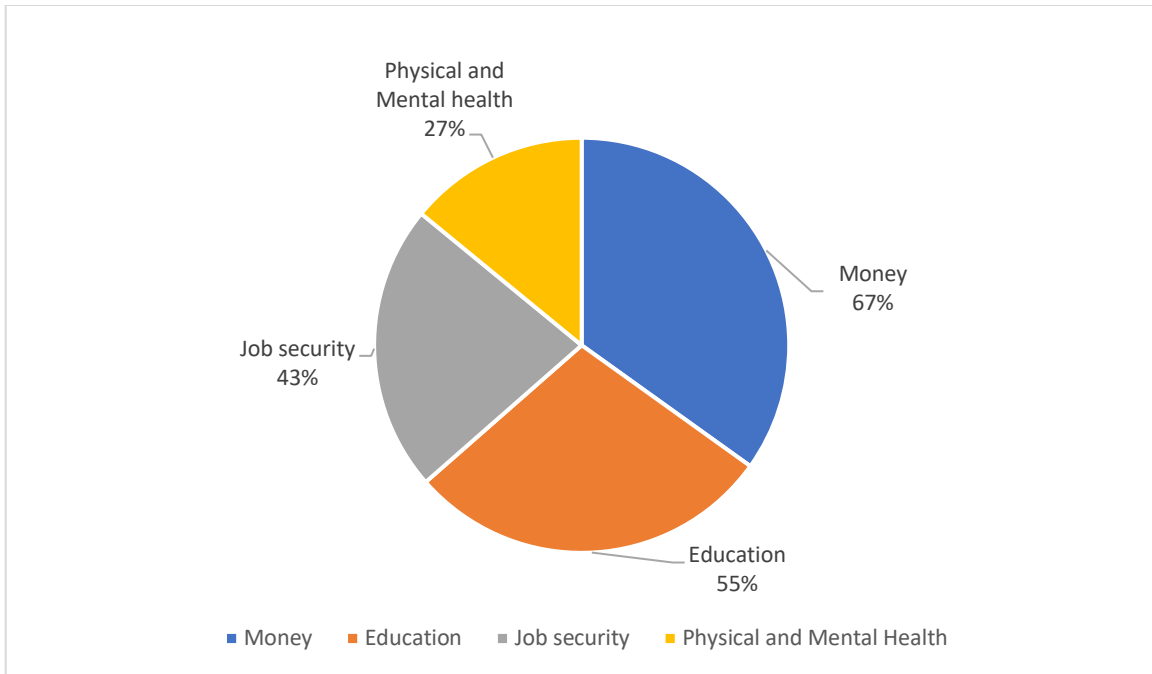
The value theory in social science explains that values directly connect with human action and motivation (Johnson et al., 2018). Therefore, human constantly adjusts their beliefs and values

following their life situation to meet social well-being (Johnson et al., 2018). According to Song et al. (2013), understanding the relationships within different dimensions of a social well-being approach and community beliefs is critical. The categorization of each dimension should not be seen as a strict association, as each dimension will also have connections to the other dimensions of well-being.

#### **4.6. Material Well-being**

Material well-being discusses assets and standards of living in a person and their family and how it will meet their needs of living well and having a good life (White, 2010). According to White, 2010 and Weeratunge et al., 2014 analysis of well-being in the coastal communities generally material well-being was divided based on two aspects: (1) Livelihood diversity such as education, mental and physical health and (2) Material assets such as fishing equipment or transportation equipment. As the study shows, essential elements of having a successful life within the coastal community are: money, education, and job security (Figure 4.2). The percentage has shown in Figure 4.2 is based on information provided in references (White, 2010; Weeratunge et al., 2014), which I modified it in this Figure.

Material well-being is the primary requirement of a successful life and sustainable livelihood in the small-scale fishery community. Their economic condition affects their mental and physical health, which is directly related to their household wealth and material assets (Graham, 2011). The connection between income and social well-being is solid for poor people compared with other people. Their material well-being directly affects their life situation, and any decrease in income, or job loss can severely impact an individual's life and, eventually impacting community survival (Graham, 2011). Study shows some factors, such as an increase in fishing activities by other people and the higher cost of fishing equipment, affect the living cost, and the higher living cost will affect community livelihood (Weeratunge et al., 2014).



**Figure 4.2: Top three requirements for a successful life as chosen by Coastal Communities (Adapted and modified from White,2010; Weeratunge et al., 2014)**

Material well-being has different gender effects among the SSF community in Chilika lagoon, as female members give their gained income to the male household member. Additionally, much of the systematic gender differences in material well-being are due to society's composition of social, economic, and political hierarchies (Weeratunge et al., 2014). Rafferty (2013) stated, "social norms, cultural traditions, patriarchal attitudes and ideology, gender stereotypes and discrimination ... are at the root of gender-based social inequalities that benefit men and boys [over women and girls]" (p. 7). There is a crucial connection between the objective dimension of values and beliefs and the erosion of material well-being within the Chilika lagoon SSF community members.

#### **4.6.1. Livelihood Diversity**

Well-being is directly related to the improvement of livelihood approaches that describes people's economic activities as a complex mix of priorities, strategies and alliances (Allison et al., 2011). Livelihood can be defined as the natural, physical, financial and social capital assets and the combination of them determines the livelihood improvement or degradation of a household and community (White et al., 2007). In this research, I focused on primary or alternative activities and resources such as education and physical and mental health of the Chilika lagoon SSF community to pursue material well-being. Primary livelihood activities in The SSF community (fishing) could make up around 50% of their income. As fishers have no other skills than fishing and no land for agricultural activities, their livelihood and survival intensely depend on the existence and survival of coastal-marine ecosystem services (Sarkar et al., 2012). Climate change and weather conditions have a crucial impact on the survival of the SSF community, as the main source of their income relies on primary fishing activities (Sarkar et al., 2012).

The alternative activities to fishing during the low fishing season caused by weather changes could be construction, farming or working for the Fisherman Association of the Lagoon. Many people are forced to temporarily move to their place of work due to long distances. The positive outcome is financial stability, and the adverse effect is adaption, identity and security concerns (Allison et al., 2009). Previous studies identified the benefits of fishers' livelihood on marine conservation provisioning of successful fishery industry studies (Daw et al., 2012; Katikiro, 2016). There are some challenges to alternative livelihood in the small-scale fishing communities, for example, lack of transitional funding and support programs, which has a negative influence and unfair distribution of benefits among communities' households. Researchers argue that to turn livelihood diversification into a success, a systematic and bottom-up approach must be followed in policy and practice (Salagrama et al., 2008).

Research shows education is essential to a successful life as it plays a vital role in empowering the SSF community. As a result of the cycle of poverty in the community, most of them cannot have formal education, which causes compunction barriers between them and the mainland society and impacts their life stability and livelihood (Salagrama et al. 2008). As a result, most fishermen in the community want their children to get the proper education. Additionally,

the material circumstances of the SSF community shape their beliefs regarding the importance of education in having a successful life. They believe education enables a person to have a better chance of a better profession instead of forcibly entering laborious jobs. They can communicate and be involved in mainland society and confidently express their concerns (Salagrama et al. 2008).

The other essential requirement in the small-scale fishery in Chilika lagoon is the community's physical health. The nature of the fishing activity and uncertainty of the coastal-marine environment due to climate change and weather change concerns regarding occupational hazards (Udolisa et al., 2013). Research shows that the most common injury among fishermen is eye problems caused by sun and sea glare, hearing issues caused by boat motors and skin problems due to exposure to sun and salty water. Also, there are cases of accidental injuries, such as life losses due to finding a sufficient amount of catch (Udolisa et al., 2013). Good physical health is an essential factor for everyone and will influence the livability of a person. The other concern in the SSF community of the Lagoon is not having access to a proper health care system and professional doctors, which is concerning. A recent increase in sickness and accidental injuries has led some fishermen to quit their traditional profession and face more poverty and isolation (Weeratunge et al., 2014).

Climate change affects sea level rise and rainfall patterns frequently, which cause extreme weather events and significantly impact the Lagoon's SSF community (Acharyya et al., 2020). Both short and long-term impacts of natural hazards affect the socio-economic of the related community, with the poor in the Lagoon community suffering more (Mazumdar et al., 2014). According to the World Bank report (2001), the loss of assets could force the poor towards more poverty, and replacing the assets and coping with the situation will have adverse physical and mental health in the community.

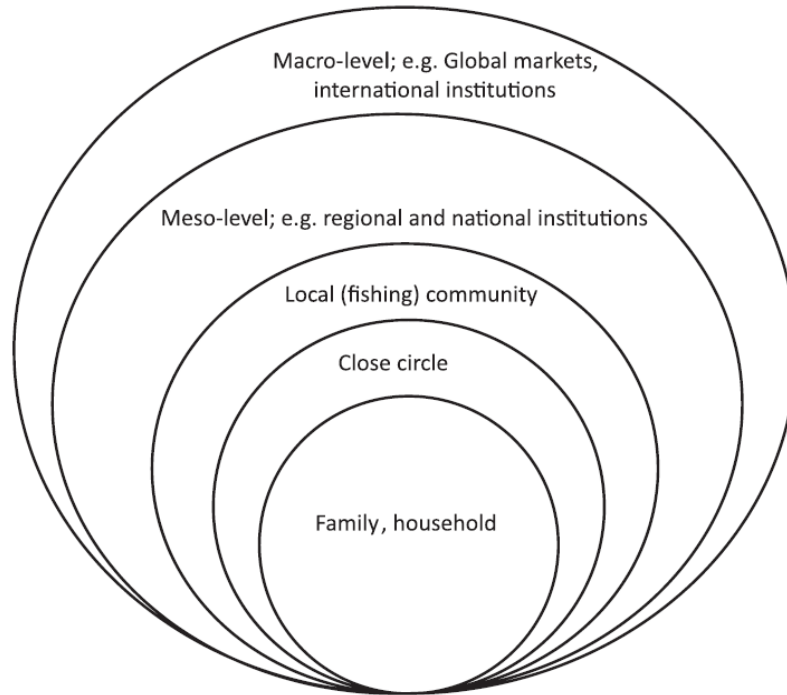
Regardless of fishing methods and equipment the community uses, a fishing boat is one of the essential tools for small-scale fishers. Therefore, it is crucial to have a secure and robust boat in case of a sudden change in the weather causing solid winds or rain to protect the fishermen's safety (Nayak et al., 2004). This level of financial security motivates fishers to buy boats with more powerful engines and borrow money from local moneylenders, which may result in more

debt and mental pressure due to the inability to afford the cost and return the loan (Nayak et al., 2004). The other concern in the SSF community of Chilika lagoon are poorly constructed houses, which are not solid and standard according to Indian culture and negatively impact the community status in the society (Nayak, 2012). As a result of not getting any tangible assistance for better housing or strong engine boats, the community's livelihood has been negatively impacted and moving towards more poverty (Acharyya et al., 2020).

#### **4.7.Relational Well-being**

Relational well-being is based on people's relationships considering their beliefs about living a good life. Relationships permeate the SSF community in many ways, such as social, cultural and religious (White & Ellison, 2007). Finance is one of the crucial aspects of society and influences the relationship between community members. As past studies show, many SSF community members of Chilika lagoon accept that it is impossible to have a good life without having a good relationship with people in their community. They believe being surrounded by family and friends is one of the essential requirements for a successful life (White & Ellison, 2007). Relationships within small-scale fishers' community members influence access to material and non-material benefits, and understanding the positive and negative aspects of existing relationships within the community requires studying the relations that have been established in the fishing communities, such as the interaction between community members, boat owners and intermediaries (Weeratunge et al., 2014).

Each community member can relate to various organizations such as political parties, sports, religious groups and clubs. Membership in these groups might depend on multiple factors, such as demographic and psychographic factors (White, 2010). One of the benefits could be an acknowledgement of the community regarding new rules and regulations in society, which could lead to improved management of fisheries resources and a better economic situation (White, 2010). The SSF of Chilika lagoon social circles are complex and overlapping. As past research shows, most community members mentioned that considering their differences, they all try to stay as one family (White, 2010).



**Figure 4.3: The relational landscape of relational well-being. (Adapted from Britton & Coulthard 2013).**

Marginalization and economic barriers significantly impact the structuring of solid bonds among community members. The fishing community members are supportive of each other even though the existing poor material well-being worsens (Weeratunge et al., 2014). Women play an essential role in increasing the livelihood of their household by participating in different activities, such as catching small fish and shrimps and participating in dried fish production. This has made the concept of family business more tangible and culturally gives a more important role to women in the SSF community (Nayak et al., 2011).

#### **4.8. Subjective Well-being**

Subjective well-being reflects how one perceives the world, therefore, is a thread through all aspects of life - including both material and relational well-being (White, 2010). For example, while a quantity of money is objective, satisfaction attained with this money is entirely subjective (White, 2010). Social identity is one of the factors in relational well-being, although understanding



the self-identity aspect influences how each experiences life (Ellemers et al., 2002). According to Weeratunge et al. (2014) research, even in the presence of other livelihoods, fishing comprises the core of a fisher's identity. Fishing is not just a matter of what fishers do but also forms the substance for who they are. Inheriting the profession through one generation significantly impacts people's self-identity. Hence, the outcome of day-to-day work is an essential factor in social perception. Therefore, transitioning from fishing to a new occupation might require strategies to mitigate the devastating impact of identity loss.

Past studies show that life satisfaction is linked with others using subjective well-being and life satisfaction synonymously (Ellemers et al., 2002). Subjective well-being has been identified as a personal satisfaction concerning life goals achievement (Copestake et al., 2009). It is essential to understand that satisfaction is an important factor of subjective well-being, but it is not the only factor (Weeratunge et al., 2014). Hence, satisfaction could be replaced by desperation and misfortune due to social and economic barriers. This could be one of the reasons that the new generation of small-scale fishers in the Chilika lagoon communities are not interested in following their parents' fishing business (Weeratunge et al., 2014).

#### **4.9.Social ecological and Social wellbeing indicators**

Various global and national drivers have severely affected the marine community, such as Chilika lagoon social, cultural and environmental problems. There are various reasons causing Social-ecological changes such as shrinkage in the area covered by water due to changes has been made by the government, which in the case of lagoon could be refer to the sea mouth, and causing changes in siltation of water due to out-water and in-water flow, and increasing pollution as a result of unstandardized industrial waste management practices and urban development projects (Finlayson et al., 2020). Increasing pressure on the lagoon ecosystem is caused by various drivers driving socio-economical vulnerability in the area, causing biodiversity to be lost and influencing the values of surrounding communities (Panda et al., 2010). Previous research and studies emphasise these impacts on the reducing water dept due to changes in PH or siltation and shrinkage of water distribution, caused reduction in fish production and traditional fishing practices, restrictions in access to customary fishing grounds and limitation in suitable fishing activities, and increase in local community migration to seek a job elsewhere (Finlayson et al., 2020; Panda et

al., 2010; Panigrahi et al., 2007; Nayak & Berkes, 2014). For the scope of this research, relevant dimensions of social ecological changes and social wellbeing, as conceptualized by Britton & Coulthard, 2013; Finlayson et al., 2020; Nayak & Armitage, 2018; Weeratunge et al., 2014; White, 2009a) are noted in Table 4.1.

**Table 4.1: Social ecological and Social wellbeing indicators and examples (adapted from Britton & Coulthard, 2013; Finlayson et al., 2020; Nayak & Armitage, 2018; Weeratunge et al., 2014; White, 2009a).**

Indicators	Examples
Social Ecological changes	Caused by various reasons <ul style="list-style-type: none"> <li>• Shrinkage in the area covered by water, example sea mouth has been made by the government in the Chilika causing PH changes in water</li> <li>• Impacting fish species due to change in salty water causing fish migration to deeper area</li> <li>• Unstandardized waste management</li> <li>• Climate change influences the coastal ecosystem and has direct impact on aquaculture, erosion, runoff, and sedimentation.</li> <li>• Biodiversity loss and Invasion of new species- Barnacles</li> <li>• Change in water depth, turbidity &amp; transparency which can cause Low light penetration &amp; Heavy sedimentation</li> </ul>
Social Well-being <ul style="list-style-type: none"> <li>• Material Well-being</li> </ul>	<ul style="list-style-type: none"> <li>• Access to provisioning ecosystem services, species and natural materials targeted for fishing or collection</li> <li>• Access to fishing gear; income, assets, level of consumption, housing quality; availability of water, food, sanitation, and healthcare</li> </ul>



will have negative impact on other indicators such as subjective well-being which has close relation with life satisfaction and personal satisfaction concerning life goals achievement (Weeratunge et al., 2014). The secondary data collection is based on past researches and existing literature review which is revealing the dynamic of conflict and unity within community values and how their understanding and perception of these values affect their well-being and economic situation. According to Johnson et al. (2018), there is a strong need to pay attention to various drivers to have a better strategy to deal with the complex reality of society.

#### **4.10. Chapter Summary and Conclusion**

In this chapter, the three dimensions of social wellbeing are examined: (1) material wellbeing (e.g., livelihood diversity, assets, access to primary resources); (2) relational wellbeing (e.g., social relations, fisher institutions); and (3) subjective wellbeing (e.g., self-identity, living right, satisfaction, autonomy). The review suggests that the fishing community's priorities on the requirements for a successful life are aligned with their definition of their beliefs. Monetary-related conditions have been shown as top priorities for satisfactory quality of life among the fishing community. Throughout the different facets of social well-being, we have seen that the well-being of fishers depends, to a large extent, on the circumstances of the fishery and fishing community they are part of, their relationships with them, and how they feel about them.

The secondary data collection is based on past studies and research in the area. The small-scale fishery production ranked as one of the essential industries in the Chilika lagoon area, revealing the dynamic of conflict and unity within community values and how their understanding and perception of these values affect their well-being and economic situation. Wealth, secure livelihood, attachment to place, social cohesion, and social recognition are the most important element of well-being among the SSF community members. Study shows that increasing life and economic risks in the Chilika lagoon SSF community caused high social cohesion within the community, leading to social marginalization due to various beliefs. According to Johnson et al. (2018), there is a strong need to pay attention to various drivers to have a better strategy to deal with the complex reality of society. Although objective contributions are invariably important to securing sustainable livelihoods of fishing communities, so are the subjective and relational ones.

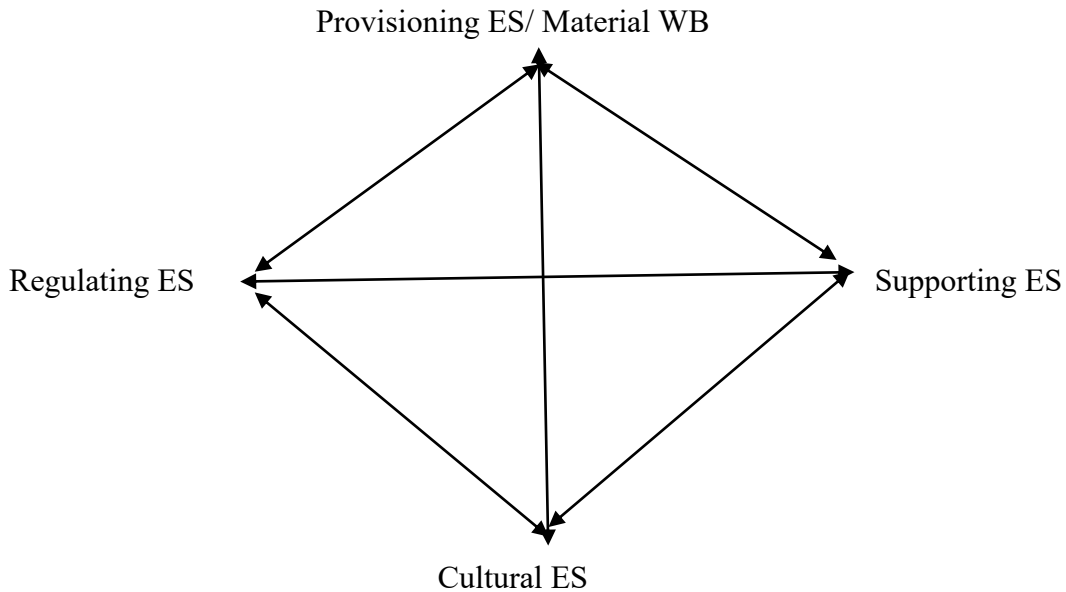
## **Chapter 5 The link between Ecosystem Services, Social Well-being and Adaption Techniques**

### **5.1.Introduction**

The SSF community of Chilika lagoon viability can be promoted through poverty mitigation, food security, livelihood provisions, new employment opportunities and economic development. This may help to mitigate irreversible changes in the Chilika lagoon ecosystem and improve the livelihood of SSF communities. There are various coping and adaptation techniques that are useful to enhance the viability of the SSF community of the Lagoon. In this chapter, I will address objective three as it outlines strategies employed by fishers to adapt to the changes in the social-ecological system of the Chilika lagoon concerning wetlands' socio-economy drivers. I introduce and compare broad ES-SW linkages for fishers and non-fishers. The examination of the relationship between the ES-SW linkages and adaption techniques corresponds with objectives three of this research. The viability measures are explored for a better understanding of the ecosystem of the Chilika lagoon through multidimensional zones considering possible management options. Short-term and long-term approaches, locally and internationally, have been described to address sustainable livelihood, resilience, and improvement of well-being in The SSF community of the Lagoon.

### **5.2.Ecosystem Service Bundles**

In Chapter 2, I discussed the bundled qualities of ES, described as the unidirectional or bidirectional interactions between multiple ES (Bennett et al., 2009). Research has indicated that when prioritizing ES for conservation, relationships among multiple ES must be carefully accounted for (Bennett et al., 2015). Interactions between ES can lead to two outcomes: 1) trade-offs (i.e., where the increase of one or more ES results in the decrease of other ES); and 2) synergies (i.e., either an increase in multiple ES simultaneously, or a decrease in multiple ES simultaneously). Therefore, the relegation of certain ES and ES categories into silos during conservation planning may result in unintended ES decline (Bennett et al., 2009). This research acknowledges the “bundled qualities” of ES with bi-directional arrows, which also symbolize the bi-directionality of ES influence (Figure 5.1).

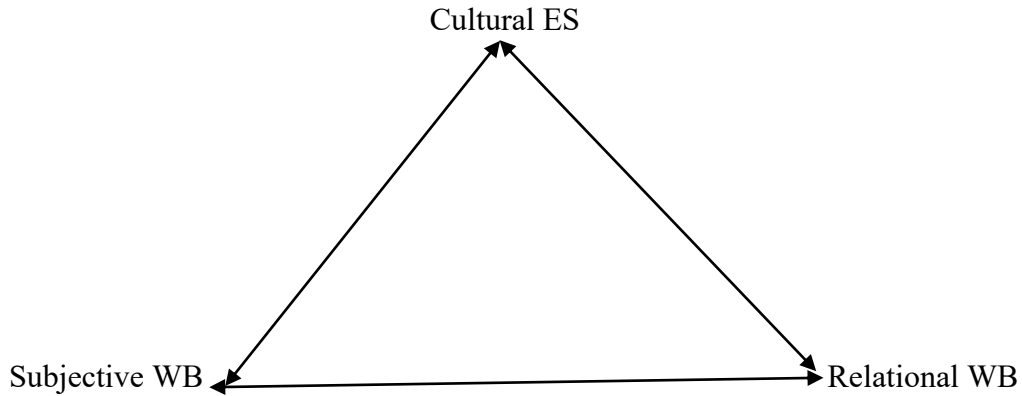


**Figure 5.1: The ES square and bundled qualities of ES.**

### **5.2.1. Social Foundation**

The social foundation in this research comprises relational wellbeing (e.g., social interaction, socially determined rules, practices, and norms) and subjective wellbeing (e.g., ideologies and beliefs that influence people’s perceptions of their lives) (Chapter 4), and cultural ES (i.e., the culturally significant intangible benefits that people obtain from ecosystems) (Chapter 4&2) (MA, 2005; White, 2009b). I argued that cultural ES are central to both relational and subjective wellbeing, and that some cultural ES serve as the bridge between the individual (i.e., subjective self) and society (i.e., relational self). Findings from this thesis support this argument. The Chilika Lagoon Community members not only identify with lagoon structure on a subjective level, but also are relationally bonded through this shared identity. For fishers, this subjective and relational identity is strong, since the lagoon is an important part of their self-perception (e.g., sense of identity, belonging, feelings of success or failure) and their ability to provide food, shelter and education for their families. Moreover, the subjective and relational ties formed through cultural ES can be increasing self-enforcing. For example, access to certain cultural ES (e.g., recreation and leisure) can enhance relationships (i.e., relational wellbeing), in turn supporting components

of subjective well-being, such as life satisfaction and happiness (chapter 4), can be observed in the reverse of this situation, where cultural ES cannot be accessed.



**Figure 5.2: The social foundation relation**

### **5.3. Ecosystem Service and Social Well-being Linkages**

The three dimensions of social well-being are connected through arrows (Figure 5.2), reflecting the impact of each dimension on the others. Previous study shows many fishers expressed that a decline in access to provisioning ES and material wellbeing, can lead to declines in both subjective (e.g., feelings of failure) and relational wellbeing (e.g., arguments with family or community members). Ecosystem services remain a crucial aspect of well-being linkages in the Chilika lagoon SSF community, since provisioning ES are strongly tied to material well-being, and cultural ES are central to subjective and relational WB. Insights from this research validate this conceptual framework by emphasizing the importance of strong social foundations in conservation efforts. The governance challenges all point to the crux of conservation issues internationally and locally: the human dimension.

This research proposes that without considering the relation between continued access to cultural ES and efforts to build robust levels of relational and subjective wellbeing, long-term conservation efforts to restore the “ecological system” are unsustainable. Weakening of social foundations has negative impact on ecological system by and will cause conflict over resource scarcity which is a known phenomenon (Potschin, et al., 2011). I explored Ecosystem service and social well-being linkages for coastal communities in this chapter through the perspectives of specific community groups to examine impact of linkages and coping system (Table 5.1). As it is important base on human dimension definition which is the relation between human and natural resources (in my research international wetlands) by considering of the positive and negative impact they have on each other.

**Table 5.1 Linkages between Ecosystem Services (ES) and Social Well-Being (SW)**

<b>Ecosystem Services</b>	<b>Social Well-Being</b>
Provisioning services	Ecological bundles concern the provisioning, regulating, and supporting services of an ecosystem. Provisioning services are direct, tangible, and material benefits, where regulating and supporting services support the production of these benefits. In a resource-based community, material well-being at an individual level can be distilled to resource access, which promotes the increase of financial and material assets (White, 2009a). As such, material wellbeing is directly tied to the availability of natural resources (e.g., fish).
Regulating services	Regulation services refer to many indirect benefits of wetlands like air quality regulations, Water purification, disease regulation, climate regulation, pollution, pest regulation, and natural hazard regulation such as flooding (Mitsch et al., 2015; MEA, 2005). Regulating services may likewise support the availability of sociocultural bundles (i.e., cultural services), which could be tangible (e.g., places of worship, ethnobotany, raw

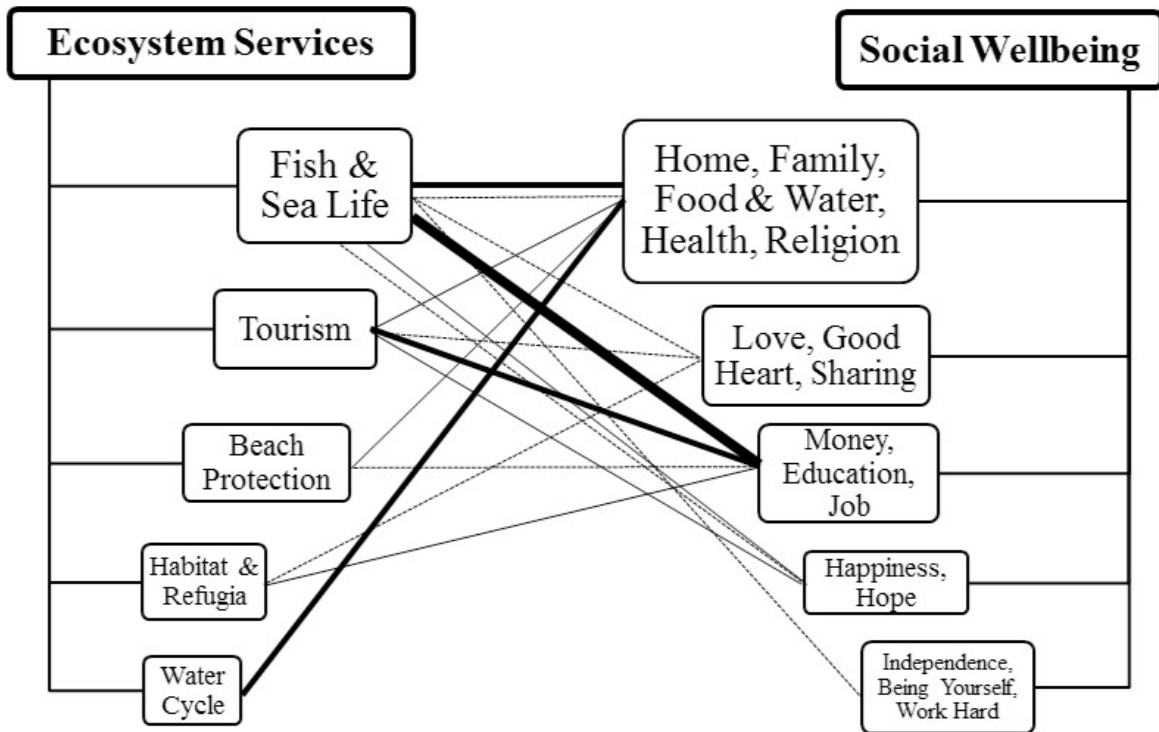


	<p>materials in cultural artefacts), and intangible (e.g., spiritual inspiration, recreation, aesthetic enjoyment, educational value). However, social relations also determine degrees of material well-being (e.g., policy, social capital, institutions).</p>
<p>Cultural Services</p>	<p>Cultural services support individuals’ spiritual needs, recreation, and tourism industry, influencing education directly and indirectly, as well as cultural beliefs. Also, Wetlands are known as unique lands to provide a home for plants and animals, specifically migrant birds, to support their biodiversity (Verhoeven et al., 2006; Schulte-Hostedde &amp; Schrubsole, 2003). A lack of access to ES (material and non-material bundles) may contribute to a decline in all aspects of well-being. For example, a failed fisher may experience identity loss (i.e., subjective well-being) and a strain on relationships with those who rely on them for natural and financial capital, such as their immediate family, or business partners (i.e., relational well-being)</p>
<p>Supporting Services</p>	<p>ES supporting services are based on nutrient cycling, soil formation and hydrological cycle information. These processes are primary and the foundation for other services and ecosystem livability functions, which benefits human well-being and wetlands survival (Mitsch et al., 2015; MEA, 2005).</p> <p>How to access ES and well-being, is an important aspect which in many circumstances are not transparent and are unclear (e.g., which ES, which dimensions of well-being, to what extent). Answering the “how” may inform governance practices for failing. The complex linkages and convergences between the ecological and social systems may offer insights into why some conservation efforts fail. For example, if</p>

	there are no robust social institutions to manage these governance practices they fail (e.g., to monitor and enforce its rules).
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The linkage between fish and sea life (provisioning ES) and money, education and job (material wellbeing) is especially important. As previous study shows these findings validates the importance of fishing as a primary livelihood activity in the Chilika lagoon (Panigrahi, et al., 2009). Figure 5.3. revealed that while a provisioning service emerged as the most important ecosystem service, community members thought of their “home” as more than just a material asset. Home is a multi-faceted microcosm of social well-being (Weeratunge, et al., 2014). Elements of material well-being (e.g., food and water) and physical health (chapter 4) are incorporated in the SSF community definitions of home. These findings suggest that while provisioning ES may impact material being, the impact of ES access on the community social is united with material, relational, and subjective components (Rafferty, et al., 2013).

Non-fisher, in this thesis, refers to non-fishing women and other community members. While women linked fish with money and hope, saying that they hoped for more fish so the community could make more money. For non-fishing women fish has the same knowledge map connectivity as supporting ES like water cycling and habitat and refugia. Moreover, wellbeing is an intangible element of subjective wellbeing for fisher groups. These findings support that fish and sea life, at the top of the ecological system, has multi-dimensional impacts beyond the surficial impacts on material wellbeing. Furthermore, these multi-dimensional impacts are especially relevant to fishers.



**Figure 5.3: The complexity of ES-SW linkages.** (Thicker lines show a stronger relationship. Solid lines show the second important relationship and dotted lines show a less important relationship between ES and Social Well-Being) (Adapted from Salagrama, 2008; Rafferty, et al., 2013; Coulthard et al., 2011)

The review of ecosystem services, social wellbeing, and governance of the Chilika lagoon shows the need for involvement of small-scale fishing communities in planning and policy. Nonetheless, conceptual gaps at the intersection of ecosystem services and social well-being require theoretical clarification. While ES have been widely studied for the past two decades (e.g., Costanza et al., 1997; Gómez-Baggethun et al., 2010; Polasky & Segerson, 2009), research on social wellbeing, particularly in small-scale fisheries, is an emerging body of literature (Weeratunge et al., 2014). The advantages of a social well-being approach are to draw attention to equity and empowerment by examining the multiple paths through which individuals realize

fulfillment in life, in contrast to traditional frameworks (e.g., sustainable livelihoods) that measure material wealth and socioeconomic vulnerability (Weeratunge et al., 2014).

Considering relation between ES and social well-being could lead to advances in the sustainable governance of wetlands and identifying the drivers of conservation with the greatest influence on wetland sustainability and surrounding communities' livelihood, which is the basis for successful resource management strategies; and providing insight on how these drivers may be applied in future planning, decision-making (e.g., policy in a small-scale fisheries context) (Coulthard et al., 2011). In this chapter I identified the ecosystem services and social well-being linkages, where ES SW linkages represent drivers of action. One of these actions has been taken by the SSF community in the Chilika lagoon is adaption or coping mechanisms to achieve more sustainable livelihood in the community. Next, I explained variety approaches taking by community to achieve this goal.

#### **5.4.Coping Mechanisms**

Coping mechanisms are a short-term reaction to an impact, such as changes in the Lagoon hydrological interventions due to changing the structure of the wetland. Coping may influence adaption techniques due to its measure as a short-term adaption mechanism (Shelton, 2014). This refers to reactions to disruptive activities that mobilize the capacity of the actor to draw on the available resources, skills and experiences. Usually, coping strategies are associated with changes to improve viability, for example, reduction in abundant species and appearance of new species in case of changing stocks (Ojea et al., 2020). Coping mechanisms could be categorized as the ones that aim to minimize vulnerability and avoid entry into poverty. The prevention and post-risk control strategies of coping mechanisms are considered to promote a transition out of poverty (Shelton, 2014). In Table 5.2, coping plans in the SSF community are listed, which include setting limits to the catch and changes in market strategies. It may also entail occasional changes without any systematic trend in fishing practices (Ojea et al., 2020).

**Table 5.2: Coping mechanisms of the SSF communities in Chilika Lagoon (adopted from Kumar & Pattnaik, 2012; Nayak & Berkes, 2014)**

Coping Measures	Related Activities
Livelihood approaches	<ul style="list-style-type: none"> <li>▪ Borrow money from bank &amp; non-bank institutions</li> <li>▪ Aids from religious group</li> <li>▪ Gifts from relatives &amp; non- relatives</li> <li>▪ Utilize savings</li> <li>▪ Reduced consumption</li> <li>▪ Assistances from government &amp; non-governmental organizations</li> <li>▪ Selling assets including land and property</li> <li>▪ Withdrawing children from school</li> <li>▪ Diversification methods</li> </ul>
New fishing practices	<ul style="list-style-type: none"> <li>▪ Change in the fishing technique</li> <li>▪ Improved fishing gears</li> <li>▪ Varied fishing grounds</li> <li>▪ Restructuring vessels</li> <li>▪ Intensification methods</li> <li>▪ Extensification methods</li> </ul>
Lagoon water protection plans	<ul style="list-style-type: none"> <li>▪ Raising social awareness about ecological changes in water</li> <li>▪ Identifying vulnerable species and habitats</li> <li>▪ Lagoon clean-ups</li> <li>▪ Clearing sediment filled channels</li> <li>▪ Wastewater treatment plants</li> <li>▪ Watershed management practices</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Hobbies/Skill development activities</li> <li>▪ Add value to existing products</li> </ul>

Social cohesion	<ul style="list-style-type: none"> <li>▪ Training programs</li> <li>▪ Strengthening of community support systems</li> <li>▪ Expanding communication and cooperation by developing networks within villages</li> <li>▪ Social and political empowerment</li> <li>▪ Women’s education and developing self - esteem</li> </ul>
Transitioning alternative occupations	<ul style="list-style-type: none"> <li>▪ Temporary shift to other income sources</li> <li>▪ Switching to additional occupations</li> <li>▪ Casual labour</li> <li>▪ Shrimp Aquaculture</li> <li>▪ Livestock rearing</li> <li>▪ Seasonal cropping</li> <li>▪ Farming</li> </ul>

❖ Livelihood approaches

As the study shows, one coping strategy for the SSF community of Chilika lagoon is borrowing money and getting loans from banks or money lenders (non-bank resources). Or using other money resources like grants or aid. Appropriate incentive measures can be used by establishing economic premiums through subsidies and taxes; creating marketing endorsements, for instance, eco-labels and access rights, can promote a more straightforward implementation of rules and regulations for controlling vulnerabilities faced by fishing communities (Nayak, 2017). Relief funds such as subsidies from governmental or non-governmental organizations are one of the best ways to empower the SSF community to overcome the negative impact of natural disasters and ecological changes caused by human or climate change. Other coping practices in the Chilika lagoon community are trading household properties and land, mortgages and the sale of fishing equipment. Also, discontinuing children's education to engage them in income-generating activities and engagement of women in daily labour, temporary transfers to other sources

of income, and reduced consumption to save food for the future are different coping mechanisms in the Chilika lagoon (Nayak, 2017).

❖ New fishing practices

The SSF communities can rely on modified fishing activities to achieve a more sustainable social-ecological environment. This will increase the populations of target species and help restore damaged areas to upgrade the ecosystems. Due to the low catch using traditional net catching, soft landings of fish and shrimp and reduced incomes shifted communities into coping using new fishing techniques (Nayak, 2014). Another option could be modifications in gear which is usually suitable for catching non-targeted species. Limiting the mesh size can be an appropriate measure to avoid the capture of target species at immature stages. Still, there are limitations in multi-species fisheries due to the probability of organisms of various sizes and shapes in the same fishing ground (Nayak, 2017).

The other measures include neglecting the time and space restrictions in fishing areas and catching the targeted species, commercial fishing operations, fishing overnight to get long fishing hours, intensive aquaculture and emphasis on one species based on the market value and availability (Nayak, 2014). Higher monetary investment and improved fishing laboratories are considered some intensification coping strategies. Several extensification initiatives include moving far to increase the catch, capturing all available species and using motorized boats. The emissions of gases can have negative impacts on lagoon habitats and water pollution. Improved management of fishing gear and restructured vessels can reduce the breakdowns and disturbances in lagoon waters (Nayak, 2014).

❖ The Lagoon water protection plans

Updating the water quality and protection plan of the Chilika lagoon is one of the essential steps to increase the livelihood of the lagoon species and the community. Education about the importance of maintaining water resources should be recognized as a tool that is essential to facilitate the implementation of lagoon water management plans (Kumar & Pattnaik, 2012). Community awareness regarding various social-ecological changes helps prevent wetland and water quality degradation. Implementation of proper management is necessary to protect the

livability of the Lagoon and its community. One of these strategies is removing sediments from the choked channels and mechanical scraping of algal weeds from the lagoon waters to mitigate the negative environmental impact caused by human or climate change effects (Kumar et al., 2013). Creation and implementation of a framework for active management of the Lagoon, such as building treatment plants, can reduce water pollution and help in habitat restoration. The development plan also helps save the lagoon ecosystem's threatened species (Kumar & Pattnaik, 2012).

#### ❖ Social cohesion

Another coping mechanism in the Chilika lagoon community is empowering fishers by teaching other skills to them and improving their financial situation. Additional income options could improve the SSF community's livability and vitality (Allison et al., 2012). Empowering women by educating them regarding wetlands policies, labour rights, and food protection has far-reaching benefits for the community. This will increase opportunities for women, especially in fishing households headed by women. Collective action is recognized as a critical element to successfully implementing sustainable fisheries. Collective action is widely acknowledged as a crucial component of implementing sustainable fisheries (Torre et al., 2019). Educating and empowering women in the community as decision-makers, leaders, and entrepreneurs helps strengthen community bound and decrease women's vulnerability in society. Involvement of corporate and companies can produce marine value-added goods allowing direct means of approach to wholesale fish markets by laying off intermediaries. A proper system to understand the value of the social-ecological system by utilizing the local knowledge and traditional expertise of fishers needs to be implemented. There should be investments in information, training, health, and education sectors to educate children and adults in the SSF communities to lead sustainable lives (Torre et al., 2019).

#### ❖ Transitioning to Alternative Occupations

The reduced wages, short seasons, and low landings of fish and shrimp force the SSF community of Chilika lagoon to find employment opportunities outside of the fishing industry. Some families shift to agriculture and livestock rearing as it provides vast employment opportunities. Animal farms and seasonal cropping play essential roles in supporting families'



income and providing various job options in the community as they can provide food and nutrition to their families (Allison, 2011). Although there are advantages and disadvantages associated with this transformation to new job markets and casual labour, the lagoon fishing communities prefer to get involved in them to secure their income. Incorporating aquaculture into local fishing communities provides opportunities for fish farming, mitigates conflicts in fishing grounds and improves the economy of the SSF community. Aquaculture can improve the local community's skill levels and create jobs, valuable linkages with external production sites and draw public investment (Allison et al., 2012).

### **5.5.Adaption Strategies**

Adaption strategies decrease the harm caused by various social-ecological factors and improve opportunities for the future generation. Adaption strategies may address short-term or long-term impacts (Holbrook & Johnson, 2014). Deliberate adaption must identify vulnerable communities and possible future social-ecological changes to prevent maladaptation (Shelton, 2014). Migration is a common adaptation strategy within the SSF community of Chilika lagoon to improve their lives and families. The root causing outmigration actions are restrictions in fishing rights and limited access to resources, causing the decline in the catch (Ojea et al., 2020). Other reasons are unpredictable natural disasters, climate change issues, health and social-cultural problems, reduced employment options, deprivation of education, and pressure from non-fisher communities and technological development (Nayak & Berkes, 2010). Migration could be seen as a resilience strategy to learn new skills that improve the community's livelihood. They can return to their community with the acquired knowledge to create pathways of community resilience (Himes-Cornell & Hoelting, 2015). Migrant workers return to their houses regularly, whereas outmigration often means moving away. Many people who return from migrant labour have ties to the village fishery or resource base. The SSF communities of Chilika lagoon benefit from migration by gaining knowledge on improved technology, financial remittances and developing interactions between countries and regions (Nayak, 2017).

One of the advantages of the lagoon ecosystems is to provide diverse biodiversity that makes up the ecological system and provides fishing communities and marine life with valuable benefits (Sundaravadivelu et al. 2019). Efforts to restore biodiversity can be beneficial in reaction

to increased public knowledge regarding the care of social and ecological assets in the lagoon. Lagoon habitat conservation and restoration programs can be initiated by creating schemes to protect valuable land surrounding the lagoon, restoring degraded ecosystems, utilizing advanced technologies, and supporting vegetation. Management plans such as zoning, proper land use and agri-environmental program expect to give more productive outcomes in generating employment opportunities and food security (Kumar & Pattnaik, 2012). Wetlands and mangroves provide critical ecological services such as recharging groundwater, enhancing water quality, stabilizing shorelines, preventing pollution, and mitigating natural floods (Arie et al., 2018; Bell et al.,2018).

Development of defence structures such as breakwaters, groins and sea walls are intended to shield fishing communities and the environment from tides and natural disasters (Arie et al., 2018). Integrated land use and management approach, along with the development of regulation, provide viable solutions to protect the lagoon ecosystem. Sustainable fishing practices must be followed to reduce the impacts of commercial activities, overfishing, hydrological interventions, and pollution leading to social-ecological changes affecting water quality (Bell et al.,2018). Technologies such as Global Positioning Systems can be used in fishing sectors to track the fish population. That reduces the process of catching in unsustainable ways. The Global Positioning System helps small-scale fishermen navigate back to the jetty safely. At the same time, the echo sounder enables fishers to assess the depth of the water, which can significantly improve the efficiency of fisheries (Abu Samah et al., 2019).

These user-friendly and easy-to-use fishing technologies could help the SSF communities by improving their physical movements and efforts, reducing the energy utilized. Early warning and monitoring technologies can be adopted to deal with weather issues promptly and reduce vulnerabilities faced by fisher communities (Arie et al., 2018). A disaster risk mitigation plan that emphasizes proactive activities such as lagoon zone management, accurate weather forecasts, and an early warning and emergency response system can promote the livelihood of SSF communities (Bell et al.,2018).

Another adaptation strategy that could be helpful to improve the SSF community of the lagoon is implanting flexible policies to mitigate the socio-economic impact of declining fish catch (Jentoft and Chuenpagdee, 2015). Implementing best practices for better fisheries management,

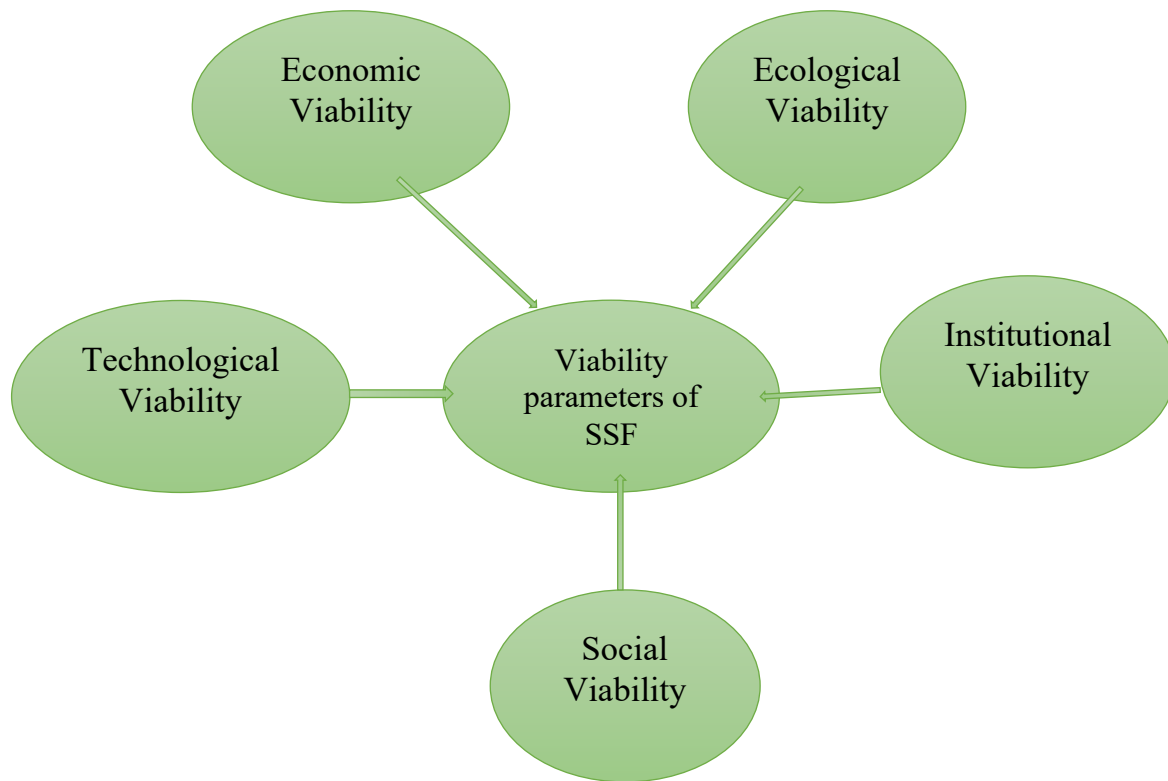
such as adaptive strategies, ecosystem management, planning tools, and regulatory techniques, including zoning and land use planning, will enhance resilience and increase system adaptability (Kumar & Pattnaik, 2012). Co-management and community-based management methods involve local fishing communities, various levels of government agencies and other stakeholders that agree to share benefits and obligations for the sustainable use of renewable natural resources. Co-management approach values the positions and contributions of fishers and local authorities. It is a largely successful way to restore fish stocks, eliminate overfishing, protect biodiversity, and secure better livelihoods. This will empower fishing communities by providing greater access to decision-making processes, vital legal representation, and increased social visibility (Nayak & Armitage, 2018). Building responsive strategies that are practical to imply at regional and national levels helps policymakers create viable measures for the sustainable livelihood of the SSF communities. Raising local authorities, societies and other resource user groups' awareness of the irreversible nature and its impacts on cultures ensures mutual understanding and dedication to take action against vulnerabilities (Magawata & Ipinjolu, 2013).

Strengthening cooperation and collaborations can be facilitated in the fisheries sector by developing partnerships with regional institutions to assist in securing fisher communities' lives and preserving lagoon resources. Promoting disaster risk mitigation and preparedness can reduce fishing and fish farming communities' vulnerability to natural disasters and severe weather events. Such relief can also reduce economic and environmental impact and improve fishing communities' productivity, efficacy, and long-term sustainability. Integrated watershed management and integrated lagoon zone planning provide the best management strategy to address constraints and challenges faced by SSF sectors (Wang et al., 2016).

## **5.6. Viability Parameters of SSF**

Managing fishing resources in the fisheries industry is based on a sustainable ecosystem. Therefore, any changes in the Lagoon's social-ecological system could significantly influence the SSF viability approaches. Viability means adopting measures to reduce vulnerabilities faced by the Lagoon's SSF community involving attaining well-being and proper access to capital (Nayak & Berkes, 2019). The viability framework, as shown in figure 5.4, illustrates the contribution of the SSF communities to food protection, economy, nutrition, and livelihoods depends on many

factors. These factors include economic, governance, policy, technological and social changes. The resulting framework explains the ecological aspects (biodiversity, productivity and trophic structure, and ecosystem integrity of habitats), economic factors (sustainable livelihoods, economy generation, viability and stability, allocation of access and profits, regional and community benefits), technological as well as institutional concepts (advanced fishing techniques, successful decision and policy-making, legal responsibilities, a robust framework of government and regional institutions) and social aspects (health and wellbeing, ethical fisheries, sustainable livelihood of communities) (Stephenson et al., 2019).



**Figure 5.4: Framework of various domain in viabilities of SSF (adapted from Salagrama, 2012; Schuhbauer & Sumaila, 2016).**

### **5.6.1 Ecological Viability**

Some factors are involved in achieving Ecological viability, for example, improving water quality, restoring habitat to maintain biodiversity, conserving wetlands and mangroves, eliminating overfishing, and preserving wild species. This can promote the self-purification capacity of the Chilika Lagoon and help it withstand disturbances to a certain extent. The gain of natural capital, which must be conserved in Chilika, is an excellent aspect of ecological viability (Schuhbauer & Sumaila, 2016).

### **5.6.2 Social Viability**

Promoting resiliency of the SSF community in the Chilika lagoon depends on securing the livelihood of fishing communities providing food security, educational advancements, and raising the standard of living and access to resources. There mix factors of relational and subjective value factors of well-being are involved in reducing social crisis, such as mitigating migration, decreasing conflicts within communities and more bonding in families, in addition to increasing community advancement level by promoting education and updating fishing skills in the community (Nayak & Berkes, 2019).

### **5.6.3 Economic Viability**

Creating employment opportunities, diversifying markets, and providing access to financial sources will improve the economic viability of the SSF community and address financial capital. More attention is required to improve the financial assets concerning the social dimension of Chilika. The monetary assets have to be profitable now and in the future. Cost-benefit analysis is frequently seen as a suitable method for determining how economically viable fisheries operations are, as it incorporates time into assessing net benefits (Schuhbauer & Sumaila, 2016).

### **5.6.4 Institutional Viability**

Implementation of rules and regulations, proper land and water resources planning, and setting policies for good fishing and catch collection reflect institutional viabilities in the SSF

sector. Adequate allocation of funds for sustainable fisheries in government projects, improving subsidies to fishing communities, and continuous monitoring of water quality with appropriate equipment and stations are some of the approaches for conserving natural assets and promoting material well-being in terms of political, physical, and cultural assets (Salagrama, 2012).

### **5.6.5 Technological Viability**

Technological advancement to improve fishing requires the involvement of advanced telecommunications to identify species, water quality monitoring, and executing warning and monitoring systems that lead to technological viabilities. Wireless communication has improved fishing efficiency, emergency response, and shore arrangements for preservation, transport, and trading. In deeper seas, mobile phones are ineffective, yet they are widely employed in small-scale operations and many aspects of shore-based activity (Salagrama, 2012). These improvements in natural resources promote material well-being in terms of job security, the standard of living and better access to markets.

Viability theory identifies "viable evolutions" rather than attempting to identify any "optimal solution". These evolutions are consistent with the restrictions because they always satisfy them, and the viability kernel can be placed (Salagrama, 2012). Overall, a viable approach involves an integration of all ecological, economic, social, institutional, and technological dimensions into fisheries management. When economic, social, and environmental restrictions are met, viability is achieved; it specifically evaluates a fisheries quota system (Schuhbauer & Sumaila, 2016). Focusing on Sustainable Development Goals can be very significant in achieving viability measures in the Chilika Lagoon and preserving the capital (political, physical, cultural, natural, social & financial) and improving the well-being (relational, subjective, material) of small-scale fishing communities (Stephenson et al., 2019).

### **5.7. The International Convention Wetland Ramsar Site Viability Approaches**

Viability indicates that social and ecological well-being must accompany favourable economic conditions. Global approaches are studied in the research to supplement the viability approach. This provides a solution to describe the multiple factors influencing the Chilika Lagoon

resource system (Chuenpagdee 2019). There are various advantages in involving communities to determine vulnerability and viability solutions, as they can become agents in working towards better livelihoods (Millán, 2019). The water environment at Chilika Lagoon reflects a complex assemblage of coastal, brackish, and freshwater habitats with estuarine characteristics. This combination, including endangered species like the Irrawaddy dolphin, has created a highly active ecosystem with important biodiversity (Iwasaki & Shaw, 2008).

These valuable features granted Chilika Lagoon to be classified under the Ramsar Convention as a wetland of international significance. This became India's first Ramsar site in 1981 (Behera et al., 2020; Sarkar et al., 2012). The management plan framework outlines the policies and actions needed to achieve the wise use of resources in the Chilika lagoon and to advance the protection of its rich biodiversity. A thorough analysis of scientific evidence and consultations with stakeholders, especially local communities, were crucial to formulating the strategy (Behera et al., 2020). The plan also involves the Chilika lagoon Development Authority's institutional reorganisation strategy to improve its effectiveness by connecting the Chilika's river and coastal zone management. The Chilika Development Authority (CDA) adopted an ecosystem restoration approach, including opening the sea mouth for habitat conservation, avoiding the lagoon's deterioration, improving salinity levels, fish capture, and biodiversity, and strengthening the livelihoods of dependent fishing communities (Sarkar et. al., 2012). In 2002, the restoration effort was honoured with the prestigious CDA "Ramsar Award" as it successfully managed the ecological services in all aspects of biodiversity, hydrology, wetland ecology, and conservation (Finlayson et al., 2020). With the support of the Wildlife Trust of India (WTI) inside the Chilika lagoon, CDA has a bird rescue and rehabilitation centre for fishing cats, Irrawaddy dolphins, and otters to resolve habitat degradation and rehabilitate biodiversity (Behera et al., 2020).

### **5.7.1 Water Resources Management and Sustainable Development Goals**

The Chilika lagoon conservation area has followed the ecosystem approach towards a more sustainable ecosystem. Due to the significant changes in hydrological regimes in Chilika lagoon, an integrated system for the management of water resources was included in the management plan (Kumar & Kumar Pattnaik, 2013). The National Institute of Oceanography (NIO) and the Central Water and Power Research Station (CWPRS) also play a significant role by

setting out strategies to save the body of water. The framework brings stakeholders, institutions, and communities together at all levels, considering their needs and desires while ensuring that the wetland environment within the river basin is maintained (Kumar & Kumar Pattnaik, 2013).

The introduction of land use, water planning and management mechanisms based on the river basin and coastal zone scale is a crucial prerequisite for IWRM implementation in Chilika. Some of the strategies implemented by central and state governments collaborating with national and international agencies are the following: collaboration and institutional arrangements for ecosystem restoration; maintaining connectivity in hydrology by the creation of sea mouth; construction of barrages to improve freshwater inflow; conservation of catchments to manage flow regimes; monitoring water quality using buoy mounted sensors; executing community education, training and awareness program; research and development involving assessments of ecosystem services (Kumar & Kumar Pattnaik, 2013).

They consist of principles discussing SSF policies, strategies, legal mechanisms, and other concerns affecting fishing-dependent communities' livelihoods. Critical concerns in the SSF Guidelines are as follows: resource management and responsible distribution of rights; encouraging decent work and social development; promoting gender equality; social and political empowerment; considering climate change and disaster risk (Sarkar et al., 2012). The SSF Guidelines are tools for millions of people employed in the SSF sector to meet the Sustainable Development Goals (SDGs) and the 2030 Agenda for Sustainable Development. (FAO, 2017). The study's primary target is maintaining the lagoon's water management system. The mutual correlation between the 17 goals impacts each other for the sustainability of the SSF. Maintaining water quality in SSFs is not only one of the leading players in lagoon governance but can also play an essential role in achieving reduced poverty (SDG1), food security (SDG2), community health and well-being (SDG3), quality education (SDG4), gender equality (SDG5), economic development (SDG8), industry, innovation and infrastructure (SDG9), reduced inequalities (SDG10), climate action (SDG13), life below water (SDG14), life on land (SDG15), peace, justice and strong institutions (SDG16), and partnership for goals (SDG17). Their dreams have close ties to SSF communities and are socially and culturally embedded in achieving viability (Finlayson et al., 2020).



The SSF Guidelines significantly improve the possibility of attaining viability in SSF. SDGs are wide in context and without a requisite scope. This provides enough room for interpretation as they touch on significant objects (Behera et al., 2020). The SSF Guidelines, on the other hand, are clear about how current governance structures can be strengthened and provide insight into how SDGs can be achieved and how they can help promote sustainability through governance. For instance, apart from defining marine biodiversity, SDG 14 also indicates the following aspects: lowering marine pollution, conserving marine habitats; minimising acidification in the seas; establishing and developing scientific capabilities associated with fisheries; improving the enforcement of international law for sustainable use of the oceans (Said & Chuenpagdee, 2019).

## **5.8. Conclusion**

I began this Chapter by overviewing of ecosystem services and social well-being linkage for fishers' community. Then I examined changes to provisioning, regulating, supporting and cultural ES access for key actor group of the SSF community of Chilika lagoon, to address the positive and negative impact of ES on the community and the importance of taking action by intuitions, policymakers and community. There are no unity and organization related to changes and their impacts on the SSF community of the Lagoon, even though natural and anthropogenic activities impact them. The need for fisheries to adapt to these shifts and various changes is critical. The impact of these changes on the fishery system of the Lagoon is tremendous, and diverse coping and adaptation strategies will be needed in the Chilika. Recently there have been more changes in the Lagoon, such as catch composition, catch capacity, biodiversity variations, water management and governance and fishery revenues impacting the community livelihood. International policy has become more interested in remediation and adaptation methods to the impacts of social-ecological changes on fisheries. Given how widely variables the SSF ecosystem is likely across continents, there will not be a one-size-fits-all solution to these changes. In this chapter, the linkage between ES and community social well-being have been discussed in addition to various coping and adaptation strategies and methods, and the drivers behind the vulnerability and marginalization of SSF communities have been explored. Adaptation practices can sometimes mutually affect two sectors and have unintended repercussions for fisheries and fishing communities. Any unintended effects of adaptation can be resolved by long-term preparation and identified through scenario

analysis to reveal future alternatives. This will have great influence on ES services and their relation with wetland and community livelihood and sustainability. Therefore, in my research based on exploring ES and variety of policy approaches has been taken locally and internationally and throughout the case study I explored the importance of addressing human dimension criteria in addition to nine existing criteria on Ramsar Site to encourage governments and policy maker to implant necessary policy and adaption techniques to prevent mitigation of international and local wetland and improve livelihood and social well-being of communities.

## **Chapter 6 Conclusion**

### **6.1.Introduction**

In this chapter, I offer a summary of research findings, key insights, contributions, and areas for future research. I begin by reviewing the objectives for this thesis, alongside a summary of relevant points from chapters in which each objective was addressed. I emphasize critical insights on ecosystem services, social well-being, and wetland governance in the context of small-scale fisheries. Oceans and coastal communities are facing profound changes. Some of these changes include the effects of climate change and sea level rise, increased sea surface temperature, increasing storm intensity, biodiversity loss, marginalization, and the overexploitation of natural resources (Bell et al., 2018; Jentoft, 2015; Nayak et al., 2014; Rojas, 2019). Governments and organizations worldwide collaborate to create a network of marine protected areas (MPAs) to save the ocean and its resources. In some cases, however, these MPAs are hastily planned without the acknowledgement of or consultation with related communities, which is the main concern regarding their impacts on wetland and surrounding communities' survival.

This case study, in the Chilika lagoon, India, highlights wetlands governance in the context of small-scale fisheries. Through applying ecosystem services and social well-being as conceptual lenses, this research aims to uncover the challenges and opportunities of addressing the human dimension through its essential relation with wetland governance in small-scale fishing communities as an example. Identifying issues of wetland governance is a critical step for mitigating the trade-offs between conservation and the well-being of small-scale fishing communities in India.

### **6.2.Thesis Summary**

My research aimed to evaluate the importance of addressing the human dimension criteria on Ramsar Site by analysing the effect of wetland governance on the vulnerability and viability of SSF communities of Chilika Lagoon as an example. The Ramsar Convention Site relies on the collaboration of neighbouring countries to protect the international circulation of water and water system and support wildlife and fish species (Matthews, 1993). Its goal is to conserve wetlands important to each national government on an international level by encouraging adapting

management and policies (Farrier & Tucker, 2000). This study had three primary research objectives. To address these objectives, I presented findings and, ultimately, the main research goal (Chapter 1). This research took a qualitative approach, and results were analyzed concerning the conceptual framework built from a synthesis of secondary research in the literature reviewed in Chapter 2. According to this study, the social well-being and socio-economic conditions of the Chilika are linked to the impact of wetlands policies and governance internationally and locally. Considering these relations and addressing them on International Conservation Ramsar Site could help improving wetlands sustainability and communities' social well-being by encouraging national governments and policy makers to implant more practical policies to meet ES users and providers, which will result in better protection of wetlands globally. The next section discusses major findings in connection to the three research objectives. This chapter also covers the most important findings and contributions of my thesis

### **6.2.1 Objective One**

*To identify the significant effect of climate change on wetlands survival and its socio-economic impact on the local communities*

The social, biological, and physical features of the Chilika lagoon were identified by describing the context of biodiversity, SSF communities, hydrological regimes, and water quality influenced by climate change and human interaction. Human-induced and natural differences in the Chilika were explored, leading to social-ecological and socio-economic modifications from the past 50 years through a systematic literature review. Various changes related to water quality such as salinity variation, water flow imbalance and nutrient proportion caused by climate change effects and more storms leading to numerous shifts in ecosystems, were analyzed by gathering secondary qualitative data on the vulnerability parameters of Chilika during this period. The data were organized in the form of tables and graphs to understand the gradation of biodiversity changes caused by climate change effects and its impact on the SSF community livelihood over time. The analysis revealed that climate change affects water quality and biodiversity changes in coastal marine due to the impacts of natural and anthropogenic activities addressing my first objective (Chapter 2 & 4). Water cycling and biodiversity were also noted as recognized benefits. Likewise, regulating services, which included weather and storm mitigation, and coastal erosion prevention,

were mentioned as a concerned to wetlands sustainability and coastal communities' livelihood in most literatures and Ramsar Site Secretariate. These findings suggest that to better support supporting coastal communities and natural species by considering the important of provisioning and cultural ES and how they should be incorporated with other knowledge and data (e.g., from technical experts, government) during decision- making. Further, governance processes should be transparent and communicated effectively with communities to mitigate the effect of climate change on wetlands survival and coastal communities.

### **6.2.2 Objective Two**

*To better understand the importance of addressing human dimension criteria on the Ramsar Site by defining wetlands' social ecological effect on communities*

Out of provisioning, cultural, regulating, and supporting ES, both fishers and non-fishers in the SSF community of the Chilika lagoon acknowledged provisioning and cultural ecosystem services as the primary categories of importance. The single ecosystem service of notable importance for the SSF community members in the Chilika lagoon is fish. Some benefits of fish in the SSF community include nutrition, livelihood, culture, and enjoyment from eating, fishing, or sharing. Another provisioning ES mentioned as necessary has other sea life (e.g., shrimp). (Chapters 2 & 5). The cultural services of ES in the community included cultural heritage value, knowledge systems and educational value, tourism, and spiritual and religious value (Chapters 4 &5). Previous studies suggest that to better support supporting small-scale fishing communities, consideration of critical provisioning and cultural ES should be incorporated with other knowledge and data (e.g., from technical experts in government) during decision-making.

Further, governance processes should be transparent and communicated effectively with communities. In assessing ecosystem service bundles, several bundles stand out: 1) provisioning-cultural bundles, like the fundamental association of fish with culture and way of life; 2) supporting-provisioning bundles, like the importance of habitat and refugia for supporting fish stocks, or the role of biodiversity in increasing the resilience of fish stocks; and 3) supporting-cultural bundles, like the role of habitat and refugia in fostering a sense of place, enhancing aesthetic value, and providing bequest values (chapter 5 ). The presence of ecosystem service

bundles suggests that the complex linkages between ES should be acknowledged in the SSF community governance. For example, governing authorities must recognize that fish is more than just a livelihood and that the cultural benefits of fish are much more difficult to replace than its material benefits.

### **6.2.3 Objective Three**

*To Identify better incorporation of human interaction by adapting better decision making and wetland governance to meet the social well-being of local community and society*

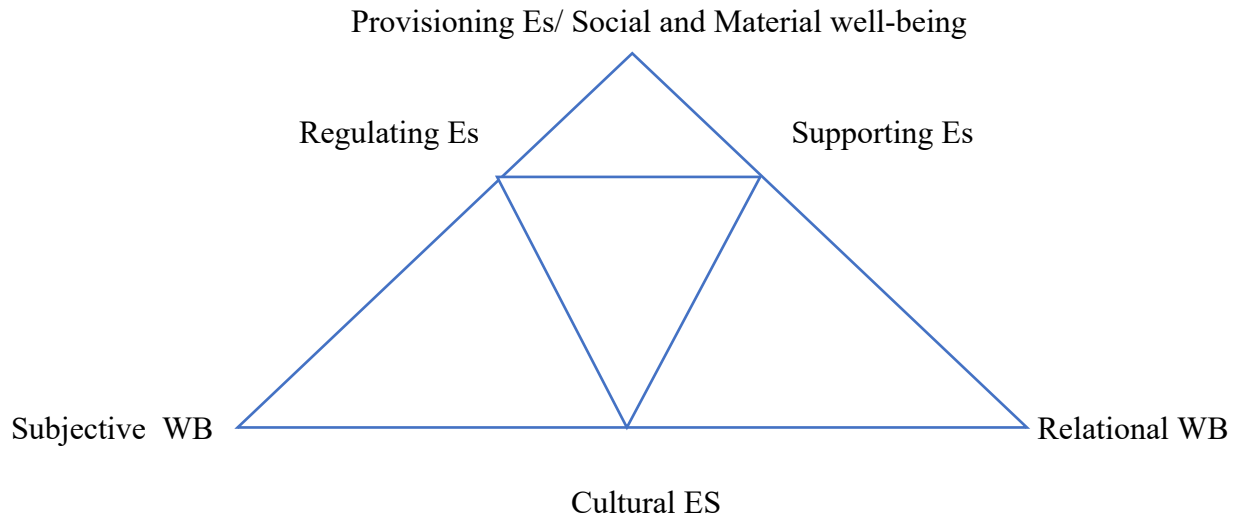
A previous study shows that most coastal communities are not adequately managed globally (Behera et al. 2020). This happens due to a lack of proper governance, policy, and adaptation strategies. It is essential to include more considerations in decision-making to benefit local fishers. In this research, I explored a variety of short- and long-term measures that reflected coping and adaptation strategies (Chapters 4). Those served as the basis for considering various responses and plans for the viability of the SSF communities in the Chilika as an example. Promoting viability should focus on the SDGs and the marine Guidelines to protect the social-ecological ecosystem from further degradation. Many global initiatives that were taken out in the Chilika to maintain the SSF were also mentioned in chapter 4. The systematic literature review guided sustainable fisheries and proper water management measures. On numerous scales and levels, having a management approach to diminish the harmful effects of water quality degradation may lower the social-ecological risks and vulnerability of the SSFs. Linking an international wetland management strategy to local management and governance strategies is the first step in practically figuring out how to deal with ongoing changes. I attempted to integrate all of the information gathered to address my objectives and analyze the wetland governance changes internationally and locally. This helps implement viability to the SSF communities in the Chilika and the presence of all different drivers. Using a conceptual framework helped to develop response measures in terms of the six main viability domains, including ecological, social, values, economic, institutional, and technological dimensions.

Opening of sea mouth, shrimp aquaculture, frequent industrial and commercial encroachments (dam construction and tourism) and recurrent natural disasters (cyclones, floods,

and droughts) damage the biodiversity and ecosystem of the Lagoon and affect the fish and other aquatic resources. This results in the disturbances of the socio-economic system of the Chilika lagoon. These factors lead to multidimensional vulnerabilities such as water pollution, resource overexploitation, biodiversity loss, disease outbreaks, livelihood issues, poverty, and migration. On an exposure and viability level, there is a lack of understanding of the interaction and interconnection between water quality and SSF, which is addressed in this research. Also, by utilizing existing opportunities and constraints, the study provides pathways to strengthen the viability of the SSF community through various coping and adaptive measures. Perceiving these interactions will help in adequately executing strategies for SSF sustainability; it will address the better incorporation of the human and social-ecological dimensions into the criteria for adopting the governance of wetlands.

### **6.3. Linkage between ecosystem services and social well-being**

The study of linkage between ecosystem services and social well-being generated for this thesis can be applied in the broad study of other social-ecological systems (Figure 6.1). This framework illustrates ecosystem services and social well-being in a cohesive picture that integrates the ecological and social context. Therefore, this may help to unpack the complexities of various tangible and intangible aspects of ecosystem services, and further enable a novel analysis of how these aspects link to the tangible and intangible dimensions of human social well-being and its relation with wetlands suitability to meet SDGs goal.



**Figure 6.1: Linkage between ecosystem services and social well-being**

As demonstrated in this thesis, analyzing linkages between ecosystem services and social well-being can highlight and differentiate the diversity of experiences that people have with ecosystems. In understanding these diverse social-ecological experiences, opportunities may emerge for more context-specific approaches to the governance of natural resources which has direct connection with human relations with these resources. Therefore, it addresses the importance of considering human dimension criteria on International Ramsar Site to improve wetlands sustainability and socio-economic aspect in each community.

#### **6.4. Contribution and Key Insights**

The conceptual framework generated for this thesis can be applied in the broad study of other social-ecological systems (Chapter 2). This framework illustrates ecosystem services and social well-being in a cohesive picture that integrates the ecological and social context. Therefore, this framework may help to unpack the complexities of various tangible and intangible aspects of ecosystem services and further enable a novel analysis of how these aspects link to the tangible and intangible dimensions of social well-being. As demonstrated in this thesis, analyzing linkages between ecosystem services and social well-being can highlight and differentiate people's diverse experiences with ecosystems. In understanding these diverse social-ecological experiences, opportunities may emerge for more context-specific approaches to the governance natural resources.



The Ramsar Convention approach to the wise use of wetlands clears connections between humans and the sustainable use of natural resources to encourage more community engagement and clear and transparent policies concerning trade-offs and equitable outcomes for conservation (Finlayson et al., 2011). It focuses on economic benefits, cultural values and natural heritage protection in decision-making processes and adapting a joint and multi-disciplinary approach to wetland management on an international level (Tolentino, 2013). Hence, some criticized the Convention approach to wetland management, claiming the limited focus of this approach is on land and water rather than on socio-ecosystem and human relations with these lands (Farrier and Tucker, 2000). The focus on the 'wise use' definition needs a more in-depth guide on human values. It helps to identify threats tracing to various sources provided by wetlands, rather than focusing only on the ecological aspect and concluding the socio-economy point of view (Farrier and Tucker, 2000).

There was a predominant research gap in linking wetland governance and coastal management related to issues of vulnerability of the coastal communities. Previous studies focused on the wetland governance and management separately. Understanding the integration and interactions of both components is critical for outlining resilience measures and formulating strategies to advance viability. The importance of this study lies in recognizing key variables, drivers, and consequences of wetland governance issues and influences in a social-ecological system of the Chilika lagoon to address the importance of addressing human dimension criteria on the International Wetland and Conservation Ramsar Site. As such, this research provided new knowledge on wetland ecosystem services and its drivers in the Chilika lagoon is the first empirical contribution to the research literature.

The SSF activities are at the land and sea, bridging numerous sectors that the SDGs address. Hence this research contributed practical insights into advancing local wetland sustainability through the management and governance of fishery resources that focus on the viability of SSFs. Addressing several SDG objectives and targets can ensure sustainable and viable SSF. Overall, this study's information and recommendations could help ensure the survival of SSFs, their proper governance, and the sustainability of fishing communities. Such contributions extend beyond the Chilika lagoon and can be utilized in similar contexts.

From a policy perspective, insights from these data can facilitate the development of a model that is more inclusive of all actors in small-scale fishing communities. This research advocates that it is advantageous to consult with individual communities (in all senses of the word) in early planning stages on a case-by-case basis. Whether drawing on comparisons at local, regional, or international scales, communities are diverse and exhibit unique social-ecological contexts. These top-down policies may not encompass the sociocultural requirements for successful implementation. To improve the overall success, governance should be adaptive and context-specific. As this case study demonstrates, conservation progress may depend on efforts to engage actors early in the governance process. Early engagement and participation in decision-making could mitigate some potential trade-offs between conservation and the well-being of small-scale fishing communities down the road.

The lack of transparency and clear guidelines on ecological conservation and balanced and sustainable use of environmental services are causing concerns regarding the Framework of the Ramsar Convention Site (Finlayson et al., 2011). Therefore, the Ramsar Convention is pressuring to make sure individual countries around the globe have met the wise use of wetlands and the adaption of several mechanisms to mitigate wetlands loss globally. The movement will lead to more sustainable wetland management (Kim, 2010).

The research approach is based on understanding the past, present, and future challenges in social-ecological systems and how communities, specifically in my research, coastal communities respond to them. SSF communities in the Chilika that rely on the lagoon for their social, cultural, and economic requirements continually adapt to social and environmental change and chronic instability. The study of the SSF in Chilika lagoon reveals a lot about the interconnections of social and ecological systems, as well as many environmental change processes, such as rising temperatures, water quality and climate change that are constantly reconfiguring the Chilika resources. It is critical to continue working towards a deeper understanding of communities social-ecological system and natural and human drivers of change.

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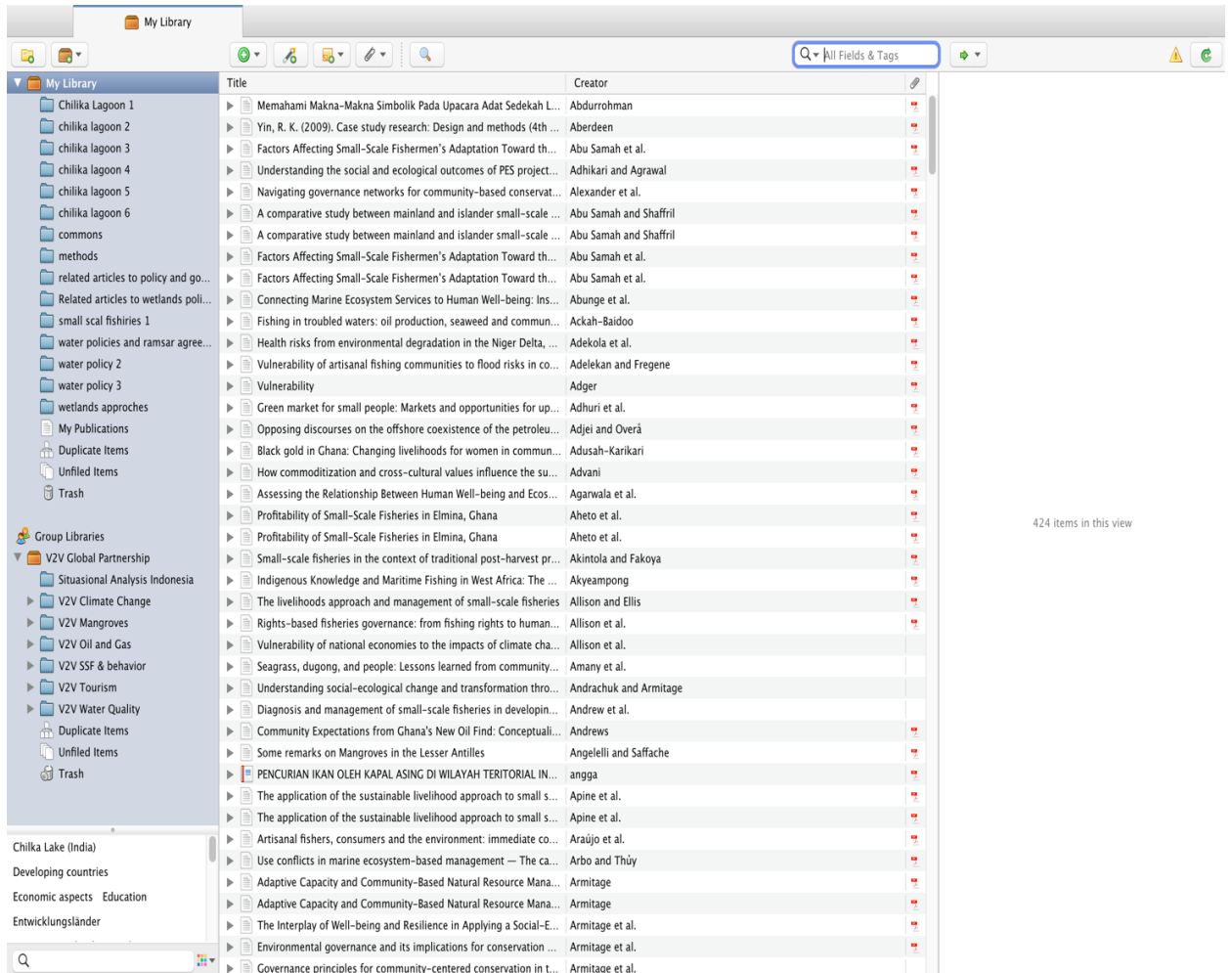
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# Appendix A: Zotero a Reference Management tool



Appendix B: 75 Ramsar Wetland Site in India



Appendix C: The Chilika Lagoon Air Map

