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Theoretical
Impulses + Case
Studies

Interdisciplinary Perspectives on the Interplay between Human Rights and Sustainability

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Preface

The following collection of manuscripts emerged from an interdisciplinary virtual exchange held during the Winter semester of 2023/2024 at the Environmental Campus Birkenfeld, organized by Prof. Dr. Milena Valeva and Prof. Dr. Kathrin Nitschmann. Additionally, Prof. Dr. Héctor Bombiella Medina, a lecturer of anthropology in the Department of World Languages and Cultures at Iowa State University, contributed to the virtual exchange and supervised case studies 3 and 4, bringing his extensive experience in this field and facilitating the international exchange. Within the elective module on Human Rights, students from the Bachelor's programs "Nonprofit and NGO Management" and "Environmental and Business Law," as well as the Master's program "Energy and Corporate Law," explored the interconnections between human rights and sustainability.

In an era marked by unprecedented environmental challenges and profound social transformations, the intersection of human rights and the rights of nature has emerged as a critical area of inquiry and debate. Today, as we face the dual crises of climate change and biodiversity loss, the traditional boundaries between human and environmental rights are increasingly blurred. This confluence demands a fresh, interdisciplinary approach to understanding and addressing the complex and interrelated issues at hand.

Human rights, fundamental to the dignity and freedom of individuals, are deeply impacted by environmental degradation. Communities worldwide are experiencing firsthand the devastating effects of polluted air, contaminated water, and deforested landscapes, all of which undermine basic human rights to health, livelihood, and well-being. Conversely, recognizing the rights of nature – the intrinsic value of ecosystems and species – challenges us to reconsider our legal, ethical, and philosophical frameworks. It calls for a paradigm shift from an anthropocentric world-

view to one that embraces the interconnectedness of all life forms.

Engaging in robust discussions and research on these topics is essential in today's context. By exploring interdisciplinary perspectives, we can forge innovative solutions that honor both the rights of individuals and the integrity of nature. This special issue aims to contribute to this vital discourse, providing insights and fostering dialogue on how we can collectively navigate the complex landscape of human rights and environmental sustainability.

The first chapter „Human rights and SDGs in the context of democracy“ examines the significance of international human rights in today's context and links them to new value systems like sustainability.

The second chapter, the case study „Rights of Nature“ explores the concept of granting legal rights to nature itself by comparing laws from various countries to show how it combats environmental exploitation.

The third chapter, the case study „Traditional coca leaf consumption and drug trafficking in Colombia“ delves into the complex issues surrounding coca cultivation in Colombia, highlighting its economic, social, and political impacts.

The fourth chapter, the case study „The artisanal fishing community of Chorrillos, Peru“ aims to provide theoretical insights and recommendations for improving the livelihoods of artisanal fishing communities in Peru, considering legal, ethical, and environmental perspectives as well as how economic liberalization, privatization, and deregulation affect the community's socio-economic conditions.

Artisanal fisheries in circumstances with political framework and comanagement

Author: Dorothea Hensing

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1 The marine ecosystem of Peru

The first chapter provides an overview of three main topics: the Humboldt Current Large Marine Ecosystem (HCLME), El Niño and La Niña phenomena, and marine heatwaves. It discusses the unique characteristics of the HCLME and its vulnerability to global warming-induced changes. Furthermore, it examines the impacts of El Niño and La Niña on weather patterns and fisheries in Peru, particularly affecting artisanal fishing communities.

Lastly, it explores the increasing frequency and intensity of marine heatwaves and their detrimental effects on ocean ecosystems, emphasizing the importance of understanding and addressing these issues for coastal regions in Peru.

1.1 The Humboldt current large marine ecosystem

The Peruvian coast is located at the Humboldt Current Large Marine Ecosystem (HCLME) and is

spreads more than two hundred nautical miles from the coast. Within the HCLME is the Humboldt Current System which makes up 65% of the HCLME. Significant is that the Humboldt Current System differs from comparable ecosystems like the eco-systems of California, the Canary Islands, Humboldt, and Benguela. Those differences include that the HCLME is the ecosystem closest to the equatorial line. There for it is most affected by ENSO (The equatorial Pacific is the source of the El Niño-Southern-Oscillation, which is the predominant type of interannual variability there. It has significant links to the other oceanic basins and has an impact on the environment and physical landscape of the Pacific basin. Oceanic and atmospheric teleconnections are responsible of this) (Baldenhofer, 2014). While, compared to the other four ecosystems, it has the high-est effectiveness in fishing stocks even though that the facts show that the primary effectiveness in fishing is equal to them. And lastly it is significant that the HCLME has a flat and intensive subsurficial minimum layer of oxygen which is combined with the oxygen-rich epipelagic habitat, compressed to a small area. In summary, this means, that the HCLME has an extraordinary pelagic fishproductivity which is mostly compact in the Peruvian buoyancy system (Dimitri et. al., 2016).

An assumption is that, triggered by global warming, the warming and matter-exchange between the atmosphere, ocean and continent will bring about change to pressure gradients, coastal and cross-costal wind fields, ocean currents, sea surface temperature (SST) and thermal stratification. Another fact is that the expansion of entering carbon dioxide into the ocean and large stratification will lead to acidification and oxygen depletion, triggering a cascade of biogeochemical and ecological changes in the marine ecosystem.

It is unclear how these stressors affect the productivity and biodiversity of the HCLME, and if the physical and biogeochemical alterations will affect the phenology, species compositions, and spatial distributions of primary and secondary producers. Globally it is prognosticated that without a change, the marine primary productivity will be declining, and the marine ecosystem will suffer loss, especially in the tropical, and polar regions (Dimitri et al., 2016). Therefore, morphological, sym-

biotic, and metabolic traits appear to be crucial adaptations required for larger organisms to be able to survive the many stress factors. However, this also deserves further research (ibid.).

1.2 El Niño and La Niña

Further ecological issues influenced by global warming are the effects El Niño and La Niña; The unusual weather on the west coast of South America, South Asia, and Australia, is due to El Niño and La Niña which bring heat, frost, hurricanes, and torrential rains. Droughts, enormous waves, floods, and landslides can be the results. Extreme weather occurrences are typically triggered by the El Niño weather phenomena. El Niño frequently causes destructive and severe effects such as heat waves, droughts, floods, hurricanes, low fish stocks, starvation, droughts, forest fires, and landslides. But El Niño can also cause the blooming of deserts, replenishing dried-up water reserves. Precise research has not yet been done on why the erratic weather phenomena El Niño causes in the southern hemisphere on the Pacific Ocean around Christmas time. The Pacific coasts of Ecuador, Peru, and Chile typically see a steady high-pressure area during this time of year, while the coast of South-East Asia experiences a low-pressure area. The cold winds travel northward toward the equator due to the area of high pressure off South America. Once there, the Coriolis force deflects the winds westward, creating a trade wind that blows from the southeast. The air gradually rises in temperature and collides with the low-pressure area off the Australian coast (Rundfunk, 2023). These anomalies have a major impact on Peru, especially for local fishermen, whether industrial or artisanal. The impact on Peru's artisanal fishermen is multifaceted. Economically and socially, phenomena such as El Niño and La Niña are drastically restrictive for them. Artisanal fishers are particular affected by these phenomena because their local communities depend on the ecosystem and the resources that it is providing. In this manner, climate variations like the anomalies have the potential power to impact whole socio-ecological systems, (SEs). A deeper comprehension of these dynamics on a management level and whether they are socially and ecologically-related, directly, or indirectly, could have a positive influence on the existential

basis of communities, specifically as it relates to marine resources (Kluger et. al., 2019).

1.3 Marine heat waves

An anomaly the Peruvian Coast and Ocean are also affected by marine heatwaves. Marine heatwaves are periodic extremely warm sea temperatures that can last for days or months. They can extend over more than 1000 kilometers and reach several hundreds of meters in depth. These heatwaves occur twice as often today as they did 35 years ago and, according to climate model predictions, will occur more frequently in the future.

Recurring weather phenomena such as El Niño appear to be an important factor in marine heatwaves. However, marine heatwaves have not been as well researched, either quantitatively or qualitatively, as heatwaves on land (Frölicher, 2019). The concentration of greenhouse gases in the atmosphere increases due to the heat stored in the earth system. Most of the heat is absorbed by the ocean, which contributes to rising sea levels. This is illustrated in figures: between 1987 and 2010, the ocean stored 93% of the heat. The remaining 7% was distributed on land, in the atmosphere and on ice. This makes the ocean the largest heat reservoir in our climate system, slowing down the warming of the atmosphere to a significant extent. However, this has the effect that the uppermost ocean layers are continuously warmed (ibid.).

Marine heatwaves are periodic extremely warm sea temperatures that can last for days or months. They can extend over more than 1000 kilometers and reach several hundreds of meters in depth. These heatwaves occur twice as often today as they did 35 years ago and, according to climate model predictions, will occur more frequently in the future.

The rising temperatures in the ocean increase the probability of both the frequency and the intensity of marine heat waves. This trend has already been observed. For example, in 1982 marine heatwaves occurred 1.5 times per year and in 2016 already five times per year.

The warming of the ocean negatively impacts organisms and ecosystems, and such deterioration can trigger further cascading effects, leading to the extinction of entire species and ecosystems (ibid.).

The following sections provide facts, examples, assumptions, and suggestions of what these independences means in concrete terms. Political cornerstones are the main pillars of many changes that need to be tackled to help artisanal fisheries prepare for subsequent El Niño phenomena and strengthen fishing communities, be it socio-ecologically, economically, politically, or in the manner of management. These anomalies are influencing coastal regions of Peru like Chorillos, Piurra, Sechura and many more.

2 Economic aspects

Peru's artisanal fisheries industry is vital for food security and economic prosperity, notably driven by the Jumbo Flying Squid (JFS) fishery along the northern coast. However, the sector faces informality, hindering its full potential despite significant contributions to GDP. Challenges including regulatory ambiguity and market vulnerabilities exacerbate poverty and vulnerability. A comparative study with Chile underscores the importance of formal co-management structures in enhancing economic efficiency and curbing illicit markets. Thus, institutional reform and proactive management are imperative to ensure sustainable livelihoods and economic resilience amidst ongoing challenges.

2.1 Navigating challenges and opportunities for sustainable livelihoods and economic impact

Artisanal fisheries are elementary for food security and the economy of Peru. In fact, they are aggregating nine to fifteen percent of the gross domestic product. Even during the COVID-19-pandemic in 2020 artisanal fishers could have been profitable (Jara et. al., 2020). Between 2010 and 2019 official data are showing that the JFS-fisheries (Jumbo flying Squid) account for 38% of all Peruvian land-

ings for direct consumption and that they make up 59% of all seafood exports for direct human consumption. Artisanal fishers are also worldwide the most affected by the weather anomalies (ibid.). But besides this fact artisanal fishers are not only confronted with weaknesses. Peru is one of the largest fishery-nations. More than eighty percent of the land catches are reprocessed for fish flour and fish oil and seafood sales are largely generated by artisanal fishermen. The artisanal fishers of Peru are predominantly settled on the northern coast, where one third of them are in the state of Piura (López de la Lama et. al., 2022). According to the data, land prices fell sharply as the quantity of land for Peruvian fisherman increased. Conversely, Chilean, and Peruvian fisherman and exporters maintained a high degree of price stability across nearly all supply levels. The research indicates that one of the main causes of Peruvian fishermen's varying price elasticity is the informal nature of JFS fishing in the country, which is devoid of co-management systems. Based on the findings, to benefit fishermen both financially and environmentally it is recommended that, the artisanal fleet currently in operation be granted secure exploitation rights as soon as possible and that cooperative management agreements be developed at a swift pace (Jara et. al., 2020).

2.2 Challenges of informality

Small scale fisheries are intrinsically complex, dynamic, and diverse. They face numerous multifaceted, and wicked challenges that result in poverty and general vulnerability. The interdependencies between poverty and vulnerability have many implications, but among them, the institutional dimensions have been found to be particularly important. Even though the Peruvian artisanal squid fleet is economically significant and contributes to income, food security, and export revenues, there are several risks associated with the lack of institutional support. A few policy concerns pertaining to the fishery hinder the industry from fully contributing to both the local and national economies. Small-scale fishermen in Peru are disproportionately affected by this informality, demonstrated by the fact that fifty percent of all small businesses, seventy percent of the economically active population, and one-fifth of the countries' GDP (Gross

Domestic Product) are reportedly involved in the informal economy (Gozzer-Wuest et. al., 2022).

A first problem with the policy is that, like most small-scale fisheries in the nation, the fishery is still de facto open to the public, which makes sustainable use difficult. Programs to legalize the active operational fleet through individual and collective legal regimes have been initiated by the government since 2016. These initiatives have yielded mixed results and have been sluggish. In addition, the coexistence of different tenure regimes exacerbated tensions within the sector and hindered the collective action needed to address fisheries related problems.

Second, many of the fishing vessels are still being built outside of the law, having been constructed in local artisanal shipyards with dubious legal standing.

Third, there is frequently an informal relationship between ship owners and fishermen, which results in the hiring of unskilled seafarers and the avoidance of social security, accident, and health benefits payments. Shocks like the COVID-19 pandemic have contributed to the vulnerability of workers, particularly those groups exposed to social exclusion such as migrant workers in the fishing industry.

Fourth, informality makes it more difficult for owners of vessels to get credit from formal lenders like banks, which forces them to rely on unofficial lenders.

Fifth, although fishing is done on the informal side, distribution to exporters and post harvesting happen inside the legal system, which may create power imbalances in negotiations.

Sixth, due to a lack of efficient organization and understanding of market mechanisms, fishermen frequently overfish the market. Periodic overfishing encourages the development of an illicit squid market for fishmeal and causes abrupt drops in squid prices, which lead to cyclical social tensions.

Seventh, a sizable number of exports are shipped to Europe, where actions taken to stop illicit, unreported, and unregulated (IUU) fishing may target Peruvian JFS fisheries. In this regard, the US International Trade Commission has recently voiced concerns. Communities that depend on fishing may suffer even more unfair effects from such measures (Gozzer-Wuest et. al., 2022).

Because of informality, government officials are unable to clearly see how JFS fisheries contribute to the nation's economy and the creation of jobs. Since a large portion of fishing activity is hidden from regulators, fishery has not received the level of government support that would be expected given its importance.

Similar situations have been reported for the Peruvian scallop fishery, where government structures, due to the informal nature of traditional local users, do not function effectively and making them invisible among official stakeholders (ibid.). Various authors have suggested that the entry of industrial companies into this fishery would bring economic benefits. This could, for example, mean an increase in state income resulting from the payment of fishing rights. The possible socio-economic impact of this measure should be considered, as market flooding could be exacerbated and sensitive communities along the Peruvian coast could be negatively affected. Also Contrary is that this measure would displace the historic artisanal businesses, which already receive too little attention from the authorities and institutions (ibid.). To preserve the culture of artisanal fishermen, alternative solutions should therefore be considered.

2.3 A better price elasticity due to a management committee – a comparison between Peru and Chile

The aim should be focused on the treatment of the artisanal fisheries and how they can successfully be incorporated into the formal economy. An already proven concept has been implemented in Chile, with respect to price mechanisms, food security and regulations, which could be tried to be implemented in Peru as well:

A factor examined by Gozzer-Wuest et. al. is the significant decline in prices paid to fishermen, despite increasing landings in Peru, specifically for the Peruvian squid fleet. Accordingly, prices in Peru dropped by sixty percent while Chilean and Peruvian exporters maintained consistent prices across all levels of supply. While Peruvian fishermen experienced a sixty percent price decline with rising landings, this decrease was only twenty percent for Chilean squid fleets. The following causes were identified; Lower yield of the Chilean fleet, growing demand in international mar-

kets, processors-exporters can store products for a longer period, differences in the logistics and infrastructure of processing facilities, and trade agreements concluded by the countries during the period studied.

Considering all these factors, the authors, however, operated on a different assumption, suggesting that differences in price elasticity between Peru and Chile are attributable to Peruvian fishermen having less negotiating power than Chilean counterparts. This is due to the consequences of institutional marginalization, such as widespread dependence on informal lenders or weak organizational capacity, which is essential for pursuing communal interest (Gozzer-Wuest et. al., 2022).

To confirm the cause-effect links between institutional marginalization and price elasticity, it was found that price declines due to market flooding was a problem and that Chilean fishermen met in the governmentled management committee before the introduction of the price. This management committee, set up by the fishing communities themselves, seems to be the key to the different price declines between Peruvian fishers and Chilean fishers. Consequently, this explanation seems plausible:

During the first stages of the committee's operation in 2015, discussions on prices were driven by the artisanal sector and became one of the main focal points of the discussions held in the committee. This issue was resolved through an agreement between the representatives of the industrial and artisanal sectors participating in the committee and prevented market flooding due to the industrial sector's race to fish. From then on, the industrial sector agreed to fish its allocated quota in eight months to avoid market glut.

This agreement was made possible by the institutional recognition of the fishing sector and the introduction and operation of the management committee (a formal co-management mechanism), where fishermen's representatives could voice their concerns and effectively participate in fisheries management decision-making. This case points to the economic importance of institutional recognition and suggests that the institutional marginalization of the Peruvian artisanal catch sector could prevent greater economic efficiency that could bring environmental benefits, prevent social

tensions, and even stop the continuous rise of illegal markets for the product (Gozzer-Wuest et. al., 2022).

The measurement of the present and future vulnerability and the development of adjustment strategies are rudimentary for their sustainability as well as for the livelihoods of many humans (Jara et. al., 2020).

3 Social aspects

Fishery-communities are complex socio-ecological systems. Social, cultural, ecological, and economical aspects are interconnected and mutually influence each other, forming a broad biophysical and human network.

These interactions are influencing the total resilience of the system. Decision processes, which are ignoring or misunderstand the biophysical or human dimensions of the system will be probably lead to inadequate governance agreements, unsustainable fishing practices, undermining rights and historic personal possessions, threat the ecosystem and health, and threaten the food security of coastal fishing communities (López de la Lama et. al., 2022).

The Autor's, Santiago de la Puente et. al., examined the wellbeing of small-scale fisher's, which is in literature are rarely researched and quantified. They evaluated the socio-economic performance and evolution of two small-scale fishing communities in Northern Peru using the Sustainable Livelihoods Approach (SLA). SLA is one of the most holistic frameworks for assessing the effectiveness of development policies and interventions aimed at improving wellbeing in fishing communities (ibid.). Quantitative indicators were used to characterize fishers' financial, human, natural, physical, and social capitals.

Identified was, that the two fishing communities (CB: Cabo Blanco, EN: El Nuro) have low human and financial resources, strong social capital, and improvement in their physical capital resources and contemporary a simultaneous decline of their natural capital resources.

The results have also shown, that their target stocks and incomes are declining even though they are using selective slightly fishing methods. This indicates that such communities are highly sensitive of external environmental impacts, for

example El Niño, economic impacts like market accesses, and poorly governance (López de la Lama et. al., 2022).

3.1 Types of capital

This chapter will have a closer look into the financial capital, the human capital, and the social capital because, natural capital was already illuminated at the beginning. Physical capital also is not discussed in more detail here, as it is of no further significance for the analysis. Notable is that the types of capital are related to the vulnerability of the artisanal fishery community, which were researched in the following chapters. Remarkable is that vulnerability is a cause-effect-relationship that affect all fishing communities nationally, some stronger than others.

3.1.1 Financial capital

Most small-scale fisheries were impoverished. While the monthly minimum wage in Peru was PEN 850 (≈ USD 265) in 2017, 67% of fishermen in CB and 65% in EN reported monthly earnings below or equal to PEN 500 (≈ USD 156). In these communities, the proportion of fishermen who earn more than PEN 1000 (≈USD 311) per month is quite low (CB 12%, EN 3%). This is much less than the national average; for instance, 31% of Peruvian small-scale fishermen made less than PEN 500 per month in 2015, while 30% made more than PEN 1000.

A significant portion of the surveyed population was unable to secure their monthly income through fishing throughout the entire year (CB: 44%, EN: 62%). Alternative sources of income are rare in these areas, and only a few fishermen (CB: 24%, EN: 31%) can supplement their income through tourism, trade, or construction. Nevertheless, 60% of the surveyed fishermen (in both communities) stated that they are the sole sources of income for their households. But meanwhile the access to credit has improved, which is widespread in this communities; In CB 69% of small-scale fishermen have obtained loans from microfinance institutions or banks. In EN, this percentage account to 87%. This represents a significant increase compared to data from 2012 (at that time, for example, 50% of fishermen in CB and 63% in EN had access to loans) (ibid.).

3.1.2 Human Capital

Educational levels were similar in both communities. Most fishermen had only completed elementary school (61%) or secondary school (19%) and only 2% had obtained degrees from institutions of higher education. The remaining (18%) fishermen had not completed elementary school. Related to that, nearly half of Peruvian small-scale fishers have six to twenty years of experience and in the researched areas CB and EN, fishers averaged started working at the age of fourteen.

These results present a lack of education and without the basics of education, fishery-communities are highly vulnerable. (López de la Lama et. al., 2022).

3.1.3 Social Capital

A development has taken place in Peru, even if it just counts for the two researched areas CB, and EN, this can be seen as a positive development;

Over 75% of the surveyed fishermen belonged to local fishing guilds (OSPAs, abbreviated). OSPAs, like unions, aim to improve fishermen's pay and strengthen their rights. Fishermen from EN and CB are better organized than the average small-scale fishermen in Piura or Peru (OSPA membership: 48% and 54%, respectively). Furthermore, most organized fishermen reported regularly attending OSPA meetings and found that OSPA membership provided them with a direct benefit.

The most common benefits included: (1) improved ability to market their catch; (2) better access to formalization pathways, such as obtaining a fishing permit; (3) the presence of a safety net, e.g., a network of colleagues who can help in times of need; and (4) improved access to information. Fishermen mentioned that they trust the members of their OSPA and would collaborate in mutual interest.

As a result, from interviewed fisher and local leaders, identified were a view differences between CB and EN. In contrast to CB EN is a highly organized and united fishing community that prides itself on using highly selective, traditional fishing methods with a low ecological impact. CB is also a united fishing community, even though there are known internal conflicts (e.g. net sinkers versus hand liners) that limit cooperation between fishermen. Perhaps a crucial difference between

the two communities is that fishermen in EN regularly implement self-management mechanisms based on traditional knowledge (ibid).

As mentioned in the introduction, the forms of capital are influencing each other and show synergetic effects. The wellbeing of the fishers is enabled through policy, which support marine ecosystems. Likewise, would an improvement of the livelihoods also improve the marine ecosystem. This valuation could support policymaker during a reconstruction of sustainable developments like improved social, economic and ecological goals. Relying on that, policymakers could also aim to improve the trust and long-term sustainable developments, which may seem challenging short-term or high in costs, but in long run strengthening adaptabilities. The SLA could be a point of reference for improving customization capabilities.

Social capital was highest within the CB and EN communities. However, negative effects also influence each other negatively, so that a negative factor also weakens other capital resources.

Fishermen do not have the power to contain external fishing pressure or negotiate prices. If this hardship worsens, social capital would decrease as rivalries between fishermen would intensify and trust among fishermen may decrease. Low levels of education, which implies a low level of knowledge including their limited access to information, and the lack of alternative sources of income also make these communities more vulnerable (López de la Lama et. al., 2022).

4 Political Aspects

This paper underlines several circumstances, with which the artisanal fisheries are confronted in combination with the lack of institutional interests, actions, and assertiveness. The following current political grievances have been identified:

a) To improve the resilience of the HCLME to increasing climate pressures, clearer governance, and management of the ecosystem services of the HCLME is needed, especially because fish production is of high importance to the country's economy and society. The main threats to biodiversity are overfishing, pollution and coastal development, which reduce biodiversity in the HCLME by 65%- 75%. As a result, in the southern area of the HCLME, six fisheries have collapsed, eight are

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overfished and another eight are fully biologically exploited, and in the entire HCS (Humboldt Current System) area, fisheries have no management approach, biological reference points, or quotas.

b) Often artisanal fisheries have been not included in decision and research processes. Negative results from that are inefficient instructions, sensitivities for environmental insecurities, social traps, and market instabilities. Thus, situations are not uncirculated in developing countries such as they are in Latin America (ibid.).

c) To safeguard the transportation of goods and services out of the HCLME-area, it is important to understand the main threats to this LME, both natural and anthropogenic, as well as the annual gross domestic product of the regions. The wide variations in value reflect factors: (1) the absence of an established, standardized method for evaluating LME providers and services; (2) The varying importance of the range of economic activities in the various LMEs; and (3) the lack of data regarding important activities in some countries, such as coastal tourism (Dimitri et. al., 2016).

d) Informality in the Peruvian fleet has clear causes. According to the Peruvian National Center for Strategic Planning (CEPLAN), informality is a result of corruption, lack of transparency, low

government allocations to families, low investment in research and development, overregulation and the low average formal education duration of the population. A formal goal of clear government guidance would be of great value for artisanal fisheries.

e) Social Sciences identified institutional weakness as the cause of vulnerability of artisanal fishers. Problems like dept traps, which spring from dependence of informal financiers, and as a cause are identified as an environmental impact, negative effects at the level of bio-ecological perspective should be more closely considered for a better institutional integration in governance- and decision findings.

f) Regional experiences in Chile have shown that the implementation of comanagement solutions in small-scale fisheries is advantageous. It has become evident that fishermen have gained the ability to connect knowledge at the local level to shape decision making processes at the national level. This presents an opportunity to address many issues more effectively through active participation in management at the administrative level.

Unlike Chile, the Republic of Peru still needs to establish the political framework and create the necessary conditions to allow for the establishment of participatory comanagement mechanisms and institutions in the JFS fishery and elsewhere. Effective co-management institutions are the product of well defined elements like leadership, cooperation and necessary conditions like legally granted secure usage rights by government authorities. However, these institutions effectively can be compromised by subpar institutional procedures and corruption, some of the main reasons given by CEPLAN for Peru's informal economy (Gozzer-Wuest, 2022).

5 Management approach

As in the caption "Political Aspects" shown, many political issues are related to management approaches, which should had taken place, or at least are urgent to take place. In Chorrillos and elsewhere in Peru. The following parts present some rudiments, which related to the artisanal fisheries of Peru, are possible to implement and adopt.

5.1 ABFM's

Area-based Fisheries Management Measures (ABFM's) are conservation and/or fisheries policies that are spatially defined and formally established with the goal of achieving one or more desired fisheries outcomes. Many modern fisheries management plans and regulations use ABFM's, and their results are usually linked to resource sustainability. States should put management measures in place to stop overfishing and make sure that fishing effort is in line with ecosystems' sustainable use and productive capacity, as per the FAO Code of Conduct for Responsible Fisheries. When the conservation benefits produced are in line with their stated and intended primary or secondary objectives, ABFM's support primary or secondary conservation outcomes. ABFM's support complementary conservation when management actions are specifically designed to support the sustainable harvest of the target species while also successfully easing pressure on ecosystem function and biodiversity (Petza et. al., 2023).

There are three main types of restrictions on ABFM's: time (areas permanently or temporarily closed to fishing activities), space (closure of all or part of a fishing area or Exclusive Economic Zone) and type of fishing activity (restrictions may apply to all fishing activities in an area or to specific gear or socio-economic categories).

Many ABFM's may arise due to the different combinations of the three options and the degree of restrictions. While the ratification of international fisheries agreements and harvest control rules have also contributed significantly to the reduction of overfishing and rebuilding biomass, fisheries management measures, in particular rebuilding plans, have had particularly strong effects on reversing overfishing (ibid.).

The implementation of ABFM's would be an easy and effective method to immediately secure the marine ecosystem and support the recovery of Biomass, as well as for all marine organism, who are affected by the fishing activities.

5.2 IMTA

The growing demand for fish, combined with global population growth, makes efficient and sustainable aquaculture highly relevant to ensure global food security (Loayza-Aguilar et.al., 2023).

Based on global trends, the development of industrial mariculture on the coasts of Peru will continue to increase, which is primarily characterized by monospecific. This has an impact on ecosystems, as organic matter can degrade the benthic system, promoting eutrophication, which will have negative consequences for biodiversity and fishery resources. This could lead to unsustainable practices in the long-term.

The current contradiction in aquaculture is that, although aquaculture farms depend on the environment and the performance of ecosystems, the management of these systems is mainly determined by monocultures, which damages and destroys the ecosystem and the environment, as is the case in Peru.

It is therefore necessary to apply methods that can ensure both the protection of natural capital and profitability. Monoculture practices cannot reconcile this, whereas integrated and sustainable practices are desirable and necessary to keep aquaculture healthy and bio diverse. A concept of the Ecosystem Approach to Aquaculture (EAA) has already been derived from this problem. This concept aims to coordinate sustainable development, equity, resilience of interrelated socio-ecological systems and to implement these activities in a broader ecosystem. Building on the EAA, there is a trend to implement so-called IMTA.

From this perspective, it is important to implement new production models in fisheries that are based on sustainable practices, such as Integrated Multi-Tropical Aquaculture (IMTA). This combines greater efficiency, competitiveness, and profitability with ecological balance. IMTA represents the integration of four types of aquacultures: feed, in the form of fish, organic extraction (filter-feeding and suspension-feeding invertebrates), in-organic extraction (macroalgae) and sediment extraction such as suspension-feeding and sediment-feeding invertebrates. For this integration, it is important to harmonize the relationship between the species and their specific functional roles and the abiotic conditions of the ecosystem. The aim of this strategy is to utilize the advantages of the different tropical levels, to diversify activities and thus to combine sustainability with economic profitability. A positive side effect could also be the improvement of the image of the aquaculture sector.

IMTA has already been successfully applied in Dalian (China) and Canada (Loayza-Aguilar et. al., 2023).

5.3 A transboundary issue

A Transboundary Diagnostic Analysis (TDA) and a Strategic Action Program (SAP) for the GEF-UNDP Humboldt Project have been developed because of the cooperative efforts between Chile and Peru, as well as their respective fisheries research institutions, IFOP (The Fisheries Development Institute) and IMARPE (The Institute of the Sea of Peru). These efforts have been backed by national protected areas authorities and environmental ministries. Through a thorough analysis of transboundary issues and the development of focused strategies, these initiatives seek to address the urgent concerns affecting the Humboldt Current System's (HCS) health. The findings from the TDA and SAP are summarized in this translated text, emphasizing the primary issues found, their socio-economic and environmental ramifications, and the suggested solutions. The focus areas highlight the need for collaborative management approaches to protect marine ecosystems and advance sustainable development in the region. These include the suboptimal use of fishery resources and anthropogenic disturbances to marine habitats.

To create a Transboundary Diagnostic Analysis (TDA) and a Strategic Action Program (SAP) for the GEFUNDP Humboldt Project, Chile and Peru, along with their respective fisheries research institutions, IFOP (The Fisheries Development Institute) and IMARPE (The Institute of the Sea of Peru), have worked with the authorities for national protected areas and environmental ministers.

The SAP described several goals and steps to address the issues found in the system, while the TDA listed the primary concerns affecting the Humboldt Current System's (HCS) health.

The TDA's main objectives were to identify transboundary problems (TPs), characterize, assess, and evaluate their socioeconomic and environmental effects, as well as ascertain their root causes. Anthropogenic disturbance of marine habitats (TP2) and suboptimal use of fishery resources (TP1) were the two main issues found.

Weak governance, inadequate or nonexistent monitoring, control, and surveillance (MCS) sys-

tems, a lack of democratic processes in resource management and decision-making, and unfavorable incentives that promote prolonged participation in the industry with increased overfishing are the main causes of TP1. The misuse of fishery resources has the following negative effects on the environment: a) a reduction in biomass and population structure; b) a modification of trophic relationships in ecosystems; and c) a modification of biodiversity, environment, and ecosystem resilience.

For TP1, the following socioeconomic effects were noted: A decline in net income and job prospects; B a reduction in the availability of fisheries resources for food security.

Regarding TP2, various forms of land and marine pollution, such as organic matter, hydrocarbons, heavy metals, microbiological compounds, and solid and liquid chemical waste, have an impact on the environmental conditions of the HCLME. These pollutants have social and economic effects on human and ecosystem health, as well as affecting productivity in coastal areas. Therefore, the decrease in fish biomass and HCLME productivity is also a result of this transboundary issue. For TP2, the ensuing environmental effects were noted: Increased mortality in the early life stages of biological resources; a) deterioration of water quality and marine sediments; b) mortality of marine animals; c) alteration of biodiversity and reduction of ecosystem resilience; d) high amounts of unintended catch (bycatch and discards).

The following socioeconomic effects were also noted: a) losses in the economy, employment, and competitiveness; b) a decrease in the food security of marine products. Moreover, as previously mentioned, the HCLME's natural climate variability – such as ENSO – as well as climate-related manifestations affect productivity and bring about changes across all trophic levels (Dimitri et. al., 2016).

To successfully implement these complex and varied issues, it is very important to mention, that building translocal management initiatives is a crucial element in developing long-term adaptation measures that should be subsequently implemented by local and national government agencies in order to resilience to environmental change (Kluger et. al., 2019).

6 Summary

Pelagic fish productivity in the HCLME is exceptionally high, particularly in the Peruvian buoyancy system. Marine ecosystems are predicted to be impacted by acidification and oxygen depletion brought on by changes in atmospheric, oceanic, and continental interactions brought on by global warming.

Peru is impacted by extreme weather events caused by El Niño and La Niña, which are linked to global warming and occur on South America's west coast. These occurrences affect communities and the economy, especially artisanal fishermen whose livelihoods are disrupted.

Although artisanal fisheries face difficulties, they make a substantial contribution to Peru's GDP. A lack of institutional support, price fluctuations, and informality all affect the financial stability of artisanal fishermen. Artisanal fisheries are essential for food security despite their difficulties. Based on a price elasticity analysis, it is evident that institutional recognition and management committees are important factors in both countries. Overfishing and price fluctuations are caused by Peru's lack of institutional support, whereas Chile's management committee works to keep prices steady.

Political issues include the need for co-management mechanisms to be established, artisanal fisheries to be included in decision-making, threats to the ecosystem to be understood, and policy changes to be made to address informality. The susceptibility of Peruvian artisanal fishermen is a result of institutional flaws that necessitate strengthening governance and decision-making processes.

Unsustainable use, a lack of legal recognition, and poor management are some of the issues associated with Peru's small-scale fishing industry's informality. Informal labor relations and illegal vessel construction are examples of informal practices that impact workers' rights and vulnerability in times of crisis such as the COVID-19 pandemic.

With intertwined social, cultural, ecological, and economic facets, fishing communities are intricate socio-ecological systems. Social capital is essential to these communities' resilience and is impacted by elements like trust and organizational strength. Evaluations of wellbeing show how susceptible small-scale fishing communities are to outside influences.

Political issues include the need for co-management mechanisms to be established, artisanal fisheries to be included in decision-making, threats to the ecosystem to be understood, and policy changes to be made to address informality. The susceptibility of Peruvian artisanal fishermen is a result of institutional flaws that necessitate strengthening governance and decision-making processes.

The intricate interplay among ecological, economic, social, and political factors highlights the difficulty in maintaining Peru's marine ecosystems and the artisanal fishermen's livelihoods.

Furthermore, it should be emphasized, once again that management systems for Peruvian artisanal fisheries are key factor in actively shaping their conditions today and in the future. Which management approach suit which local communities would have been determined in further work. However, every artisanal fishing community should have at least one crisis management system in place to address environmental impacts such as ENSO, ocean acidification, marine heatwaves, and the current and future effects of overfishing. It would also be an easy, cheap, and effective way to identify and set ABFMs to prevent, or at least reduce, further ecological damage. Furthermore, the OSPA in Peru has shown positive changes for artisanal fishers and that this does not require financial capital, or a low budget to establish such "unions" locally and trans-locally. Therefore, artisanal fishers should be encouraged to get organized and work together on improvements, problems, disagreements, etc. and together de-

mand a higher level of commitment, respect, visibility, and integration from the government and authorities.

Without this, all management approaches and improvement potentials may be valuable theoretical approaches, but they cannot be implemented without active action and stronger collective commitment, as the government and authorities will remain "lazy" and the potential for shaping the country will remain untapped by artisanal fisheries.



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