Encountering Seaweed:

Life In and Beyond Macroalgae Farming Through Lived Experience of Farmers in Shandong and Fujian, China

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Abstract:

In the past few years, macroalgae farming has surged in popularity on a global scale as a potential major contributor to carbon dioxide removal. As the world's biggest producer of seaweed, China has actively engaged in this global effort to develop macroalgae farming as a nature-based climate solution. Amid this global enthusiasm, however, is a lack of attention to the local living worlds. This study focused on two major farming regions in China, and adopted a feminist approach to ground the study in perceptions and experiences of coastal villagers. Data were collected mainly through ethnographic interviews, complemented by village visits and document research, and the analysis was guided by Braun & Clark's Reflexive Thematic Analysis. The findings suggest that villagers' experience and sense-making of farming, ways of life and environments are deeply intertwined with both more-than-human dynamics and social constructs. For generations, villagers have embodied responsive coexistence with nonhumans and built ecological knowledge relationally; nevertheless, these engagements are increasingly undermined by power-laden social constructs within and beyond China. By identifying risks of naturalizing hegemonic social constructs and disembedding the economy and the environmental functions from social and ecological relations, this research emphasizes that the meanings and consequences of seaweed farming as a climate mitigation strategy cannot be fully understood without attention to the everyday contexts in which it unfolds.

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1 Introduction

Seaweed has been a part of traditional diets in East Asia including the east coast of China, as a key ingredient in salad, soup, stew and even snack. However, it wasn't until after the country's 1978 economic reform that seaweed farming became a commercial production, growing 7.7-fold in the next three decades (Xiao et al., 2017). At present, several species of brown and red algae are farmed along the Chinese coastline, making the country the biggest producer of seaweed worldwide. In another aspect, the ocean has been getting increased attention in the recent decade as a site for climate mitigation, especially carbon dioxide removal (CDR), acknowledged by the Paris Agreement as essential to address climate change. Low trophic level mariculture—especially macroalgae[1] farming—has under these circumstances gained global enthusiasm for its potential to significantly draw down carbon dioxide. The macroalgae concerned in this study is kelp, the most farmed brown algae in China[2] and widely recognized for its CDR capacity. Fueled by the global momentum, in China policy discourses, scientific studies and financial institutions have actively engaged in developing macroalgae farming as a tool for climate mitigation.

I grew up on the east coast of China, fed by marine plants and fish, and had especially close ties with my grandfather who worked with maritime matters his entire life. This has developed into a deep respect for and attachment to marine environments. I acknowledge that, by disagreeing with reductionist, market- and tech- driven dominant environmental discourses, I tend to question initiatives by powerful actors. This search for alternatives coupled with doubts about the schemes of powerful actors have affected my approach to this topic: I intended to avoid top-down orientation, deductive reasoning, or instrumental framing, which would have not only fixed macroalgae farming villages as sites for climate mitigation, but invisibilized villagers and negated their agency and lived experiences.

Macroalgae farming regions produce both economic and ecological benefits, but they are much more than mariculture sites or carbon sinks. First, they are living worlds—communities that have been sea-based for generations. Approaching these farms as inhabited spaces is necessary to avoid undermining long-standing livelihood practices, erasing

[1] In this thesis, "macroalgae" and "seaweed" are used interchangeably.
[2] See Chapter 2 for more information.

the alternative ways of knowing and being, and causing environmental violence on humans and nonhumans[3].

1.1 Aim and Research Questions

Research into the social aspects of fisheries has largely overlooked macroalgae cultivation, and studies concerning rural China were mostly interested in terrestrial communities instead of coastal ones. In recent years, macroalgae farming has been given increasing visibility in relation to blue economy and blue carbon, but studies often approach it as a rational production system or technical solution (e.g., Fricke et al., 2024; Pessarrodona et al 2024). Little attention has been paid to the social and cultural dimensions of macroalgae farming communities. It is against this context that I ask:

How do macroalgae farming villagers in Shandong and Fujian provinces of China experience and make sense of their farming, ways of life, and environments against the backdrop of changes in broader environmental and sociohistorical contexts?

To guide my data collection and analysis, I ask the following operational questions:

- *What changes have villagers experienced in macroalgae farming and their ways of life?*
- *How do villagers perceive macroalgae farming, and how do they understand and value their ways of farming and living?*
- *How do villagers relate to local environments and nonhuman beings?*
- *How are villagers' ways of living, farming, relating and perceiving shaped by environmental and sociohistorical conditions, discourses, and their choices in interpreting and interacting with these changes?*

In this thesis, I seek to center the local communities involved in macroalgae farming to bring to light their experiences, perspectives and sense-making. By centering the voice of

[3] In this thesis, I use "nonhumans" to refer to beings other than humans as well as environmental forces (e.g., marine species, algae, tides), and "more-than-human" to foreground the relational world in which humans and nonhumans co-constitute everyday life. The two terms are not used interchangeably, but in complementary ways aligned with their conceptual significance.

villagers who engage in macroalgae farming, I aim to destabilize the dominance of its instrumental framings and try to understand villagers' sense of being, living and relating as shaped by interactions with societal and more-than-human forces in past and present. In doing so, I intend to contribute to the efforts of avoiding reductionist anthropocentric planning and opening space for alternatives that consider sustainability beyond metrics and markets.

1.2 Thesis Outline

This thesis consists of seven chapters. The next two chapters establish necessary background information and review literature relevant to this topic. Chapter four explains methodology and methods adopted to conduct this research, and chapter five introduces the theoretical framework constructed to assist analysis. In chapter six, I discuss three major findings of this study and their implications. The final chapter concludes and provides suggestions for future studies.

2 Context

This chapter is written from historical records, policy documents, and technical papers I collected as secondary data to situate this study[4]. Before diving into this study, we need to familiarize ourselves with macroalgae cultivation as well as the historical and social aspects of macroalgae farming villages in China.

2.1 Macroalgae Farming in China and the Two Provinces

Macroalgae has long been a traditional food in China, but it wasn't until the 1940s that cultivation began. Shandong province is the birthplace of macroalgae farming, and brought it to southern China, especially Fujian and Zhejiang provinces in late 1950s. In the 1960s macroalgae farming had become a widespread form of livelihood for coastal villages. In the 1980s as the country reformed its economic strategy to actively engage in foreign trade, seaweed cultivation grew massively through commercial production in the next three decades.

Currently the biggest macroalgae farming regions are the coastal zone under the jurisdiction of Weihai municipality in Shandong province (hereafter, "Shandong") and the coastal zone under the jurisdiction of Fuzhou municipality in Fujian province (hereafter, "Fujian"). Both regions also produce their own seedlings locally. Historically, these two regions relied mainly on capture fishery, and welcomed macroalgae farming to reduce poverty. This was especially the case for villages in Fujian given that their geographical conditions left them no other choice than a sea-based livelihood. They also formed village-based cooperatives in the 1990s to support the sale and farming of macroalgae.

2.2 China's Economic Reform and the HRS

The 1978 Third Plenary Session of the 11th Central Committee of the Chinese Communist Party was a landmark meeting that officially launched China's economic reform, shifting the country's focus to economic modernization. Modernization was implemented through massively increasing productivity in agriculture, decentralizing economic power to prioritize market logic and value, and actively introducing foreign capital, technology and

[4] See Chapter 4 for more information on data collection.

market. Decentralization unfolded in rural agricultural areas primarily through the household responsibility system (HRS), the first and perhaps the most influential reform policies in rural China that dismissed collectives and asked households to be directly responsible for their assigned quotas. Individual households obtained means of production and began to make their own decisions on production, including whether to produce surplus to sell in the market. Contributing to a significant increase in agricultural productivity, HRS also liberated excess workforce and brought about abundant internal migration out of rural areas (Raimondo, 2019).

2.3 Practical and Ecological Processes of Macroalgae Farming

While there are numerous seaweed species, in China four types make up 98% of the total production. The species cultivated in Shandong and Fujian is *saccharina japonica*, commonly known as kelp, a type of brown algae. As a cold-water marine plant, cultivation of macroalgae is carried out when the water is cool enough, i.e. in Shandong November to July, and in Fujian December to June. At the same time, sunlight is considered the key factor for growth throughout kelp's lifecycle, from seedling onshore, to growing in the ocean, and drying on land.

Different from wild seaweed that grows from the seabed, cultivated ones grow on large floating structures—a long rope kept afloat by buoys and anchored in the nearshore area. Before they are ready to be put back into the ocean, seedlings are first grown onshore in autumn until they reach over one centimeter. When harvesting, macroalgae requires immediate drying, because it rots quickly. Thus for productivity, many farmers nowadays, when financially feasible, turn to drying facilities from the traditional weather-dependent sun-drying method. In this respect, macroalgae farming follows conventional agriculture in pursuing a commodity- and productivity- driven development (Gliessman, 2015, Chapter 1).

As a low trophic level organism, seaweed requires no external feed and reduces nutrients in water. In addition to reversing eutrophication, it also facilitates carbon flux from atmosphere to the sea during photosynthesis, through absorbing dissolved inorganic carbon and improving local water's sequestration efficiency. Macroalgae farming is thus considered an environmentally beneficial form of aquaculture.

2.4 Recent Policy Attention on Macroalgae Farming in China

Given the urgency of CDR and macroalgae's carbon sequestration capacity, seaweed farming has been recognized enthusiastically at both national and international level. On a regional level for Shandong and Fujian, the local policies share three focuses: environment mitigation through macroalgae farming, technology driven development of the blue economy, and exploration of offshore framing. However, their emphases differ. In Shandong, the emphasis is on developing marine ranching as a key blue economy activity, incorporating tourism, mitigation and multi-trophic mariculture. In Fujian, the core focus is on CDR, promoting pilot projects on marine carbon neutrality and carbon trading not only with macroalgae farming, but also other low trophic mariculture as well as intertidal ecosystems.

3 Literature Review

This chapter reviews empirical literature relevant to this study. I will start by looking at studies on everyday life, social fabric and culture at sea-based communities, then zoom into the Chinese context to understand how development-induced shifts in political economy and societal structure since the 1978 reform have both enabled and impaired rural and sea-based communities. The last theme focuses on academic debates and research trends in studies situated in dominant framings of macroalgae farming. By identifying and synthesizing these three themes, I will identify gaps in the previously conducted studies and highlight the need to foreground social, cultural, relational, and experiential dimensions of macroalgae farming communities.

3.1 Situated Life at the Sea

Sharing similar ecological conditions and dependency on the open sea area, fishing and mariculture communities inherently overlap in ways of life and being. Many mariculture communities once depended on capture fishery, and some still practice both (e.g., Francisco et al, 2017; Hair et al, 2020; Sievanen et al, 2005; Slater et al, 2013). While scholars like Steenbergen et al. (2017) argue that transition to mariculture has transformed local communities' social patterns, other scholars like Brugere et al. (2023) state that fishing and mariculture communities, both sea-based, continue to share many social and cultural patterns. For this review, I zoom out to fishery communities to grasp the main social and cultural patterns of sea-based villages in existing literature, especially because studies on human and social aspects of mariculture villages are lacking (Brugere et al, 2023; Murray & D'Anna, 2015).

In this empirical field, governance and institutional structures are arguably the most discussed topics (Mansfield, 2007; MacDonald, 2005). At the same time, in highlighting issues brought by traditional individualistic management practices, scholars like Ommer et al. (2012) urge their peers to approach these communities as socio-ecological systems. It is with this different focus that understandings of their communal dynamics and more-than-human interactions surfaced (e.g., Bresnihan, 2016, Chapter 5; Ommer, 1999; Nightingale, 2013).

A common thread in these writings is a communal and collective sense of being and perceiving. In sharing experience and supporting each other during fishing or cultivating at a common sea area, villagers consider resources, risks, burdens as well as decisions as shared (Davis & Ruddle, 2012; MacDonald, 2005; Nightingale, 2013; Steenbergen et al, 2017). This exchange of material and emotional support, which permeates everyday life and work (Bresnihan, 2016, Chapter 5), fosters a sense of mutual care and obligations that surpasses work-related tasks, influencing various generations and extending beyond family units (Cubillo et al., 2023). In some cases, it creates a bond more reliable and crucial than blood relations (Lyu et al., 2023). Bresnihan (2016, Chapter 5) enriches this discussion by introducing a notion of commons—a communal collective of care that flows among not only humans, but also nonhumans, ensuring ecological and social reproduction. He argues that because the line between reproduction and production is blurred in these communities, practices of livelihood enable and sustain the commons. Whitmore et al.'s (2025) study on social license issues in small-scale mariculture also shows that efforts to build informal relationships for social acceptance lead to care, solidarity as well as monetary gains over time.

Another common thread is local peoples' deep connection with their more-than-human worlds: from affectional ties with local wild species and aquatic seedlings (Cubillo et al., 2023; He et al., 2022), cultural bond with their boats (Ó'Sabhain & McGrath, 2019), to sense of rootedness linked to certain coastal spaces and features (Bresnihan, 2016, Chapter 5; Collins & Kearns, 2013; Pafi et al., 2023), deep connection with places of livelihood activities (Bennett et al., 2018; Cubillo et al., 2023; He et al., 2022), and emotional reliance on the sea (Lyu et al., 2023). In some coastal communities, residents perceive their own well-being as part of and influenced by experiences of other local beings, things and spaces (Cubillo et al., 2023; Murray & D'Anna, 2015; Nightingale, 2013). Nightingale (2013) elaborates that not only their well-being, but their sense of being is also relationally produced, and thus hinges on particular moments where relations happen. According to Jones (2011) and Ingold (1993), humans and nonhumans dwell within a locale-specific temporality structured by these embodied relations, since they experience and actively interact with marine rhythms, such as the powerful tidal movements.

Recognizing uncertainty at sea has been brought up by several studies, especially in terms of local and traditional ecological knowledge (Bresnihan, 2016, Chapter 5; Davis & Ruddle, 2012; Nightingale, 2013; Whitmore et al., 2025). Fishermen underscore a readiness to respond to any circumstances—rather than attempting to dominate their environment or standardize their practices, they build this capacity with awareness, a negotiating attitude, and the appropriate tools (Bresnihan, 2016, Chapter 5).

Fishery experienced industrialization, globalization and market-driven governance, confronting traditional ways of life at sea-based communities (MacDonald, 2005). Research on this aspect often focuses on environmental management mechanisms, such as access control and ecosystem services, and many point out negative impacts on local communities in terms of relation with their ancestral and historically communal land and ocean (Carothers et al., 2010; Cubillos et al, 2023; Mansfield, 2004; Olson, 2011; Vergara et al. 2021). Some scholars also raise concerns over long-term consequences of this shift: specialized production left local communities more vulnerable to ecological and social fluctuations; globalized trading obscured interdependency from sight, allowing irreversible damages to the local environment; external forces disrupted their communal sense of care and responsibility by dismissing their relational and nonhierarchical way of practices; and market-driven governance displaced not only original communities but their situated ecological knowledge crucial to climate adaptation (Davis & Ruddle, 2012; Hair et al., 2020; Leitch, 2023; MacDonald, 2005; Nayak, 2005).

In the next section, I will zoom into China, where the circumstances sea-based communities face are shaped by the country's decades of reforms and development that have restructured rural life across China since 1978 (Garnaut et al., 2018, Part III).

3.2 Chinese Rural Worlds Through Society-Wide Shifts

Debates over whether and how China engages with neoliberalism mostly refer to the 1978 reform and the developments that followed (Ong, 2006; Weber, 2018). Studies tend to be macro or meso scale analysis of policy effectiveness, structural changes and their implications (e.g., Horesh & Lim, 2017; Liew, 2005; Guo et al., 2022; Su et al., 2020; Wu, 2010). Those that emphasize local changes also primarily focus on the functions and dynamics

of local governments (e.g., Ang, 2017; Ahlers & Schubert, 2018; Yang & Gao, 2024; Michelson, 2012; Sun & Collins, 2013).

The majority of studies on social fabric of contemporary rural societies refer to the famous concept of 'acquaintance society'[5], arguing that changes following the 1978 reform have led to weakened communal order and a shift away from acquaintance societies (e.g., Cohen, 2005; Xu & Fuller, 2018; Yao, 2018). Many scholars like Liu (2000) and Yang & Gao (2024) attribute this phenomenon to HRS and other decentralizing policies. In the context of sea-based communities, central to this topic is discussion of its impact on collective power. Su et al. (2020) emphasize that as fishermen obtained autonomy and more income from the dismissal of the commune system and production brigades, they also lost the collective organizations that previously acted as intermediaries between them and the government. Losing the negotiation power of their perspectives and needs indicates a removal of practices of bottom-up societal power, which was not in their favor. Xiong and Wu (2024) identifies this lack of collective actors as a major problem in coastal management nowadays, especially fishery governance, impeding true participatory approaches. Furthermore, Zhang et al. (2025) argue that because the reform was state-led, notwithstanding decentralization policies, it cultivated a habitual reliance of villagers on top-down forces. Fishermen therefore allocated little resource or effort to foster communal trust and collective power in their communities.

Conversely, Cohen (2005) rejects this reasoning given that having the economy organized around family units was already the case in the commodified late imperial period. He puts forward the concept of 'peasant' to unravel the diminished communal basis of reasons and actions in post-reform rural communities. This notion was created by Chinese intellectual elites in the May Fourth Movement who described rural populations as backward and incapable and their traditional cultural practices as impeding progress. Cohen argues that these practices have long acted as the foundation of local kinship- and community-based networks, without which the communal basis inevitably became fragile. However, in the post reform

[5] This concept was introduced by Fei Xiaotong (1947/2006) in his ethnographic work to highlight the high degree of interpersonal familiarity and connection in rural communities of pre-modern China, on which informal rules and community cohesiveness were enacted.

period, many rural communities have already experienced their traditional beliefs and rituals being forcefully removed or gradually abandoned.

This perspective might explain why not all cases of HRS show diminished social cohesion. For example, Lin's (2016) case study of HRS in a coastal village shows a rapid increase in economic return through villagers' collective effort. However, this attitude toward rural people manifests in studies on local cadre post-reform, as they assumed two roles: either one that implemented and safeguarded state power or one that engaged in entrepreneurial activities through partnering with economically powerful actors (Ahlers & Schubert, 2018; Ang, 2017; Yang & Gao, 2024). In either role, they related to top-down nonlocal forces and detached from local ordinary villagers.

Participation of external actors—especially foreign actors—is viewed as a distinct characteristic of the economy after the reform, following the state's opening up to global trade and joining the World Trade Organization (WTO) in 2001 (Sun & Collins, 2013; Wu, 2010). These external forces mediated through market logic dramatically reshaped some coastal rural landscapes in a short period of time, transforming many into modernized zones ready to attract foreign investment (He et al., 2014; Yang & Gao, 2024; Institute of Party History and Literature, 2009). For villages that remained rural and continued fishery, these forces generated larger demand through non-local markets, offered access to bank loans and advanced technologies, but also restricted local autonomy of production because of external stakeholders and industrial regulations (He et al., 2022; Su et al., 2020; Sun & Collins, 2013). Changes altered ways of work and life, on which relations, valuations and social norms are contingent. Furthermore, scholars maintain that these alterations often happened in a top-down form of partnership between state and industry, out of control to local villagers (He et al., 2022; Zhang et al., 2025). He et al. (2022) reveal a decrease in people's rootedness to their ancestral land which kept them aware of their entanglements with other humans and nonhumans in an interdependent web. Literature on local resistance to these external forces is absent, which might suggest a smooth acceptance of the market-driven economic culture by rural communities in the post-reform era.

Despite interest in studying social practices and transformations in Chinese society since the reform, investigating these dynamics through the lens of everyday life and lived

experiences is less common (Liu, 2000, p. 22; Zhuo et al., 2022). Scholarship on rural worlds lacks bottom-up perspectives, and when it does appear, it tends to center on land-based rather than sea-based rural communities (e.g., Liu, 2000; Kaufmann & Tao, 2025; Steinmüller, 2013).

In addition, there are no studies examining rural worlds as one constituted by both humans and nonhumans. In spite of increased scholarship on ecological impacts since the 2010s with China's commitments to the environmental agenda (e.g., He et al., 2014; Yang et al., 2016; Zhao & Jia, 2020), research that touches on relations with nonhumans remains scarce. Moreover, these studies on marine and coastal degradations reinforce a binary understanding of society and nature, human activities and natural processes, by ascribing the degradations utterly to post-reform economic policies and growth. Therefore, they bring limited insights to reviving and renewing human-nonhuman relationships, as He et al. (2022) advocates.

The influence of framing brings us to the third theme. The relevance of macroalgae farming spans several discursive, geographic, and societal contexts, consequently giving rise to various narratives. Depending on the narrative, research tends to approach, analyze, and represent the farming practice of macroalgae and its farming community differently.

3.3 Framing Seaweed

In the past three decades macroalgae farming has gained ample attention in research as a practice for livelihood resilience and poverty alleviation (e.g., Fröcklin et al., 2012; Sievanen et al, 2005). These studies are usually situated in tropical developing countries, examining macroalgae farming through its social-ecological benefits to the local community. In the majority of the cases, studies reveal that farming practices were introduced to local communities in a top-down manner, framed as a development project or an alternative livelihood (Fröcklin et al., 2012; Rimmer et al., 2021; Sievanen et al, 2005; Steenbergen et al., 2017).

In this arena, livelihood security and women's empowerment are the most often addressed benefits, especially in terms of lifting local communities out of poverty (Andrianomenjanahary, 2021; de Souza Maia et al., 2020; Spillas et al., 2023). Yet, some

scholars point out accompanying health-related issues and market volatility, which raise questions about the purported benefits (Fröcklin et al., 2012; Spillas et al., 2023). The environmental dimension is relatively less discussed, but most studies agree on macroalgae farming's benefit on water and habitat restoration (Spillas et al., 2023). Simultaneously, mixed results are shown in fishery related benefits: while illegal fishing and wild stock exploitation are seen reduced in some cases, fishery pressure continues in others (de Souza Maia et al., 2020; Sievanen, 2005). In some villages macroalgae farming creates a space for bonding and sharing which results in enhanced community cohesion. In other villages, it has reportedly worsened this bonding, especially in cases where traditional local livelihoods such as capture fishery were rapidly replaced by macroalgae farming (Spillas et al., 2023; Steenbergen et al., 2017). As for relations with nonhuman actors, unlike in scholarship on fishery communities, it has been rarely addressed, though it has been reported on in the media (e.g., Fabro, 2022).

As a large worldwide industry (Hasselström, 2020), macroalgae farming has also been studied as an economic activity (e.g., Deepika et al., 2022; Wu et al., 2021). Studies from this angle are often situated in regions without poverty issues, and converge in their focus on market value, profitability and innovation. Some studies investigate socioeconomic conditions and delve into local social dynamics, notably the common subject of social acceptance in aquaculture (Brugere et al, 2023; Pantzar, 2020; Whitmore et al., 2025). However, increasingly more studies direct attention to business or market models for macroalgae farming as part of the blue economy (e.g., Albrecht, 2023; Jelić Mrčelić et al., 2024). In studies examining socioeconomic factors, macroalgae farming is often small-scale at sea-based communities (e.g., Wu et al., 2021; Whitmore et al., 2025), while in those emphasizing the blue economy it is often visioned as large-scale, technologically advanced and capable of driving economic growth while benefiting the environment (Albrecht, 2023; Deepika et al., 2022; Hasselström, 2020; Spillas et al., 2024).

This trend is likely relevant to if not a result of how macroalgae farming has, on regional and global stage, in recent years been promoted with a sustainable focus (e.g., European Commission, 2022). For studies in this discourse, discussions on institutional role often surface, and depending on context, argue for less blocking or more institutional support through policies and fundings (Franzén et al., 2024; Jelić Mrčelić et al., 2024).

The newest, and possibly the most debated and the most funded arena of research, is macroalgae farming for carbon sequestration (e.g., Christianson et al., 2022; Siebert et al., 2025). While benefits on CDR are also addressed in studies before the emergence of this framing (e.g., Ullmann et al., 2021; de Souza Maia et al., 2020), positioning macroalgae farming as primarily a nature-based carbon solution moves it away from producing macroalgae as a commercial product, and aligns it with climate mitigation (e.g., Hughes et al., 2025). Underpinned by global authorities (e.g., United Nations Environment Programme, 2023; European Commission, 2021), this narrative is largely driven by the approaching 2030 goal of CDR (Pessarrodona et al., 2024; Sieber et al., 2025). Despite its momentum in both research and practice on a global scale, macroalgae farming's carbon offsetting effectiveness is still under debate (Christianson et al., 2022; Thomas & ETC Group, 2023; Spillias et al., 2023). Current trend of research under this narrative is mostly in biological, ecological and technical dimensions, with emphasis put on assessing environmental benefits and engineering species for blue carbon (Frick et al., 2024).

In the Chinese context, social studies of macroalgae farming mostly fall into this framing, with a focus on scalability, efficiency of carbon removal, and trading mechanisms on a national level that abstract it from local contexts (Jiao et al., 2018; Yang et al., 2021; Zhao et al., 2021). Few take interest in cultural or human aspects on the local level. Much of the literature tends to prioritize ecological or economic outcomes, often at the expense of understanding how these initiatives interact with local social fabrics, cultural norms, and embedded temporalities. Macroalgae farming areas are much more than sites for scientific research or technical optimization. They are first of all living worlds—communities that have been sea-based for generations. Framing macroalgae farming as a forward-looking green solution obscures its rootedness in place-specific knowledge, historical labor forms, and community-based relational economies. It is necessary to recognize and approach these farms as inhabited spaces to avoid undermining long-standing livelihood practices, erasing the alternative ways of knowing and being, and causing environmental violence on humans and nonhumans. In this thesis, I seek to address the omissions mentioned above by taking a grounded approach to the ways work, life, and sense of being are constructed and perceived at macroalgae farming villages on the coastline of China. By centering the voice of villagers, I aim

to foreground their lived experiences and contribute to destabilizing the dominance of instrumental framings and reductionist anthropocentric plannings.

4 Methodology

In this chapter, I will explain the methodology and methods adopted in this study. Starting from briefly explaining my epistemological and methodological standpoints, I will introduce my research design before disclosing my methods in data collection and analysis. Limitations and ethical considerations of this study will then be discussed. To conclude, I will reflect on my positionality and subjectivity.

4.1 Research Design

While this study does not center gender as its primary analytical focus, it draws on feminist methodological principles—particularly in rejecting the binary ordering of objectivity and subjectivity and embracing a constructivist perspective (Haraway, 1988; Prins, 1995). Approaching knowledge as partial yet valid, I center relational dynamics and lived experiences to re-situate macroalgae farming within its spatial, social, and historical context countering dominant framings that abstract it as a purely forward-looking green solution.

For this purpose and given limited existing literature, this study takes an exploratory approach and relies primarily on the voices of villagers that practice macroalgae farming. Therefore, I followed an inductive logic that develops analysis from data instead of based on preconceived notions, and an ethnographic interview approach that considers context, welcomes complexity and contradictions, and refrains from focused questions and unequal relationships between the interviewer and the interviewee (Cecez-Kecmanovic & Kennan, 2018; Trundle et al., 2024). Different from traditional ethnography, the ethnographic interview is decoupled from participant observation but still enables researchers to encounter the unexpected, complex and fluid aspects of respondents' contextualized experiences and perceptions (Trundle et al., 2024).

4.2 Methods and Data

Semi-structured in-depth interview was the main method used for data collection. Interviews were conducted during my visit to Shandong and Fujian in February, 2025. Relevant documents including archives, policy documents and scientific technical papers were

also collected during and after the fieldwork to situate, validate, and support understanding of the interview responses.

4.2.1. Village Visits and Interviews

I first traveled to Shandong, and later based on my progress, objectives, and the data collected, I decided to also visit Fujian. Fieldwork at each location started with exploration in the villages and at shore farming preparation sites to arrange interviews. Observations and casual chats with locals during the exploration phase assisted me beyond making contacts, providing me with valuable contextual information. I also visited local libraries and record offices to collect local historical and policy archives for a more holistic understanding of these villages and their macroalgae farming practices.

Eleven interviews were conducted using standard Chinese (普通话), six in Shandong and five in Fujian. Nine of those were done face to face as I visited participants in their everyday physical spaces, and the last two were through phone calls mainly due to my time constraints. An interview guide was prepared to support me in covering all necessary themes for this study. It was checked by the end of each interview, but not explicitly followed to avoid conveying a questionnaire sense of interview which could constrain participants' elaboration (della Porta, 2014; Patton, 2015). This guide was also continuously revised in light of new insights, which could be interpreted as that the villagers co-directed the trajectory of my research focus (Trundle et al., 2024). As products of social interactions (Brayboy & Deyhle, 2000), interviews were different in their dynamics and lengths, varying between 15 to 85 minutes, with an average of 43 minutes.

Nine out of the eleven interviewees gave consent to recording, although one recording was lost due to technical failure. For the three unrecorded interviews, notes taken were used for analysis. There was always space for casual chatting at the beginning of each interview and comments off the record at the end of each interview, which was a culturally sensible thing and helped me gain both more trust from my participants and better understanding of our interviews (della Porta, 2014). Nonverbal signals unable to be recorded on tape were noted immediately after every interview (Brinkmann & Kvale, 2018, Chapter 8).

4.2.2 Sampling

For my research aims, I purposefully looked for villagers who have engaged in macroalgae farming locally for at least five years. Participants range in age from 39 to 69, and all live in the local coastal villages with their families (see Table 1). Names of the villages were intentionally left out to avoid leaking their personal information, given the small scale of those villages. The choice to focus on the intersection of residents and local cultivators was based on my aim to approach cultivation as part of their everyday life.

Table 1

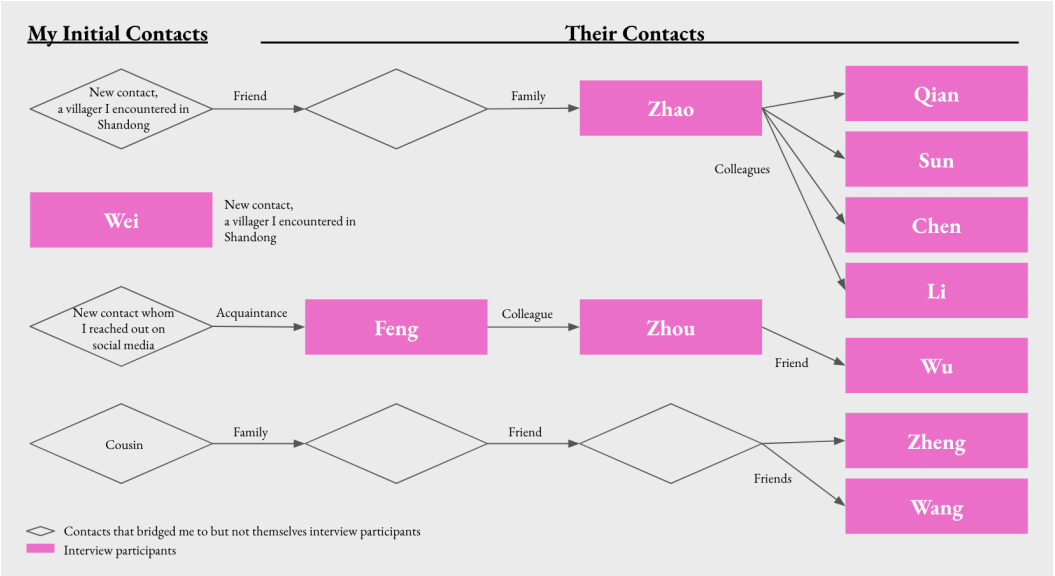
Overview of Interview Participants (pseudonymized)

Participant	Location	Gender	Age	Marital Status	Mother Tongue	Education Level	Years in Macroalgae Cultivation
Zhao	Shandong	Male	≈40	Married with kid	Jilu dialect of Mandarin	University	10+
Qian	Shandong	Female	40+	Married with kid	Jilu dialect of Mandarin	Secondary	10+
Sun	Shandong	Female	40+	Married with kid	Jilu dialect of Mandarin	Secondary	10+
Chen	Shandong	Female	40+	Married with kid	Jilu dialect of Mandarin	Secondary	7
Li	Shandong	Male	≈60	Married with kid	Jilu dialect of Mandarin	Elementary	20+
Wei	Shandong	Male	50+	Married with kid	Jilu dialect of Mandarin	Secondary	20+
Feng	Fujian	Male	70+	Married with kid	Min Chinese	N/A	50+
Zhou	Fujian	Male	≈40	Married with kid	Min Chinese	University	10+
Wu	Fujian	Male	50+	Married with kid	Min Chinese	Secondary	30+
Zheng	Fujian	Male	40+	Married with kid	Min Chinese	Secondary	20+
Wang	Fujian	Male	50+	Married with kid	Min Chinese	Elementary	30+

In addition to common snowballing, I also utilized *guanxi*, described by Kriz et al. (2014) as the native Chinese version of snowballing, which moves the researcher closer to an insider position and helps gain access in the low-trust society of China. Figure 1 contains what Kriz et al. (2014) describes as a tree of *guanxi,* showing branches of old and new connected personal relations that led me to my interview participants. Gender balance was also considered but in Fujian it wasn't achievable, because I encountered few women and they only spoke the local dialect.

Figure 1

Tree of Guanxi Snowballing in this Study (pseudonymized)



4.2.3 Data

In addition to the primary data from eleven villager interviews. secondary data of twelve documents were collected: local archives collected during fieldwork, and national and global policy documents and scientific technical papers collected afterwards from official websites. Local archives include recent policy planning documents and historical records dating back to early days of macroalgae farming in the 1950s, on both their lifeways and farming practices. National and global policy documents are from two Chinese institutions, the National Congress of the Communist Party of China and the State Council of the People's Republic of China, plus one international body, the United Nations Environment Programme. The two technical papers are from websites of the Chinese Academy of Sciences and the Food and Agriculture Organization of The United Nations. Based on these documents I wrote the context chapter.

The interviews were transcribed in their original language with the help of speech recognition tool, TurboScribe. Although both transcribing and coding were done in Chinese, I acknowledged the differences between oral and written languages, and thus transcribed in

between verbatim and formal style to produce comprehensible transcripts that stayed true to participants' intended meanings (Brinkmann & Kvale, 2018, Chapter 8). Margin notes on nuances and mannerisms were also added to assist later analysis. During the writing process, I translated the selected quotes to English. Some nuances were inevitably lost in translation, but this step is necessary for the thesis to be comprehensible to English speakers.

In bringing to surface the voices of research participants, I also acknowledge that not only the villagers' positionality but my own engaged in and influenced the research, producing subjective data and understandings (Braun & Clark, 2021; della Porta, 2014). While incorporating subjectivities in knowledge production aligns with my epistemological stance and allows rich and multilayered insights, it also demands practicing reflection critically and repeatedly throughout (Thorpe et al., 2018). Reflexivity was therefore a core element of my interactions with data.

4.2.4 Data Analysis

The analysis was guided by the six-phase process of Braun & Clark (2021)'s Reflexive Thematic Analysis. This iterative and interpretative way of data engagement allowed me to embrace reflexivity, subjectivity and complexity which are essential to my methodological approach. One deviation I made was to juxtapose my margin notes before coding to signal areas of contradictions and commonalities across transcripts, from which I generated preliminary codes. Therefore, my process can be roughly described as follows: (1) Transcribing, familiarizing, and adding margin notes, (2) Juxtaposing notes and generating codes, (3) Coding the data with iterations, (4) Generating themes, (5) Reviewing themes, codes and data items in relation to each other, (6) Defining final themes.

The theoretical framework employed in this study was formed in an inductive manner during theme generation phase. The final themes are results of my interactions with the data, influenced by my subjective understandings and choice of theories (Byrne, 2022). Instead of topic clusters, they were constructed as narratives addressing my research questions (Braun & Clark, 2021).

4.3 Limitations

My time constraints were perhaps the biggest limitation in this study, especially given that Chinese societies demonstrate a low level of trust toward strangers (Kriz et al., 2014). Spending more time conducting fieldwork would have allowed villagers to gradually see me more as a familiar visitor and less as an intruder. It would have also helped me feel less out of place, which could lead to a better rapport with villagers, and hence a richer data production. Visiting during the harvesting and planting season (i.e., around May and December) would have allowed me to encounter experiences, perceptions, and emotions not available in February. Longer and more flexible fieldwork time could have also helped me get access to conduct participant observations. It would have also allowed me to establish more diverse initial contacts for snowball and *guanxi* sampling, to achieve a broader width of opinions which is the weakness of this sampling method (Kriz et al., 2014).

4.4 Ethical Considerations

All participants were given explanation of study objectives and space to ask questions before they provided oral consent to participate. A printed consent form in Chinese was also offered to all participants to provide them with further and contact information. In general, I adhered to strict confidentiality and data safety protocols in compliance with GDPR in my data handling. Interviews were taped and stored on a local voice recorder. The transcribing service I employed, TurboScribe, keeps all files encrypted, avoiding them to be used for AI training purposes or by any third party (Foged, 2024). Transcripts were saved in Lund University's Google Drive with only pseudonymized names. I chose to anonymize all participants after asking their preference (Brinkmann & Kvale, 2018, Chapter 3). While not everyone explicitly requested anonymity, no one expressed a desire to be recognized. Full anonymization thus helped avoid drawing attention to the differences.

4.5 Positionality and Reflexivity

As established in the beginning of this thesis, emotional closeness with my grandfather and my personal perception of environmental discourses led me to the approach taken in this study. However, I do not have a personal past in sea-based farming or coastal

villages and have been educated in a critical but westernized academic environment. Therefore, my initial familiarity with and knowledge of this topic came from news, reports, and academic journal articles, which later encountered much unexpectedness and divergence in local realities. I have hence allowed my research questions to be modified accordingly.

Returning to China and conducting research in regions geographically and linguistically different from places I have lived, I consider myself simultaneously an insider and an outsider, shifting in degrees contingent on context (Hill & Dao, 2021; Thorpe et al., 2018). Being Chinese allowed me to communicate comfortably in standard Chinese and comprehend cultural forces behind words for more situated understandings. Nevertheless, not speaking the region-specific dialect prohibited me from making conversation with older villagers or perceiving locally specific nuances contingent to the language used in everyday life[6]. My identity was also perceived differently by different participants and influenced our trust building processes (Trundle et al., 2024). Given their disconnected relation with academia and scientific research, many participants needed to be assured that information they tell me is indeed important for my research in order to talk about their personal experiences, feelings and understandings (Yip, 2024). For two cases, however, the participants did not position me as a researcher and were initially concerned about my non-local identity: I was questioned implicitly in one case whether I held a position in government, and in the other whether I was from anti-China foreign forces. Understanding the social and historical context of China, these initial trust issues were not surprising to me. I was able to resolve their doubts by providing more details and holding nothing back.

At the same time, I also recognize myself actively playing up or diminishing my different subjectivities on different occasions during fieldwork to facilitate access and interview quality (Brayboy & Deyhle, 2000; Yip, 2024). I avoided clothes or accessories that would distinguish me from the farming communities. At the same time, I was explicit about my little

[6] China is a linguistically highly diverse country. Chinese or standard Chinese (普通话) usually refers to the Beijing dialect of Mandarin, but there are many other languages and dialects. For the two coastal regions in Shandong and Fujian visited for this study, Jilu dialect of Mandarin is used in the former and Min the latter. Younger generations are mostly bilingual in both standard Chinese and their region-specific dialect, but for everyday life in the village they use the dialect. Older villagers often only speak the dialect.

experience with macroalgae farming to avoid my interviewees assuming me as an expert. My lack of exposure to macroalgae gave my respondents more willingness and confidence in sharing their perceptions. I was also explicit about being a student—as a culturally favored identity that tends to elicit more support, it allowed me greater access to and less guardedness from villagers, as well as more patience when I asked for further explanation.

5 Theoretical Framework

To make sense of villagers' way of farming, perceiving, relating and interacting, I weave together three disparate theoretical strands: (1) the more-than-human worldview in early Daoism, a Chinese indigenous philosophy, (2) the symbolic order in Lacanian psychoanalytic framework, and (3) Karl Polanyi's theories on market embeddedness and modern market societies. This tripartite framework allows for a multi-layered analysis, with each tradition offering distinct, yet connected and complementary lenses to approach villagers' macroalgae farming not just as labor but as a way of being, shaped by histories, conditions, and imagined futures.

Early Daoism provides a situated worldview to approach villagers' way of interacting with things in life and to understand villagers' sense-making as hinging on their everyday encounters with nonhumans. It also serves as a theoretical resource capable of critiquing naturalized orders. The Lacanian framework provides tools to decipher how these naturalized orders shape villagers' self-identity, their interpretations of and interactions with the world around them, through the process of interpreting and interacting with it. Including Polanyi to these two traditions grounds these abstractions in political-economic terms, which is especially relevant to rural China under the state's emphasis on market logic and development since the economic reform. My choice to begin with a Chinese indigenous philosophy is not to perform a cultural nod, but to create conversation among different knowledge, acknowledging the epistemic hybridity of contemporary rural China (Ziliotti, 2025). In doing so, I intend to respond to the growing calls in decolonial scholarship to recognize and engage non-Western thought systems as legitimate sources of academic knowledge production, and to take seriously that philosophies often dismissed as pre-modern can provide valuable insights. These three theories combined provide a pluralistic yet grounded approach to analyze my findings. In the following sections, I will elaborate on each strand.

5.1 *Daodejing* (道德经) of Daoism and the More-Than-Human Worldview

As an ancient philosophy written in ancient Chinese, Daoism inevitably induces various understandings and ongoing debates. Martin Heidegger, whose philosophy later in life

is often viewed as greatly influenced by Daoism, stated himself that his version likely diverged significantly from the original intentions (Ma, 2006). Although translating into a foreign language adds an additional challenge, both Chinese and foreign scholars have to mediate the texts through their own interpretation as they translate them into modern languages, and thus more or less depart from the original. Furthermore, Daoism has constantly been developed in the dynasties following its emergence in the Spring and Autumn Period (approximately 8th c. - 5th c. BC). Nowadays Daoism is usually considered in two strands, an ancient Chinese philosophical school *Daojia* (道家) and an indigenous and popular religion *Daojiao* (道教), although whether the latter aligns with the former is debatable. For the purpose of this thesis, I choose to base primarily on the *Daodejing* (道德经), the founding literature of *Daojia*, through my own reading.

Similar to many other ancient philosophies, the *Daodejing* (ca. 6th century B.C.E./2009) tries to develop an understanding of this world. But the particularity of Daoism is that it does not assume a human-like figure as the creator of the world or attempt to fully explain how the world works. From the very beginning the *Daodejing* states that the origin of the world, termed as the *Dao*, should not be considered as fully explainable by speech or fully comprehensible to humans (verse 1). It can only be indirectly approached through its manifestations in observable phenomena. According to the *Daodejing*, the *Dao* brings and fosters life but does not possess or dominate it, nor does it assume power. Those that come to life realize themselves through an internal force as they constitute themselves relationally with others in their contexts (verse 51). In other words, the movements of lives stem from within and cannot be cast on by external power (Lai, 2007).

The convergence of this worldview with posthumanist and multispecies scholarships can aid our understanding of this philosophy[7]. In stating that "[t]o be one is always to become with many" (p. 4), Haraway (2008) denotes that life unfolds through the inevitable interdependence of all things. In introducing her concept of "intra-action", Barad (2007, Chapter 4) highlights the interconnectedness and embeddedness of all entities by stating that

[7] In this section I use some theories from western traditions to help unwrap the worldview in the *Daodejing*, because they are more familiar to the audience of this thesis who are mostly situated in the western context. It is by no means saying that Daoist theories can be represented by theories in western traditions.

no entities shall be presumed before they come into existence relationally with others. In viewing the boundaries and properties of entities as dependent on and built upon encounters, we come into a world where the process of composing is constantly ongoing (Barad, 2007; Haraway, 2008). That is, the world is constantly worlding itself, without external forces.

To express this movement from within, the *Daodejing* (ca. 6th century B.C.E./2009) employs the term of *ziran* (自然), commonly translated as 'self-so' in recent academic works. Given that in early Daoism, the aim of understanding the rhythm of nature holistically is to live in synchronization with its ways, *ziran* is at the core. In modern Chinese, this term refers to the natural environment, understood as opposite to human or manmade. However, it is crucial to approach *ziran* in the *Daodejing* as situated in its more-than-human worldview, indicating a relational mode of embeddedness in mutual becoming. To put it differently, *ziran* is not to indicate a being, but to convey becoming, a fluid understanding of existence (Liu, 2016). It is in this way *ziran* gained its more recent translation as *self-so*. In expressing the movement as from within, *ziran* could be interpreted as a normative way that implies conformity, or an innate order that implies passive acceptance (e.g., Li, 2015; Liu, 2016). However, this interpretation misses the contextualized yet active engagements in the worlding process the *Daodejing* stresses in several verses (Lai, 2007; Wang, 2018). The *Daodejing* rejects interpreting the responsive mode as passively receiving and enduring all happenings.

In the early Daoist worldview, *ziran* serves as the overarching rule followed by all, even the *Dao*. Lives respect and respond to dynamics in soil, on land, and in air to coexist with each other in a more-than-human world (*Daodejing*, ca. 6th century B.C.E./2009, verse 25). Under this view, the human being is formulated as one of the many beings, included by instead of dominating them (Liu, 2016). Approaching being in this manner enacts a form of responsive coexistence with the becoming and shifts of many others. A similar thinking is expressed by Deborah Bird Rose (2012) who argues that "every creature has a multispecies history" (p. 136). We are accustomed to the idea of cultural and genetic elements passing down through generations, but both early Daoism and posthumanism urge humans to step out of the anthropogenic viewpoint to recognize our embeddedness in the more-than-human world, the multispecies *becoming-with*. It is in the capacity to sense our entanglement with others that humans are capable of responsive coexistence (Rose, 2012). This orientation therefore helps

explain the practical rhythms, accepting attitude, and responsive ways in which villagers leading a sea-based life engage with the world around them. At the same time, it enables critical stance toward approaches that portray these lifeways as static or backward—often an excuse to impose external, power-laden orders that attempt to dominate local spaces and beings.

Another important and related point the *Daodejing* (ca. 6th century B.C.E./2009) made on responsive coexistence is a cyclical pattern of the movements: one season gives way to the other, and one shall not attempt to cling on to anything, achievement or excessive desire, in this dynamic process (verses 9, 23). Therefore human-centered and contextless interferences, such as engineering modifications and external power, risk impairing the world's systematic process of holistic becoming (Lai, 2007; Ma, 2006). This is a distinction that needs to be highlighted: while the *Daodejing* aligns with an acceptance of the natural forces unfolding in due course, it does not advocate naturalizing socially constructed orders or hierarchies.

5.2 The Symbolic Order in Lacanian Psychoanalytic Framework

Where the *Daodejing* foregrounds an ontological embeddedness with rhythms in the multispecies world, Jacques Lacan offers a way to approach how villagers navigate social structures, meanings and legitimacy. Three dimensions construct Lacan's psychoanalytic framework: the Imaginary, the Symbolic, and the Real (Lacan, 1977). They are heterogenous but interact and co-constitute one's experience. The initial experience of the *Imaginary* occurs when a child identifies with their reflection in a mirror. This self-identification continues to manifest throughout their life in building relationships with others, and is fundamentally imaginary, as they are based on external representations embodying an ideal self-image. Lacan describes this process as the *méconnaissance,* misrecognition or misconstruction in English, in which an illusionary coherent image is mistaken for a unified personal identity (p. 6). As a child enters language and culture, they enter the realm of the *Symbolic* and inherit a system of meanings and social roles structured by the pre-existed symbolic order. This symbolic order contingent on the use of language enables communication with the external world and construction of subjectivity, but never to their full extent because of those left in the *Real*—the dimension that exists prior to the symbolic representations and stays unmediated by them (Lacan, 1977, Chapter 3; Chiesa, 2007). In other words, it escapes the symbolic order

and is thus a realm not fully graspable by the consciousness of human beings—like the *Dao*. For the purpose of this thesis, my focus is on the Symbolic register, as it discusses the subject in societal context, highlighting its structural attribute.

The *méconnaissance* introduced above is central to Lacanian thinking, which he deepens in discussing language and the symbolic dimension (Lacan, 1977, Chapter 3). In the Symbolic, its power lies in enabling dominant norms to be taken as fixed reality (Neill, 2011, Chapter 7). We therefore perceive those inscribed in us as what we are and what we think. For example, one can internalize "traditions are backward" as a truth instead of just one perspective among many. This historically and socially constructed order, perceived as inevitable and natural, possesses the power to shape desires and perceptions, and thus reaches into the future to maintain its dominant stance (Lacan, 1977, Chapter 3). It therefore aids my adoption of the Daoist thinking by explaining how we lump up the natural forces and the naturalized socially constructed orders.

Žižek (2007) refers to this invisible controlling power as the "second nature of every speaking being" (p. 8). In Lacanian terms, this is 'the Other', the symbolic order internalized and carried out in everyday life (Lacan, 1977). It isn't specific to any individual or organization though it can be embodied and temporarily represented by them. Instead, it is an untouchable authority that guides, regulates and drives our speech and behavior. In almost dictating how we assume our roles and move in society, the Other directs our acts into maintaining the power-saturated social structure (pp. 70-73). In this way, Lacanian thinking of the symbolic order not only enables me to distinguish internalized socially constructed orders from the order of *ziran*, but prepares me to approach the villagers' sense of desirable future and desirable way of life through asking "what symbolic order is maintained and who benefits?"

An important point of Lacan's subject is that it is never fully represented by the subjectivity formed in the symbolic order, and the incommensurables also do not cease to exist (Lacan, 1977, pp. 73-75). What's insightful with this point is that the subject thus cannot be fully controlled by the dominant symbolic order. In this way, the unobserved but persistent incoherence in the symbolic order points to its instability: the signifier chain is not unbreakable, and the subject has the capacity to act beyond the order (Žižek, 1999, Chapter 3). The split Lacan identifies as crucial in the subject prepares me to attend to

ruptures—moments when villagers express ambivalence, nostalgia, or dissonance that opens way beyond what the Other permits.

5.3 Polanyi's Analysis of Economy-Society Relations

In his book *The Great Transformation*, Karl Polanyi (1957/2001) discusses the emergence and impact of market societies. Although his analysis concerns primarily Europe since the 19th century, the growing worldwide economic interdependence and the widely adopted market-centric mindset make his ideas more than relevant to contemporary societies. For Polanyi (1957/2001), the distinguishing characteristics of a market society lies in the change in relations between the market system and other aspects of life. In pre-industrial societies, economies were embedded in and constrained by social and cultural relations. Markets existed but never took a central position, both their scope and function playing a limited role. The rise of a market society not only expanded the role of market but cut loose the traditional social limits on it, which he calls a 'disembedding' of the economy. By disembedding the economy from social relations, a market society not only frames the market as supposedly free from external forces, but replaces society's central position with the market, allowing it to dominate other aspects of life, including relations and values. To put it differently, a market society follows broader supply and demand mechanisms independent of local life. This is to serve the market instead of the society, meaning that social and human-nature relations are not imagined. In this mode, the market-centric economy reverses its relationship with society, dominating and remodeling relations to cater to the market's needs, turning living beings and spaces into market subjects.

As one of the most influential critiques of the market-driven economic system in the 20th century, Polanyi's work has served as the foundation of many later works in political economy. David Graeber's *Debt: The first 5,000 years* (2014) can be seen as a historical elaboration of Polanyi's insights in highlighting ways economy has been interwoven within social and cultural practices. Biao Xiang's (2016, 2021) analysis of social tensions and reproduction issues in contemporary China can be seen as examples of the disembeddedness that Polanyi described. He stresses that the power of market relations and market-driven mindset not only changes ways of social life but transforms perceptions of life in general.

Pinkerton & Davis (2015) also reflect on Polanyi's theories in analyzing governance in North America fisheries, pointing out its commodifying tendency that has subordinated and reorganized local social life.

For this study, Polanyi's theory provides me with a political-economic lens that interprets the Other as the internalized market-driven logic and developmentalism. It helps me approach the villagers' responsive coexistence and the restructuring of their life in terms of market's (dis)embeddedness. Similar to Lacan's (1977) attitude toward the symbolic order, for Polanyi (1957/2001) the market economy is not natural nor inevitable, but historically and socially contingent. In other words, it is a socially constructed order the *Daodejing* calls to attention, to avoid naturalizing or passively accepting. This theory allows me to examine the power of market logic beyond production, especially to recognize its attempt to turn space, human, time and relations into commodities.

While arguing that the market economy promotes human and nature as commodities and thus threatens human and ecological life, Polanyi (1957/2001) also identifies a counter-tendency: social efforts mobilize to resist intensified market forces and re-embed the economy in moral and communal values (p. 138). This social pushback is inevitable for the society to save its social and ecological fabric of life, to continue functioning, because the dominating system of market cannot fully accommodate human and ecological realities. The coexistence of disembedding and re-embedding forces is in Polanyi's term the 'double movement', and it reveals that market societies are not fixed, and the order of the market is not total. This instability not only reflects a becoming, a responsive way of existence but also mirrors, in material practice, the Lacanian ruptures in meaning between symbolic representation and lived experience. Fred Block (1990), in his interpretation of Polanyi's theories, highlights the constant reassembling of the entanglement of the economy and social life. In this way, a hopeful countercurrent could be captured through recognizing continued existence of relational practices, alternative visions of life, and valuation of ancestral knowledge alongside scientific advice.

6 Findings and Analysis

This chapter is organized thematically with three major themes that emerged from my thematic analysis of interviews and field notes. Looking at changes villagers have experienced in macroalgae farming and in their ways of life, the analysis will investigate their perception, meaning-making and more-than-human relations. Through these discussions I attempt to understand how they and their farming practices have interacted with and been shaped by changes and discourses they encountered.

Although cultivating the same species and following similar procedures and techniques, farming practices in the two provinces have their production organized in vastly different ways. In Shandong, large enterprises hold the rights to use local sea areas[8], and hire villagers from nearby villages to carry out mariculture practices. Decisions, planning, and interactions with external actors are done solely by management of the enterprises, with villagers focused on operations. In Fujian, rights to use sea areas belong to households in coastal villages and can only be inherited. Farming related activities are carried out in family units or through self-organized collaborations among villagers. While some also run their farming practices as business, these corporations are small and limited to the scale of the village, either owned by the village as a collective entity or co-owned by several villagers who run the operations. This difference in relations of production repeatedly manifested itself in interviews as playing an important role in shaping villagers' experience of and approach to their life.

6.1 Becoming with Many

A recurrent theme throughout the interviews is how intertwined villagers' arrangement of their everyday work and life is with rhythms of their physical world. They adopt a responsive lifestyle that is integrated into their local space. While their existence is embedded in social, spatial and ecological relations, it is also deeply affected by socially constructed orders and *méconnaissance*.

[8] Per my interview participants in Shandong, there are still a few villages whose villagers retain the right to the use of sea areas and carry out mariculture themselves, but it has become increasingly rare. I did not encounter such cases in this study.

6.1.1 Embodied Interactions

From cultivating seedlings onshore, to growing seaweed in the open ocean, to harvesting and drying, more-than-human actors such as sunlight, water movements, temperature, and other organisms in the ocean are not only recognized but given full credit by the villagers. Sunlight and local marine ecosystems enable the villagers to cultivate macroalgae, and, in their perception, all they need to do is to adjust accordingly. They see themselves as assistants rather than chiefs in this farming practice. During the seedling and growing phases, the villagers arrange working schedules and to-do lists according to more-than-human dynamics of the day. When determining the specific time appropriate for harvesting, they consider multiple factors such as wind, tide, and sunlight, in order to both collect seaweeds undamaged and bring the fully-loaded boat ashore. Such engagement is not limited to their farming practices. For example, to engage in common pastime like beachcombing, the villagers tactically pick a season, time, and place, based on their understanding and familiarity of local coastal dynamics.

I realize that the villagers navigate their everyday life through embodying *ziran*. They are aware of and work with how things work in the ocean and in the air. Instead of trying to dominate or alter the ecosystem, they negotiate with the dynamics of their surroundings to achieve a responsive coexistence (*Daodejing*, ca. 6th century B.C.E./2009, verse 25). This negotiative approach corresponds to Bresnihan's (2016, Chapter 5) finding of fishermen's emphasis on the capacity to negotiate with uncertainty and unpredictability. Responding and negotiating is not merely an attitude of willingness—it is an empirical learning process through which the villagers become familiar with the tidal rhythms, wave formation and breaking, rip currents, depths, and trenches in the ocean. "I'm not born with it. It isn't a *thing*. You can't own it by listening to your parents or village elders. You need to do it to learn." (Zheng, 17 February 2025, Fujian). It aligns with Ingold's (1993) analysis that actively interacting with ecological movements plays a determining role in navigating through accordingly. Contrary to fixed procedures or thresholds, villagers' local ecological knowledge is relationally built upon encounters with nonhumans. It is embedded in and contributes to a multispecies becoming (Barad, 2007; Haraway, 2008).

As the ecological dynamics never stop becoming and villagers keep on encountering nonhumans in everyday life, they continue to negotiate with and thus inevitably continue to renew their understanding and farming approach (Barad, 2007). This is highlighted in interviews when villagers talked about their recent adjustment to farming practices. Sometimes seaweeds get partially destroyed by newly hatched fish larvae in the beginning of the fifth lunar month. It has been a common practice to harvest them before the onset of that month; however, one interviewee, Wang remarked that hatching doesn't always occur this early, especially when temperatures are lower, and the extra time will allow seaweeds to grow significantly larger. Another interviewee, Feng has modified the practice by introducing an additional buoy in the center of certain ropes, based on his observations of interplay between sunlight and current and trials to improve conditions. These active yet fundamentally responding engagements attest to *Daodejing*'s (ca. 6th century B.C.E./2009) rejection of interpreting the responsive mode as passive and merely enduring the worlding process (Lai, 2007; Wang, 2018). What's more, these engagements show that there is more than one way—especially more than the anthropocentric way that approaches macroalgae farming as a rational production system or a technical solution solely for human needs—to participate in actively worlding the world.

A distinction of participants from Fujian is that they live by a different sense of time, which immediately responds to their more-than-human context. When mentioning time and season, all of them used the Chinese calendar and the 24 seasons[9]. At first, I understood this phenomenon as a cultural fact, something pertaining to relatively more traditional communities. But after several participants used this system to indicate important time points in our conversations, I realized that this is more a result of everyday interactions with the physical world they live in and rely on. The Chinese calendar and the 24 seasons, given their ability to signify tidal movements, amount of sunlight and detailed seasonal changes, are essential for pre-season planning and in-season arrangements. These villagers are not against the Gregorian calendar—in fact, they are familiar with it, but they choose not to switch

[9] Both the calendar and the 24 seasons are indigenous Chinese, traditionally produced based on observations of more-than-human dynamics: the calendar is lunisolar and the 24 seasons is based on weather peculiarities and movements of other species. They were the dominant timekeeping tools in ancient China.

because it is detached from their way of life, a way constituted by interactions with nonhuman actors. Hence not only their practices and activities but their sense-making of the world is also entangled with and configured by encounters with nonhumans (Barad, 2007; Rose, 2012).

Participants in Shandong seem to share my experience of being accustomed to the Gregorian calendar and four seasons, with the indigenous Chinese ones only used for cultural celebrations. Two things related to their corporatization might have contributed to this difference. First, in following timetables set by their employer and indications given by monitoring devices, villagers see themselves primarily as employees whose focus is on finishing the assigned work. Although they inevitably carry out farming practices in an interconnected web of humans and nonhumans, their focus on following instructions prevents them from true encounters. In this way, villagers would not have possibly developed a responsive mode in sense-making of time because they are not aware of how time manifests itself in the more-than-human entanglements in their practices (Rose, 2012). In addition, work and life are clearly separated in Shandong, as the relations of production alienate economic life from other aspects of life (Polanyi, 1957/2001). Villagers' sense of being at work, i.e., as labor, is therefore barred from their sense of being as themselves. Therefore, the different temporal system functions merely as a tool used in their work, detached from influencing their sense-making of the world. Situations like this block villagers from recognizing the relational and organic qualities of their life, and such invisibility poses a risk to multispecies coexistence, disrupting the world's systematic process of *ziran*.

6.1.2 Radical Acceptance

While they actively engage with and become with their more-than-human worlds, the villagers also expressed a great deal of acceptance of natural events out of their control. This shared acceptance is directed towards annual fluctuations in water quality, sunlight, temperature, as well as events conventionally categorized as disasters. Typhoons visit Fujian every few years and have always completely damaged participants' macroalgae production that year. Shandong is naturally protected from typhoons given its geographical location, but participants shared that in 2022 all macroalgae seedlings in their bay died. Despite describing disastrous impacts, participants expressed total acceptance of the events, their consequences,

and the time needed for the environment to recover. While their lack of wish to prevent these occurrences seems to suggest fatalism, I argue that this interpretation is rooted in failure to perceive the world's constantly ongoing process of composing, a cyclical process in the case of typhoon, in which these dramatic events are integral to and sometimes necessary for the multispecies becoming (*Daodejing*, ca. 6th century B.C.E./2009, verse 23; Rose, 2012). For example, in Wang's opinion, typhoons also act as start-overs, in the long-term bettering water quality and hence mariculture quality. With almost a sense of anticipation for a typhoon this year, he told me: "it is time!" (17 February 2025, Fujian). Overall, the villagers' attitude toward natural events out of their control aligns with the worldview of *Daodejing*. It reveals explicitly that they view humans as one of the many beings living in this world, a world that is not for them to control or alter.

At the same time, this radical acceptance of happenings seems to extend beyond the natural environment. When discussing developments, market fluctuations, or instances of structural neglect, the villagers—though emotionally affected—tended to also accept these events and perceive them as inevitable. This high degree of acceptance resembles the absence of literature on local resistance to top-down external forces during the post-reform period. It also provides an alternative explanation to Cohen's (2005) argument regarding the historical familiarity of rural communities with commercialization and commodification. In China, recognizing and joining the dominant discourse is culturally viewed as a wiser way of living, and this thought is often attributed to Daoism thinking. However, as I reflected in chapter 5, *Daodejing* (ca. 6th century B.C.E./2009) advocates letting nature take its course without supporting naturalizing human centered, socially constructed orders. Instead, it asks people to recognize and resist these interferences that attempt to control and manage the powerless for the benefit of the powerful, and to foster a society that functions in responsive coexistence with the multispecies becoming (verse 48, 71).

6.1.3 "Parent" and "Child"

In efforts to share with me feelings toward the natural environment they live in, the villagers converged in utilizing an analogy between connections with ocean and seaweed and those with family members. Repeatedly in interviews the ocean was compared to a parent, to

whom the villagers expressed a mixed feeling of reliance and awe. At heart of this connection is a material entanglement of their sea-based lifestyle. Nothing other than mariculture has fed these villages. “We live by the sea, we feed on the sea” (Sun, 11 February 2025, Shandong). Polanyi’s (1957/2001, p. 187) description of human and land as inseparable as man and his limbs finds a matching understanding here among the villagers. Zheng specifically pointed out that their connection with the ocean is not the same with those who travel to the seaside for vacation, as it is much more than a liking or an amusement. He struggled to find a fitting adjective, but managed to convey with his tone that he sees his being, as well as those of his fellow villagers, as deeply entangled and at least partly given by the ocean—like a parent to a child.

A mix of admiration, fear and obedience is culturally prevalent in traditional Chinese cross-generation relations, especially between parents and their children. Children are supposed to view their parents as more capable and follow their word, and any doubt or attempt to intervene is viewed as disrespectful[10]. This can be perceived as taking the place of a Lacanian symbolic order in Chinese societies—an internalized, power saturated order passed down and maintained through generations (Lacan, 1977, Chapter 3). It enriches our understanding of the radically accepting attitude of the villagers toward negative happenings in their natural environment. Although they actively engage with the worlding of their more-than-human world, the villagers do not consider interfering with the affairs of the ocean, their ‘parent’. This enactment of a socially constructed cultural hierarchy reveals a mutual shaping: villagers’ attitude toward nature informs the symbolic structure they maintain, and conversely, social relations exert subtle influence over their engagements with the natural world.

Different from the ocean, the macroalgae is perceived as children to the villagers, to whom they feel attached as well as proud of. Emotionally, Wu knocked on the wall during our interview and said to me “these walls ... whose home here isn’t given by seaweed?” (14 February 2025, Fujian). Their implied but obvious preference to local macroalgae is similar to

[10] This interpretation of parent-child relation was described by my participants as I asked them to explain to me what they meant by referring to the ocean as a ‘parent’, but it is also a shared cultural element in Chinese society. Thus, I choose not to phrase it as “according to my participants”.

Liu's (2000) observation of farmer's fondness toward their crops. Inland farmers that he encountered viewed everything local, except locally grown food, as inferior to those from faraway urbanized regions. Similarly, coastal villagers I met prefer most things from developed cities and countries, but not in the case of food—nothing can compare to those captured or cultivated in their area of the ocean. This pride and fondness are especially present with macroalgae, given the added attachment from cultivating them. Through interacting with their local nonhuman counterparts, the villagers continually renew and deepen the bonding. Their affection to macroalgae would probably lead them to challenge Wu et al.'s (2021) point on it being a less valued kind of mariculture.

On top of the familial ties, the villagers also unanimously used the term *xiguan* (习惯), meaning habituated, to describe their feelings toward village life or their sea-based way of living. They expressed a deep sense of relational existence: beyond material and emotional entanglement, the villagers see their lives as embedded in the interconnected lives of their local nonhuman counterparts. Their being is therefore integrated into the local space. This was expressed stronger by participants in Fujian. Having farming practices organized around social relations rather than wage labor might play a role in this (Polanyi, 1957/2001). In such arrangements, the boundary between work and everyday life becomes blurred, deepening their embeddedness in the more-than-human world they inhabit, as Bresnihan (2016, Chapter 5) also notes in his engagement with the fishing community he worked alongside. Interwoven with not only kinship and communal ties but also multispecies entanglement, arrangements of economic life for the villagers are embedded in not only social relations, as according to Cohen (2005) and Polanyi (1957/2001), but also spatial and ecological ones.

At the same time, the country's market-oriented reforms and push for modernization spare no effort in restructuring the life of the villagers, replacing their responsive coexistence in the order of *ziran* with a market-centric one. In the next theme, I will unpack how the power of market logic influences the villagers and their communities beyond the arena of production.

6.2 Their Future but *Not* Theirs

Among participants in both regions, a future that praises modernization and a subjectivity that disparages the less modernized self are commonly perceived. The Other works

to transform the villagers' present and future into efforts to maintain itself—to maintain power saturated structures and orders (Lacan, 1977, pp. 70-73), at the cost of their social and ecological reproduction.

6.2.1 One Destined Future

Current studies of macroalgae farming in China mostly frame it as for carbon sequestration. However, the villagers I met in this study—especially younger ones—seem to see it primarily as an economic activity, one that not only satisfies their basic needs but brings economic growth to the region. The two youngest macroalgae farmers I interviewed, Zhao and Zhou, are also the only two that have received higher education. They both brought up repeatedly the trajectory of macroalgae farming, and despite not knowing each other and living in different provinces, shared with me the same perceived future: farming operating on a much larger scale, increasingly by machines, managed and owned by a corporate entity.

Out of the three, mechanization is explicitly expected by all participants, perceived as an inevitable outcome of shrinking manpower in macroalgae farming. Many participants have witnessed their childhood playmates moving away to towns and cities. They also share the opinion that there will continue to be fewer individuals engaging in macroalgae cultivation, because younger generations look down on raw material production and thus will likely also leave the village. In fact, that's what they wish for their kids, because they perceive macroalgae farming as nothing more than low-class physical work that requires no intellectual engagement. For the same reason, the villagers foresee an increase in corporatization: participants in Shandong have already observed and experienced diminishing family or community-based farming and merging of usage rights of sea areas into large enterprises; participants in Fujian perceive this change in Shandong as also their future.

Compared to mechanization and corporatization, large-scale operation was presented as coupled with the other two, but with little explanation on its own. In discussing relation between market mechanism and use of machinery, Polanyi (1957/2001, pp. 77-8) points out that when mechanization moves from machines as tools to a factory system, then only long term and large-scale production can match the need and risk. Through this view, large-scale production, mechanization, and corporatization cease to be three separate courses but

characteristics of one depiction. Moreover, this depiction is imagined by a socially constructed discourse, a desire of the Other in Lacanian terms, rather than independently by the villagers (Lacan, 1977). The decrease in manpower is not framed as an issue to be altered but an inevitable change and a progress in which manual labor will be replaced by machines. Similarly, large-scale production is not a different way of organizing production that needs to be examined before adopted, but a blueprint—in Zhao's view modeled by large-scale agriculture in western developed countries—destined to happen and to be looked forward to as the country moves toward a prosperous society.

As a constituent part of the symbolic order, this perceived future that praises modernization and development is necessarily accompanied by a subjectivity that disparages itself to its urban counterpart (Lacan, 1977, p. 68). As noted in the literature review, Chinese intellectual and political elites have defined their fellow countrymen in rural areas as inferior since the May Fourth Movement and continued post-reform (Cohen, 2005; Liu, 2000). This subjectivity is not only alive today but further internalized by the villagers who perceive themselves as villagers and macroalgae farmers in an overwhelmingly negative way. In our conversations, villagers were described as old-fashioned, uncultured, short sighted and not knowing how to talk properly, and macroalgae farmers were portrayed as lacking knowledge or skill. They perceive their choice of farming macroalgae as an inferior livelihood and not really a choice, despite their genuine affection toward macroalgae. Such emotional preference is also the case with their living place. Although deeming towns and cities to offer higher income, more diverse choice of goods and services, and better education for their children, they regard life in their village as more comfortable, with cleaner air and fresher food. This is where they feel they belong. This conflicting perception represents a small but obvious rupture that signals the illusion of dominant symbolic order fully controlling a subject (Žižek, 1999, Chapter 3). In disrupting the illusionary coherence and stability, the feelings of the villagers contingent on their lived experiences, dissonant to what the Other directs, open space for alternative systems of meanings that would be agential for the villagers to actively engage in creating their future.

6.2.2 Challenges to Social and Ecological Reproduction

Through their own experiences of farming practices moving toward the perceived destined future, the villagers mentioned several changes they have enjoyed: more controllable production, increased productivity, less human labor, and more stable income in the form of wages. Although villagers described them in positive terms, the less beneficial impacts of these changes should also be recognized. One of them is the risk of overproduction, which is already happening in both provinces. My participants informed me that until the recent decade, farmers had only produced the amount they knew would be bought up by local buyers, regardless of how much sea area they owned right to do mariculture. It has ceased to be the case for my participants beside Zheng whose family still farms the traditional way, because the more produced, the more cost-effective to justify the use of machinery. This corresponds with Polanyi's (1957/2001) explanation of market logic's impact on production. Zhou mentioned that despite a significant amount of last year's harvest remaining in cold storage at the village facility, many villagers are still cultivating as much this year. He sighed when imagining the price this year and noted drastic price fluctuations in recent years as a result of supply-demand dynamics: sometimes villagers ended up earning nothing at the end of the year. According to Polanyi (1957/2001), corporatization, although temporarily securing a stable income for villagers, does not solve this issue in the long run. He warns that while a market system loads people with blind faith, its changing price level has the power to solely tear down a company (p. 137). Yet scholars in China studying carbon sequestration potentials of macroalgae are picturing an even larger production and developing an additional market system with carbon trading (Yang et al., 2021; Zhao et al., 2021).

The risk of mass production is not just on farmers' livelihood, but also on the environment. Macroalgae farming does not introduce synthetic input to the marine environment, but mass production of macroalgae prioritizes the yield of one single species, and, similarly to conventional agriculture, deprioritizes other processes of the ecosystem it relies on (Gliessman, 2015, Chapter 1). While the traditional practice, producing only the quantity needed, can be understood as similar to any living beings' engagement with the more-than-human world for their existence, extensive monoculture puts human desire and reasoning on top of all others. It therefore overlooks the world's holistic becoming following

ziran and risks disrupting the organic dynamics without considering the consequences. In addition to production, impacts caused by storing excessive products and generating extra waste also need to be recognized. In short, mass production can easily become an arrogant attempt that forces all beings to obey the dominant order constructed by human society. Alarmingly, this can be done in the name of environmental benefit as with the carbon sink narrative (Christianson et al., 2022; Zhao et al., 2021).

On top of direct impacts, there are also less visible but far-reaching influences on ecological reproduction. Several participants mentioned that technical and technological advancements have and will continue to reduce environmental limitations in macroalgae farming and enable them to rely less on traditional and experience-based knowledge. Data on this aspect is less extensive compared to the emphasis on familiarity and learnt capacity to negotiate with the environment. Nevertheless, it indicates a trend: when the need to recognize, comprehend, adapt, and negotiate with environmental dynamics and uncertainties decreases, people will gradually care and engage less with their nonhuman counterparts in their everyday life, because "after all you probably just need to read the numbers" (Zhou, 14 February 2025, Fujian). Moreover, attention once given to entanglement with nonhumans will likely be given to supply-demand induced ups and downs. Reduced awareness of our interdependency, however, doesn't change the fact that we live in a world of co-becoming. In the context of coastal communities, losing the ability to read signals of danger means being vulnerable to future ecological fluctuations and hazards. This capacity to sense and respond to major changes is also emphasized by Leitch (2023) in writing about governance in climate adaptation.

Farming practices in Shandong and Fujian differ in their organization. Interestingly, villagers in the two provinces also position farming differently in relation to other parts of their life. While villagers in Fujian view farming as a lifestyle, and as part of familial and sometimes communal activities in which they support each other, villagers in Shandong not only separate farming and life conceptually but try to keep them apart from each other in everyday life. Examining this through Polanyi's (1957/2001) critique of a disembedded market economy, I argue that a corporate mode of macroalgae farming serves the market in turning villagers from comrades bonded by their shared livelihood and social relations into wage earning individuals,

replacing a relational mode of being with "an atomistic and individualistic one" (p. 171). This might explain these communities' lack of collective societal power, in addition to Su et al.'s (2020) attribution to decentralization in economic reform. Without the emotional and material sharing Bresnihan (2016, Chapter 5) argues as vital for realizing entanglement, care and responsibility to others cannot emerge organically. Communal reproduction will hence be left disregarded. By disembedding arrangements of economic life from villagers' social, spatial and ecological relations, a market-oriented order disregards all limits. It gradually reverses the relationship between livelihood and life, and shifts cultural standards toward pursuing money and contributing to market expansion at the expense of long-term local social and ecological wellbeing (Polanyi, 1957/2001).

Polanyi's (1957/2001) theory of the double movement at the same time reveals that the order of the market, though dominant, is not the entirety. In this instability, enabled by the constant remaking of the world and becoming of the living beings, lies possibilities of alternative ways of society. In this sense, I hold that a hopeful countercurrent can be captured through recognizing the continued existence of relational senses and practices.

6.3 Being Outside when Inside

Beside macroalgae farming practices, the villagers also shared with me their living experiences and opinions of other happenings in their regions and policies regarding socio-economic development of rural areas as well as mariculture. A strong sense of not being involved is conveyed through these conversations.

6.3.1 Peripheral Lives in Central Plans

When sharing their experiences living through changes in their spatial, environmental, and social surroundings, the villagers mentioned several past and ongoing developments. In Shandong, some villages have been demolished and relocated (e.g., Figure 2), and a large-scale coastal park has been constructed to develop nature-based tourism and education. In Fujian, vacation apartments have been built on the shore, and occasionally a few villagers get hired to assist with certain tourism activities. However, I was repeatedly told that those changes are under broader industrial initiatives or national agenda, and thus are not relevant to their

life—although close by and altering their worlds materially and socially. Their tone was unanimously neutral, sometimes accompanied by indifferent shrugs. “There isn't any interaction,” said Chen (11 February 2025, Shandong).

Figure 2

A Demolished Nearby Village in Shandong

This flat emotion, however, turned intense with participants from Fujian when our topic moved onto national and regional policies on supporting rural villages and mariculture. While all expressed familiarity with these policies, the villagers described them as on no account benefiting ordinary people, impossible to participate, “roaring thunder with little rain” (Wang, 17 February 2025, Fujian), and “a lovely daydream” (Zhou, 14 February 2025, Fujian). Substantial funding is promised by these policies, but instead of opportunities for villagers, these grants have ended up going to big-name enterprises in China. Strategies such as

Corporate Social Responsibility (CSR) and Environmental, Social, and Governance (ESG)[11] seem to have enabled large enterprises to take projects outside of their fields. After naming a few big names and accusing these companies of robbing grants for rural revitalization, Wu exclaimed furiously but also with a hint of confusion: "internet, footwear, online shopping... They can also do agriculture? 'Subsidies'.. who knows!" (14 February 2025, Fujian).

In 2023, the Chinese government issued its first carbon offset credit of macroalgae farming to a company in the same region as some of my participants (Lan & Lin, 2023). After bringing this up in our conversations, I was shocked to learn that the company does not yet farm seaweed. Zhou framed it as trading a concept, for which he believes having connections and proposal writing skills is more important than having actual farming practices. It seems that while narrating macroalgae farming in terms of its carbon offsetting benefits has induced enthusiasm and higher valuation on the global scale (Frick et al., 2024; Pessarrodona et al., 2024), local macroalgae farming villagers in China have not been able to experience any benefit.

This vulnerability in dealing with policies echoes Su et al. (2020)'s point on fishermen post-reform losing voice in government: without bottom-up societal power to communicate and negotiate their perspectives and needs with government officials, villagers are left to passively receive whatever comes or fails to come their way. Passivity facing power-laden happenings is far from the responsive mode of *ziran* (Lai, 2007; Wang, 2018). It serves to maintain the hierarchical man-made order instead of the plural relational coexistence *Daodejing* argues for. At the same time, participants' intense emotion against this reality shows a rupture, an unconformity that is not represented by the subjectivity allowed by the Other, a potential capacity that could be activated to act beyond and create alternatives (Lacan, 1977, pp. 73-75; Žižek, 1999, Chapter 3).

Although the villagers protest the diversion of subsidies and grants to enterprises, their frustration is directed at local rather than central government actors. Participants complained to me that local cadres only care about their own job security, implementing

[11] CSR and ESG are terms in the business field, aiming at increasing business morality and sustainability through management strategies (Atkins, 2020; Stobierski, 2021). They have received increasing emphasis by investors and governments in recent years.

top-down policies without considering local contexts, and never mentioning villagers' concerns or needs to influence governance. Instead of being supported, the villagers feel disempowered with local cadres increasing their presence and expanding administrative oversight on the one hand, and handing over grant opportunities to enterprises on the other. Local cadres' closeness with economically powerful actors and distance from ordinary villagers resembles the post-reform time (Ahlers & Schubert, 2018; Ang, 2017; Yang & Gao, 2024). Nevertheless, this finding defies these scholars' assumption that such division is coupled with accentuated spatial and social differences post-reform between towns and villages, because now spatially and socially villages have become, from the villagers' point of view, increasingly similar with nearby towns. It aligns, however, with Cohen's (2005) argument that intellectual and political elites in China continue to look down on rural people, maintaining a clear-cut division between themselves and their rural counterparts.

This is a reality created not to sustain webs of life at rural villages and mariculture, but to serve the elite group who makes both government and business, the trading class in Polanyi's (1957/2001) terms. He warns that left unchallenged, the binding state and industry place society in peril. By abusing power to satisfy desire driven by market logic without society's regulation, current reality is sculpting an order that could impede the interdependent co-becoming so much that it would eventually collapse not only business units or an industry but the whole of society.

6.3.2. Science/Practice

Although related studies have been ongoing for over a decade and pilot projects in both provinces started five years ago (Godfrey, 2022; Yang & Shen, 2021), most of the participants are unaware of the country's carbon offset planning with the mariculture sector. During our conversations, participants were indifferent to this topic. Unlike in Europe where carbon farming is promoted for seaweed practices (Hughes et al., 2025), in China, according to my participants, carbon sequestration is a purely academic topic. Some of them are aware of the ongoing studies; many of them have noticed researchers coming to measure data or installing devices; a few of them have even assisted data collection. Still, the villagers place it outside of their worlds. Responses I received consist of the word "interfere", as my participants

assured me that studies taken place in their farming area do not interfere with their practices. While they were trying to convey a positive note, the villagers also conveyed that in their perspective, researchers and farmers, hence science and practice are two separate worlds. Farmers are in this for livelihood, and researchers are "well, they are different" (Zhao, 10 February 2025, Shandong). The two worlds may interact on an operational level, but do not really communicate. This clear division of science and practice seems to be a perception shared by the researchers. Although farmers and their cultivation are fundamental for the studies to happen, they were not involved in the sharing of knowledge. Zhao told me that during the year all macroalgae seedlings died in the bay of Shandong, many researchers came to study that rare incident, but no results or suggestions were shared with the villagers. Zhou mentioned a study on kelp-mollusk polyculture carried out in sea areas of his village, but nothing followed to pilot or share this new way of practice with them.

Approaching this matter with the Lacanian Other, I argue that internalizing the concept of 'peasant' might have contributed to participants positioning themselves in a separate world from the researchers (Lacan, 1977; Cohen, 2005). The Other leads the villagers to deny themselves the right to be considered equal to well-educated researchers. They keep themselves outside of the world of research, even with studies where they are insiders in spatial, material, and epistemic terms. Additionally, this internalized subjectivity is simply not factual. Familiarity with the local ecosystem and capacity to respond to different incidents, are precious ecological knowledge that enables the villagers to live and share a sea-based life. In Wu's village, each year the sea area needs to be divided with neighboring villages, and then to households. This is a difficult job because, unlike land, the ocean is liquid and ever-moving, which makes it almost impossible to parcel equally. Only one 80-year-old villager is capable of this task now. Although his village has started to try remote sensing, in practice it still relies on this village elder to check visually and correct errors. Traditional and local ecological knowledge like this one is relationally built through repeated encounters with the more-than-human world. Sadly however, this relational and situated way is not often perceived as knowledge production, and positivist science and the market economy constantly contribute to obstructing real encounters.

Having said that, this study does not intend to refuse carbon sequestration through macroalgae farming. In fact, I stand with putting effort into understanding and enabling organic processes to mitigate carbon emissions, instead of developing heavy-industry geoengineering solutions. However, focusing solely on carbon sequestration would do the opposite of enabling organic processes, because it would push everything else out of sight and legitimize instrumentalizing the local worlds. I argue that we need to not only re-embed the economy back into social relations, but also its ecological functions to the relational organic dynamics from which they emerged in the first place. In other words, focus should be on the relational organic dynamics, not on the function. The countermovement, as in Polanyi's (1957/2001) theory of double movement, needs to be considered in terms of the more-than-human world instead of just the human society, because entanglements do not stop with social relations, and impacts go beyond the human race.

7 Conclusion

In a blog post on environmental humanities, LaFauci & Åsberg (2020) questioned for whom sustainability is intended. This issue ought to be explored concerning ocean-based solutions to climate change. This study recognized the importance of approaching macroalgae farming villages as living worlds and the current lack of attention to these local worlds amid the global enthusiasm of macroalgae farming as a potential tool for climate mitigation. Through interviews with villagers in major macroalgae farming regions in Shandong and Fujian, China, this study revealed that their experience and sense-making of farming, ways of life and environments are deeply intertwined with both more-than-human dynamics and social constructs. For generations, everyday encounters with nonhumans have shaped the lifestyles, farming practices, and perceptions of the villagers; nevertheless, these engagements are increasingly undermined by power-laden social constructs within and beyond China, such as market-centric mindset, the desire of modernization, and the concept of "peasant".

The findings revealed that the villagers embody responsive coexistence with their nonhuman counterparts through an empirical learning process during which their ecological knowledge is relationally built. At the same time, they also tend to naturalize human centered, socially constructed orders. Drawing on Daoist philosophies and Lacanian theories, I argued that it is necessary to analytically distinguish between natural and social constructs, in order to recognize and resist interferences that attempt to control and manage the powerless for the benefit of the powerful, and to nurture a world of co-becoming (*Daodejing*, ca. 6th century B.C.E./2009; Lacan, 1977).

Lacan's (1977) concept of the Other was central to this study. This study offered insights on how the Other works to transform the villagers' present and future into efforts to maintain itself and serve the elite group, instead of sustaining webs of life locally. This study also identified challenges it brings to social and ecological reproduction, including overproduction, price instability, loss of the relational mode of being and farming, and diminished awareness of more-than-human entanglements. Focusing solely on carbon sequestration risks would further worsen these risks in the name of environmental benefit. Integrating Polanyi's (1957/2001) theory of (dis)embeddedness, I cautioned that left

unattended, the binding state and industry would push everything else out of sight and place and leave the society in peril. I also argued that we need to not only re-embed the economy back into social relations, but also re-embed the ecological functions to the relational organic dynamics from which they emerged in the first place.

At the same time, as Lacan (1977) argues, the Other is never in full control of a subject. The profound affinity and sense of rootedness exhibited by the villagers toward their lifestyle and villages contradict the subjectivity that disparages the less modernized self; their awareness of intertwined existence with nonhumans questions organizing life around the market; and their intense emotions toward market fluctuations and policies challenge the hegemonic social order. These ruptures signal a potential capacity that could be activated to open space for alternative systems that would be agential for plural futures to emerge.

By grounding the analysis in perceptions and experiences of coastal villagers, this study brought their lived worlds into the heart of macroalgae farming debates. In doing so, it revealed how the meanings and consequences of seaweed farming as a climate mitigation strategy cannot be fully understood without attention to the everyday contexts in which it unfolds. This approach offered a critical complement to nature-based climate mitigation studies that often privilege biophysical metrics or policy frameworks. The findings thus contributed to a more integrated understanding of macroalgae farming within the broader repertoire of climate solutions not limited to the Chinese context. Practitioners and researchers need to approach nature-based climate solutions as lived and negotiated practices embedded in complex social and ecological relations.

Built on this study of a relatively small sample of interviews and limited fieldwork, future research should conduct in-depth investigations of more macroalgae farming villages. As this study revealed that farmers are disproportionately male and younger generations are increasingly moving away from farming, studies focusing on women and youth would provide valuable insights into macroalgae farming in China. Furthermore, it would be informative to study macroalgae farmers in western countries (e.g., in Sweden) who mostly joined in recent years, to understand their experience and sense-making, in comparison to those practicing in China. Last but not least, I believe that action research is also needed to work with and assist

macroalgae farming villagers in China in exploring ways to assert their agency and in creating their futures.

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Appendix I

Interview Guide (translated into English)

Introduction	☐ Thanks for taking part ☐ My basic personal information ☐ Introduction of the research project (ask if any questions) ☐ Introduction of today's interview structure (ask if any questions) ☐ Ask for consent 1)participation 2)basic demographic information 3)voice recording (provide a hardcopy of consent form) ☐ Ask if there's anything they would like to discuss before recording
begin recording if consent given, and ask to record oral consent	
Start with life in general (to feel more at ease)	☐ Age & Have always lived in this village? ☐ Growing up experience & Education ☐ Their life now
Personal history with macroalgae farming	☐ For how long and How it started? & Why ☐ Family history with macroalgae farming? ☐ Which step/phase/job they do now and have done?
Local macroalgae farming practices	☐ For how long and How is it compared to other forms of livelihood? ☐ How is it organized? ☐ Daily routines and interactions with nonhumans ☐ If the practice/routine has changed over time, and how? ☐ Big changes/shifts in the local seaweed cultivation and how they felt? ☐ Any local custom, festive, stories or sayings when it comes to the sea and seaweed?
Changes in local world	☐ How have the local sea and seaweed cultivation changed over time? & their opinion ☐ How have the local spaces changed over time? & their opinion ☐ How have their ways of life changed over time? & their opinion
Feelings on local life and farming practices	☐ How it feels like growing up so close to the ocean? Has it changed and how? Anything they feel they might not be or have if growing up elsewhere? ☐ How it feels like growing up so close to seaweed? Has it changed and how? Anything they feel they might not be or have if growing up elsewhere? ☐ Do they see their life in the village in future? ☐ Do they see themselves (and their kids) continue the seaweed cultivation?
Thoughts on macroalgae farming and rural life	☐ How do they find their work? ☐ How do they find the local macroalgae farming? ☐ How do they find macroalgae farming in general? And compared to other jobs? ☐ How do they see people like them (cultivating seaweeds), vs people who sell it, study it, or related policy-makers? ☐ How do they see their fellow villagers and the local community?
Ending	☐ If there's anything I should have asked ☐ If there's anything else they would like to share with me
end recording, and ask if anything they would like to discuss off the record	
Ask if there's anyone they think I should talk to, and if yes, ask if they can introduce me to that person Ask if there's any place I should visit or any document I should check	

Appendix II

Consent Form (original)

社会科学院研究生课题参与同意书

我同意参与“海带养殖与人–海带–环境的共生关系”课题研究。

此课题研究为本院硕士学生的研究项目，您的例如姓名、住址等个人数据将不会被收取。

关于对个人数据的处理：

将被收集的个人数据如下：声音、家乡及成长地域、年龄

收集的个人数据将依如下方式处理：由录音笔录取后，暂存于加密USB，文字版本暂存于隆德大学云储存空间，并在项目完成后（不晚于2025年底）彻底删除。

您的个人数据不会被分享于第三方。

数据控制者（controller）信息：瑞典隆德市隆德大学117号箱，邮编22100，组织编号 202100–3211。您可以在 www.lu.se/integritet 页面找到隆德大学的隐私政策。

您有权获取关于您的个人数据如何被处理的信息。您也有权更正任何不准确的个人数据。如果您需要进行投诉，请通过 dataskyddsombud@lu.se 联系数据保护负责人。如果您认为您的个人数据被错误的处理，您有权向监管机构（数据保护权威机构 IMY）提出投诉。

我同意参与“海带养殖与人–海带–环境的共生关系”课题研究。

所在地	签名
日期	楷书签名

Consent Form (translated into English)

Consent to participate in a Thesis at the Faculty of Social Sciences

I agree to participate in the study of seaweed farming and humans-seaweed-environment relations.

This is a student project of Master's thesis at the faculty. Sensitive personal data such as your name and address will not be collected.

Information on the processing of personal data

The following personal data will be processed:
voice, hometown and growing-up areas, age

Personal data will be processed in the following ways:
The voice recordings will be stored on a local voice recorder, and the text transcripts will be stored on in Lund University's Google Drive.

We do not share your personal data with third parties.

Lund University, Box 117, 221 00 Lund, Sweden, with organisation number 202100-3211 is the controller. You can find Lund University's privacy policy at www.lu.se/integritet

You have the right to receive information about the personal data we process about you. You also have the right to have inaccurate personal data about you corrected. If you have a complaint about our processing of your personal data, you can contact our Data Protection Officer at dataskyddsombud@lu.se. You also have he right to lodge a complaint with the supervisory authority (the Data Protection Authority, IMY) if you believe that we are processing your personal data incorrectly.

I agree to participate in the study of seaweed farming and humans-seaweed-environment relations.

Location	Signature
Date	Name clarification