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Rethink of Individual Transferable Quota Fishery Management System in China: A Case Study in Zhejiang Province, China

RESEARCH ARTICLE

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ABSTRACT

In light of the successful experience of ITQ-management in many countries' fishery reforms, the Chinese government has also carried out corresponding reform pilot projects in some cities. But unfortunately, these reforms were not successful. Based on the author's own participation in the pilot reform of the fishery industry in Zhoushan City, Zhejiang Province, this article analyzes the reasons for the failure of the reform through research methods such as interviews and investigations. This study finds out that on the surface, the reason for the failure is the inaction of local governments, which has led to inadequate definition, transfer, supervision, and protection of fishing rights. However, the underlying reason is the inadequacy of the existing legal system of China's fishing industry, leading to a lack of corresponding responsibility of local governments, followed by the absence of motivation to reform. This article reveals the close connection between the willingness of local governments in implementing ITQ management and the existing legal design, and explores a neglected key issue— the responsibility of local governments that comply with the ITQ-management method. Although ITQ-management has achieved remarkable results in some developed countries, its failure in China reveals the importance of local government responsibility. Therefore, this article, targeted at the responsibilities of local governments, proposes suggestions like adding ITQ management legal responsibilities to fisheries law, and refining its structure, content and evaluation methods. This research can not only be used for reference by the Chinese legal system, but also by many other countries with inadequate local government responsibilities.

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INTRODUCTION

Various of fishery management methods have been applied globally for coastal countries to minimize the increasing impact of overfishing, improving the efficiency of fishery resources management, while enhancing marine conservation and sustainability outcomes (Arthington et al., 2016; Mora et al., 2009) For fishery resources management, traditional fishery management primarily employs input control method, which regulates the input (e.g., measure the fishing volumes of vessels, nets, and hooks regularly), to maintain and measure the fishery management efficiency. Another option is to regulate the timing of fishing activities (e.g., establishing closed seasons) to protect fish resources (Abbott & Haynie, 2012; Zhou et al., 2010). Alternatively, Output Control (OC) is a fishery management method that focuses on regulating the output – quantity of the catch, to measure the fishery catch landing volume while estimate the fishery management efficiency. (Tang and Hang 2000).

OC is a series of methods which includes:

1. Total Allowable Catch (TAC), which governs fisheries based on the total catch within a specific area over a specified time.
2. Individual Quota (IQ), which governs fisheries based on individual catch quotas over a specified time.
3. Individual Transferable Quota (ITQ), which governs fisheries based on individual catch quotas that can be traded over a specified time.
4. Vessel Catch Limits (VCL), which governs fisheries based on catch quotas assigned to each vessel over a specified time.

Among all these methods, the core of OC framework is ITQ, in which individual catch quotas can be traded (Morgan 1997). ITQ is a more straightforward and intuitive approach compared to VCL management, and it is also more efficient than IQ management. Thus, ITQ is considered as a preferable choice for sustainable development of fisheries (Christy 1973). This study is an empirical analysis based on the ITQ management reform in Zhoushan, Zhejiang Province, China.

ITQ management is supported by Coase Theorem and Public Choice Theory regarding property rights. (Holland, 2018; Kaufmann & Geen, 1998; Pinkerton & Edwards, 2009). Grafton (1996) suggests that ITQ management can enhance economic benefits and sustainability in fisheries while reducing overfishing, to protect fishing resources effectively (Grafton, 2019). In practice, many countries, such as Iceland (Árnason, 1997), New Zealand (Arnason & Gissurarson, 2017), and Australia, have adopted ITQ management, and demonstrated its effectiveness in fishing resources conservation (Cancino et al., 2007).

ITQ has been developed, discussed, and recommended in China (e.g., Zhang 2006). Chinese government initiated ITQ management reforms in several provinces and cities, such as the Taihu Lake (Jiangsu Province), Zhoushan City (Zhejiang Province), Dongying City (Shandong Province), and Yantai City (Shandong Province). However, research on China's ITQ implementation is limited to theoretical introduction rather than practical implementation. This study is the first of its kind to conduct an empirical investigation into the ITQ reform, aiming to fill this research gap.

Our investigation into the Zhoushan ITQ Reform reveals unsuccessful. The reason behind the failure is that local governments were unwilling to implement ITQ management, which is different from challenges faced by other countries, where problems arise during the management process due to flawed ITQ design. In China, issues occurred in the policy implementations are: lack commitment from the local government and poor policy implementation. The Zhoushan ITQ Reform was marked by flawed policy design, superficial execution, and inadequate institutional support. This study, however, focuses on the root causes—fisheries law and the local governments' willingness to implement ITQ management.

In the discussion section, the recommendations provided may not fully address the scientific aspects of ITQ management, as they focus on primarily the local governments› lack of willingness. Therefore, they are necessary but imperfect. Since fisheries law in China is national and affects all local governments, the lack of willingness to implement ITQ due to legal flaws becomes a widespread problem. From this perspective, the empirical study of the Zhoushan ITQ Reform holds significant importance for rethinking the shortcomings of ITQ management in China.

CONDITIONS FOR THE ZHOUSHAN REFORM

Zhoushan City, located in Zhejiang Province, is situated near the estuaries of large rivers facing the sea, providing abundant fisheries resources, which attracts a big population engaged in the fishing industry. Zhoushan covers an area of 22,000 square kilometres, of which approximately 20,000 square kilometres is maritime territory (Figure 1). Zhoushan City has a population of about 1.1 million, with over 100,000 people involved in the fisheries sector, including 70,000 active fisheries. In 2020, the total fisheries output value (including marine and freshwater production) was around 1.6 billion CNY (approximately 220 million USD), with a total catch of 1.75 million tons. The marine fishing output value alone was 1.4 billion CNY (approximately 190 million USD), with a catch of about 1.45 million tons (Ministry of Agriculture and Rural Affairs of the PRC, 2021).

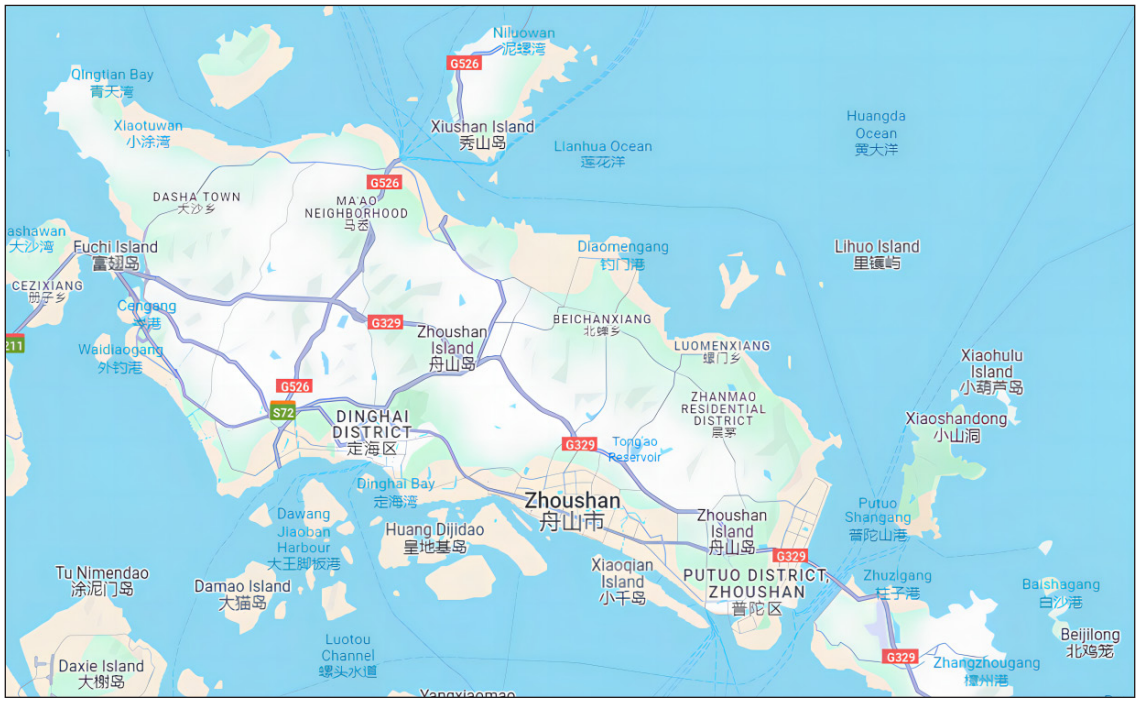


Figure 1 Location of Zhoushan, Zhejiang Province.

Selecting the Zhoushan ITQ Reform as the study subject is primarily based on four reasons: 1) It represents the highest level of ITQ reform in China and reflects strong reform intentions from the central government. 2) Zhejiang Province is one of the most economically developed provinces in China (MARA of the PRC, 2021), indicating that financial constraints at the provincial level are not the cause of the Reform's failure. 3) Zhejiang Province ranks among the top three provinces in terms of administrative efficiency nationwide (JNU MDERC & BNU GMRI, 2022), ruling out low administrative efficiency as a reason for the reform's failure. 4) Zhoushan is one of China's most resource-rich cities for fisheries (Han and Wang 2017). Therefore, identifying potential barriers to the implementation of ITQ is crucial for its broader application across China via using Zhoushan city as a case study example.

DETAILS OF THE ZHOUSHAN REFORM PROCESS

On April 26, 2016, the Chinese Ministry of Agriculture (now is named the Ministry of Agriculture and Rural Affairs) issued a document titled "Letter from the Ministry of Agriculture on the Principle Agreement to Carry out National Marine Fisheries Sustainable Development Pilot Work in Zhejiang Province" (Ministry of Agriculture 2016). This document determined to carry out the fishery reform pilot projects in Zhejiang Province, with a primary focus on the "quota fishing system under total catch management," known as ITQ management (Ministry of Agriculture 2016). In January 2018, Zhejiang Province designated Zhoushan as a pilot city (Wang 2021).

In March 2018, the former Zhejiang Ocean and Fisheries Bureau (now the Agriculture and Rural Affairs Department) organized experts and social organizations to discuss the implementation of the pilot policy (People's Government of Zhoushan 2018). In April 2018, the People's Government of Zhejiang Province issued "Several Opinions on the Reform of Fishery Management in the National Green Fishery Experimental Base in Zhoushan" (People's Government of Zhoushan, 2018), that officially launched the pilot implementation of the fishery reform (Zhoushan Reform).

The Zhoushan Reform is designed to cover four aspects. 1. Delineating the pilot area and defining rights. The Zhejiang provincial government designates the coastal fishing grounds of Zhoushan City as a pilot area for reform, granting fishing rights to vessels below 12 meters while prohibiting those exceeding 12 meters.2. Controlling the total fishing catch and allocating quotas. The Zhejiang provincial government calculates the total catch target based on the market demand for fishing catch as the economy grows, and on the ecological carrying capacity of the pilot area. Quotas are then allocated to each entity with fishing rights. 3. Establishing markets for quota transfer. 4. Planning by the superior and managing by the subordinate. The Zhoushan Reform is proposed and planned by the Zhejiang provincial government, and implementation is carried out by the Zhoushan local government and the Fisheries Association. In the initial timeline of the Zhoushan Reform was from June 2018 to December 2019, with the goal of completing fisheries reform across the entire province by 2022 (Zhejiang Provincial Bureau of Ocean and

Fisheries, 2017). However, just a few months after the pilot implementation commenced, a series of issues occurred. In early 2019, the scope of the Zhoushan Reform was narrowed from Zhoushan City to Putuo District in Zhoushan City (mainly focusing on Lianhua Port) (People's Government of Putuo District, 2019). However, even with the reduced scope, the Reform failed to address existing problems. By 2021, the progress of the Reform had stagnated, and relevant information about the Reform remained limited to a brief summary in the 2020 annual report of Zhoushan City and Putuo District (People's Government of Zhoushan, 2021). Based on its historical development, it is evident that the Zhoushan Reform has essentially failed.

The Zhoushan Reform encountered a series of problems, including but not limited to the following: 1) Flawed policy design: Policies such as the 12-meter fishing vessel entry standard were overly simplistic. 2) Superficial policy execution: The local government of Zhoushan did not adjust its existing input control management after introducing ITQ, leading to a conflict between the two management models. 3) Severe lack of institutional support: The Fisheries Association designated to implement tasks like quota allocation and transfer lacked the personnel, funding, and management capacity to carry out these responsibilities. These diverse problems led to widespread opposition among fishers, ultimately resulting in the failure of the Zhoushan Reform. This study, however, this study using in-depth interview method to generate the real-world reasons for the phenomenon by interviewing associated stakeholders such as fisheries and people who are working for the government agencies.

METHOD

IN-DEPTH INTERVIEW, DOCUMENT ANALYSIS, AND ON-SITE OBSERVATION

This study employs three qualitative research approaches including in-depth interviews, document analysis, and on-site observation. A number of government reports and documents have been reviewed before conducting this research. Literature review and document analysis provide clear explanation of the reform policy, while on-site observation facilitates understanding of policy implementation. In-depth interviews enable direct engagement with individuals involved in the Zhoushan Reform to uncover the social impacts and changes and delve into the operating mechanism behind policies, transcending the confines of policy documents (Kodithuwakku, 2022). These three approaches enable the application of the triangulation method: conducting multiple interviews with the same respondent, cross-checking statements from different respondents, and verifying interview content with documentary evidence and on-site observations, which validates the credibility of respondents' descriptions and reduce the potential risk of recall bias.

The in-depth interviews were conducted in semi-structured and open-ended formats (Table 1).[1] The interviews aimed to explore the reasons for the failure of the Zhoushan Reform. All respondents had either direct or indirect involvement in the Reform, ensuring high representativeness (Table 1). The interview process was anonymous. Necessary ethical process has been followed in the recruitment and interview processes. The interviews resulted in 54 interview transcripts used as raw data for thematic analysis. Through open coding, selective coding, and theoretical coding, core themes were explored and summarized to understand the obstacles to the Zhoushan Reform.

The research team also conducted on-site observations at three fishing grounds involved in the Zhoushan city-level reform and two fishing grounds in the Lianhua Port reform. Additionally, administrative personnel were observed during on-site fisheries management in the first and third rounds of interviews. During the second round of interviews, the research team accompanied multiple times to observe fishing activities.

The document materials include internal and external reports. Internal materials are provided by staff from the former Ocean and Fisheries Bureau of Zhejiang Province

STATUS	NO.	PERCENTAGE
Staff of the Former Ocean and Fisheries Bureau of Zhejiang Province (Government staff)	6	10.3%
Staff of the Fisheries Association of Zhoushan City (industrial organizations)	8	13.7%
Fishers in Caiyuan Town, Shengsi County, Zhoushan City, Zhejiang Province (fisheries)	20	34.4%
Fishers in Changtu Town, Daishan County, Zhoushan City, Zhejiang Province (fisheries)	20	34.4%
Section-Head level official of the Ocean and Fisheries Bureau of Zhoushan City (Government official organization)	2	3.4%
Division-Head level official of the former Ocean and Fisheries Bureau of Zhejiang Province (government official organization)	2	3.4%

Table 1 Summary of participants.

(now divided into the Natural Resources Department and the Agriculture and Rural Department). These include the annual fishery work reports of Zhejiang Province from 2018 to 2020, fishery reform documents issued by the Zhejiang provincial government, marine fishery-related materials from Zhoushan City, and documents pertaining to fishers' quota rights. Document analyses are sourced from public channels such as databases and media outlets, including official websites and news reports on Zhoushan Reform and Zhoushan City, and associated legislations and administrative regulations.

DATA CODING

Open coding

Open coding is a process of conceptualizing raw statements and forming conceptual clusters through continuous comparison and analysis, ultimately leading to the extraction of categories. Coding was independently conducted by an author who did not participate in the interviews to avoid objective biases. For ease of organization, all original materials were divided into three categories based on the level of participants. The original materials were numbered according to the abbreviations of the locations where the interviewees were located (ZJ, ZS, CY, CT) and the interview sequence. To ensure the accuracy and objectivity, on-site observations were conducted for error message removing and consistence checking after completing the analysis and organization of the original interview materials. This process resulted in 68 valid concepts, and 20 initial categories were summarized and coded, such as "high cost (P1)", "lack of political achievements (P2)", and "insufficient funds (Z1)" (Table 2).

CATEGORY	CATEGORIZATION	THEMS
Government personnel of Zhejiang Province (province, abbreviated as P)	ZJ01: The fisheries reform will lead to a decrease in fish catch (reduction in catch). ZJ08: If fisheries cannot catch fish, how can we (the government agencies) collect taxes? (Reduction in tax revenue). A large number of fishery industries rely on fishing resources supply (reduction in industry income). ZJ07: The reform poses great risks to the fisheries industry (high economic risk). ZJ03: The protective effect of the reform on fisheries resources cannot be seen in the short term (long-term environmental protection effect). ZJ02: No one cares about how many fish you ultimately protect (environmental protection achievements are not measurable or valued). ZJ06: Environmental reform only needs to be proclaimed as reform (environmental protection achievements rely on slogans). ZJ05: The law does not care about how much fish we protect (lack of formal recognition from the law system for the environmental conservationachievements).	P3 – no economic achievements (ZJ01, ZJ08, ZJ07). P4 – no environmental achievements (ZJ03, ZJ02, ZJ06, ZJ05).
Zhoushan City government personnel (City, abbreviated as C)	ZS01: How much does the Zhoushan City government receive in a year? (Insufficient regular funding). ZS08: Without money, nothing can be done in terms of reform (No funds). ZS04: Previously, for social reforms, the Zhejiang Provincial Government would allocate funds specifically, but not this time (No allocation of funds). ZS02: The reform requires a lot of money, but the Zhejiang Provincial Government has not provided special funding support (No special funds). ZS05: The reform has reduced the number of fish caught by fishers, so who will subsidize them? (No subsidies). ZS03: The Zhoushan City government lacks local legislative power and cannot manage the reform (Passive legislation); ZS09: The Zhejiang Provincial Government blames us, so we won't manage the reform (Unwilling to govern). ZS02: When the Zhejiang Provincial Government does not want to implement fishery reform, no one will manage the issue of reform (No governance).	C1: Insufficient funds (ZS01, ZS08, ZS04, ZS02, ZS05C4); Negative attitude (ZS03, ZS09, ZS02).
Fishers in fishing villages (village, abbreviated as V)	CY01: The reform is unreasonable, so I have to secretly fish at night (night fishing). CY10: I won't report the real fishing data to the government (data concealment). CT2: Many people fish beyond the quota, and no one manages (lack of supervision). CT9: We went to the provincial government to report the situation (petition). CT10: We complained to the Fishery Bureau (complaint); CT17: I want to report these officials (reporting).	V1: Secretly fishing (CY01, CY10, CT2); V8: Expressing opposition (CT9, CT10, CT17).

Table 2 Open Coding – Categorization of Original Materials.

Axis coding

Then an axis coding process is conducted to organize and summarize the interview results. The purpose of axis coding is to discover connections between categories and then uncover the main categories. After extracting preliminary categories, the relationships between each category remain relatively scattered. Therefore, based on internal logic, the 20 preliminary categories were connected, compared, and analysed to further summarize and refine seven sub-categories, such as excessive costs, lack of political achievements, and shifting responsibilities (represented as AAi). Ultimately, these sub-categories were consolidated into three main categories: "the Zhejiang provincial government is unwilling to truly implement reform," "the Zhoushan municipal government lacks the capability to implement reform," and "fishers oppose reform" (represented as Ai). After determining the main categories, they were validated against the original data to ensure the reliability of the extracted categories (Table 3).

Theoretical coding

Through in-depth analysis, comparison, and connection of the existing three main categories, the main categories A1 and A2 were combined into a typical "provincial government – municipal government" relationship, while A2 and A3 are combined into a "municipal government – public" relationship. This forms the study's "storyline": 1. The Zhejiang provincial government was unwilling to substantially promote reform because it did not yield political achievements, thereby shifting the main responsibility for reform to the Zhoushan municipal government. 2. The Zhoushan municipal government, lacking substantial assistance from the Zhejiang provincial government, was unable to implement reform, leading to numerous problems. 3. Issues associated with the reform provoked opposition from fishers, resulting in significant resistance to the reform. (Table 4 for typical relationships between main categories). Finally, a saturation test was conducted on the above coding based on the data and information from on-site observations and document materials.

MAIN CATEGORIES	SUBCATEGORIES	INITIAL CATEGORIES
A1 The Zhejiang Provincial Government is unwilling to truly implement reforms	AA1 The cost is too high	Z1 Capital demand is too high. Z2 The cost of governance is too high
	AA2 No political achievements	Z3 No economic achievements. Z4 No environmental achievements
	AA3 Blaming others for the responsibility	Z5 Decentralize power to the Zhoushan Municipal Government Z6 "Not providing substantial support
A2 The Zhoushan Municipal Government lacks the ability to implement reforms.	AA4 Lack of capability	C1 Lack of funding C2 Lack of authority. C3 Lack of staff
	AA5 Neglecting issues	C4 Negative attitude C5 Laissez-faire governance C6 Fishery Association shifting responsibilities
A3 The fishers oppose the reform	AA6 Violation of rules	V1 Illegal fishing V2 Overfishing V3 Collusive fraud V4 Fishing beyond designated areas V5 Evading fines V6 Poisonous fish
	AA7 Opposition to reform	V7 Passive resistance V8 Expressing opposition

Table 3 Results of axial coding.

TYPICAL RELATIONAL STRUCTURE	COVERING CATEGORY	INTERPRETATION OF RELATIONSHIP STRUCTURE
Provincial government—municipal government	A1 Zhejiang provincial government is not willing to really implement the reform; A2 Zhoushan municipal government capacity is insufficient, unable to implement the reform.	The Zhejiang provincial government has shifted the responsibility for reform to the Zhoushan municipal government because of its lack of political achievements, and the Zhoushan municipal government is in fact unable to carry out reform.
Municipal government—the public	A2 Zhoushan municipal government capacity is insufficient, unable to implement the reform; A3 fishermen oppose reform	The limited capacity of Zhoushan municipal government has led to many problems in the reform, which has led fishermen to oppose the reform.

Table 4 Typical Relation Structure of Main Category.

RESULT: REASONS FOR THE ZHOUSHAN REFORM FAILURE

INACTION OF THE GOVERNMENTS

The final result of this research indicate that the main obstacle to the Zhoushan Reform in Zhejiang Province is that the provincial government's lack of willingness to promote reform, as the implementation of this reform does not fit for the government's performance review purpose, or the reform results are uneasy to verify or quantify. The Zhoushan municipal government, with limited capacity and motivation, faced challenges in enforcing the reform due to opposition from local fishers. Deeper, underlying reasons need to be explored to understand why existing fisheries legislation in China discourages local governments from actively promoting ITQ management. If fisheries law, particularly the allocation of responsibilities to local governments, are identified as the fundamental reason of the failure of the Zhoushan Reform, then modifying these legislations becomes a critical step in advancing ITQ implementation forward (Table 2).

INADEQUATE LEGAL RESPONSIBILITY STIPULATIONS

Legal responsibility forms the foundation of the local government accountability system, and this responsibility is derived from a series of fishery laws and regulations. The most significant of these is the Fisheries Law of the People's Republic of China (the Fisheries Law). In its chapters related to fishing (Articles 21–37), the Fisheries Law establishes various legal responsibilities for local governments (The Fisheries Law of the People's Republic of China 2000).

It is precisely the absence of ITQ responsibilities for local governments in fisheries law that leads to their reluctance to effectively promote ITQ management, thus resulting in numerous problems in the Zhoushan Reform. Specifically, the lack of ITQ provisions is not limited to the Fisheries Law but extends to other fisheries regulations as well. While Article 21 of the Fisheries Law touches on ITQ management, it will be more accurate to describe it as IQ management, as it does not encompass quota trading and circulation.[2] Moreover, Article 21 merely offers a declarative statement on ITQ without providing detailed implementation guidelines. This allows local governments to focus solely on defining and issuing total catch limits without considering the scientific basis for catch, infrastructure development, quota allocation to fishers, protection of fishers' rights, or enforcement against overfishing (Gu, 2018). In summary, the Fisheries Law lacks comprehensive provisions for ITQ management, thus failing to assign local governments the corresponding legal responsibilities.

Not only does the Fisheries Law lack ITQ provisions, but other fisheries regulations, such as the Implementation Rules of the Fisheries Law of the People's Republic of China,[3] Opinions of the State Council on Promoting the Sustainable and Healthy Development of Marine Fisheries, (State Council of the PRC, 2013), and Regulations on the Inspection of Fishery Ships of the People's Republic of China,[4] also fail to establish legal ITQ responsibilities for local governments. Without these defined responsibilities, local governments, under the framework of Article 21 of the Fisheries Law, are limited to determining and allocating total fishing quotas, without extending governance in line with ITQ management.

During the process of on-site observation, government personnel demonstrated impatience and disregard for fishery reform. In the face of illegal fishing practices by fishermen, government personnel were reluctant to expend excessive energy to prevent them, and instead perfunctorily dealt with the complainants. Simultaneously, government personnel evaded the responsibilities they should undertake in fishery reform, for instance, replacing on-site inspections and catch quantity checks with verbal inquiries on multiple occasions, and failing to disclose quota information in accordance with procedures.

This brings the conclusion from the interviews: in Zhejiang's fisheries reform, the provincial government merely declared ITQ reform but showed no real commitment to implementing it.

DISCUSSION AND RECOMMENDATIONS

DISCUSSION: GOVERNMENT RESPONSIBILITY IN LAW

The study reveals that while the immediate cause of the Reform's failure stems from the inaction of local governments, which has led to dissatisfaction among fishers, the underlying issue is the inadequacy of China's fishery legal system. The absence of defined legal responsibilities results in a lack of motivation for local governments to implement the reform. This paper concludes that for ITQ management to succeed in China, fisheries laws must be reformed to assign local governments clear responsibilities and establish evaluation systems aligned with ITQ management. The study's key contribution is highlighting the critical link between local government attitudes toward ITQ management and the existing legal framework, and offering constructive recommendations on the often-overlooked issue of local government responsibilities in ITQ management.

In China, while the concept of ITQ management was introduced early on, it has yet to be effectively implemented.

A fundamental yet often overlooked reason for this is the lack of genuine willingness from local governments, particularly at the provincial level, to enforce ITQ management. As a result, challenges become more pronounced, and the capacity to address them is significantly diminished, ultimately leading to the failure of ITQ management. Studies that focus only on these amplified challenges or weakened capacities, without addressing the core issue of local government willingness, miss the key factor in advancing ITQ management. The willingness of local governments is not merely a supportive factor but a crucial prerequisite for the successful implementation of ITQ management.

Even under China's hierarchical system, local governments are still self-interested entities. In China, where there is a strong focus on "competition for political performance", local governments prioritize governing and achieving political goals that align with their legal responsibilities. Local governments are unlikely to fully commit to ITQ management if they are tasked with responsibilities tied to input control management. Only by changing the legal system, establishing legal responsibilities for local governments based on ITQ management, can they be motivated to implement ITQ management. Furthermore, to encourage local governments to fulfil their legal responsibilities in ITQ management, fisheries laws should also introduce an evaluation system centred on resource sustainability and ecological outcomes.

RECOMMENDATIONS: IMPROVE FISHERY LAW

The failure of the Zhoushan Reform provides important insights: ITQ reform is impossible without the willingness of the implementation from the local governments. However, the willingness of reforming of the local governments are largely depends on whether the implementation responsibilities are assigned to them by legislation reinforcement. Therefore, legal responsibilities in the current fishery legislation system necessarily needs to be added for the local governments to practically implement ITQ management. Only after completing the legal reinforcement, there would be room for discussion on how to scientifically implement ITQ management.

The current fisheries legislation in China impose significant legal responsibilities for the local governments to manage inputs, with extremely stringent standards for this management. To avoid conflicts between the new ITQ system and the existing input, the first step in updating fisheries law should be to establish clear and distinct boundaries the new ITQ system and the pre-existing input management legislations, as they serve different management purposes. Although ITQ management has been successfully integrated with factor input management in many countries, and better outcomes have been achieved for fisheries resource governance than using ITQ alone, considering the existing conflict between the two in China, feasible approach will be establishing a separate chapter or section for ITQ management. The primary provision should explicitly state that regions implementing ITQ management should not engage in factor inputs management (or local governments should restrict it situation).

Addition of ITQ legal responsibilities

Currently, complete implementation of ITQ management across China is not feasible (Zhang and Yu, 2007). The most appropriate positioning for ITQ management remains as a reform pilot in a few provinces (Yue et al., 2021). In order to address various uncertainties in the reform pilot, a prudent approach will be separating and enriching Article 21 of the Fisheries Law into a dedicated chapter for ITQ management. In essence, Article 21 of the Fisheries Law pertains to IQ management, which aligns more closely with the core of ITQ management (Dong et al., 2021). The most significant differences between ITQ and IQ lie in two aspects. Firstly, Article 21 only requires local governments to allocate total fishing quota, but fails to explicitly specify the distribution of fishery quotas. Secondly, Article 21 does not regulate the trading and transfer of quotas. Therefore, this paper suggests creating a dedicated chapter for ITQ implementation based on Article 21 of the Fisheries Law by incorporating additional clauses and responsibilities for different aspects of program design, quota allocation, implementation, and monitoring and enforcement.

However, the task of establishing an explicit chapter for ITQ remains challenging. Since the goal of amending fisheries laws is to provide local governments with legal responsibilities aligned with ITQ management, this chapter needs to focus on two aspects regarding the addition of clauses: first, to demonstrate the legal responsibilities of local governments through various tasks for ITQ management; second, to evaluate the legal responsibilities through fishing yield results.

Levels and contents of ITQ legal responsibilities

Unlike inputs management, which only involves fishers, ITQ management requires action from local governments (Edvardsson, Păstrăv and Benediktsson, 2018). Additionally, ITQ management transcends the limitations of local governments and individual fishers. It operates at four levels, spanning from the central government to individual fishers (Bai, 2012) (Figure 2). Local governments (provincial, municipal, and county level, etc.) play an indispensable role in this system as they act as intermediaries between the central government and individual fishers. Their rights and responsibilities are demonstrated through specific tasks at each level. Given the current underdeveloped

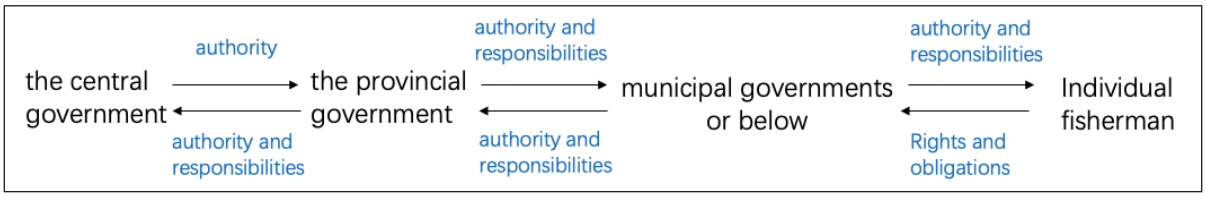


Figure 2 Levels of ITQ legal responsibilities.

state of industry associations in China, with most being entirely subordinate to local governments (Ren and Yan, 2022), the idea of involving fishery associations in ITQ management (and assigning them primary responsibilities) is unrealistic although countries like Australia, Canada, New Zealand, and United States of America allows and encourages associated fishery organizations to participate in ITQ management. Instead, local governments should assume full responsibility for ITQ management. However, if industry associations in China make substantial progress in the future, their involvement in ITQ management should also be considered. This would require a higher standard for fishery legislation, for instance, involving a multi-level authorized legislation system, or introducing a boarder public participation and public engagement.

Article 21 of the Fisheries Law, as the foundation for the separate ITQ chapter, has taken the first step for ITQ management—determining and issuing the total fishing quota. A scientifically determined quota is a prerequisite for the smooth implementation of ITQ, and its mandatory attribute is crucial for local governments and individual fishers to faithfully implement ITQ management (Wang, 2022). Therefore, the determination of the total allowable catch requires expert discussion and demonstration, negotiations between the central and local governments, and the central government's issuance of the set total catch to provincial local governments. Considering the diversity and complexity of current methods for calculating total fish catch, fisheries laws cannot directly determine the total quota or calculation methods in their provisions and can only ensure scientific validity through multi-party participation as much as possible (Zhang and Gao, 2021). This section of the provisions should assign the legal responsibility to the central government for determining and issuing the total allowable catch and assign the provincial local governments the legal responsibility to participate in discussions and accept the total fishing quota.

The second step involves the provincial government decomposing the total fishing quota issued by the central government into quotas for different regions within its jurisdiction and informing lower-level local governments. Due to China's vast territory and complex coastal jurisdictions, the central government cannot directly distribute the total fishing quota to local governments at and below the municipal level (Yu and Huang, 2017). Therefore, it is essential for provincial governments to accept and decompose the total fishing quota in ITQ management. During allocation, provincial governments should adhere to the basic principle of maintaining the sustainability of fishery resources and follow procedures involving expert discussion and demonstration, as well as participation from lower-level governments, to ensure a scientific process of decomposing the total fishing quota. Legal provisions in this part should assign the provincial government the legal responsibility of decomposing and issuing the total fishing quota, while assigning local governments at and below the municipal level the legal responsibility of participating in discussions and accepting the fishing quota.

The third step involves municipal and lower-level local governments conducting fishery management within their respective jurisdictions in accordance with the total fishing quotas issued by the provincial government. Drawing from the experience of the Zhejiang fishery reform, the responsibilities of local governments in this step can be divided into two categories: quota determination and quota regulation and transfer.

The responsibility of quota determination entails establishing eligibility criteria and defining the content of fishing rights. On the other hand, the responsibility of quota regulation and transfer involves implementing related support systems, providing technical assistance and services, and overseeing the utilization and trading of fishing quotas.

Specifically, responsibilities for quota determination include delineating areas (defining the areas for ITQ management and issuing public announcements), approving fishing (identifying eligible fishing entities, specifying fishing methods, processing fishing applications, and maintaining a registry of authorized fishing entities), and allocating quotas (distributing fishing quotas to fishers, defining corresponding rights based on quotas, and registering allocated quotas).

Supervisory and transfer responsibilities encompass quota transfer (establishing a quota trading market, releasing quota trading information, managing quota transfer activities, and publicizing quota trading situations), quota transaction oversight (establishing and publishing quota trading rules, supervising quota trading activities, mediating and adjudicating transaction disputes, and

regulating the market to prevent monopolies), offshore supervision (patrolling the sea, overseeing various fishing activities, combating overfishing, and safeguarding the legitimate rights of fishers), onshore supervision (inspecting and supervising landed catches, verifying and calculating quota usage, and registering catch transactions), quota regulation (regularly compiling and adjusting quota allocations to ensure balance with marine ecological carrying capacity), resource monitoring (establishing a fisheries resource monitoring system to provide a scientific and efficient assessment system for ITQ management), and behaviour monitoring (implementing systems such as fishing vessel monitoring to support the management of the entire "fishing-landing-sales" process).

It's essential to emphasize that local governments, while fulfilling their initial delineation responsibilities, should adhere to the principle of "open access", ensuring that all individuals capable of engaging in fishing activities are entitled to fishing rights (Wang et al., 2017). Local governments need not worry about individuals' fishing capacity exceeding the carrying capacity of the marine ecosystem or wasting fishing productivity and production materials because ITQ management is based on the quota rather than productivity. Ultimately, individual fishers will choose fishing production materials and methods that best match the quota or stop fishing (Tian et al., 2023).

Regarding quota regulation and transfer responsibilities, relevant provisions should be lenient, as overly detailed stipulations are not suitable for the current exploration and development of ITQ management (Bai, 2011). Furthermore, when establishing procedures and rules for each step, relevant provisions should not be overly detailed to ensure that local governments have sufficient autonomy and flexibility to implement ITQ management.

The fourth step involves fishers actively exercising their rights after obtaining quotas while fulfilling legal obligations. The core right of fishers is fishery access, which refers to the right to engage in fishing activities within the quota (Yang and Deng, 2022). Based on the right of access, fishers also have various subsidiary and procedural rights, such as the right to apply for quota allocation, sell and purchase quotas. Fishers' obligations can be divided into mandatory and soft ones. The former includes quota fishing, maintaining fishing logs, accepting boarding inspections, while the latter includes undergoing technical training, using environmentally friendly fishing gear.

The rights and obligations of fishers may vary according to the governance of local governments, implying that both the rights and obligations of fishers often correspond to the respective responsibilities of local governments. For instance, the right of quota fishing corresponds to the responsibility of local governments to protect this right, and the obligation to maintain fishing logs corresponds to local governments' inspection of these logs. Even for non-mandatory soft obligations, local governments have the responsibility to encourage, guide, and incentivize individual fishers to fulfil their duties. Therefore, the rights and obligations of fishers are inseparable from local governments fulfilling their corresponding legal responsibilities, which consistently span across the four steps of ITQ management.

ITQ legal responsibility evaluation

Adding legal responsibilities for local governments in fisheries laws alone is not sufficient to ensure their willingness to implement ITQ management. Without a comprehensive evaluation mechanism for these responsibilities, local governments lack the incentive to promote ITQ management, as they benefit or lose nothing whether they implement the program or not (Mu, 2006). Therefore, fisheries laws need to establish an evaluation mechanism tailored specifically to ITQ management.

The current evaluation mechanism of China's fisheries laws is set up for input control management, focusing on controlling the fishing process. However, this mechanism is not well-suited for ITQ management, which is an output control system focusing on regulating fishing yields. Although fisheries laws can provide legal responsibilities for local governments related to governance (such as on-sea and on-shore supervision), merely evaluating whether local governments perform these tasks does not equate to assessing whether the total catch is within the carrying capacity of the marine ecosystem (Tong and Fang, 2013). For instance, while local governments fulfil legal responsibilities by issuing quota certificates to fishers and installing quota computer systems, it does not necessarily indicate the ultimate outcome of ITQ management. Therefore, fisheries laws need to explore a new evaluation mechanism.

ITQ management focuses on controlling total production. Given that the primary goal of implementing ITQ management in China is the protection of fisheries rather than economic gains, the corresponding evaluation mechanism should be guided by ecological protection outcomes (Wang, 2020). In other words, whether a local government has fulfilled its legal responsibilities depends on whether the total catch output in its jurisdiction is controlled within the ecological carrying capacity of the marine environment. A predetermined ecological and resources goal should be established in this evaluation mechanism, such as achieving a certain level of ecological reserve for certain fishery resources within a few years and require local governments to fulfil this goal on schedule. Given the current difficulty of tailoring specific ecological and resource goals for each sea area or region, a feasible

approach is to establish an evaluation mechanism through procedural regulations, designating relevant central government departments as the primary evaluation body and providing local governments with the freedom to showcase their capabilities (Bai et al., 2020).

The evaluation mechanism should be divided into two parts. First, relevant central government departments should design reasonable ecological and resource goals in advance. Second, local governments should independently implement management and achieve pre-set goals, with sufficient authority and responsibility delegated to them. Given the legal controversy surrounding penalties for local government negligence, the provisions of the evaluation mechanism in fisheries law should focus on complete and thorough evaluation procedures, empowering local governments internally instead of relying on deterrence through retroactive accountability (Xu, 2019).

Compared to input control-based evaluation mechanisms, the ITQ evaluation mechanism ensures that local governments pursue resource and ecological goals, rather than completing fishery governance superficially (Cai et al., 2021). Meanwhile, the ITQ evaluation mechanism also integrates various governance powers well, ensuring that the exercise of these powers ultimately aligns with ecological and resource goals, and preventing local governments from arbitrary use of power or rent seeking (Chen, 2022).

CONCLUSION

The direct reason for the failure of Zhoushan fishery reform is that the Zhejiang provincial government only regards ITQ management as a political slogan, rather than a genuine willingness to implement this management model. The underlying reason for the failure is that the fishery law fails to give local governments the legal responsibility to comply with ITQ management, which makes the Zhejiang provincial government reluctant to spend the cost of governance on ITQ management that cannot produce performance. In order to change this dilemma, China 's fisheries laws need to be reformed around ITQ management.

The center of the reform should be to increase the legal responsibility of the fishery law to match ITQ management, and to give these legal responsibilities to local governments. The legal responsibility of local governments runs through the whole process and tasks of ITQ management, and finally through the results of fishing to determine whether local governments have fulfilled the above legal responsibilities. By fulfilling the above legal responsibilities, local governments can construct a scientific power/right and responsibility/obligation relationship between the central government, provincial governments, local governments at lower levels and fishermen, and then achieve better ITQ management by controlling the total catch.

The experience and suggestions presented in this study are not limited to China alone. In any countries attempting ITQ management, a crucial aspect always involves modifying fisheries laws, assigning legal responsibilities to local governments, and establishing complementary evaluation mechanisms. Of course, in addition to the legal reform around legal liability, there are many legal, policy and institutional innovations that help to achieve ITQ management. For example, local governments can encourage commercial fishery stakeholders to participate in the implementation of ITQ, thereby enhancing the feasibility and efficiency of implementing ITQ management.

NOTES

1 To faithfully reconstruct the original state of the Zhoushan Reform and identify existing problems, interviewees have been categorized into four major groups based on the time and procedure of their involvement with the Zhoushan Reform policy: Government staff, government officials, industry organizations, and fishers. These individuals directly formulate, execute, or interact with the fishery reform, covering the entire process from initiation to conclusion. Therefore, they can provide insight into the real situation of the Zhoushan Reform.

2 The text is as follows: Following the principle of maintaining the allowable catch below the increase of fishery resources, the State establishes the total allowable catch of fishery resources and implements a quota system for fishing. The fisheries administrative department under the State Council is responsible for conducting surveys and assessments of fishery resources to provide a scientific basis for implementing the fishing quota system. The total allowable catch in inland waters, territorial seas, exclusive economic zones of the People's Republic of China, and other waters under its jurisdiction are determined by the fisheries administrative department under the State Council and allocated by higher-level authorities to lower levels after approval by the State Council. The total quotas for fishing in key rivers and lakes designated as such by the State are determined by the people's governments of relevant provinces, autonomous regions, and municipalities directly under the Central Government, or through consultation among them, before being allocated by higher-level authorities to lower levels. The allocation of total fishing quotas adheres to principles of fairness and impartiality. The methods and outcomes of allocation are made public and subject to supervision.

3 Regulations on the Inspection of Fishing Vessels in the People's Republic of China, passed by the 11th Executive Meeting of the State Council on June 11, 2003, and promulgated by the Order of the State Council of the People's Republic of China No. 383 on June 27, 2003, shall come into force as of August 1, 2003. http://www.gov.cn/flfg/2005-08/06/content_21046.html.

4 Regulations on the Inspection of Fishing Vessels in the People's Republic of China, passed by the 11th Executive Meeting of the State Council on June 11, 2003, and promulgated by the Order of the State Council of the People's Republic of China No. 383 on June 27, 2003, shall come into force as of August 1, 2003. http://www.gov.cn/flfg/2005-08/06/content_21046.html.

COMPETING INTERESTS

The authors have no competing interests to declare.

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