

## IMPACT OF INLAND FISHERIES DEVELOPMENT SCHEMES ON LIVELIHOOD ASSETS OF FISHERMEN

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### ABSTRACT

*The study investigates the impact of fisheries development schemes on the livelihood assets of fishermen in Telangana, India, focusing on changes in natural, financial, human, and social capitals. Using an ex-post facto research design, data from 240 fishermen across six districts were analyzed, employing statistical methods like the Wilcoxon signed-rank test to assess changes. The results reveal significant positive transformations across all livelihood capitals: natural capital increased by 145.25%, financial capital by 84.82%, human capital by 75.24%, and social capital by 76.73%. These gains are attributed to expanded aquatic resources, enhanced market access, improved water availability, and effective training programs. The findings underscore the efficacy of fisheries development schemes in bolstering livelihood assets and fostering sustainable economic growth within Telangana's fishing communities.*

**Key words :** inland fisheries, impact, fisheries development schemes, livelihood assets

### INTRODUCTION

Inland waters, defined by the FAO as ecosystems like lakes, rivers, and reservoirs, though occupying only a small fraction of Earth's water volume, are vital for supporting biodiversity and livelihoods. Globally, these waters sustain nearly 40% of fish species and 20% of vertebrates (Vörösmarty et al., 2010). However, these ecosystems are increasingly threatened by human activities, with 65% facing pressures like pollution, habitat degradation, and overexploitation (Reid et al., 2019). The ecological imbalance caused by these pressures directly impacts millions of people who depend on inland fisheries for sustenance and economic stability.

In India, inland fisheries have undergone significant transformation through targeted development schemes under the Blue Revolution, contributing 70% to the national fish production. With resources including 195,000 kilometers of rivers and over 2.9 million hectares of reservoirs, India ranks third globally in fish production, accounting for 8% of the global total (FAO, 2022; Shah et al., 2021). Telangana stands out as a key contributor, supporting 500,000 fishing families through a network of tanks and reservoirs. Government initiatives like fish seed distribution, aquaculture promotion, and training programs have significantly enhanced the livelihoods of these communities by improving income levels and socio-economic conditions (Sharma et al., 2018; Singh et al., 2020; Vinaya and Shivamurthy, 2021; Archit et al., 2023).

Evaluating the impact of these development schemes is essential to ensure their sustainability and effectiveness. By assessing their contribution to the livelihood assets-natural, human, social, physical, and financial capital of fishermen, policymakers can identify areas for improvement and promote long-term economic and environmental benefits.

### OBJECTIVE

To assess the impact of inland fisheries development schemes.

### METHODOLOGY

The Telangana state was chosen as the locale of the study. The existing 31 districts of the state are divided into three nearly homogeneous strata (each stratum with a given a number of districts 10-11-10) based on climate, rainfall, soil quality, resource spread, intensity and diversity of fisheries and aquaculture activities. For sampling, two districts from each strata were selected in consultation with the Department of Fisheries. Thus six districts were selected for study. Karimnagar, Nizambad, Medak, Wanaparthy, Mahabubabad and Yadadri Bhuvanagiri districts were selected. Forty fishermen were selected from each of the selected districts purposively based on availability of aquatic resources. Thus, thus constituting a total of Two hundred and forty fishermen. Fishermen was operationalised as 'a registered member of fishermen cooperative society and is eligible for capturing fish in river, lake, tank, reservoir etc'. Ex-post

facto research design was adopted in this study. The data was collected with the help of pretested interview schedule. The statistical methods and tests such as frequency, percentage and Wilcoxon signed-rank test technique were used for the analysis of data.

The Wilcoxon signed-rank test is a non-parametric statistical test used to compare paired samples or repeated measures. It assesses whether there is a significant difference between two related groups or conditions.

The general formula for Wilcoxon signed-rank test.

$$Z = \frac{T^+ - \mu_{T^+}}{\sigma_{T^+}}$$

Where, 
$$\mu_{T^+} = \frac{T^+ - (N + N)}{4}$$

$$\sigma_{T^+} = \sqrt{\frac{N(N + 1)(2N + 1)}{24}}$$

T<sup>+</sup> = sum of ranks for smaller sample size (of signed-rank)

N = sample size

**Development of a standardized index to measure the Impact of fisheries development schemes**

For the present study, the impact of fisheries development schemes was assessed in terms of improved livelihood assets.

A list of 13 indicators to measure the livelihood assets were identified based on the review of literature and consultation with the experts in the concerned field. The list included different indicators namely physical capital, financial capital, natural capital, human capital, social capital, cultural assets, psychological assets, public capital, employment generation, Food and nutritional security, environmental security, health security and habitat security as indicators for livelihood assets index.

**Table 1. Principal component matrix**

Sr. No	Indicators	Initial Eigenvalues			Extraction Sums of Squared Loadings		
		Total	% of Variance	Cumulative percentage	Total	% of Variance	Cumulative percentage
1	Physical capital	3.012	20.312	20.312	3.012	20.312	20.312
2	Financial capital	2.658	16.252	36.564	2.658	16.252	36.564
3	Natural capital	2.297	14.651	51.215	2.297	14.651	51.215
4	Human capital	1.601	11.531	62.746	1.601	11.531	62.746
5	Social capital	1.103	9.719	72.465	1.103	9.719	72.465
6	Cultural assets	0.646	7.825	80.290			
7	Psychological assets	0.557	5.213	85.503			
8	Public capital	0.432	4.816	90.319			
9	Employment generation	0.285	3.412	93.731			
10	Food and nutritional security	0.201	2.345	96.076			
11	Environmental security	0.161	2.013	98.089			
12	Health security	0.123	1.021	99.110			
13	Habitat security	0.024	0.890	100.0			

The obtained scores were subjected to Principal Component Analysis, which has revealed that out of the total thirteen indicators selected for the study, five namely physical

capital, financial capital, natural capital, human capital and social capital contributed for more than 70 per cent of the variance and with eigen value greater than one. (Table 1).

**Table 2 : Total variance explained**

Sr. No.	Initial eigen values	% variance	Cumulative variance
1	3.012	20.312	20.312
2	2.658	16.252	36.564
3	2.297	14.651	51.215
4	1.601	11.531	62.746
5	1.103	9.719	72.465

The factor loadings of the respective indicators were worked out using the percentage of the variance shown by the initial eigen values (Table 3.) and that value was taken as the weighted score of the respective indicators.

**Table 3 : PCA results for the construction of the livelihood assets index**

Composite index	Major indicators	Factor loadings (W <sub>i</sub> )	% Variation explained by the composite sub-indicators
Effectiveness index	1. Physical capital	0.280	72.465
	2. Financial capital	0.224	
	3. Natural capital	0.202	
	4. Human capital	0.159	
	5. Social capital	0.134	

Thus, the obtained factor loading values were taken as W<sub>i</sub> and the composite effectiveness index was constructed using the formula

$$\text{Composite Effectiveness Index} = \frac{W_i X_i}{W_i} = \frac{W_1 X_1 + W_2 X_2 + W_3 X_3 + W_4 X_4 + W_5 X_5}{W_1 + W_2 + W_3 + W_4 + W_5}$$

Where,

X<sub>i</sub> is the sub index value of the concerned indicator

Where W<sub>i</sub> = Weights associated with X<sub>i</sub> indicator

Thus the composite index on effectiveness comprised of five major indicators i.e. physical capital, financial capital, natural capital, human capital and social capital.

Each of these indicators were provided with a set of sub-indicators and items which measures particular indicator. This whole set of sub-indicators and items were administered to the respondents and were asked to give their response to the items under each indicator. The composite livelihood assets index values ranged between 0 to 1. The respondents were categorised into three categories based on the obtained index values as follows:

Sr. No	Category	Composite index value
1	Low (< Q1)	< 0.26
2	Medium (Between Q1 & Q <sub>3</sub> )	0.26-0.57
3	High (> Q3)	>0.57

## RESULTS AND DISCUSSION

In accordance with the methodology outlined in the materials and methods, the study examined the responses of fishermen both before and after the implementation of fisheries development schemes. The analysis focused on evaluating the impact of these schemes on different livelihood assets. The responses were recorded using the recall method, which involved capturing information from participants recollections. Physical capital had 6 parameters with maximum possible score of 107. Financial capital had

six parameters, with maximum possible score of 30. Human capital had eight parameters, with maximum possible score of 64. Natural capital had nine parameters, with maximum possible score of 36. Social capital had seven parameters with maximum possible score of 28. Table 4 presents the impact of fisheries development schemes on all livelihood capitals of fishermen.

A hypothesis was formulated to test the impact of fisheries development schemes in terms of change in livelihood assets before and after the implementation of schemes.

### Null Hypothesis

There will be no significant difference between the livelihood assets of fishermen before and after the implementation of fisheries development schemes.

### Empirical Hypothesis

There will be significant difference between the livelihood assets of fishermen before and after the implementation of fisheries development schemes.

From Table 4, it is clear that there has been a positive impact on all livelihood capitals due to fisheries development schemes. Interpreting the empirical evidence of the study, it can be said that one of the main outcomes so far of the fisheries development schemes is the effect on natural capital. The highest improvement was observed in natural capital, with a remarkable increase of 145.25 percent in the scores. Financial capital also demonstrated significant progress, exhibiting an 84.82 percent positive change. Physical capital experienced a positive transformation, showing an improvement of 81.46 percent. Social capital displayed a positive change of 76.73 percent, followed by human capital, which exhibited a change of 75.24 percent.

**Table 4 : Impact of fisheries development schemes on livelihood assets of fishermen**

(n=240)

Sr. No	Livelihood assets	Before		After		% increase	Z  values (P=0.000)	Decision
		MS*	NMS**	MS*	NMS**			
1	Physical capital	39.53	0.23	71.73	0.43	81.46	13.552 (P=0.000)	Reject H <sub>0</sub>
2	Financial capital	11.00	0.37	20.33	0.68	84.82	13.561 (P=0.000)	Reject H <sub>0</sub>
3	Human capital	24.27	0.38	42.53	0.66	75.24	13.523 (P=0.000)	Reject H <sub>0</sub>
4	Natural capital	11.47	0.32	28.13	0.78	145.25	13.872 (P=0.000)	Reject H <sub>0</sub>
5	Social capital	4.47	0.16	7.9	0.28	76.73	13.523 (P=0.000)	Reject H <sub>0</sub>

MS\* = Mean score, NMS\*\* = Normalized mean score

# NMS = MS / Maximum possible score

The implementation of fisheries development schemes has significantly enhanced various forms of capital. As noted by Pavankumar & Salunkhe (2024), “these schemes have fostered holistic growth and sustainability in fishing communities.” Natural capital grew with expanded land and aquatic resources, increasing fish output through diversified species and saturated water bodies. This led to a rise in financial capital, facilitating investments in food, health, education, fishing equipment, and housing, and improving physical capital. Social capital was bolstered through grants to fishery cooperatives, increasing member participation, community relationships, and trust. Educational programs empowered fishers with sustainable fishing knowledge, enhancing human capital and quality of life. Overall, these schemes have fostered holistic growth and sustainability in fishing communities (Pavankumar & Salunkhe, 2024;

Madhuprasad *et al.*, 2024).

Results of the non-parametric Wilcoxon signed rank test also revealed that there was a significant difference in the before and after scores at the 5 percent level of significance for all livelihood capitals. This clearly indicates that there was an improvement in livelihood assets due to fisheries development schemes on all capitals (Chuadhari *et al.*, 2022).

**Physical capital**

In the present study, parameters for physical capital included nature of house, hygiene & sanitation, water accessibility, fishing assets, credit facility and market accessibility. Table 4.26 represents effect of fisheries development schemes on physical capital of fishermen.

**Table 5 : Effectiveness of fisheries development schemes on physical capital of fishermen**

(n=240)

Sr. No	Physical capital	Before		After		%
		MS*	NMS**	MS*	NMS**	
1	Nature of house	2.20	0.55	2.73	0.68	24.09
2	Hygiene & Sanitation	7.27	0.61	11.33	0.94	55.85
3	Water Accessibility	4.00	0.44	7.93	0.88	98.25
4	Fishing assets	13.47	0.23	35.31	0.61	162.14
5	Credit facility	1.33	0.44	2.20	0.73	65.41
	Market Accessibility	6.33	0.30	11.93	0.57	88.47

Based on the data presented in Table 5, the implementation of fisheries development schemes has led to significant positive changes in various parameters related to physical capital. Fishing assets exhibited the highest improvement, with an increase of 162.14 percent, indicating substantial enhancements in resources and equipment used for fishing activities. Water accessibility improved by 98.25 percent, reflecting increased availability of water resources

for fishing. Market accessibility also saw a significant positive change of 88.47 percent, suggesting better opportunities for fishermen to access markets. These improvements occurred at both household and community levels, highlighting the multifaceted impact of the fisheries development schemes in addressing individual and communal needs to promote overall growth and development within the sector.

Such advancements align with findings from Chuadhari, Chauhan, and Chaudhary (2022), which highlighted that livelihood security programs had a transformative effect on the accessibility and utilization of local resources in Gujarat. Furthermore, Bene et al. (2016) emphasized that improvements in physical capital, such as market connectivity, play a crucial role in enhancing the food security and economic prospects of fishing communities.

### Financial capital

In the present study financial capital parameters included respondent's household annual income, savings, credit borrowing, family expenditure and employment gain. Table 4.27 presents the scores of the financial capital of fishermen due to fisheries development schemes.

**Table 6 : Impact of fisheries development schemes on financial capital of fishermen** (n=240)

Financial capital	Before		After		%
	MS*	NMS**	MS*	NMS**	
Household annual income	2.47	0.41	4.20	0.70	70.04
Household savings	1.02	0.20	1.93	0.39	89.21
Credit borrowing	1.73	0.35	3.20	0.64	84.97
Credit repayment	0.60	0.30	1.60	0.80	166.67
Family expenditure	2.20	0.44	3.73	0.75	69.54
Employment gain	3.53	0.50	5.67	0.81	60.62

From Table 6, it is evident that fisheries development schemes have had a substantial impact on financial capital, improving credit repayment, savings, borrowing, income, and expenditure. Credit repayment saw a remarkable increase of 166.67 percent, reflecting improved borrower repayment behavior and reduced debt burdens. This aligns with the findings of Fauziah and Afriyadi (2019), who

noted that structured capital grants led to better repayment performance and enhanced trust between fisherfolk and lending institutions.

Household savings improved by 89.21 percent, reflecting enhanced financial stability and future planning. Studies by the Selvam (2021) emphasize that government schemes, such as the Blue Revolution in India, significantly contribute to creating robust savings patterns among fishing communities by providing financial support for equipment and infrastructure.

Credit borrowing increased by 84.97 percent, suggesting better access to financial resources and increased inclusion in formal credit systems. The role of NABARD in refinancing fisheries-related activities has been pivotal in this regard, as it has consistently supported fisheries projects through loans and capacity-building initiatives (Babu *et al.*, 2020).

Household annual income rose by 70.04 percent, indicating better income generation and financial well-being. Family expenditure increased by 69.54 percent, showcasing improved financial management and sustainable resource utilization. Employment gain saw a moderate rise of 60.62 percent, further supporting the economic empowerment of fisherfolk through targeted government initiatives.

### Human capital

In the present study, human capital parameters include fisheries skill, fisheries related information, fisheries knowledge, awareness, desire to learn new tasks related to fisheries, participation in the fisheries training programs, attitude towards fisheries department, availability of labor for fisheries activity and food security. Table 4.28 represents scores of the human capital of fishermen due to fisheries development schemes.

**Table 7. Impact of fisheries development schemes on human capital of fishermen** (n=240)

Sr. No	Human capital	Before		After		%
		MS*	NMS**	MS*	NMS**	
1	Awareness on new methods in fish capture/culture	1.07	0.27	1.87	0.47	74.76
2	Training on new methods in fish capture/culture	0.57	0.14	0.72	0.18	26.32
3	Improvement of knowledge and skills in value addition and post-harvest management	0.47	0.12	0.68	0.17	44.68
4	Attitude towards fisheries department	1.20	0.30	2.03	0.51	83.00
5	Access to skilled labour	0.67	0.17	0.81	0.20	20.89
6	Access to formal education to children	1.20	0.30	3.33	0.83	177.50
7	Access to proper medical treatment	0.67	0.17	1.03	0.26	53.73
8	Food Availability	7.53	0.42	12.91	0.71	71.44
9	Food Entitlement	9.47	0.53	12.80	0.67	35.16

Based on the data in Table 7, the implementation of fisheries development schemes has positively impacted several parameters related to human capital. Access to formal education for children saw a significant increase of 177.50 percent, likely due to enhanced infrastructure, resources, and educational initiatives. Balasubramaniam and Braj Mohan (2002) emphasized the importance of such interventions in addressing educational gaps among fisherfolk communities.

There was an 83.00 percent increase in positive attitudes towards the fisheries department, driven by improved infrastructure, equipment, and support services. Awareness about new fish capture and culture methods grew by 74.76 percent, thanks to effective awareness campaigns and educational programs. Swathilekshmi (2011) highlighted that extension services play a crucial role in improving the technical knowledge and practices of fisherfolk.

Food availability increased by 71.44 percent, reflecting better fishing practices and management. Knowledge and skills related to value addition and post-

harvest management rose by 44.68 percent, indicating a focus on training in these areas. Studies by Bihari et al. (1999) demonstrated that training programs for value addition significantly enhanced livelihoods in coastal communities.

Access to proper medical treatment improved by 53.73 percent, suggesting better healthcare services and facilities. Food entitlement grew by 35.16 percent, highlighting efforts to ensure equitable food distribution. Training on new fish capture and culture methods saw a modest increase of 26.32 percent, constrained by limited resources. Access to skilled labor increased by 20.89 percent, with labor migration potentially impacting this growth. Overall, these findings underscore the effectiveness of fisheries development schemes in enhancing human capital within the fisheries sector.

**Natural capital**

Table 8 represents scores of the natural capital of fishermen due to state fisheries development schemes.

**Table 8 : Impact of fisheries development schemes on natural capital of fishermen** (n=240)

Sr. No	Natural capital	Before		After		%
		MS*	NMS**	MS*	NMS**	
1	Aquatic resources (water spread area)	1.20	0.30	3.06	0.77	155.00
2	Supply of better quality of fish seed	1.41	0.35	2.19	0.55	55.32
3	Accessibility and availability of fish seed	1.08	0.27	2.12	0.53	96.29
4	Saturation approach in fish rearing in water bodies	1.53	0.38	3.60	0.90	135.29
5	Diversification in terms of fish species grown	1.80	0.45	3.47	0.87	92.78
6	Increase in production per unit area	1.33	0.33	3.07	0.77	13.82
7	Access to fresh drinking water	1.27	0.32	3.27	0.82	157.48
8	Market place	1.20	0.30	3.67	0.92	205.83
9	Community land	1.86	0.465	2.67	0.67	43.55

The data in Table 8 clearly demonstrates that fisheries development schemes have positively impacted various parameters of natural capital. The “market place” parameter exhibited the highest positive change of 205.83 percent, likely due to enhanced marketing infrastructure and improved access to fish products. According to Meena et al. (2016), improved marketing infrastructure and accessibility play a vital role in strengthening fisheries’ economic outcomes.

“Access to fresh drinking water” showed a 157.48 percent increase, reflecting efforts by the Telangana state government to improve water management and ensure a sustainable supply of clean water. This improvement is consistent with studies by Patel and Sharma (2021), who highlighted the impact of water management interventions on rural communities.

The “water spread area” parameter saw a 155.00 percent increase, attributed to the expansion and development of aquatic habitats for fish production. The success of such efforts in enhancing aquatic resources has been documented in various research initiatives (Prajapati et al., 2020).

The “saturation approach in fish rearing in water bodies” parameter increased by 135.29 percent, indicating the adoption of optimized fish rearing techniques. Such optimized practices have been successfully implemented through extension programs, as noted by Shah and Kadiya (2019), to promote sustainable aquaculture.

Additionally, improvements in the area of land under fish production, water availability, and availability of fish seeds were noted. These changes can be linked to measures such as constructing new fish farms, enhancing irrigation systems, and establishing fish seed production

centers, as discussed by Meena et al. (2016). Overall, the positive changes in these parameters highlight the success of fisheries development schemes in enhancing marketing infrastructure, water management practices, and aquaculture environments, leading to improved natural capital.

### Social capital

Social capital includes networks and connectedness, membership of more formalized groups and relationship of trust (DFID, 1999). Table 9 represents scores of the social capital of fishermen due to state fisheries development schemes.

**Table 9 : Impact of fisheries development schemes on social capital of fishermen**

(n=240)

Sr. No	Social capital	Before		After		%
		MS*	NMS**	MS*	NMS**	
1	Earn social recognition/prestige in the community	0.80	0.20	1.34	0.34	67.50
2	Interest and attitude has developed towards social development activities	0.73	0.18	1.21	0.31	65.75
3	Leadership qualities developed	0.53	0.13	1.20	0.30	126.42
4	Membership of formal and informal organization increased	0.40	0.10	0.62	0.155	55.00
5	Awareness and knowledge about other community welfare programs increased	0.53	0.13	1.03	0.26	94.34
6	Participation in social-cultural activities	0.47	0.12	0.79	0.19	68.08
7	Communication and interaction with the villagers increased	1.00	0.25	2.20	0.55	120.00

Table 9 reveals that fisheries development schemes have positively impacted all parameters of social capital among fishermen. Leadership qualities saw a significant increase due to activities promoting skill development, training programs, and leadership opportunities, fostering decision-making skills and providing mentorship. Communication and interaction improved substantially through initiatives like community meetings and platforms for dialogue, enhancing connectivity and community cohesion. Increased awareness and knowledge resulted from information dissemination, awareness campaigns, and educational programs, informing community members about welfare programs and their benefits. Social recognition and prestige grew through recognition programs, awards, and public appreciation, boosting individuals' self-esteem and sense of belonging. Interest and attitude towards social development activities improved due to awareness campaigns and success stories demonstrating the benefits of these initiatives, shifting perceptions and increasing willingness to engage. Participation in social-cultural activities rose due to organized festivals, cultural programs, and community gatherings, fostering cultural pride and social cohesion. Lastly, membership in formal and informal organizations increased as activities highlighted their benefits, offering social connections, resources, and collaboration opportunities. Overall, these results underscore the effectiveness of the fisheries development schemes in enhancing social capital within the community.

**Table 10 : Categorization of fishermen based on their overall livelihood assets**

(n=240)

Sr. No.	Category	Before		After	
		F	%	F	%
1	Low	98	40.83	44	18.33
2	Medium	112	46.67	129	53.75
3	High	30	12.50	67	27.92

The data presented in Table 4.31 demonstrates a noticeable difference in the distribution of livelihood assets among fishermen before and after the implementation of fisheries development schemes. Scientific analysis provides insights into the reasons for these observed changes.

Before the schemes, the majority of fishermen (46.67%) possessed a medium level of livelihood assets. This was followed by those with low levels of assets (40.83%) and a smaller proportion with high levels of assets (12.50%). These distributions represent the baseline situation and reflect the existing disparities in the fishermen's asset levels.

However, after the implementation of fisheries development schemes, there was a significant shift in the distribution of livelihood assets. More than half of the fishermen (53.75%) now had a medium level of assets, indicating an increase in this category. The proportion of fishermen with high levels of assets also notably increased to 27.92 percent. Conversely, the proportion of fishermen with low levels of assets decreased to 18.33 percent. The results are in line with findings of Chovatia *et al.*, (2024) of Gujarat

and Madhuprasad *et al.*, (2024) of Karnataka.

In conclusion, the significant difference in the distribution of livelihood assets before and after the implementation of fisheries development schemes indicates their effectiveness in improving the assets of fishermen. The positive changes can be scientifically attributed to interventions that targeted financial, human, social, and natural capital, thereby leading to an overall improvement in the livelihood assets of fishermen.

## CONCLUSION

The findings suggest that fisheries development schemes have had a positive impact on inland fisheries, particularly in Telangana, India. The schemes have contributed to improvements across various dimensions of livelihood assets for fishermen. Natural capital, such as aquatic resources and fish production areas, experienced remarkable growth, followed by financial capital, with increased income, savings, and access to credit. Human capital showed positive changes, including improved education, skills, and healthcare access. Social capital also saw enhancements in leadership, communication, participation, and community engagement. To further enhance inland fisheries, it's recommended to focus on sustainable management of natural resources, continued investment in infrastructure, and the expansion of educational and skill development programs. Strengthening social networks and cooperative efforts among fishermen can foster collaboration and knowledge sharing. Additionally, monitoring and evaluation mechanisms should be implemented to ensure the ongoing effectiveness of development schemes and their long-term benefits for both livelihoods and the environment.

## POLICY IMPLICATION

- (1) Emphasize an integrated approach to fisheries development, targeting physical, financial, human, natural, and social capital simultaneously for maximum impact.
- (2) Prioritize sustainable resource management to maintain fish stocks, habitat restoration, and responsible fishing practices.
- (3) Focus on empowerment through education, training, healthcare, and community engagement to enhance the capabilities and resilience of fishing communities.

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## CONFLICT OF INTEREST

This is to declare that there is “No conflict of interest” among researchers.

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