Research Article

Indian Journal of Extension Education
Vol. 59, No. 3 (July–September), 2023, (48-53)

ISSN 0537-1996 (Print)
ISSN 2454-552X (Online)

Livelihood Assessment of Fishers in Dal Lake, Kashmir

Shakir Ahmad Mir, Shekhar Nath Ojha*, Pachampalayam Shanmugam Ananthan, Neha Wajahat Qureshi, Shivaji Dadabhau Argade, Shahid Gul and Velumani Thangavel

Fisheries Economics, Extension and Statistics Division, ICAR-Central Institute of Fisheries Education Mumbai-400061, Maharashtra, India
*Corresponding author email id: snojha@cife.edu.in

ARTICLE INFO

Keywords: Livelihood, Vulnerability, Dal Lake, Kashmir, Network governance

http://doi.org/10.48165/IJEE.2023.59309

Conflict of Interest: None

ABSTRACT

The study investigates the livelihood conditions, vulnerability, and resilience of the Dal Lake fishers and their readiness and strength to withstand climate shocks and vulnerabilities. The study was conducted in 2019-2020 in three fishing villages of Dal Lake Kashmir, where the livelihood and vulnerability of fisheries-based livelihoods were assessed through a composite index development approach. The fishers of Dal Lake are moderately vulnerable to climate variability and changes. The status of the livelihood capitals of the fishers reveals that most of the capitals are of moderate type, however, the financial capital is poor horizontally among all the fishing villages. It was also found that the socio-economic conditions and resilience of the people are in very poor condition. The fisheries-related activities and policies are being side-lined because of giving more importance to tourism. The management of the lake is shared between the Fisheries & Tourism departments, and the Jammu and Kashmir Lakes Conservation and Management Authority (power). However, lack of coordination, less availability of resources, less priority to the fisheries sector, and lack of accountability hindered the desired outcomes. Proper management of the lake, coordination between the key stakeholders and fishers is very important and can be achieved through network governance.

INTRODUCTION

The fisheries sector is an essential source of food, nutrition, income, and livelihoods for millions of people and globally supports the livelihoods of around 59.51 million people through fisheries and aquaculture (FAO, 2022). Within the realm of fisheries management and development policy, the importance of sustainable small-scale fisheries has been increasingly recognized as a livelihood source for millions of households (Allison, 2001; Smith & Basurto, 2019).

As inland fisheries are an open access and culture system (Cooke et al., 2016), small-scale fishers mostly in developing countries, face different climatic shocks and stresses such as floods, cyclones, sea-level rise, droughts, land erosion, temperature, and rainfall fluctuations (IPCC, 2007; Islam et al., 2014). It leads to poverty, marginalization, and resource degradation of fishers. The increase in climate variability and extremes, linked to climate change, are affecting negatively all dimensions of food security and nutrition (FAO, 2022; Meena et al., 2022). It needs to focus on more economically efficient approaches for resilient livelihood and different means to conserve fish stocks through a combination of management measures (Allison & Ellis, 2001; Purcell & Pomeroy, 2015). Fishers need to be resilient (Allison et al., 2011) to fulfill their potential, and resilient livelihoods can evolve in response to these changing stresses and shocks (Olsson et al., 2002). Over the last two decades, the Sustainable Livelihoods Approach (SLA) globally played an essential role in framing and informing the debate on sustainable livelihoods and in analysing what enables and inhibits resilient and sustainable small-scale fisheries (Allison & Ellis, 2001; Andrew et al., 2007; Serrat, 2017). The fisher folk of Kashmir valley is the marginalized section of the society, which are prone to various shocks and seasonality trend cause of their

Received 31-05-2023; Accepted 05-06-2023

poor socio-economic conditions (Mir et al., 2022), more sensitivity, and less adaptive capacity. For instance, the fisherfolk in the Kashmir valley were severely impacted by the massive fish stock mortality that resulted from the flood in 2014, which had disastrous effects on fish variety. They depend entirely on the local fisheries resources for their livelihood, and any fluctuation in management and governance of these common resources engraves a direct impact on them. The water bodies of Kashmir, especially the lakes, are important destinations for tourists because of which the fisheries activities and policies are always side-lined or sometimes ignored (Wani et al., 2013). Besides this, the fishers are always being marginalized/ ignored at the cost of others due to the involvement of many stakeholders in the governance and management of these fisheries resources. This paper proposes that livelihood analysis could provide a means to better understand the nature of small-scale fishery production systems, and to identify appropriate entry points for development intervention or policy support for poverty reduction and livelihood enhancement in fishing communities.

METHODOLOGY

This study was carried in Dal Lake, the second largest lake in the capital city of Srinagar in Jammu and Kashmir. The SLA framework given by UNDFID (1999) was adopted to assess the livelihood resilience of the fishing communities with a primary focus on their differential capabilities and assets to deal with any kind of stresses and shocks. The vulnerability of the fishing communities was assessed by a composite vulnerability index approach by analysing exposure, sensitivity, and adaptive capacity following Islam et al., (2014). Exposure indicators include the frequency of extreme events, the annual rate of floods, and variations in temperature, snowfall, and rainfall. In sensitivity, only indicators of dependence of livelihoods on climate-sensitive activities in the fisheries sector, like for employment, income, and nutrition were used as its indicators to avoid overlapping (Macfadyen & Allison, 2009). The adaptive capacity and livelihood capitals were assessed at the individual household level and measured in terms of capital and assets owned, infrastructure, facilities available and means of livelihood (Vincent, 2007; Paavola, 2008; Salluet al., 2010). Following (Czu´cz et al., 2009), each indictaors was first normalized and then the average of respective indicators was taken to yield the three sub-indices for exposure, sensitivity, and adaptive capacity by using the formula:

$$SCvj = \sum_{i=0}^{n} Index\ svi$$

where *SCvj* is the sub-index value of the component *j* for household *v*; *Indexsvi* represents the value of indicators indexed by component *j*, and *n* is the number of indicators in each component.

Sub-indices were combined to create a composite vulnerability index by using the multiplicative equation approach because it better reflects low and high indicators and sub-index values than the additive equation approach (Hajkowicz, 2006).

$$V = E \times S \times (1\text{-}AC)$$

where *V, E, S,* and *AC* represent a household's vulnerability, exposure, sensitivity, and adaptive capacity, respectively.

Among 10 fishing villages on the periphery of the lake with 880 total registered fishers, Tailbal, Fisherman Colony (FMC) Habak and Dobighat villages were purposively taken having 125,110 and 118 registered fishers respectively because of more number of fishers and high degree of involvement in fisheries activities (DoF, 2020). A total of 180 fishers were selected using snow-ball sampling technique, with 60 fishers from each village. The data was gathered from fishers using a structured interview schedule and discussions with key informants and some department officials were also held. Frequency, percentage analysis and Kruskal Wallis t-test was used to used to describe and compare various parameters among the fishing villages.

RESULTS AND DISCUSSION

Vulnerability context

As vulnerability is a function of exposure, sensitivity, and adaptive capacity, so the individual indices were calculated for exposure, sensitivity, and adaptive capacity to assess the vulnerability status.

The results show that all the villages are similarly exposed to climatic variations as they lie either close to the lake periphery or in the nearby areas (within a radius of 5 km) with the same geographical and topographical conditions. The temperature data revealed that the minimum temperature was recorded in January (-15°C) and the maximum in July (32°C). The overall average temperature is 13.6°C, with a maximum average monthly temperature in July (23.3°C) and a minimum in January (2.5°C). The average monthly rainfall is 59 mm, with a maximum in March (121 mm) and a minimum in November (28 mm). Snowfall in Kashmir usually occurs in December, January, February, and slightly in March, with an average annual snowfall of 77 mm with a maximum in February (120 mm) and a minimum occurring in March (32.7 mm). Figure 1 shows the contribution of various variables to the total exposure index of fishers is 0.56, which depicts a moderate level of exposure with a major contribution from fluctuations in the rainfall. The excessive freezing temperature in winter, heavy rainfall, and recurrent floods are the main factors that expose and affect the fishing communities. Tailbal village is more exposed to floods than other villages because the Tailbal

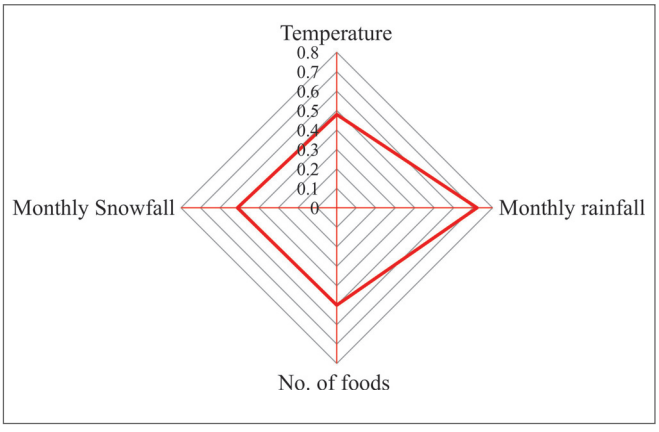

Figure 1. Exposure index of fishing villages

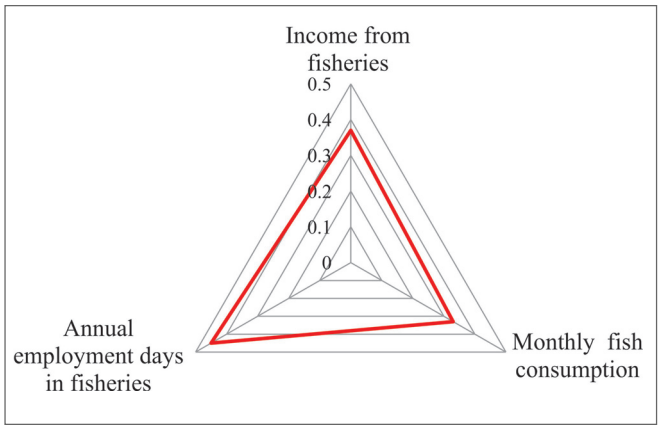

Figure 2. Sensitivity index of fishing villages

Nallah, the largest tributary of the lake, flows through the village and in the rainy season, gets fully flooded.

The results (Figure 2) show the higher sensitivity of fishers in Tailbal village is due to their dependence on climate-sensitive fisheries activities for employment, income, and nutrition and same was revealed by the discussions with the key informants from the village. This is depicted by the higher number of annual employment days in fisheries activities and also by the oral history and focus group discussion with key informants. This has increased their dependency on fisheries and, thus, their vulnerability.

The adaptive capacity index shows a value of 0.52, 0.51, and 0.44 for FMC Habak, Dobighat, and Tailbal villages respectively depicting the lowest adaptive capacity in Tailbal village. The cumulative index value for the adaptive capacity for all three villages was 0.48 showing that they have a moderate level of adaptive capacity. The lower index value was because of the poor economic condition of fishers, lack of capital assets, less livelihood diversity, poor access and availability of natural resources, and poor housing conditions. The same results have been revealed by livelihood capital analysis where the finance capital was the weakest in all three villages.

Table 1, shows the overall vulnerability scores of the three fishing villages and reveals that households of Dal Lake are moderately vulnerable. However, Tailbal village is more vulnerable to climatic variation than the other two villages, depicted by a high value of 0.04 (LVI ranges from -1 to +1, -1 low vulnerable and +1 more vulnerable- Islam et al., 2014). These findings are in line with Islam et al., (2014) & Meena et al., (2022). As these fishing villages are exposed uniformly, the Tailbal village is more vulnerable because of its high sensitivity and low adaptive capacity. The results highlight that for similarly exposed households, the higher livelihood vulnerability coincides with the higher sensitivity and lowest adaptive capacity.

Table 1. Vulnerability index scores of fishing villages

Village	Index values			Livelihood
	Exposure	Sensitivity	Adaptive capacity	Vulnerability Index (LVI)
Tailbal	0.56	0.40	0.44	0.04
Dobighat	0.56	0.36	0.51	0.02
FMC Habak	0.56	0.35	0.52	0.01
Mean	0.56	0.38	0.49	0.02

The Kruskal-Wallis test was used to determine the significant difference between the villages in terms of adaptive capacity and sensitivity. The results from Table 2, inferred that there is a significant difference ($p<0.01$) between the villages in terms of their sensitivity and adaptive capacity, with a low mean rank for Tailbal village and a high mean rank for FMC Habak. A comparison of vulnerability among fishing villages reveals a significant difference between the villages in terms of vulnerability with a high vulnerability mean score for Tailbal village, low in FMC Habak and intermediate in Dobighat.

Livelihood capitals

Evaluating livelihood resilience at the level of fishers and their households requires identifying the factors that enable or constrain livelihood resilience. The five livelihood capitals of the SLA framework were used, and under each capital, various attributes/ variables were selected (5 to 9). All these attributes were chosen to determine the sustainability and resilience of fishers' livelihoods (modified from Stanford et al., 2017). These were grouped into five "fields," corresponding to the five standard capital categories of the SLA (Natural, Human, Physical, Financial, and Social Capitals). A brief description of each field is provided below:

Natural resources and environmental services, from which resources are derived and services necessary for subsistence are derived, are included in natural capital. The index values for natural capital were determined using the weighted normalised values of several variables under all attributes. The nearest town's distance had the highest natural capital value (0.88), indicating that villages are close to the main city-an average distance of 5 km-and possession of the land had the lowest value (0.04), reflecting the fact that the majority of respondents did not own any land assets. According to Table 3, the fishers have a moderate level of natural capital, with an average index value of 0.48.

Table 3 shows the various attributes of human capital, and it is evident that female members of the household play a significant role in the marketing of the catch. They act as primary bread earners for their families, especially during the ban/ winter season; as indicated by their attribute score (0.90). There is a lack of occupational diversity (0.37), among fishers as most of them were involved in capture fishery only. It has reduced their capability for

Table 2. Test of significance among the fishing villages

Village	N	Adaptive capacity			Sensitivity			Vulnerability		
		Mean rank	Chi-square	p-value	Mean rank	Chi-square	p-value	Mean rank	Chi-square	p-value
Tailbal	60	3.15	0.366	<0.01	1.35	0.543	<0.01	55.27	6.872	<0.01
Dobighat	60	3.52			6.40			42.7		
FMC Habak	60	3.55			8.75			38.78		

Table 3. Village wise index values of attributes of livelihood capitals

S.No.	Attributes	Normalized index values			
		Tailbal	Dobighat	FMC Habak	Average value
	Natural capital (0.47)				
1	Distance to the nearest town	0.64	1.00	1.00	0.88
2	Change in catch, over last 20 years	0.31	0.28	0.29	0.29
3	Change in revenue generated over last 20 years	0.23	0.28	0.29	0.27
4	Possession of land by household	0.04	0.02	0.08	0.05
5	Loss due to natural disaster	0.80	1.00	0.98	0.93
	Human capital (0.53)				
1	Availability of time and potential to do extra work	0.96	0.92	0.91	0.93
2	Market awareness	0.44	0.49	0.53	0.49
3	Occupational diversity	0.34	0.38	0.39	0.37
4	Entrepreneurial behaviour	0.07	0.03	0.03	0.04
5	Activities done by female household members	0.88	0.93	0.88	0.90
6	Number of children present in the family	0.60	0.63	0.61	0.61
7	Importance and aspiration of education for children	0.71	0.60	0.83	0.71
8	Planning for future	0.05	0.03	0.03	0.04
9	Daily household expenditure	0.62	0.85	0.72	0.73
	Physical capital (0.45)				
1	Possession of boat by the respondent/ fisher	0.68	0.72	0.73	0.71
2	Availability of fishing gears and their performance	0.53	0.53	0.63	0.57
3	Ownership of assets	0.33	0.31	0.34	0.33
4	Value addition/ processing of catch by household	0.65	0.63	0.62	0.63
5	Housing condition	0.43	0.50	0.48	0.47
6	Marketing of the catch	0.30	0.03	0.12	0.15
	Financial capital (0.40)				
1	Money saving habit/ ability	0.48	0.38	0.33	0.40
2	Collateral for credit	0.07	0.03	0.15	0.08
3	Access to credit from various sources	0.50	0.49	0.53	0.51
4	Repayment capacity of the respondent	0.37	0.41	0.54	0.44
5	Arrangement of money in different situations	0.38	0.46	0.64	0.49
6	Supplementary livelihood source besides fishing	0.27	0.25	0.33	0.28
	Social capital (0.51)				
1	Attitude of working together in community	0.02	0.02	0.02	0.02
2	Trustworthiness of people in the community	0.40	0.77	0.62	0.59
3	Helping behaviour of community leaders	0.32	0.55	0.20	0.36
4	If you have a problem who will help you	0.64	0.69	0.70	0.68
5	Everyone have an equal right to contribute their view	0.32	0.75	0.80	0.62
	Mean capital index score	0.45	0.49	0.50	0.48

doing any future planning because of a lack of necessary funds, as indicated by the attribute score of 0.03, and signifies the need for alternative livelihoods. The index value of human capital (0.52) is of moderate type and to make it stronger, more focus should be given to alternate livelihoods, involving women in livelihood activities and providing them with necessary credit facilities.

According to Daw et al., (2013), physical assets are the producer products and essential infrastructure required to support a way of life. Table 3 shows the scores for key physical capital features and illustrates fishers lack basic amenities, access to suitable marketing facilities, forcing them to sell their catch on Srinagar's pathways and in other villages. The physical capital is also of a moderate nature, with an index score of 0.47, like the aforementioned two capitals. It may be strengthened by providing appropriate marketing facilities, value-adding their catch, departmental subsidies for gear and crafts, and improving their overall housing situation.

For the purpose of pursuing any livelihood activity, financial capital includes a capital basis (cash, credit/debt, savings, and other financial assets). Table 3, shows the majority of fishers didn't have the requisite collateral to obtain credit, hence this attribute received the lowest score (0.08). However, friends and family were the principal sources of credit, and they had a very high repayment capability (0.64 on the index). Overall, the financial capital index indicates a value of 0.43, indicating a moderate level of financial capital also found by Qureshi et al., (2017). It should be strengthened by giving additional sources of income that will increase their ability to save money fair consideration.

Social capital includes social resources like networks, social claims, social relations, affiliations, and associations upon which people pursue different livelihood strategies. Table 3 shows that most of the fishers were unwilling to work together in groups (0.01) probably because of less importance to group work and absence of cooperative society. They have great concern for others

in their community and used to help each other as indicated (0.85). The average value of the social capital index is 0.52, which shows that their social capital is of moderate type. To improve the social capital of fishers, focus should be given to joint working activities, rotational type leadership, accountability and establishing cooperative societies.

Discussions with key informants and department representatives also showed that Dal Lake fishers have inadequate physical assets, and that they are financially weak due to a lack of capital for alternate sources of income and more dependence on fishing operations. However they care and support other fishers in the community, and they do support one another in times of need or crisis.

The Kruskal-Wallis test was used to compare the livelihood capitals of three fishing villages and it was found that there is a significant difference in livelihood capitals among the villages, X^2 (3) =10.366. p<0.01 with a mean rank of 33.15 for Tailbal, 49.80 for Dobighat, and 53.55 for FMC Habak. The results show lower values of livelihood capital for Tailbal villages which indicate that the livelihood capitals are weak in the Tailbal village fishers and is probably one of the reasons for their high vulnerability.

Suggestive measures

The J&K State Department of Fisheries (DoF), J&K State Department of Tourism (DoT), J&K Lake Conservation and Management Authority (JKLCMA), fishers, and people living on the lake periphery are involved to manage various facets of the lake. The primary issues with the fisheries components of the lake are the lack of cooperation between DoF and other departments and the lower priority given to fisheries activities because of their minimal financial contribution to the state (Mir et al., 2022).The creation of alternative livelihoods to decongest the lake should focus on the abilities of the fishers, such as cage culture, ornamental fish culture/rearing, aquarium manufacturing, and aqua-based ecotourism, and the fishers should be given suitable marketing facilities. Also, strict enforcement of laws preventing the flow of civic discharge into the lake by improving the already established STPs and developing new ones.

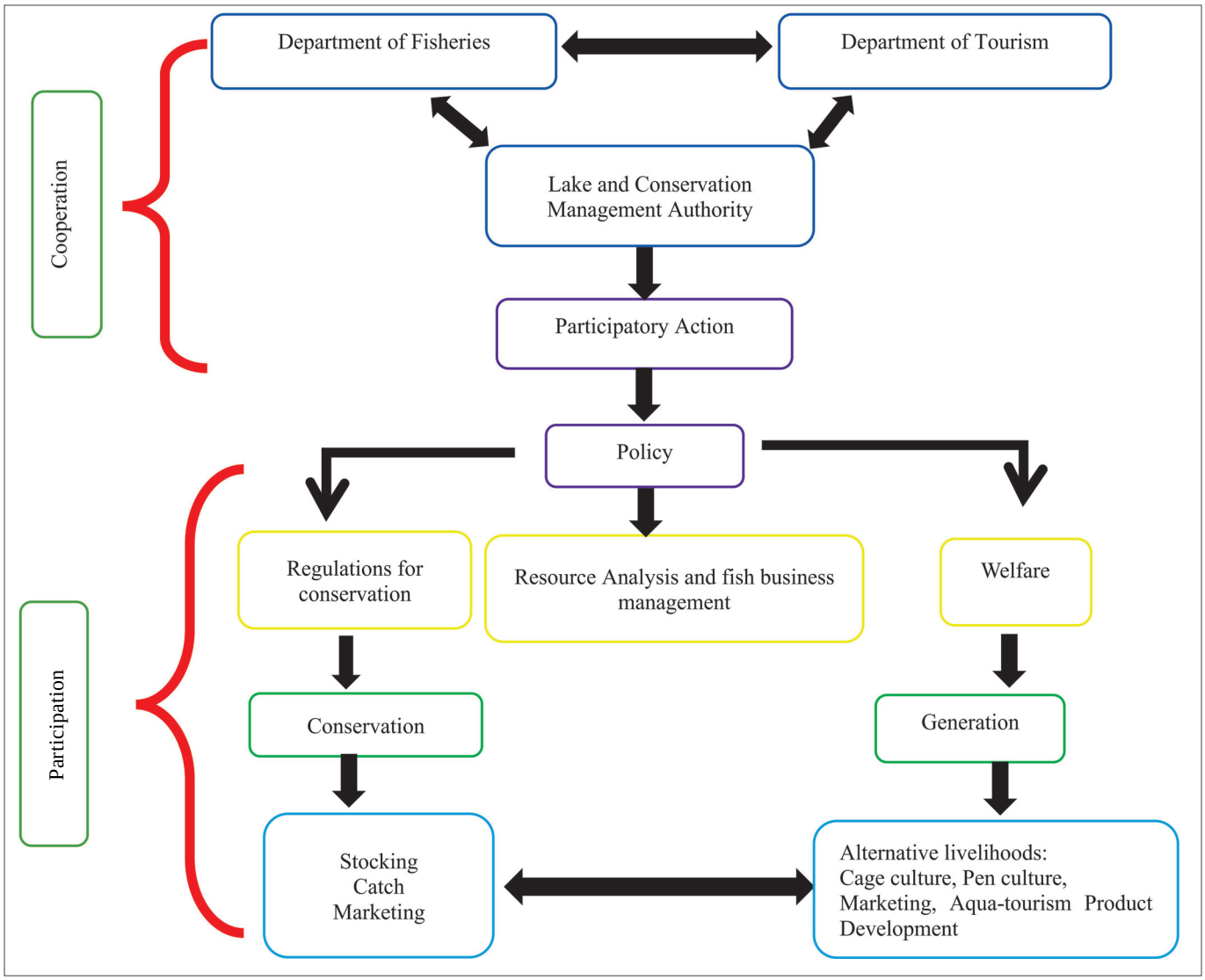

Figure 3. Network Governance for fisheries co-management in Dal Lake

Network governance

Institutional efficiency and networking performance need to be greatly enhanced, to enhance lake management as shown in Figure 3. This can be done in two steps:

Coordination and integration between the important parties involved in the governance and management of the lake is the first step. All participants should agree upon and evaluate the viability of any proposed policy, programme, or project before drafting and putting it into action also reported by also Priyanka & Devarani (2022). When these actors cooperate, the participation will be the next logical step and should ensure that policies and programmes are implemented correctly at the ground level. This will improve fishers well-being and contribute to the development and preservation of the ecosystem.

CONCLUSION

Dal lake being a famous tourist destination is also as an important source of fish and livelihood to the people. Most fisher households have a moderate vulnerability because of more sensitivity and weak adaptive capacity. The fishers livelihood depend on the lake and have moderate livelihood capitals, with social capital being the strongest and financial capital the weakest. The production and productivity of the lake has declined over the years, which resulted in the low income of fishers and thus made them more vulnerable. Proper management an governance, providing alternate livelihood to the fishers will help to prevent the over-exploitation of the fish and also improve the socio-economic condition of the people thus making them less vulnerable and more resilient to different climatic, social, economic, and natural shocks.

REFERENCES

Allison, E. H. (2001). Big laws, small catches: global ocean governance and the fisheries crisis. *Journal of International Development, 13*(7), 933-950.

Allison, E. H., Béné, C., & Andrew, N. L. (2011). 12 Poverty reduction as a means to enhance resilience in small-scale fisheries. *Small-scale fisheries management: frameworks and approaches for the developing world*, 216.

Cooke, S. J., Allison, E. H., Beard, T. D., Arlinghaus, R., Arthington, A. H., Bartley, D. M., & Welcomme, R. L. (2016). On the sustainability of inland fisheries: Finding a future for the forgotten. *Ambio*, *45*, 753-764.

Czúcz, B., Torda, G., Molnár, Z., Horváth, F., Botta-Dukát, Z., & Kröel-Dulay, G. (2009). A spatially explicit, indicator-based methodology for quantifying the vulnerability and adaptability of natural ecosystems. *WL Filho& F. Mannke, Eds., Interdisciplinary Aspects of Climate Change*, pp 209-227.

Daw, T., Adger, N., Brown, K., & Badjeck, M. C. (2009). Climate change and capture fisheries: potential impacts, adaptation and mitigation in Cochrane, K., Young, CD, Soto, D., & Bahri, T. (eds) Climate change implications for fisheries and aquaculture: overview of current scientific knowledge.

DFID, U. K. (1999). Sustainable livelihoods guidance sheets. *London: DFID*, *445*.

DoF (2020). Department of Fisheries, Srinagar, Jammu and Kashmir, India. Annual Report 2019–20.

DoT (2022), Department of Tourism Jammu and Kashmir, http://www.jktourism.jk.gov.in/List/List.aspx

FAO (2022). The State of world fisheries and aquaculture 2022. FAO Fisheries and Aquaculture

Hajkowicz, S. (2006). Multi-attributed environmental index construction. *Ecological Economics*, *57*(1), 122-139.

IMD Srinagar (2019). Indian Meteorological Department Meteorological-Centre Srinagar https://mausam.imd.gov.in/srinagar

IPCC. (2007). Fourth assessment report. Intergovernmental panel on climate change. Secretariat. Geneva, Switzerland.

Islam, M., Sallu, S., Hubacek, K., & Paavola, J. (2014). Vulnerability of fishery-based livelihoods to the impacts of climate variability and change: insights from coastal Bangladesh. *Regional Environmental Change*, *14*(1), 281-294.

Macfadyen, G., & Allison, E. (2009). Climate change, fisheries, trade and competitiveness: understanding impacts and formulating responses for Commonwealth small states.

Meena, D. C., Dubey, R. K., Pal, R., Dubey, S. K., & Bishnoi, R. (2022). Assessment of Farmer's Attitude and Social Vulnerability to Climate Change in the Semi-arid Region. *Indian Journal of Extension Education, 58*(3), 46-50.

Mir, S. A., Ojha, S. N., Ananthan, P. S., Qureshi, N. W., Argade, S. D., Gul, S., & Thangavel, V. (2022). Assessment of Fisheries and Management-Insights from Dal Lake, Kashmir. *Indian Journal of Extension Education, 58*(4), 60-65.

Olsson, P., Folke, C., & Berkes, F. (2004). Adaptive co-management for building resilience in social–ecological systems. *Environmental Management*, *34*(1), 75-90.

Paavola, J. (2008). Livelihoods, vulnerability and adaptation to climate change in Morogoro, Tanzania. *Environ Science Policy, 11*, 642–654.

Priyanka, P. S., & Devarani, L. (2022). Capturing community participation in rural tourism through PRA: A Study in Meghalaya. *Indian Journal of Extension Education, 58*(2), 35-41.

Purcell, S. W., & Pomeroy, R. S. (2015). Driving small-scale fisheries in developing countries. *Frontiers in Marine Science*, *2*, 44.

Qureshi, N. W., Krishnan, M., Wani, S. A., Sivaramane, N., &Sundaramoorthy, C. (2017). Negative Externalities in Kashmir Lake Fisheries: Transformation in Species Patronage, Use Priorities and Policy. *Indian Journal of Agricultural Economics*, *72*(1), 89-101.

Sallu, S. M., Twyman, C., & Stringer, L. C. (2010). Resilient or vulnerable livelihoods? Assessing livelihood dynamics and trajectories in rural Botswana. *Ecology and Society*, *15*(4).

Serrat, O. (2017). The sustainable livelihoods approach. In *Knowledge Solutions* (pp. 21-26). Springer, Singapore.

Smith, H., & Basurto, X. (2019). Defining small-scale fisheries and examining the role of science in shaping perceptions of who and what counts: a systematic review. *Frontiers in Marine Science*, *6*, 236.

Stanford, R. J., Wiryawan, B., Bengen, D. G., Febriamansyah, R., & Haluan, J. (2017). The fisheries livelihoods resilience check (FLIRES check): A tool for evaluating resilience in fisher communities. *Fish and Fisheries*, *18*(6), 1011-1025.

Vincent, K. (2007). Uncertainty in adaptive capacity and the importance of scale. *Global Environmental Change, 17*(1), 12-24.

Wani, M. H., Baba, S. H., Yousuf, S., Mir, S. A., & Shaheen, F. A. (2013). Economic valuation and sustainability of Dal Lake ecosystem in Jammu and Kashmir. *Knowledge Systems of Societies for Adaptation and Mitigation of Impacts of Climate Change*, pp 95-118.