Small-Scale Fishing Communities of Mahuva Light House, Bhavnagar, Gujarat: Livelihoods, Climate Risks, and Development Pathways

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Need Assessment Report

September 2025

Prepared by

Utthan
36, Chitrakut Twins, B/h Management Enclave, Nehru Park, Vastrapur, Ahmedabad Gujarat 380015
Email:contact@utthangujarat.org
Website: www.utthangujarat.org

Cover page design by
Dr. V.Selvakumar

Photo credit
Ms.Manisha Patel

Authorship Contribution Statement

- **Dr. Selvakumar Vellingiri**
  Conceptualization, Methodology, Field Design, Data Analysis, and Writing – Original Draft.
  Led the design and conduct of the study, analysed findings, and authored the report on behalf of *Utthan*.
- **Manisha Patel**
  Conceptualization, Qualitative Data Collection, Writing – Draft, and Editing.
  Contributed to the research design and development of the study, undertook qualitative data collection, and co-authored the report on behalf of Utthan.

Research Team

- **Jitendra Maru**
- **Shilpa Bambaniya**

Roles: Data collection, field facilitation, community mobilisation, and stakeholder engagement.

Publication date
September 2025
Publisher: Utthan, Ahmedabad, India

Suggested Citation
Vellingiri, S., & Patel, M. (2025). *Small-Scale Fishing Communities of Mahuva Light House, Bhavnagar, Gujarat: Livelihoods, Climate Risks, and Development Pathways – Need Assessment Report.* Utthan, Ahmedabad, India.

ISBN: 978-81-685316-2-8

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Message from CEO, Utthan

I am pleased to present this need assessment report for Mahuva Light House, a fishing village in Bhavnagar district. This report marks a significant step in Utthan's commitment to advancing climate-resilient livelihoods with a focus on gender equity. It aims to amplify the voices of marginalized communities, ensuring their perspectives shape the future of development.

For more than 40 years, Utthan has been deeply involved with women, small-scale farmers, fisherfolk, and tribal communities across Gujarat. We have learned that meaningful change occurs when communities are empowered to share their stories, traditional knowledge is valued, and local solutions are supported. The fisherfolk of Mahuva Light House, particularly the Pagadiya fishers, are central to this vision. Their time-tested, low-impact fishing methods help preserve marine biodiversity and ensure the food security of coastal households. Yet, they continue to face systemic marginalization, especially in policy discussions that overlook their contributions to both the economy and the environment.

This assessment of the Mahuva Light House community is not just an academic exercise; it is a reflection of their lived experiences, challenges, and hopes for the future. While the community exhibits resilience through their strong social networks, women's federations, and deep knowledge of the sea, they also face significant vulnerabilities, such as unstable incomes, inadequate access to welfare programs, environmental degradation, and conflicts with industrial fishing practices. These findings emphasize the urgent need for policy reforms that place small-scale fisherfolk on equal footing with other livelihood groups in terms of recognition, support, and rights.

The recommendations emerging from this study are grounded in the voices of the community, validated through discussions in village assemblies. They offer practical, actionable solutions—ranging from simplified licensing processes and the creation of fisherfolk collectives to improved infrastructure, financial protection, and climate resilience. Realizing these interventions will require a concerted effort from the government, civil society, and the private sector, in partnership with the fisherfolk themselves.

I extend my sincere gratitude to the fisherfolk of Mahuva Light House for sharing their experiences and insights. My appreciation also goes to **Ms. Pallavi Sobti-Rajpal** (Joint CEO) and **Ms. Jaya Chavda** (Area Manager, Coastal) for their guidance in shaping this study. A special thank you to **Dr. Selvakumar Vellingiri** and **Ms. Manisha Patel** for leading the research and report writing, and to the field team — **Mr. Jitendra Maru** and **Ms. Shilpa Bambaniya** — for their dedication to data collection, facilitation, and community engagement. We also acknowledge the support of the Duleep Matthai Nature Conservation Foundation (DMNCF) for making this study possible.

Warm regards,
Pravin Bhikadiya
CEO, Utthan

Executive Summary

This need assessment of Mahuva Light House village, Bhavnagar district, explores the livelihoods, socio-economic conditions, institutional challenges, and environmental vulnerabilities of small-scale fisherfolk. Based on household surveys (N = 70) and village assemblies conducted in 2025, the study highlights key resilience factors and areas for improvement.

Key Findings

- **Livelihoods:** Fishing dominates (85.7%), particularly Pagadiya fishing. However, income remains seasonal and unstable with a median annual income of ₹65,000. Women contribute significantly in post-harvest activities but are undervalued.
- **Economic Conditions:** While all households own homes, the lack of land titles (pattas) creates tenure insecurity. Limited access to formal credit and the absence of insurance worsen financial vulnerabilities.
- **Social Capital:** Women's federations are well-established, but there is no fisherfolk collective (Munch), and uptake of government welfare schemes is low.
- **Physical Capital:** Basic infrastructure (electricity, gas) is widespread, but sanitation and cold storage facilities are lacking, reducing market access.
- **Natural Capital:** Over 60% of households report declining fish diversity, worsened by cyclones, plastic pollution, and unregulated juvenile fish capture.
- **Governance:** Awareness of fishing regulations is high, but legal support and grievance mechanisms are absent. Conflicts with industrial fishing operations are common.

Recommendations

- **Licensing & Regulation:** Decentralize licensing and simplify renewals for vulnerable groups, including awareness camps.
- **Financial Inclusion:** Improve access to schemes, provide insurance for boats, and facilitate credit through SHGs and cooperatives.
- **Livelihoods & Training:** Diversify livelihoods (e.g., rope making, aquaculture) with stipends and mentoring for women.
- **Infrastructure & Markets:** Develop cold storage, auction platforms, and women's cooperative stalls; explore digital market linkages.
- **Social Protection:** Extend pensions, health insurance, and disaster compensation, particularly for widows and the elderly.
- **Climate & Environment:** Install plastic filtering systems and enhance awareness on juvenile fish capture; implement early warning systems.
- **Gender Equity in Governance:** Ensure women's representation in village-level decision-making.
- **Governance & Support Systems:** Establish fisherfolk collectives, expand extension services, and integrate needs into village development plans (GPDP).

Conclusion

Mahuva Light House's fisherfolk show resilience through community networks and traditional knowledge, but remain vulnerable due to economic instability, environmental stress, and institutional neglect. Strengthening livelihoods, institutional access, and environmental resilience is crucial for their sustainable future.

Chapter 1: Introduction

Aquatic food systems are highly diversified and furnish a variety of environmental, economic, and social benefits and services. They are increasingly recognized – both in the international arena and in the majority of countries and communities – for their nutritional value and ecosystem services that they deliver, upholding healthful diets and sea life. More than they've ever been, they are viable solutions and avenues for increasing global food security and nutrition, enhancing income, and preserving the environment.[1]

The Indian fishery sector plays a pivotal role in the nation's economy, employment generation, and food security. As one of the **top global producers of fish**, India contributes significantly to both **domestic nutrition** and **international trade**. According to recent data from the Ministry of Fisheries, Animal Husbandry and Dairying, India achieved a **total fish production of approximately 17.545 million metric tonnes in 2022–23**, reflecting a substantial increase from previous years and marking a robust growth trajectory[2]

This growth has been especially driven by the inland aquaculture segment, which accounted for over **131.13 lakh tonnes**—more than doubling since 2013–14. India now contributes about **8% of global fish production**, ranking as the **third-largest fish producer** globally and the **largest inland fish producer**[3]. These figures highlight the sector's growing importance and its alignment with national objectives under schemes such as the Pradhan Mantri Matsya Sampada Yojana (PMMSY), aimed at enhancing sustainable fisheries, infrastructure, and livelihoods.

India, with a coastline stretching over 8,000 kilometres and an extensive network of rivers, lakes, reservoirs, and other inland water bodies, possesses immense potential for the development of both capture and aquaculture fisheries. The fisheries sector continues to serve as a vital source of livelihood for millions of fishers and fish farmers, particularly in rural and coastal regions. Beyond its economic significance, the sector contributes meaningfully to the nutritional requirements of the population, with fish being recognised as a major source of affordable animal protein. In this context, the **National Fisheries Policy** has been envisaged as a comprehensive framework aimed at enhancing fish production and productivity, encouraging the adoption of sustainable and responsible fishing practices, and improving the socio-economic well-being of the fisherfolk through targeted interventions and institutional support mechanisms. (Ministry of Fisheries, Animal Husbandry and Dairying, 2020).

Moreover, the Indian fisheries sector is confronted with several critical challenges, including overexploitation of marine resources, degradation of aquatic habitats, and the adverse impacts of climate change, all of which pose significant threats to the long-term sustainability of fish stocks and the health of aquatic ecosystems. Recognising these concerns, the Government of India has undertaken a series of measures aimed at ensuring ecological balance and sustainable resource utilisation. Key interventions include the promotion of responsible fishing practices, the encouragement of technological innovations in aquaculture, and the establishment and effective management of marine protected areas (MPAs). These efforts are aligned with national policy objectives and international commitments to conserve biodiversity while securing the livelihoods of fishing communities[4].

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[1] https://openknowledge.fao.org/items/06690fd0-d133-424c-9673-1849e414543d
[2] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2083813
[3] https://nfdb.gov.in/PDF/State_Fishes_and_Aquatic_Animals_of_India_2024.pdf
[4] Pillai, N. G. K., et al. (2021). Sustainable Fisheries Management in India: Challenges and Opportunities. Indian Journal of Fisheries.

Oceans constitute the largest ecosystem on Earth, covering nearly three-fourths of the planet's surface, and form a critical arena for addressing complex and interlinked developmental challenges such as livelihood generation, climate resilience, maritime trade, and national security. Within this context, the Indian Ocean holds strategic importance, contributing significantly to the economic sustenance, food security, and geopolitical interests of its littoral states. For India, the maritime domain is both vast and vital—comprising a coastline of 8,118 kilometres, encompassing nine maritime states—namely Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, and West Bengal—and four maritime Union Territories, including Daman and Diu, Puducherry, Lakshadweep, and the Andaman and Nicobar Islands. This extensive coastal and island geography provides direct and indirect livelihood opportunities to millions of coastal communities, particularly those engaged in fishing, aquaculture, and allied marine activities. The Indian coastline, therefore, is not only a geographical asset but also a socio-economic lifeline for the nation's blue economy aspirations.[5] This extensive coast supports a 0.53 million km^2 continental shelf and an Exclusive Economic Zone (EEZ) of 2.02 million km^2, with an estimated annual fish yield potential of 3.93 million tonnes according to Standing Committee on Agriculture (2019–2020).[6]

Marine fisheries constitute a crucial component of India's fisheries sector, with substantial contributions originating from coastal states such as Gujarat, Tamil Nadu, Kerala, West Bengal, and Maharashtra. India is currently recognised as the third-largest fish-producing country globally and holds the distinction of being the second-largest aquaculture producer, following China. The nation contributes approximately 7% of global fish production, underscoring its strategic position in the global seafood economy.

Further enhancing its ecological significance, India is identified as one of the 17 mega-biodiverse countries, harbouring more than 10% of the world's fish biodiversity. This rich aquatic diversity supports a range of marine and inland ecosystems, reinforcing both ecological sustainability and resource availability. In addition to being the largest producer of shrimp globally, India's fisheries sector plays a vital role in ensuring domestic food and nutritional security, while also catering to a robust and expanding international seafood export market. These strengths position the country as a key stakeholder in advancing sustainable fisheries governance and blue economy objectives at both regional and global levels.

India's Coastal and Fisherfolk Profile: A State-wise Perspective

As per the Marine Fisheries Census, 2016, India's extensive coastline, measuring approximately 8,162 kilometres, spans 13 coastal states and Union Territories, supporting a dynamic and culturally rich maritime ecosystem. This coastal belt encompasses 1,363 landing centres and 3,477 marine fishing villages, serving as the backbone of the country's marine fisheries infrastructure. The sector supports a sizable and socio-economically significant population of 37,74,577 fisherfolk, including 6,00,890 families classified as living below the poverty line, thus underscoring both the economic relevance and developmental challenges of coastal communities in India.

Among the maritime states, Tamil Nadu stands out prominently with 349 landing centres and 575 fishing villages, sustaining the largest fisherfolk population, estimated at 7,95,708 individuals. The state also accounts for one of the highest numbers of traditional fishing families, numbering 1,96,784, reflecting its deep-rooted association with marine livelihoods. Andhra Pradesh follows

[5] https://pib.gov.in/PressReleseDetailm.aspx?PRID=1802384&reg=3&lang=1

[6] MPEDA, 2018. MPEDA Annual Report. Retrieved from. https://www.mpeda.gov.in /MPEDA/admin/app/webroot/files/annualreport/1550120514MPEDAAR201718. pdf.

as another significant contributor to the sector, with 1,52,062 traditional fishermen families, highlighting its pivotal role in India's marine fisheries production and coastal economy.

These figures not only illustrate the scale and dispersion of India's coastal fishing population but also reaffirm the critical importance of ensuring inclusive policy frameworks that support livelihood security, infrastructure development, and social protection mechanisms for coastal fisherfolk.

Kerala holds a prominent place in India's fisheries landscape, rooted in a long-standing maritime tradition and a robust coastal culture. The state is home to 1,16,598 traditional fishermen families and supports a fisherfolk population of 5,63,903, reflecting both its historical engagement and contemporary significance in the marine fisheries sector. In contrast, Gujarat, despite possessing the longest coastline in the country—approximately 1,600 kilometres, accounts for 67,610 fishermen families, underscoring the regional diversity in fisheries resource distribution and utilisation across coastal states.

Among the Union Territories, the Lakshadweep Islands and the Andaman & Nicobar Islands make notable contributions to India's artisanal fisheries sector. Though their populations are comparatively smaller, these island territories possess ecologically unique and sensitive coastal ecosystems, which support traditional fishing practices and serve as the primary livelihood base for local fisherfolk communities. Their role in sustaining small-scale marine livelihoods, conserving marine biodiversity, and preserving indigenous fishing knowledge systems is critical, particularly within the broader framework of sustainable coastal resource management and inclusive blue economy development. (see Table 1).

Table 1 India's Coastal area and Fisherfolk state wise

State	Coastal length (km)	Landing centres	Fishing villages	Fishermen families	Traditional fishermen families	BPL families	Fisherfolk population
West Bengal*	158	49	171*	81,067	56,447	55,301	3,68,816
Odisha	480	55	739	1,15,228	92,569	48,601	5,17,623
Andhra Pradesh	974	234	533	1,55,062	1,52,062	1,50,669	5,17,435
Tamil Nadu	1,076	349	575	2,01,855	1,96,784	1,83,683	7,95,708
Puducherry	45	22	39	14,347	14,328	12,968	50,270
Kerala	590	174	220	1,21,637	1,16,598	72,507	5,63,903
Karnataka	300	84	162	32,479	30,897	27,312	1,57,989
Goa	104	32	41	2,986	2,922	650	12,651
Maharashtra	720	155	526	87,717	80,906	27,400	3,64,899
Gujarat	1,600	107	280	67,610	64,395	19,123	3,54,992
Daman & Diu	21	8	12	3,163	3,094	20	15,836
Lakshadweep**	132	37	10	4,163	3,003	1,170	27,934
Andaman & Nicobar***	1,962	57	169	5,944	4,486	1,486	26,521
Total	8,162	1,363	3,477	8,93,258	8,18,491	6,00,890	37,74,577

*** Subsequent reference to villages means Gram Panchayat in West Bengal. ** Fishing islands. ***Landing centres/Landing points (Source: Marine fisheries Census 2016 India)**

The Indian fisheries sector not only supports the livelihoods of around 30 million people, especially in coastal and rural communities, but it also holds immense potential for growth, job creation, and rural development (Ministry of Fisheries, Animal Husbandry & Dairying,2024).[7]

The statistics released by the Ministry of Commerce & Industry (2024) shows that India has significantly increased in seafood exports over the past few years, achieving a growth of 30.81% from 2019-20 to 2023-24. Further it was noted that over the past five years, India's marine product production and exports have steadily increased. From 141.64 lakh tonnes in production and 13.29 lakh tonnes in exports in 2019-20, production rose to 147.25 lakh tonnes while exports dipped in 2020-21 primarily due to the global COVID-19 pandemic. By 2021-22, production reached 162.48 lakh tonnes and exports 13.98 lakh tonnes. This trend continued with production at 175.45 lakh tonnes and exports at 17.54 lakh tonnes in 2022-23. For 2023-24, production is projected to be 182.70 lakh tonnes, with exports expected to reach 18.19 lakh tonnes.[8]

India's seafood export value has experienced a significant upward trend over the past five years. In 2019-20, exports were valued at ₹46,662.85 crore, followed by a slight dip to ₹43,720.98 crore in 2020-21. The sector rebounded strongly in 2021-22, with exports reaching ₹57,586.48 crore, and further increased to ₹63,969.14 crore in 2022-23. For 2023-24, the export value is projected at ₹61,043.68 crore.

India stands as a mega-diverse nation, boasting a remarkable wealth of fish species. This biodiversity is a cornerstone of the country's ecological and economic fabric, underpinning its fisheries and aquaculture sectors. With a staggering 3,231 fish species, comprising approximately 9.7% of the global total, India harbours a significant portion of the world's ichthyofauna(Gopi & Mishra, 2015). This diverse assemblage is a testament to the country's varied marine and freshwater ecosystems, ranging from the vast oceans to the intricate riverine networks and serene lakes.

1.1 India's Aquatic Biodiversity: Marine Dominance, Freshwater Riches, and Conservation Concerns

India's aquatic ecosystems reflect a vast and diverse ichthyofauna. Marine ecosystems dominate this diversity, accounting for 75.6% of all fish species in the country. Approximately 2,443 marine fish species are recorded across 927 genera and 230 families. The Andaman and Nicobar Islands, a remote and ecologically distinct archipelago, are recognized as a major hotspot of marine biodiversity, harbouring a remarkable 1,431 fish species (Gopi & Mishra, 2015).

India's freshwater ecosystems—including rivers, lakes, wetlands, and reservoirs—also support a rich variety of fish species. These are especially concentrated in the ecologically sensitive regions of the Western Ghats and Northeast India.

In terms of endemism, India is home to 223 endemic fish species, representing 8.75% of the country's total fish species. However, this rich biodiversity is under threat. Approximately 50 marine fish species are listed as threatened and 45 as near threatened on the IUCN Red List, underscoring the urgent need for targeted conservation efforts.(Gopi & Mishra, 2015)**.**

Historical Perspective: The appreciation for India's fish biodiversity has deep historical roots. References to fisheries and conservation practices can be traced back to ancient times, evident in Kautilya's Artha Sastra and Emperor Ashoka's edicts (Joshi et al., 2017)Systematic scientific exploration of Indian fish fauna began in the late 18th century, with pioneering contributions from

[7] https://pib.gov.in/PressReleasePage.aspx?PRID=2075160

[8] https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=151994&ModuleId=3&reg=3&lang=1

renowned naturalists like Francis Day and Alcock, who meticulously documented numerous species (Nair & Kumar, 2018; Joshi et al., 2017).

1.2 Fisheries Landscape of Gujarat: Coastal Riches and Socio-Economic Realities

Gujarat, located along India's western coast, possesses abundant natural resources that support a thriving fisheries sector. Contributing nearly 20% of India's total marine fish catch, Gujarat's fisheries are a cornerstone of the state's coastal economy, providing livelihoods to over 300,000 fisherfolk (Gujarat Fisheries Statistics, 2020). Fishing has historically been the primary livelihood for many coastal communities across Gujarat's extensive 1,600 km coastline, which spans 15 maritime districts, including Valsad, Navsari, Surat, Bharuch, and Bhavnagar.

According to the Marine Fisheries Census 2016, Gujarat is home to a total fisherfolk population of 3,54,992. The state comprises 280 fishing villages and 107 landing centres. Gir Somnath emerges as the leading district, with the highest fisherfolk population (83,538), traditional fishing families (12,905), and total fishermen families (14,515), establishing it as a central hub for marine fisheries in the state. Valsad follows with 48,091 fisherfolk, making it the second-largest district in terms of population, trailed by Jamnagar (30,839) and Porbandar (25,073). In contrast, districts like Anand and Bhavnagar report limited engagement in marine fisheries, with only six and 20 fishing villages respectively, and the lowest fisherfolk populations—2,375 and 6,464.

Interestingly, Kutch, despite having the highest number of fishing villages (70), has a moderate fisherfolk population of 22,835. This suggests potential variations in fishing intensity, village size, or family structure. In terms of poverty indicators, Devbhumi Dwarka records the lowest number of Below Poverty Line (BPL) families (238), whereas Valsad and Gir Somnath reflect more significant poverty levels among fisherfolk, with 3,384 and 2,570 BPL families respectively. (Table 2).

Table 2 Fishers population of Gujarat -district wise distribution

District	Landing centres	Fishing villages	Fishermen families	Traditional fishermen families	BPL families	Fisherfolk population
Valsad	25	26	9,690	9,237	3,384	48,091
Navsari	16	18	5,318	5,310	1,738	25,645
Surat	9	21	3,442	3,389	1,422	15,256
Bharuch	3	27	2,413	2,379	1,146	13,943
Anand	0	6	377	336	374	2,375
Ahmedabad	0	19	1,948	1,943	1,244	7,713
Bhavnagar	0	20	1,324	1,302	576	6,464
Amreli	2	8	3,936	3,848	1,242	19,036
Gir Somnath	11	28	14,515	12,905	2,570	83,538
Junagadh	4	4	2,852	2,776	687	13,617
Porbandar	4	4	5,733	5,237	1,267	25,073
Devbhumi Dwarka	8	15	5,139	5,120	238	25,725
Jamnagar	7	10	4,562	4,535	823	30,839
Morbi	0	4	2,070	1,974	700	14,842
Kutch	18	70	4,291	4,104	1,712	22,835
Total	107	280	67,610	64,395	19,123	3,54,992
(Source: Marine fisheries Census 2016 Gujarat)						

1.3 Districtwide and species wise marine fish production

Gujarat remains a major contributor to India's fisheries output, accounting for approximately 20% of national marine fish production and ranking second in overall fish production[1]. In the fiscal year 2023–24, total fish production was projected at 9.15 lakh metric tonnes, comprised of ~7.02 lakh MT marine catch and ~2.13 lakh MT inland yield.[9]

In terms of economic value, fishery production in Gujarat reached ₹15,710 crore in 2023–24, rising sharply from ₹11,743 crore in 2022–23. Simultaneously, exports of fish and fish products climbed to ₹6,087 crore.[10]

Species-wise data from the Commissioner of Fisheries, Gujarat indicates that Ribbonfish and Small Sciaenids are dominant in production. Ribbonfish contributed 70,441 MT, valued at ₹96,074.94 lakhs, while Small Sciaenids accounted for 1,03,510 MT, worth ₹1,09,613.85 lakhs.[11]

High-value species such as White Pomfret, Bombay Duck, and Lobster—despite lower volumes—generate significant revenue. Their aggregated values underscore their premium status in both domestic and export markets.

A breakdown by district reveals:

- Gir Somnath and Junagadh contribute strongly across multiple species, including Ribbonfish, Shrimp, and Threadfin.
- Valsad and Navsari specialize in Bombay Duck and Shrimp.
- Jamnagar and Kachchh focus heavily on Small Sciaenids.
- Amreli demonstrates prominence in Threadfin and Squid/Cuttlefish, while
- **Bhavnagar** stands out for its output of **Catfish** and diverse **miscellaneous species**, among which the latter were estimated to total **6,599 MT** with appreciable value [11]

In total, **Shrimp/Prawns** contribute **₹75,535.19 lakhs** and **Squid/Cuttlefish** contribute **₹62,195.26 lakhs**, emphasizing the economic significance of crustaceans and cephalopods[11]. The **miscellaneous species category**, accounting for **1,08,491 MT** of catch valued at **₹92,526.42 lakhs**, further reflects the ecological diversity of Gujarat's marine waters[11]. Collectively, the districts **Gir Somnath**, **Junagadh**, and **Porbandar** emerge as key hubs for marine fish production due to their volume-weighted contributions and species diversity, making them central to the state's fisheries economy and strategic planning.

1.4 Fish Production and Value (Marine & Inland)

In the past two decades, Gujarat has witnessed a significant growth in its fish production and export sector, which has contributed to the state's economic landscape. The trends in fish

[9] ICSF. (2024). Gujarat ranks 2nd in marine fish production. International Collective in Support of Fishworkers. Available at: https://www.icsf.net/newss/gujarat-ranks-2nd-in-marine-fish-production

[10] Indian Express. (2024). Gujarat Budget: What's for fisheries sector – ₹1,622 crore package, key policy decision and more. The Indian Express, 3rd February 2024. Available at: https://indianexpress.com/article/cities/ahmedabad/gujarat-budget-whats-for-fisheries-sector-rs-1622-crore-package-key-policy-decision-and-more-9847599

[11] Commissioner of Fisheries, Gujarat. (2024). District-wise and Species-wise Marine Fish Production and Value in Gujarat State – 2023–24. Government of Gujarat. Available at: https://data.gov.in/resource/district-wise-and-species-wise-marine-fish-production-and-value-gujarat-state-2023-24

production and the export of fish products reflect both an increase in output and an enhancement in value, highlighting the strength of Gujarat's fisheries industry.

The data of Fish Production and export of Gujarat state 2023-2024 [12] indicates a consistent rise in both marine and inland fish production, with marine fish dominating the total output. In 2001-02, the total fish production stood at 701,603 metric tons, which has steadily grown to 899,828 metric tons in 2023-24. This represents a 28% increase over this period, signalling the sector's expansion. Marine fish production has seen significant increases over the years, peaking in 2023-24 with a record of 704,828 metric tons. In contrast, inland fish production, although comparatively smaller in volume, has also shown growth, reaching 195,000 metric tons in 2023-24.

The value of fish production has mirrored this growth in volume, with the total value of production reaching ₹1,571,034.47 lakhs in 2023-24. This is a significant rise from ₹571,763.71 lakhs in 2001-02, driven largely by marine production, which contributed ₹1,167,448.87 lakhs to the total value. Inland fish, though smaller in volume, accounted for ₹403,585.60 lakhs in 2023-24. This increase in the value of production suggests not only an increase in the quantity of fish produced but also improved prices, possibly due to better market conditions or the introduction of value-added products.

Gujarat's fish export market has similarly expanded. In 2001-02, the state exported 132,175 metric tons of fish products, a figure that surged to 336,991 metric tons by 2023-24. This growth in export quantity is reflective of Gujarat's increasing prominence in the global fish export market. The export value has followed a similar trajectory, growing from ₹625.72 crores in 2001-02 to an impressive ₹6,087 crores in 2023-24, despite a slight fluctuation in the per-ton export value. The highest value of exports occurred in 2012-13 at ₹2,929.61 crores, although the export value has now surpassed this peak, further reinforcing Gujarat's growing export footprint in the global market. The following table provides a detailed view of the annual fish production and export statistics, further illustrating the growth trajectory over the years (Table 3).

[12] https://cof.gujarat.gov.in/Index

Table 3 Fish Production and export of Gujarat in 2023-2024

FISH PORDUCTION & VALUE [MARINE & INLAND] OF GUJARAT STATE								FISH AND FISH PRODUCT EXPORT OF GUJARAT STATE			
SR.NO	YEAR	FISH PRODUCTION IN M.T.			VALUE IN RS. LAKHS			SR. NO	YEAR	QUANTITY IN M. T	VALUE IN Rs. CRORES
		MARINE	INLAND	TOTAL	MARINE	INLAND	TOTAL				
1	2001-02	650829	50774	701603	142127.48	26207.36	168334.84	1	2001-02	132175	625.72
2	2002-03	743638	34267	777905	169681.52	19254.95	188936.47	2	2002-03	134047	760.36
3	2003-04	609136	45436	654572	138667.15	30148.13	168815.28	3	2003-04	108386	614.41
4	2004-05	584951	50628	635579	136495.64	33613.52	170109.16	4	2004-05	119951	704.59
5	2005-06	663884	69936	733820	201544.12	42002.28	243546.4	5	2005-06	136485	934.88
6	2006-07	676762	76821	753583	227061.74	43472.07	270533.81	6	2006-07	188166	1264.61
7	2007-08	680848	78780	759628	239314.68	45087.15	284401.83	7	2007-08	150727	1141.97
8	2008-09	683855	82047	765902	254224.78	52099.19	306323.97	8	2008-09	164725	1485.72
9	2009-10	687445	84071	771516	294223.9	55150.44	349374.34	9	2009-10	183870	1838.75
10	2010-11	688930	85972	774902	356419.96	58684.73	415104.69	10	2010-11	198297	2156.2
11	2011-12	692488	91231	783719	394488.87	65990.71	460479.58	11	2011-12	196850	2533.99
12	2012-13	693560	94930	788490	434603.63	78463.92	513067.55	12	2012-13	242057	2929.61
13	2013-14	695580	102913	798493	446214.36	94015.48	540229.84	13	2013-14	251920	3658.57
14	2014-15	698450	111482	809932	473488.45	126133.65	599622.1	14	2014-15	245434	3645.23
15	2015-16	697328	112232	809560	480877.37	128225.24	609102.61	15	2015-16	208624	3567.24
16	2016-17	698832	116725	815557	484201.19	139188.03	623389.22	16	2016-17	237442	4417.4
17	2017-18	700743	137685	838428	495088.22	181285.35	676373.57	17	2017-18	312568	5071.05
18	2018-19	699230	142880	842110	506510.16	194004.23	700514.39	18	2018-19	305326	5202.3
19	2019-20	700809	157463	858272	532915.45	228351.88	761267.33	19	2019-20	279751	5019.48
20	2020-21	619720	124705	744425	632875.64	244456.34	877331.98	20	2020-21	228072	4254.21
21	2021-22	688272	185689	873961	765950.07	356176.52	1122126.6	21	2021-22	232619	5232.88
22	2022-23	703000	194422	897422	789923.3	384475.39	1174398.7	22	2022-23	284850	5864.3
23	2023-24	704828	195000	899828	1167448.87	403585.6	1571034.5	23	2023-24	336991	6087

1.5 Small scale fisherfolk of Gujarat

The term "small-scale fishery" is multifaceted and has been interpreted in various ways across different regions of the world. It is also referred to as artisanal, traditional, native, subsistence, or inshore fisheries (Johnson, 2006). There is no single, universally accepted definition for small-scale fisheries due to their inherent diversity and complexity(Alfaro-Shigueto et al., 2010). Nonetheless, many researchers have defined small-scale fisheries based on factors such as the scale of operations, technology level, employment generation, and the degree of capital investment(Carvalho, 2011). For example, Alfaro-Shigueto et al. (2010) define small-scale fisheries based on vessel size, specifying vessels that are up to 15 meters in length and are typically operated manually within 5 nautical miles of the coast. It is important to note, however, that in Gujarat, many fishing vessels that are under 15 meters in length often operate beyond 5 nautical miles. These fisheries are primarily labour-intensive, with fishers utilizing low-capital gear to harvest smaller catches compared to industrial fisheries(Hauck, 2008).

Small-scale fisheries in many countries are primarily defined by a combination of local biological, social, economic, and political factors(Carvalho, 2011). Johnson's (2006) extensive research further categorizes small-scale fisheries into two subtypes: subsistence fisheries and domestic commodity production. These two categories are distinguished by various criteria, including social-institutional organization, knowledge and technology, and spatial and temporal considerations.

Johnson (2006) explains that small-scale fisheries are not just limited to catching fish for personal or family use. When used for domestic commodity production, they usually operate on a larger scale, covering more areas, involving more activities, and reaching bigger markets compared to subsistence[13] fisheries.

Further, more than 90% of the global fishing population are small-scale fishers, the majority of whom reside in developing countries.(Hauck, 2008). These fisheries play a crucial role not only in food security but also as a primary source of animal protein for over a billion people(Alfaro-Shigueto et al., 2010). In addition to their economic importance, small-scale fisheries contribute to employment generation and poverty alleviation (Sowman, 2006). They also play a key role in promoting social justice and ecological sustainability (Reed et al., 2013). Furthermore, small-scale fisheries are characterized by significant cultural diversity, particularly when contrasted with the homogeneity of industrial fisheries(McGoodwin, 1995).

The definitions of artisanal and mechanized boats in the Indian context are complex and often unclear, with significant variations. Pillai et al. (2000) from the Central Marine Fisheries Research Institute of India identify bag net fishing as an artisanal practice along the Gujarat coast. However, based on factors such as the distance travelled by bag netters, the number of days spent at sea per trip, and the type of technology used, bag net fishing can also be classified as small- or medium-scale and semi-mechanized fishing.(Pillai et al., 2000).

The pagadiya are the part of artisanal fisherfolk of Gujarat and they use the foot for fishing. For approximately 400 years, the fishing community of Gujarat practices the traditional ‘Pagadiya’ method of fishing on foot. This cost-effective technique involves setting nets in the water during low tide and collecting the catch after high tide. The moon's phases and resulting tidal variations significantly influence catch rates. Pagadiya fishers typically engage in bag net fishing for 20 to 22 days each month. According to the lunar calendar, fishing is most productive on 20 days, while the remaining 8 days yield scant catches. This traditional knowledge allows fishers to plan their

[13] *small-scale fishing practices where fish are caught for personal consumption or for the consumption of dependents*

activities efficiently. Seasonal analysis reveals that catches are highest during the winter, followed by the monsoon and summer months. As per the study conducted by Jignesh Anjani and Prajith, K.K. (2017) in the Kutch region, the average daily catch per unit is approximately 6 kg in the monsoon, 10.3 kg in winter, and 4 kg in summer. The catch composition indicates that Acetes and other low-value non-penaeid shrimp account for 24% of the total catch, followed by penaeid shrimp and Bombay duck. Seasonal variations in species composition are evident, with Bombay duck dominating during the monsoon, Acetes in winter, and penaeid shrimp in summer. However, only 10% of the catch is of high value. The study identified poaching and operational difficulties as major challenges faced by Pagadiya fishers. Additionally, the coastal population has a deep understanding of lunar periodicity and its correlation with fishing activities.

Table 4 Pagadiya Fishermen of Gujarat

Sr. No.	Name of the District	No. of Pagadiya Fishermen
1	Valsad	24
2	Navsari	55
3	The Dangs	0
4	Surat	103
5	Tapi	0
6	Bharuch	768
7	Narmada	11
8	Vadodara	2
9	Panchmahal	0
10	Dahod	0
11	Anand	115
12	Kheda	20
13	Ahmedabad	234
14	Gandhinagar	0
15	Mehsana	25
16	Patan	75
17	Sabarkantha	20
18	Banaskantha	0
19	Surendranagar	130
20	Rajkot	502
21	Bhavnagar	228
22	Kachchh	489
23	Jamnagar	110
24	Porbandar	49
25	Junagadh	267
26	Amreli	144
	Total	**3,371**

The pagadiya fishermen data of Government of Gujarat (2012-2013) shows the distribution of Pagadiya fishermen across Gujarat's districts, with a total of 3,371 individuals practicing this method. Bharuch reports the highest number, with 768 Pagadiya fishermen, followed by Rajkot with 502 and Kachchh with 489. Ahmedabad also has a significant number, with 234 fishermen.

Several districts, including The Dangs, Tapi, Panchmahal, Dahod, Gandhinagar, and Banaskantha, report no Pagadiya fishermen. Other districts, such as Vadodara (2 fishermen), Mahesana (25 fishermen), and Valsad (24 fishermen), have comparatively low numbers. Moderate numbers are recorded in districts like Anand (115 fishermen), Navsari (55 fishermen), and Junagadh (267 fishermen). The data highlights the concentration of Pagadiya fishermen in specific districts, with

Bharuch, Rajkot, and Kachchh having the highest representation, while some districts report no activity.

Women and Their Contribution in Fishing in Gujarat

Women play a vital role in Gujarat's fisheries sector. Their participation spans the entire fisheries value chain—from fish seed collection to post-harvest processing and marketing. In fact, women dominate post-harvest activities, especially in peeling, drying, and vending, where they form the backbone of local economies (Joshi et al., 2016).

In Amreli and nearby districts, their engagement in fish processing often compensates for the irregular income patterns of male fishers (Vase et al., 2019). Despite this, women still face structural barriers, including poor access to technology, credit, training, and market linkages. While some policies do aim to support their participation, much of their work remains informal and unrecognized (Sharma et al., 2017).

Key Challenges Faced by Fishing Communities in Gujarat

1. Declining Fish Stocks and Overfishing

Industrial fishing and environmentally harmful practices have led to reduced marine biodiversity and lower catch volumes for traditional fishers. Artisanal fishers in Bhavnagar and Amreli report a consistent drop in catch, which has exacerbated livelihood insecurity (Gujarathi-Talati, 2022).

2. Climate Change and Environmental Stress

Shifts in sea temperature, irregular monsoons, and extreme weather events have disrupted fishing calendars. Fish migration and breeding cycles are also changing, posing challenges to traditional fishing knowledge systems (Das, 2017).

3. Gender Inequality and Marginalization

Women continue to be left out of fisheries decision-making, despite their essential contributions. Their work is often classified as secondary or supplementary, limiting access to benefits and policy support (Johnson & Jyothis, 2006).

4. Limited Access to Resources and Technology

Most artisanal fishers in Gujarat still depend on traditional techniques. In regions like Amreli, small-boat owners and crew lack access to cold chains, better gear, or reliable transportation, reducing their competitiveness (Vase et al., 2019).

5. Economic Vulnerability

Fishing households, especially those led by women or operating in informal markets, are vulnerable to price shocks, debt, and lack of safety nets. Many are stuck in low-income cycles without diversification options (Burman & Katyaini, 2022).

6. Inadequate Government Support

Despite their role in marine food security, artisanal and small-scale fishers struggle to access benefits from government schemes, often due to bureaucratic inefficiencies or lack of awareness at the community level (Sharma et al., 2017).

7. Unsustainable Fishing Practices

Illegal trawling and unregulated mechanized fishing continue to degrade the ecosystem, particularly affecting the livelihoods of Pagadiya fishers in Bhavnagar and Veraval (Parappurathu & Achamveetil, 2020).

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Chapter 2: Methodology

2.1 Introduction

Understanding the layered challenges faced by small scale fisherfolk demands a methodology that is both analytically rigorous and deeply attuned to the lived realities of coastal communities. This chapter presents the methodological approach adopted for the needs assessment of Bandar village located in Mahuva block of Bhavnagar district. The research was designed and conducted by Utthan, an organization with more than four decades of experience advancing the rights and livelihoods of vulnerable groups across Gujarat.

The assessment sought to explore not only what fisherfolk *do*—in terms of fishing practices, occupations, and seasonal work—but also how they experience vulnerability, navigate change, and aspire for transformation in the face of mounting environmental, economic, and social pressures. Recognizing that these phenomena cannot be understood through numbers alone, the research design deliberately combined quantitative and qualitative methods to enable a layered and participatory understanding.

To frame this inquiry, a conceptual model was developed to guide the collection, analysis, and interpretation of data. This model—explained below—places the resilience and vulnerability of fisherfolk households at its center, shaped by their entitlements, assets, exposures, and aspirations.

2.2 Conceptual Framework

This study is guided by the **Sustainable Livelihoods Framework (DFID)**, which posits that a household's capacity to withstand shocks, adapt to change, and enhance its quality of life is shaped by five interconnected domains:

1. **Structural Identity** – Social position shaped by caste, gender, religion, age, disability, and household composition.
2. **Livelihood System** – Nature of fishing practices, ownership of gear and boats, diversification of income sources, and opportunities for alternative employment.
3. **Economic Conditions** – Stability and amount of income, access to credit, levels of indebtedness, and financial burdens.
4. **Environmental Exposure** – Degree of vulnerability to cyclones, saline intrusion, biodiversity loss, and other climate change impacts.
5. **Institutional and Social Support** – Access to government schemes, identification documents, cooperatives, self-help groups (SHGs), and village-level federations.

Importantly, gender is embedded as a cross-cutting axis within this framework. Women's restricted access to assets, institutions, markets, and mobility systematically constrains their capacity to cope with risks and to drive change.

Table 5 Domains of the Sustainable Livelihoods Framework Applied in the Study

Domain	Key Elements
Structural Identity	Gender, caste, religion, age, disability, household composition
Livelihood System	Fishing type (Pagadiya, mechanized), boat/net ownership, diversification of income, seasonal variation
Economic Conditions	Income stability, access to credit/loans, debt burden, financial obligations
Environmental Exposure	Cyclones, saline intrusion, fish catch decline, biodiversity loss, plastic waste
Institutional & Social Support	Access to schemes/SHGs, legal documents, cooperatives/federations, awareness of entitlements
Gender as a Cross-Cutting Dimension	Gendered labour, women's decision-making, mobility constraints, unequal workload and discrimination

2.3 Objectives of the Study

The assessment sought to answer a core question: **How do fisherfolk in Bandar navigate vulnerabilities across structural, economic, environmental, and institutional dimensions, while negotiating gendered constraints and seeking pathways for more secure and sustainable livelihoods?**

To address this, the following objectives were framed:

- To profile the demographic, social, and gendered structure of fisherfolk households.
- To document fishing practices, ownership of assets, diversification of income, and seasonal migration patterns.
- To examine income stability, access to credit, indebtedness, and related financial pressures.
- To assess exposure to environmental shocks and ecological risks, and the coping strategies adopted by the community.
- To analyse access to welfare entitlements, cooperatives, SHGs, and government programmes.
- To understand the specific challenges faced by women in accessing resources, institutions, and decision-making spaces.
- To capture the aspirations of community members, particularly youth and women, regarding future livelihood pathways.

2.4 Research Questions

The study was guided by the following research questions:

1. How do caste, gender, age, and household composition shape fisherfolk households' vulnerabilities and opportunities?

2. What fishing practices, asset ownership patterns, and livelihood diversification strategies are followed in Bandar?
3. How stable are household incomes, and what challenges do fisherfolk face with credit access, debt burdens, and financial obligations?
4. How do climate change, cyclones, saline intrusion, biodiversity loss, and fish stock decline affect livelihoods and resilience?
5. What institutional mechanisms—government schemes, SHGs, cooperatives, federations—are accessible to fisherfolk, and how inclusive are they?
6. How do gendered roles and norms influence women's access to assets, institutions, markets, and decision-making power?
7. What are the immediate needs and long-term aspirations of the community, particularly youth and women, regarding fishing and alternative livelihoods?

2.5 Study area: Mahuva Light house, Katpar Gram Panchayat

Katpar is a situated in Mahuva block of Bhavnagar district, Gujarat, along the Saurashtra coast of the Arabian Sea. Administratively, it is recognised as both a Gram Panchayat and a Census Town. It includes 3 fishing villages including Katpar,Bandar, Light house. Its jurisdiction extends over 18.34 km^2, encompassing dense residential clusters and fishing-related spaces such as curing yards, landing points, and local markets.

The Census of India (2011) recorded Katpar's population at 8,677 persons across 1,814 households. Of these, 4,405 were male and 4,272 females, yielding a sex ratio of 970 females per 1,000 males, higher than the Gujarat average. Children (0–6 years) constituted 16.4% of the population (1,423 persons), signalling a youthful demographic.

Literacy remains a critical challenge. The overall literacy rate was 62.03%, considerably lower than the state average. Male literacy (77.15%) outpaces female literacy (46.47%) by a wide margin, highlighting entrenched gender disparities in education that directly affect livelihood diversification and women's empowerment.

The Gram Panchayaat is overwhelmingly Hindu (~99.5%), with a very small Muslim minority (≈0.5%). Caste and community affiliations continue to shape access to entitlements, cooperative membership, and local power structures, reflecting wider patterns in Gujarat's fishing communities.

Mahuva Light House Village Profile (Marine Fisheries Census -Gujarat 2016)

The marine fishing village of Mahuva Light House is part of Katpar Gram Panchayat, situated in Mahuva Taluk of Bhavnagar District, Gujarat, represents a small yet distinct settlement of traditional fishing households. The profile below consolidates available secondary data to provide a demographic, socio-economic, and occupational overview of the community.

I. Demographics and Socio-Economic Status

Mahuva Light House comprises 97 fishermen families, all identified as traditional fishing households. Of these, 44 families (45%) fall under the Below Poverty Line (BPL) category, reflecting significant economic vulnerability. The total fisherfolk population stands at 419 individuals, with an average family size of four. The sex ratio is notably skewed at 806 females per 1,000 males, indicating a demographic imbalance.

Disaggregated by age and gender, the adult population includes 124 males and 105 females, while the child population consists of 18 males and 12 females under five years and 90 males and 70 females above five years. In terms of social identity, the village is religiously homogenous, with all 97 families belonging to Hinduism, and no families recorded under Scheduled Caste (SC) or Scheduled Tribe (ST) categories.

II. Housing and Amenities

The settlement exhibits a predominantly pucca housing structure, with 96 pucca houses and only one kutcha dwelling. Despite the relative structural adequacy of housing, 96 households have fewer than three rooms, suggesting spatial limitations. All households are electrified and enjoy universal access to potable water through tap connections. However, an important gap exists in sanitation infrastructure: none of the 97 households have in-house toilet facilities, highlighting continued dependence on external or open spaces for sanitation.

Figure 1 Mahuva Light House village -map

III. Occupational Profile

Fishing remains the central livelihood activity. The village records 97 active fishermen, all engaged in full-time actual fishing, with no engagement reported in part-time fishing or fish seed collection. Allied activities are gendered in nature: 58 women participate exclusively in fish marketing, while no members are involved in net making/repair, curing, processing, or labour within allied sectors. Beyond the fisheries economy, 155 individuals are engaged in non-fishing occupations, indicating a growing occupational diversification within the settlement.

IV. Education and Cooperatives

Educational attainment levels remain modest. At the primary level, 30 males and 38 females have received schooling. A higher proportion of males (69) compared to females (37) have attained education at the higher secondary level. Beyond this, the figures drop sharply, with only one male recorded above higher secondary level, and no graduates in the village. Cooperative membership is absent, with no fisherfolk enrolled in fisheries or other cooperatives, suggesting a lack of formal collective structures for socio-economic advancement.

V. Fishing Craft Ownership

Ownership of fishing assets is limited yet uniform. The community owns a total of 14 inboard fishing crafts, with no reported mechanized, outboard, or non-motorized crafts. This reflects complete reliance on inboard motorized craft for fishing operations. Notably, while Mahuva Light House is classified as a marine fishing village, it is not independently listed as a marine fish landing centre in official fisheries utilization records, indicating potential marginalization in resource allocation and recognition.

2.6 Research Design and Strategy

This study employed a cross-sectional, mixed-methods design, combining quantitative surveys with qualitative participatory tools. This approach allowed for both the breadth of household-level data and the depth of community insights, thereby ensuring a holistic understanding of fisherfolk realities in Bandar.

Sampling

A complete enumeration strategy was adopted. 64 fisherfolk households in Bandar were surveyed, ensuring full coverage and inclusivity. This method strengthened the representativeness of the findings and provided a robust base for disaggregated analysis across gender, occupation, and socio-economic status.

Village Assemblies

In parallel, eight village assemblies were conducted as part of the broader process of fisherfolk mobilisation and collectivisation. These assemblies provided a forum for fisher families to voice their concerns, priorities, and suggestions. The deliberations from these assemblies were systematically documented and integrated into the analysis, thereby grounding the findings in the lived experiences and perspectives of the community.

2.7 Data Collection Methods

2.7.1 Structured Household Survey

The household questionnaire was developed based on Utthan's field experience, policy gaps observed, and community insights. It was digitized using KoboCollect, ensuring real-time data validation and minimizing manual error.The data been collected between April – May 2025.

The survey covered modules on:

- **Demographics**: Age, gender, religion, education, disability
- **Livelihoods**: Type of fishing, secondary income, seasonal work
- **Assets**: Boat, net, GPS, insurance, cold storage, housing
- **Income and Debt**: Daily wages, loan sources, credit burdens
- **Access to Services**: Water, electricity, sanitation, healthcare
- **Scheme Participation**: PMMSY, Ayushman Bharat, SHGs, KCC, e-Shram, widow pensions
- **Environmental Impacts**: Declining catch, plastic waste, cyclone damage
- **Aspirations**: Interest in rope making, goat rearing, aquaculture, seaweed farming

Interviews were conducted in Gujarati by trained field staff. All respondents provided informed oral consent.

2.7.2 Village Assemblies

In addition to household surveys, village assemblies were convened as part of the wider process of fisherfolk mobilisation and collectivisation. These gatherings created participatory spaces where fisher families could articulate their concerns, deliberate on potential solutions, and strengthen a sense of collective agency. The issues raised were systematically documented and fed into the analysis, with discussions centring on shifting fishing patterns and environmental signals, debt traps and migration pressures alongside intergenerational transitions, the gendered division of labour in fish drying, marketing, and unpaid care work, and broader community narratives of risk, resilience, and future aspirations. By combining survey data with participatory dialogues, the methodology ensured that the report reflects both the quantitative dimensions of vulnerability and the qualitative richness of lived experiences.

2.8 Data Analysis

The survey data were processed and analysed using Open-source data analysis software. This enabled the generation of descriptive statistics and cross-tabulations across key variables. Findings from the quantitative analysis were further triangulated with insights from village assemblies, ensuring that patterns observed in the data were interpreted in light of community perspectives. This integration strengthened the validity and contextual grounding of the results presented in this report.

2.9 Ethical Considerations

The study adhered to strict ethical standards to safeguard the dignity and rights of participants. Before each interview or discussion, researchers sought and obtained oral informed consent, ensuring that participants clearly understood the purpose of the study and their role within it. At every stage, respondents were reminded that their participation was voluntary, and they retained the right to skip questions or withdraw altogether without any consequence. In conducting the fieldwork, particular attention was paid to cultural norms and gender sensitivities, so that both women and men felt comfortable and respected during the process.

2.10 Limitations

This study has certain methodological and contextual limitations that must be acknowledged. First, the research design is cross-sectional, providing a snapshot of community conditions at a single point in time. Consequently, the analysis may not capture the seasonal fluctuations in fish catch, household income, and migration patterns that are integral to the livelihoods of fisherfolk.

Second, data related to income, debt, and participation in government schemes were self-reported by respondents. Such data are susceptible to recall bias, underreporting, and reluctance in disclosing sensitive financial information, which may affect the precision of estimates.

Third, while the sampling strategy aimed for inclusivity through complete household enumeration and village assembly discussions, it is possible that the perspectives of certain marginalised groups, such as persons with disabilities, are underrepresented in the dataset.

Finally, although the study engaged extensively with community narratives regarding environmental change, declining catch, and climate-related risks, it did not employ scientific climate modelling or longitudinal environmental datasets. As a result, the report reflects primarily the perceptions and lived experiences of the community, rather than providing formal projections of long-term climate trends.

Chapter 3: Results

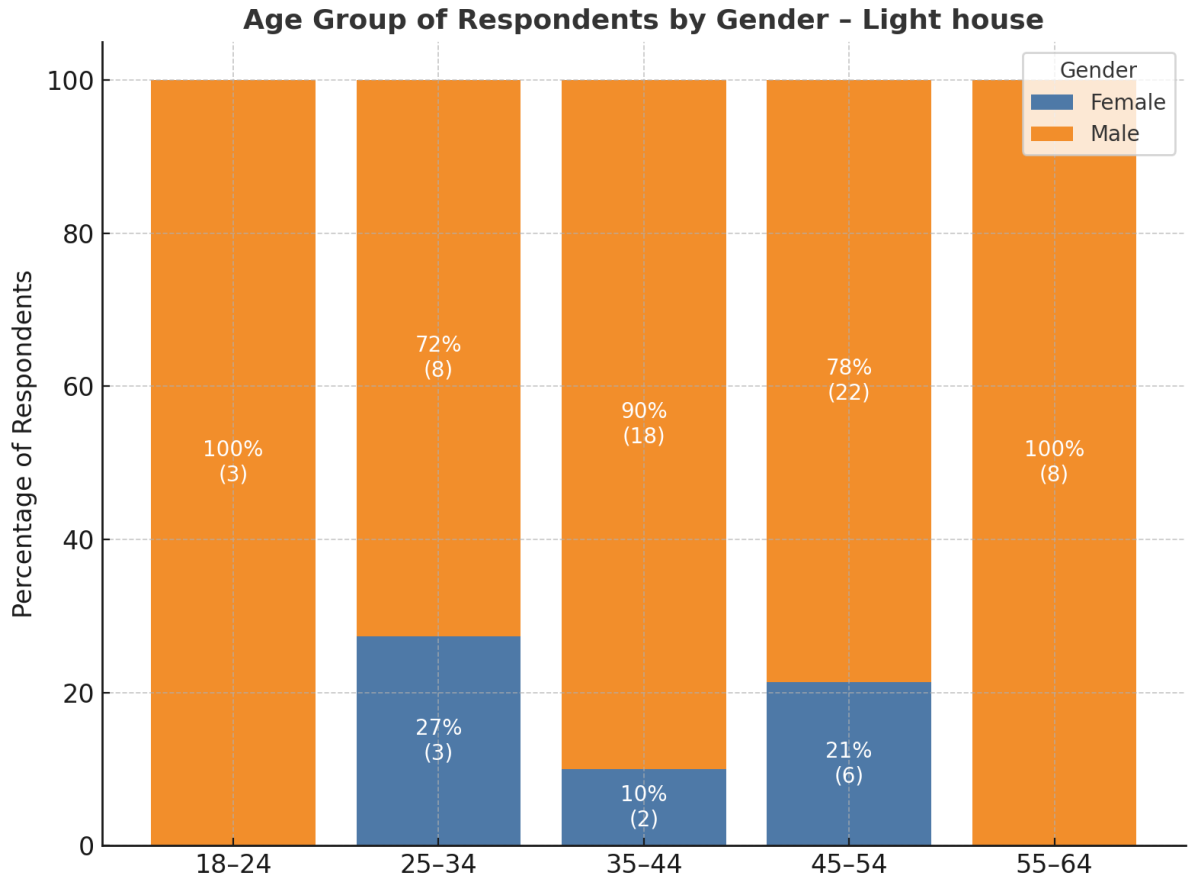
3.1 Structural Identity of Fisherfolk Households

The structural composition of fisherfolk households in Mahuva Light House offers important insights into their socioeconomic and institutional positioning. Core household characteristics—including age, gender, religion, marital status, household size, education, and the presence of elderly or disabled members—shape how vulnerability and resilience are differently experienced across groups. Drawing on data from 70 surveyed households, this section presents a disaggregated profile of the community, situating household structures as a foundation for understanding broader livelihood and social dynamics.

3.1.1 Age and Gender Profile

In Mahuva Light House, the survey covered 70 households (N=70), with one respondent interviewed per household. The age distribution is concentrated among mid-life groups, with 40.0% of respondents in the 45–54 age range and 28.6% in the 35–44 range, reflecting the predominance of economically active fisherfolk. Younger age groups were represented by 15.7% in the 25–34 category and 4.3% in the 18–24 category. Older age representation was lower, with 11.4% of respondents between 55–64 years, and none above 65.

Figure 2 Age and gender distribution of the respondents



Note: Number of respondents is shown in brackets next to each percentage.

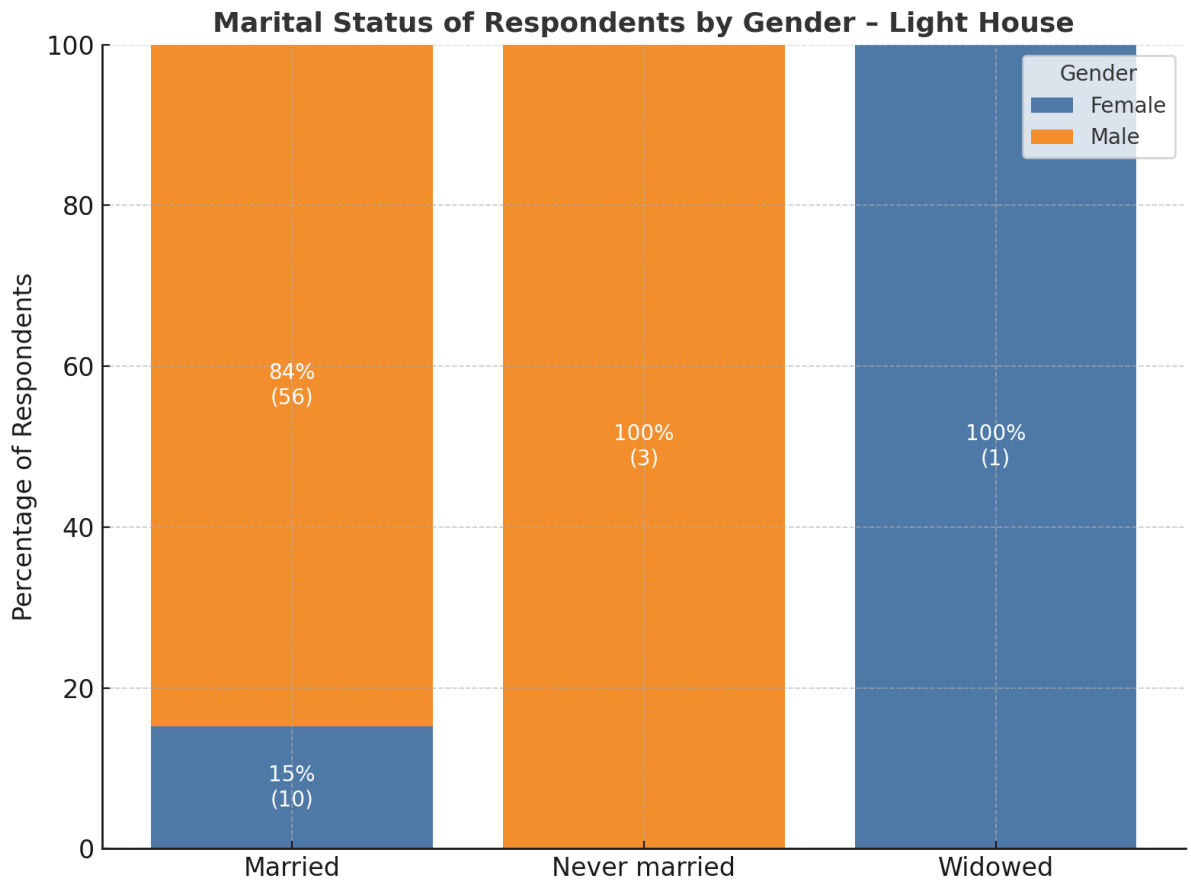
The respondent profile is largely male dominated, with men comprising 84.3% of all respondents. Male respondents were present in every age group, while women were fewer across categories, with the highest representation in the 45–54 group. This pattern aligns with household-level survey practice, where men more frequently responded to individual questionnaires, while women's views were captured and integrated through the village assemblies conducted alongside the survey.

3.1.2 Marital Status

In Mahuva Light House, the survey engaged 70 households (N=70), each represented by one respondent. The majority of respondents—66 individuals (94.3%)—reported being married. This group was composed of 56 males (84.8%) and 10 females (15.2%), underscoring marriage as the dominant household form and an important social and economic unit in this coastal settlement.

A smaller proportion, 3 male respondents (4.3%), reported being never married. The absence of never-married females in the sample reflects prevailing cultural norms of early and near-universal marriage, especially for women. Only one female respondent (1.4%) reported being widowed. Although numerically low, this widow-headed household highlights potential vulnerabilities, particularly where alternative sources of support or income are limited.

Figure 3 Marital status of the respondents by gender



Note: Number of respondents is shown in brackets next to each percentage.

3.1.3 Social Category and Religion

The entire respondent population reported Hinduism as their religion, indicating a uniform religious landscape within the village. All respondents further identified themselves as belonging to the Other Backward Classes (OBC) category, pointing to complete caste homogeneity in the sampled population.

Of the total 70 OBC respondents, 59 were men (84.3%) and 11 were women (15.7%), reflecting the overall gender imbalance observed in the respondent base. This skewed ratio aligns with the male-dominated nature of fishing as the primary occupation, while women's perspectives were incorporated through participatory village assemblies conducted alongside the survey.

3.1.4 Disability Presence

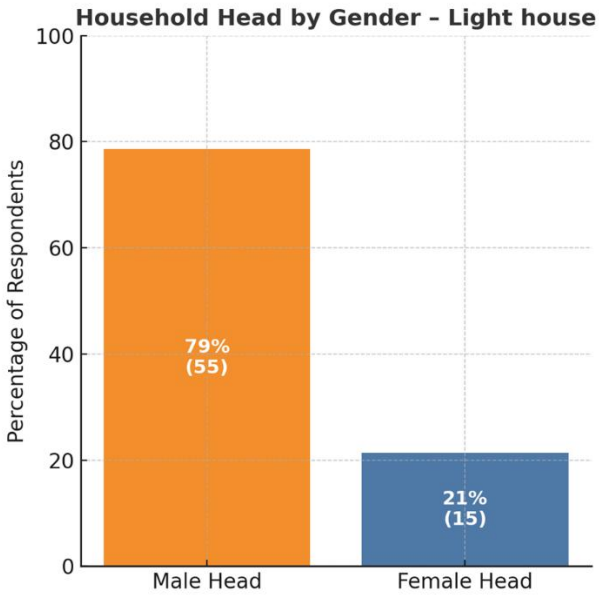
In Light House, 3 households (4.3%) reported the presence of disability—either affecting the respondent directly or a family member. Specifically, one male respondent (1.4%) reported a self-disability, while two households (2.9%) reported family-level disabilities (one male and one female respondent). The remaining 67 households (95.7%) reported no disability presence.

Disability was more frequently reported by men, who represented both the self-disability case and one of the two family-level cases. Women's reporting was limited, consistent with their lower representation in the respondent base.

3.1.5 Household Headship

In Light House, 55 households (78.6%) were headed by men, while 15 households (21.4%) reported female household heads. The predominance of male headship reflects a common pattern in traditional coastal communities. At the same time, the presence of over one-fifth of households headed by women highlights a significant demographic with potentially distinct socio-economic roles and support needs.

Figure 4 Household Head by Gender



Note: Number of respondents is shown in brackets next to percentage.

3.1.6 Educational Status

Educational attainment in Light House reveals a sharp gender divide. Among female respondents (N=11), the majority (81.8%) reported being non-literate, with only one respondent (9.1%) possessing basic reading and writing skills. None of the women had progressed to primary, secondary, or higher levels of schooling.

In contrast, male respondents (N=59) demonstrated higher educational attainment: 78.0% reported being able to read and write, while 20.3% were non-literate and 1.7% had completed primary schooling. No male respondents had studied at secondary or higher levels.

A chi-square test confirmed a statistically significant association between gender and education level (χ^2 = 24.37, p < 0.0001), underscoring the persistent educational disadvantage faced by women in Light House.

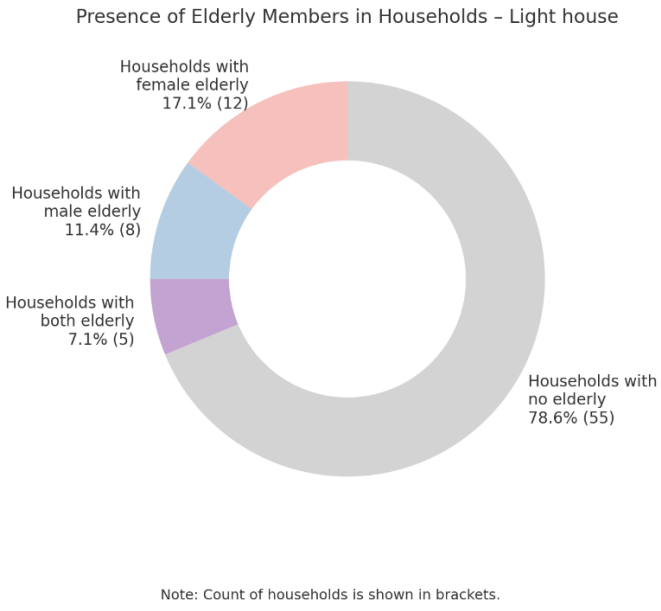
Table 6 Educational status of the respondents

Sex (N)	Ability to read and write	Higher Secondary	Non-literate	Primary Schooling	Secondary Schooling
Female (N=11)	1 (9.1%)	0 (0.0%)	9 (81.8%)	1 (9.1%)	0 (0.0%)
Male (N=59)	46 (78.0%)	0 (0.0%)	12 (20.3%)	1 (1.7%)	0 (0.0%)
Grand Total (N=70)	47 (67.1%)	0 (0.0%)	21 (30.0%)	2 (2.9%)	0 (0.0%)

3.1.7 Household Size and Elderly Population

Across the 70 surveyed households in Light House, the average household size was 5.76 members, with family size ranging from 3 to 15 (SD = 1.87).

Figure 5 Household size and elderly population



When considering elderly members (aged 60+), most households reported none. As shown in Figure 7, 55 households (78.6%) did not include elderly persons. Among those that did:

- 12 households (17.1%) had at least one elderly woman,
- 8 households (11.4%) had at least one elderly man, and
- 5 households (7.1%) had both an elderly man and woman.

Although elderly presence was limited overall, the subset of families with older adults represents an important group, particularly given women's slightly higher visibility among the elderly. These findings highlight the need to consider intergenerational support and the provision of senior citizen–focused services within the village.

Summary of Section 3.1: Structural Identity

The structural identity of fisherfolk households in Light House underscores the predominance of mid-life, married, male respondents within relatively large and socially homogenous households. The age distribution is concentrated in the 35–54 range, with few younger or elderly respondents represented. Marriage remains the near-universal household form, with only a handful of never-married men and a single widowed woman recorded. Household headship is primarily male (78.6%), yet one-fifth of households are led by women, reflecting diverse circumstances beyond widowhood.

Caste and religion show complete uniformity, with all respondents belonging to Hindu OBC families. Educational attainment reveals a sharp gender divide: while most men can read and write, the majority of women remain non-literate. Household size averages nearly six members, with elderly presence limited but notable in a minority of households, especially elderly women. Disability was reported in only a small proportion of cases but highlights added layers of vulnerability for affected households.

Taken together, these structural features highlight a community that is socially cohesive yet shaped by gendered inequalities, modest educational attainment, and intergenerational dynamics that influence both vulnerability and resilience in the coastal context of Light House.

Section 3.2: Livelihood system of Fisherfolk Households

Livelihoods in coastal fishing communities such as Light House are shaped by the interplay of the sea, seasonal fluctuations, and broader economic change. Fishing constitutes the primary occupation for most households, anchoring their income and identity. However, dependence on fishing alone is rare. Households diversify through secondary activities such as wage labour, small-scale trade, farming, or livestock rearing. These additional income sources help families cope with the seasonal nature of fishing, fluctuating catches, and rising household costs.

This section examines how fisherfolk in Light House secure their livelihoods, considering both primary occupations, such as fishing, and secondary occupations that supplement household income. It also highlights the gendered division of labour, where men are largely engaged in capture fishing, while women play vital roles in post-harvest activities, fish marketing, and unpaid domestic and care work—contributions that remain under-recognised in formal economic accounts.

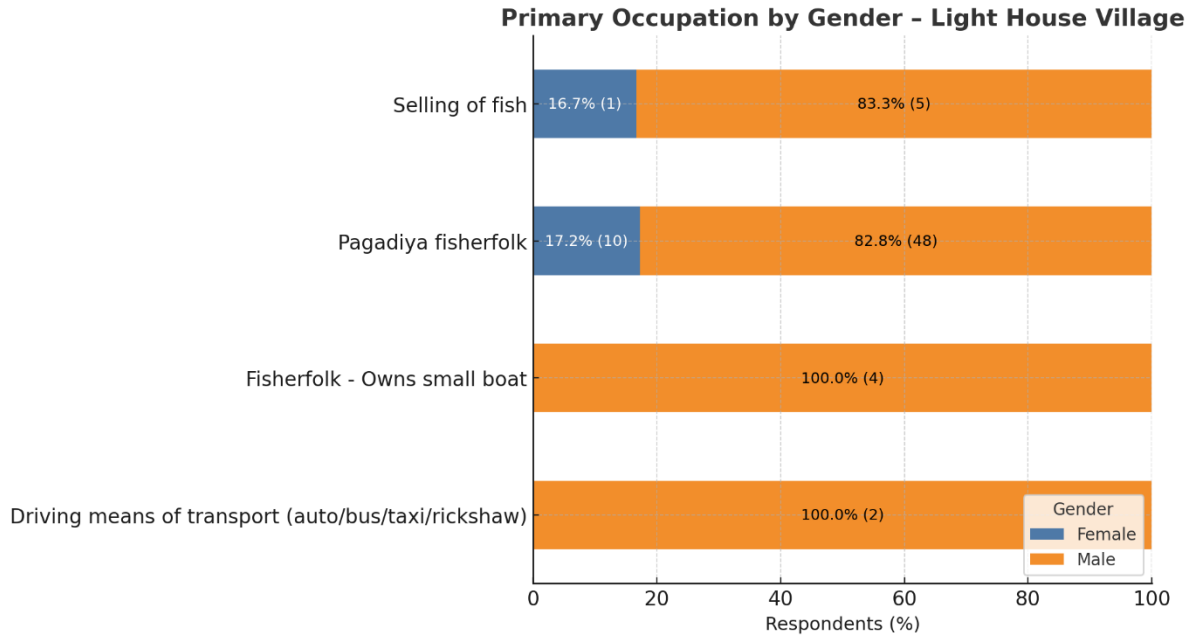
By analysing these patterns, the section provides insights into the strategies, risks, and adaptive capacities that underpin the resilience of fisherfolk households in Light House.

3.2.1 Primary Occupations

The occupational distribution in Light House demonstrates a pronounced gender divide in access to and participation in fisheries-based livelihoods. Of the 58 respondents engaged in Pagadiya fishing, 48 were men (82.8%) and 10 were women (17.2%), reflecting the continued dominance of men in direct marine fishing activities.

When occupations are examined within gender, the pattern becomes clearer. Among male respondents (N=59), the overwhelming majority were Pagadiya fishers (81.4%), with smaller proportions identifying as boat owners (6.8%) or transport drivers (3.4%). Fish selling remained a marginal male activity (1.7%).

Figure 6 Primary Occupation by Gender



Note: Values shown as percentage with count in brackets.

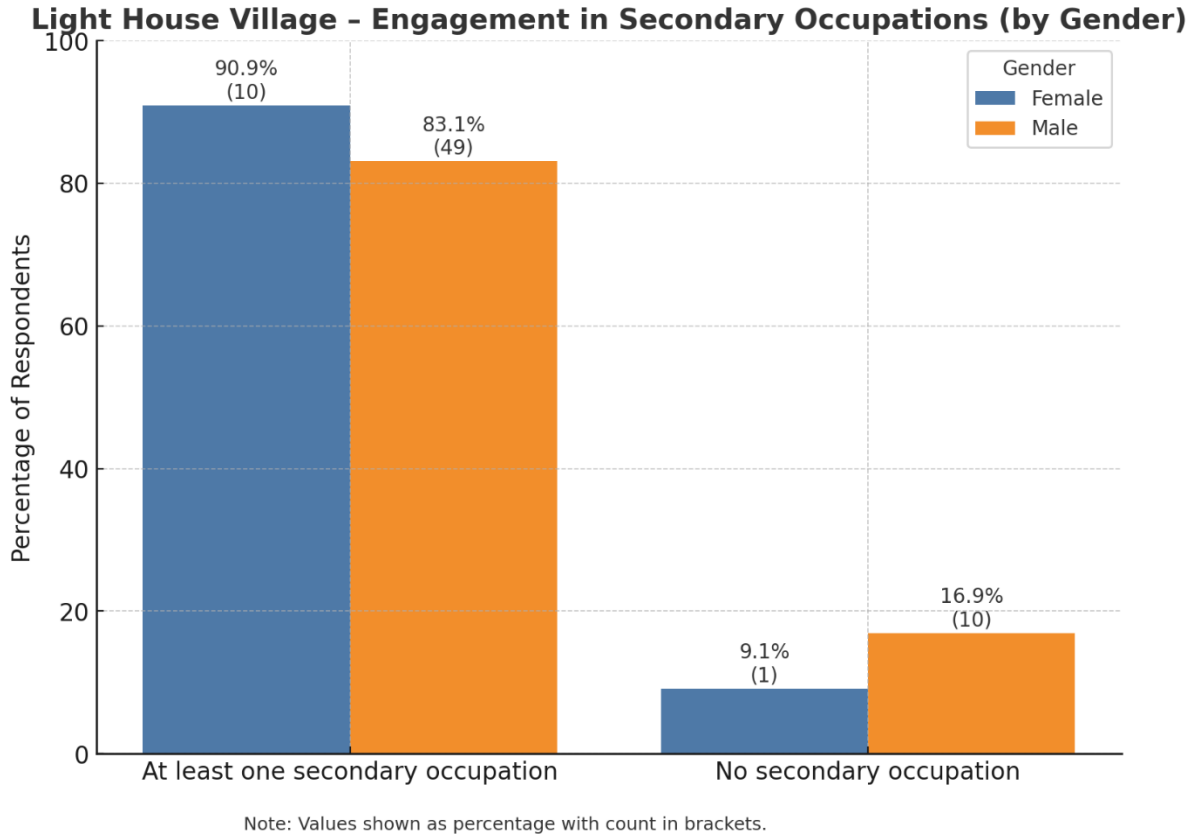
By contrast, women respondents (N=11) were concentrated in Pagadiya fishing (90.9%) and to a lesser extent in fish selling (9.1%). No women reported ownership of boats, engagement in transport, or other asset-based roles.

Taken together, these findings reveal that while women do participate in capture fishing, they are largely absent from capital-intensive and mobility-dependent occupations, which remain exclusively male. This underscores both the gendered segmentation of livelihood opportunities and the limited recognition of women's contributions in formal occupational categories.

3.2.2 Secondary Occupations

Livelihood diversification emerges as a critical strategy for fisherfolk households in Light House, buffering against the uncertainties of marine-based incomes and the absence of formal social protection. Out of 70 surveyed respondents, 59 individuals (84.3%) reported engaging in at least one secondary occupation alongside their primary livelihood. Gender-disaggregated patterns are notable: 90.9% of women (30 of 33) reported a secondary occupation compared to 76.3% of men (29 of 38). In contrast, 11 respondents (3 women and 8 men) indicated no additional occupation. All secondary workers reported only one supplementary livelihood, suggesting that diversification is widespread but relatively shallow.

Figure 7 Secondary Occupation of the respondents



Among those primarily engaged in Pagadiya fishing (N=50), secondary activities reveal adaptation through seasonal labour mobility. The most common option was agricultural daily labour (25 individuals), reflecting the importance of land-based wage work during lean fishing periods. Other secondary occupations included non-agricultural skilled or unskilled labour, salt work (Agariya), and animal husbandry, albeit at lower frequencies. Smaller numbers reported

roles within the fisheries sector itself, such as fishing boat labour, home-based work, or participation in government programmes like MNREGA. Notably, 9 Pagadiya fishers reported no secondary occupation, suggesting either reliance on a single income stream or barriers linked to age, health, or caregiving responsibilities.

For respondents whose primary occupations lay outside Pagadiya fishing (e.g., fish selling, factory work, agricultural labour), engagement in secondary livelihoods was more limited and variable, reflecting the relatively steady—though low-income—nature of these activities.

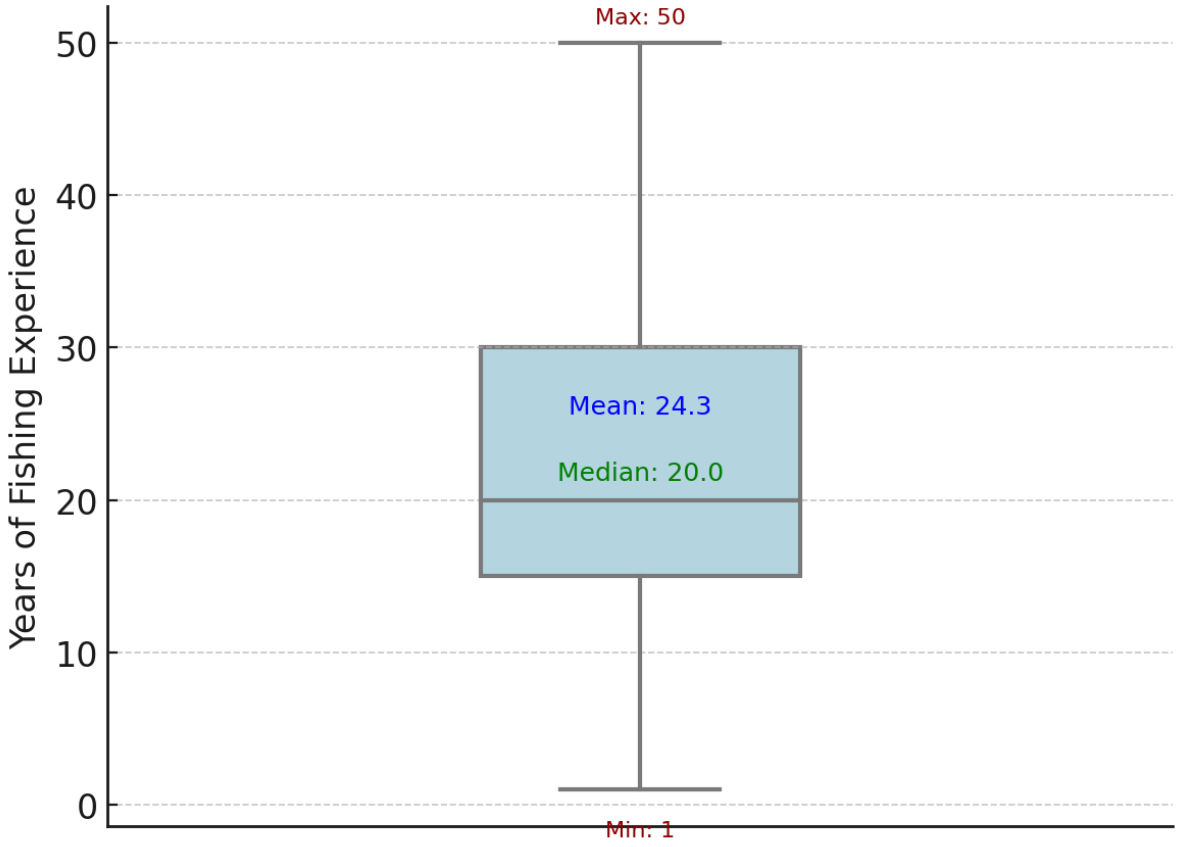
The gendered pattern of diversification is particularly significant. Women were more likely to combine flexible, low-entry-barrier activities such as agricultural labour, animal husbandry, and home-based work (Gruh Udyog) with unpaid domestic and care responsibilities. This dual role positions women as economic shock absorbers within households, sustaining family income during lean fishing seasons or in times of crisis. However, the informal and precarious nature of such work means their contributions remain under-recognised in formal policy frameworks, reinforcing structural gender inequalities.

Overall, the data highlights the importance of secondary occupations as a resilience strategy, while also drawing attention to the limited depth of diversification and the gendered burdens carried by women in maintaining household stability.

3.2.3 Fishing Experience

The mean years of experience stands at 26.6 years, with a median of 30.0 years, indicating that most fishers have long-standing engagement in marine livelihoods.

Figure 8 Distribution of fishing experience



Note: Labels indicate descriptive statistics for each village's respondent group.

The distribution is left-skewed, with a concentration of fishers reporting three decades or more of experience, while a smaller number of respondents with lower years of experience pulls down the mean. The range of fishing experience spans from 3 years to 50 years, reflecting both the presence of relatively new entrants and highly experienced veterans. The near alignment between mean and median suggests a relatively consistent occupational profile with fewer extreme outliers.

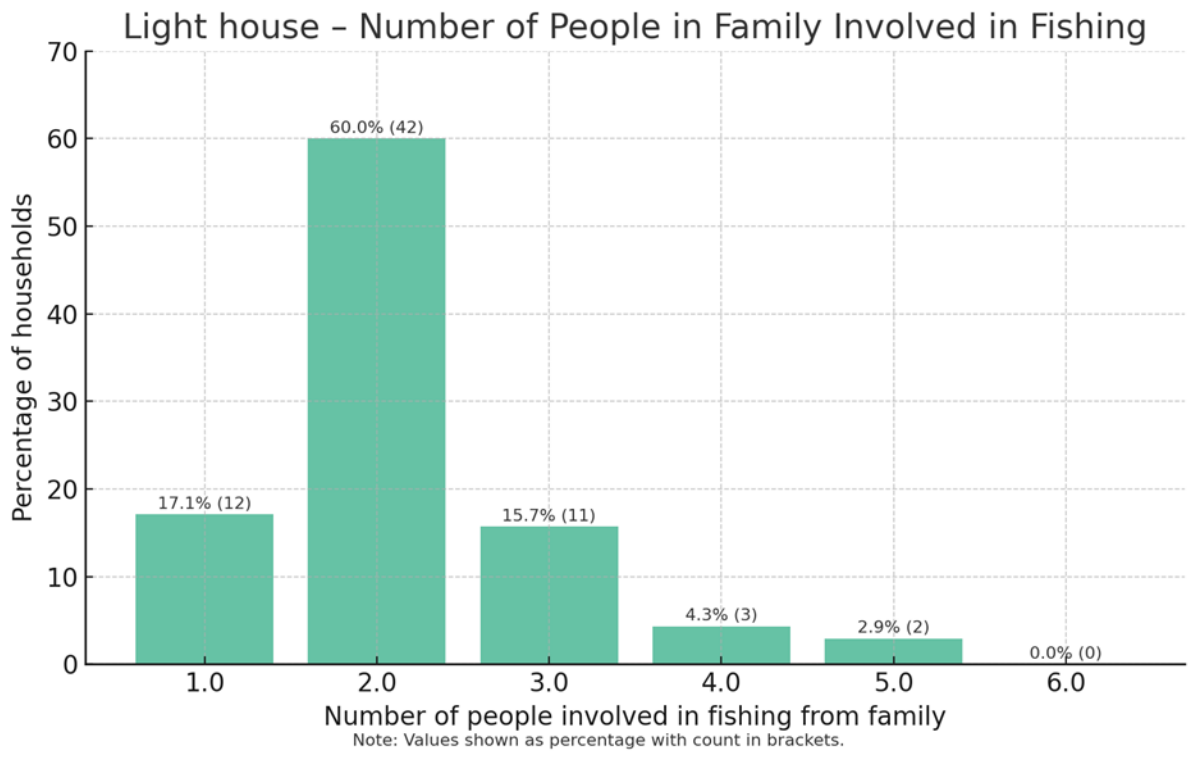
This concentration of long-term practitioners highlights the depth of traditional knowledge and vocational stability within Light House. Such embedded experience represents a significant asset, positioning the community with strong local expertise to adapt to environmental variability, regulatory changes, and evolving fishing practices.

3.2.4 Household Labour in Fishing

In Light House, fishing is often a shared household activity with multiple members engaged. The most common pattern was two members involved in fishing (36.2%, 21 households), followed by three members (31.0%, 18 households). Single-member involvement was reported in 12 households (20.7%), while larger households with four members (8.6%, 5 households) or five members (3.4%, 2 households) engaged in fishing were less frequent.

These figures point to a household economy where fishing labour is distributed among family members, reinforcing both the economic reliance on the sector and the collective nature of marine livelihoods in Light House

Figure 9 Number of members from the household involved in fishing



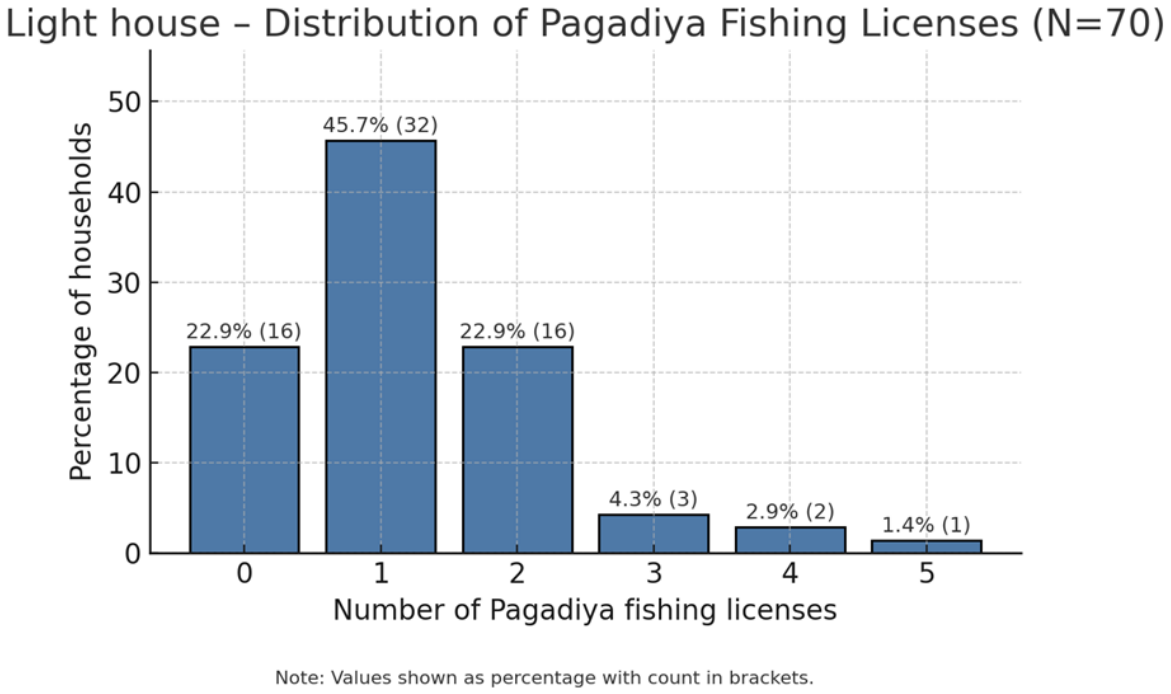
3.2.5 Fishing License Ownership at the Household Level

Fishing license ownership in Bandar was examined across three categories—Pagadiya fishing licenses, vessel/boat licenses, and fish selling licenses—with the total license count per household calculated as the sum of all three types.

A. Pagadiya fishing licenses

The distribution of Pagadiya fishing licenses is notably skewed towards lower numbers. 22.9% of households (16 households) reported having no licenses, indicating a significant portion of the fishing population may be operating without formal licensing. The majority of households, 45.7% (32 households), hold one license, while 22.9% (16 households) have two licenses. A smaller proportion of households reported owning three to five licenses, with the number of licenses owned decreasing progressively as the values rise. The range of licenses extends from 0 to 5, with a mean ownership of 1.23 licenses per household, highlighting a relatively low license density. This suggests that while many households have a single license, multi-license ownership is relatively rare within Light House.

Figure 10 Distribution of Pagadiya Fishing Licenses per Household



B. Vessel/boat licenses

The data from Lighthouse reveals a clear predominance of households without fishing vessel/boat licenses, with 85.7% (60 households) reporting no ownership of a license. A smaller percentage of households hold one or more licenses: 8.6% (6 households)

C. Fish selling licenses

The data from Lighthouse highlights the lowest mean number of fish selling licenses (0.51) among the three villages, with a range of 0 to 3 licenses. More than half of the households (57.1%, or 40 households) do not possess a fish selling license, which reflects a significant reliance on licensed sellers or intermediaries for market access. While a few households hold up to three licenses, most households have either none or only one, indicating limited capacity for independent fish sales. This dependency on others for selling fish underscores the challenges faced by households in achieving full economic autonomy in the fishing sector. Distribution of Fish Selling Licenses per Household

D. Total licenses (sum of three types)

Households are most commonly found in two groups: those with only Pagadiya licenses (31.4%, N=22) and those with both Pagadiya and fish selling licenses (31.4%, N=22), highlighting a focus on shoreline fishing and market sales. A significant 21.4% (N=15) of households have no licenses. Ownership of all three licenses is held by 10% (N=7), while vessel licenses are rare, with only 4.3% (N=3) holding both Pagadiya and vessel licenses. Only one household (1.4%) holds just a fish selling license. This indicates limited access to market and vessel rights, with Pagadiya fishing being central to livelihoods.

Table 7 Fishing License Combinations

Licence Combination	Count (%)
All 3 licences	7 (10.0%)
No licence	15 (21.4%)
Only Pagadiya	22 (31.4%)
Only Selling	1 (1.4%)
Pagadiya + Selling	22 (31.4%)
Pagadiya + Vessel	3 (4.3%)
Total N	**70 (100.0%)**

F. Licenses and household labour

An analysis in Light House village (N = 70) explored the relationship between fishing license ownership and household fishing engagement. The total number of licenses per household was calculated by summing Pagadiya fishing, fishing vessel/boat, and fish selling licenses. Household fishing involvement was measured by the number of family members actively engaged in fishing activities.

Descriptive Statistics:

- Total fishing licenses per household ranged from 0 to 8, with a mean of 1.96 (SD = 1.84) and a median of 2. The interquartile range (IQR) was 2, indicating that most households have between one and three licenses.
- Household fishing involvement ranged from 1 to 5 members, with a mean of 2.16 (SD = 0.86) and a median of 2, showing most households have 2–3 active fishers.

Correlation Analysis:

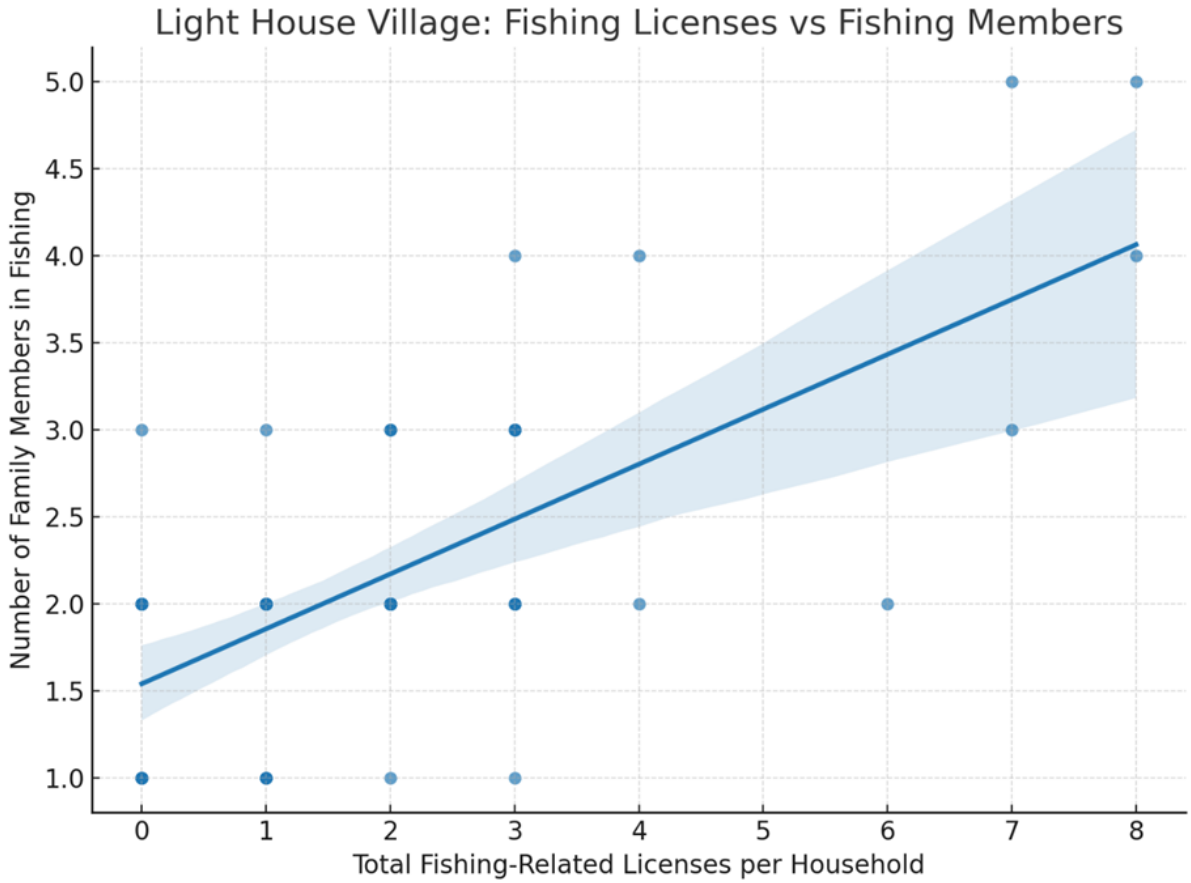
The Pearson correlation coefficient between the total number of licenses and household fishing involvement was $r = 0.672$, indicating a strong positive relationship. This correlation is statistically significant ($p < 0.001$), suggesting the observed relationship is unlikely to be due to chance.

The analysis shows that households with more fishing licenses tend to have more family members engaged in fishing. This is expected, as higher license ownership enables greater fishing operations, thus requiring more household labor. The scatter plot with a regression line confirms

this upward trend, though some households with high license counts and fewer active members may lease their licenses.

In conclusion, fishing license ownership is a strong indicator of household fishing involvement in Light House, with households holding more licenses playing a larger role in the local fishing economy.

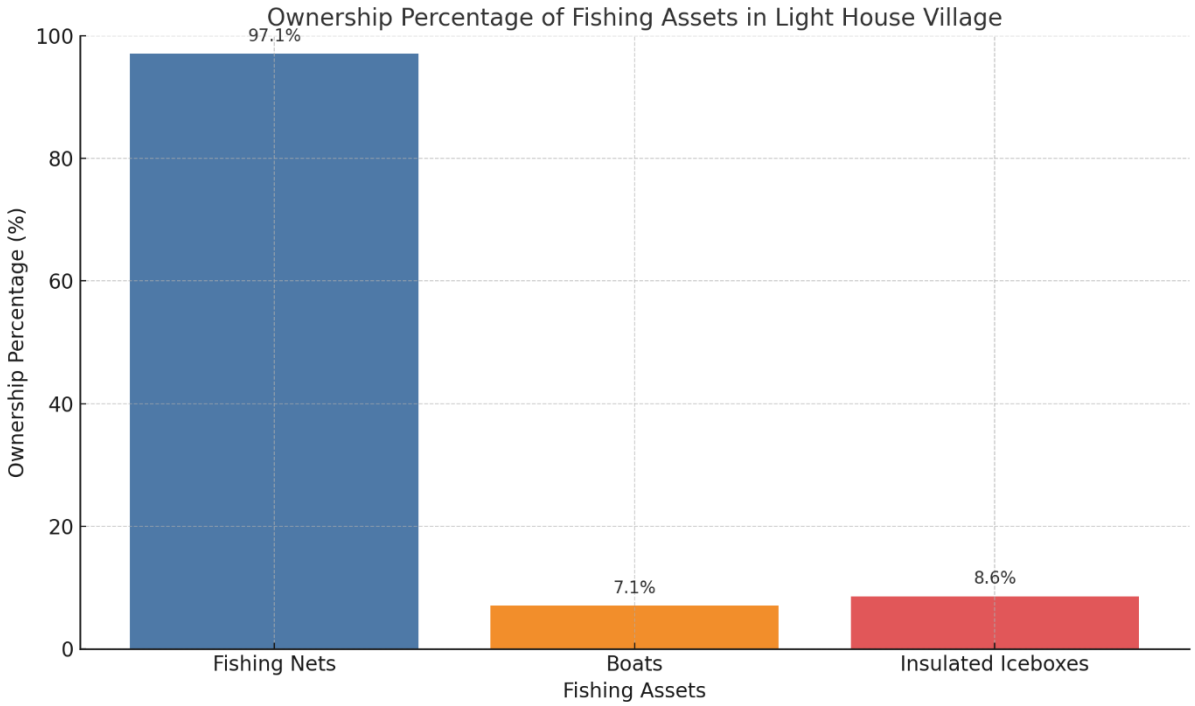
Figure 11 Scatterplot: Total Fishing-Related Licenses vs Number of Household Members in Fishing



3.2.6 Household Ownership of Fishing Assets

The bar chart above illustrates the ownership percentage of various fishing-related assets in Light House Village. As shown, nearly all households (97.1%) own fishing nets, making them the most common asset. In contrast, only a small proportion of households' own boats (7.1%) and insulated iceboxes (8.6%). ***No households reported owning cold storage, fish holding tanks, or GPS devices, highlighting the limited infrastructure available to the fisherfolk in this village.*** These findings underscore the heavy reliance on basic fishing equipment and the absence of crucial assets for preserving and adding value to the catch, leaving the community vulnerable to post-harvest losses and environmental risks.

Figure 12 Household Ownership of Key Assets



3.2.7 Gaps in Licensing Coverage

In Light House village, unlicensed participation in fish sales appears to be a common but not overwhelming practice. A total of 7 households (10%) reported engaging in unlicensed selling, with 9 individuals involved. This results in a mean of 0.13 unlicensed sellers per household, indicating that informal selling is present but not pervasive across the community.

This pattern, much like in other artisanal fishing communities, points to gaps in the formal licensing system rather than intentional evasion of regulations. Many fishing households, especially those engaged in family-based fishing activities, have multiple members contributing to the fishing or marketing processes. However, formal registration typically recognizes only one individual per household, leaving other contributors, such as women or younger family members, outside the regulatory framework.

3.2.8 Pending License Renewals

In Light House, a significant proportion of household's report pending Pagadiya license renewals. 68.57% of households (48 out of 70) are affected, with a total of 59 licenses pending renewal, which translates to an average of 0.84 licenses per household.

The issue of pending fish-selling license renewals is also prevalent in Light House, with 45.71% of households (32 out of 70) reporting 39 licenses still awaiting renewal, averaging 0.56 licenses per household.

3.2.9 Fishing Effort and Productivity

The fishing landscape of Light House is predominantly made up of Pagadiya fisherfolk (N = 47), who reported an average of 18.2 days of fishing per month (SD = 6.3). This pattern is consistent with the non-motorized, tide-dependent fishing practices characteristic of shore-based fishing. The variability in fishing days is expected, given the reliance on natural conditions such as tides and weather, which often dictate the frequency and duration of fishing trips.

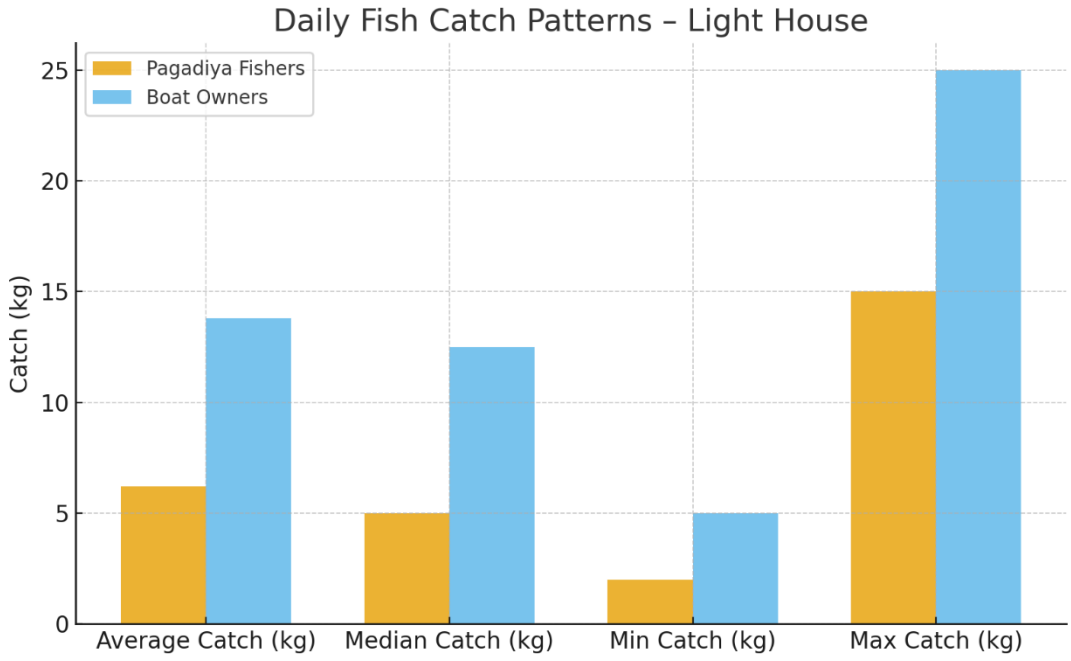
In contrast, the small boat owner group in Light House was minimal (N = 2), but their reported fishing intensity was notably high, with an average of 26.0 days per month and no variation (SD = 0.0). Despite the small sample size, this figure suggests that mechanized fishers in the village utilize their boats extensively. The lack of variability highlights the operational independence and enhanced mobility that boat ownership affords, allowing these fishers to optimize their fishing calendar and potentially access deeper or more resource-abundant waters.

Daily Fish Catch Patterns

In Light House (N = 62), both Pagadiya fisherfolk (N = 58) and small boat owners (N = 4) are represented. After removing extreme outliers, the data reveals a clear contrast between the daily fish catch of these two groups:

- Pagadiya fishers, who fish from the shore, report an average daily catch of 6.2 kg, with a median of 5 kg. The range spans from 2 to 15 kg, suggesting moderate productivity in shore-based fishing. These figures may reflect relatively favorable coastal conditions for Pagadiya fishing but also indicate the inherent limitations of fishing close to the shore.
- Small boat owners, on the other hand, report a significantly higher mean catch of 13.8 kg per day, with a median of 12.5 kg and a range from 5 to 25 kg. This stark difference suggests that unlike in Bunder and Katpar, boat ownership in Light House confers a clear advantage in terms of daily catch. The disparity between the two groups highlights the impact of technology and mobility on fish yield, with boat owners benefiting from access to deeper waters or more resource-abundant fishing grounds, a contrast that underscores how technological access enhances productivity in this coastal area.

Figure 13 Average Daily Catch of Pagadiya Fishers and Small Boat Owners



3.2.10 Motivations for Fishing and Allied Activities

The occupational motivations among fisherfolk in Light House are shaped by a combination of lifestyle benefits and economic relevance. The most frequently cited motivation was “Flexible timing,” reported by 65 respondents (92.9%), highlighting the strong preference for the autonomy and temporal flexibility that fishing offers. This is closely followed by “Commercial purpose

(Business)," selected by 58 respondents (82.9%), indicating the economic importance of fishing within household livelihood strategies.

The reason "Traditional occupation" was cited by 47 respondents (67.1%) reflects the cultural continuity of fishing in the community, though this was comparatively less dominant than in Bunder or Katpar, where traditional occupations hold more central significance. "Self-interest" was also significant, with 45 respondents (64.3%) acknowledging personal commitment and passion for the profession.

Interestingly, "Regular profit" was mentioned by 23 respondents (32.9%), the highest percentage among the three surveyed villages, which may indicate that fishers in Light House perceive better or more consistent income from fishing compared to their counterparts. The mention of "No other jobs available" by 16 respondents (22.9%), the highest figure across all villages, points to occupational constraints and suggests that local labor market limitations may restrict livelihood diversification.

Overall, these findings portray Light House as a community where fishing is valued for its functional flexibility and economic relevance, but also one where economic constraints and limited labour market alternatives influence occupational choices.

Gendered Patterns

Female Respondents (N = 11)

Among female respondents in Light House, the motivational profile was consistent, with all 11 women (100%) citing "Traditional occupation" as the primary reason for continuing in fishing. This reflects a strong cultural and intergenerational attachment to the occupation. Additionally, 10 women (90.9%) selected "Commercial purpose," "Flexible timing," and "Self-interest," underscoring that fishing is not only a legacy but also an economically relevant and personally fulfilling occupation.

Only 1 woman (9.1%) cited "Regular profit," and none reported lack of alternative jobs. This pattern suggests that, for women, fishing is primarily pursued out of passion, cultural legacy, and business viability, rather than out of economic necessity.

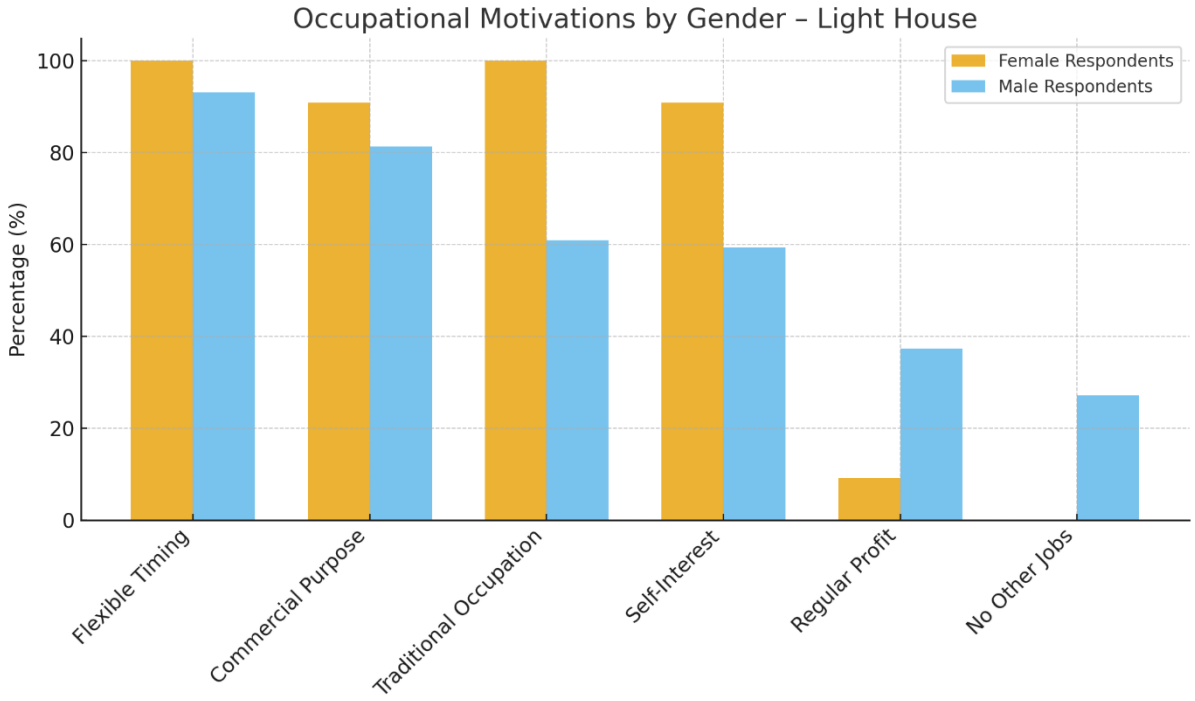
Among male respondents, the motivations were similar but slightly more varied. The leading motivations were "Flexible timing" (93.2%, 55 respondents), "Commercial purpose" (81.4%, 48 respondents), and "Traditional occupation" (61.0%, 36 respondents). Notably, the cultural connection to fishing is weaker among men compared to women, indicating a shift in occupational continuity.

"Self-interest" was cited by 35 respondents (59.3%), highlighting the autonomy of men in choosing fishing as their livelihood. A smaller proportion, 22 men (37.3%), mentioned "Regular profit," and 16 men (27.1%) cited lack of alternative jobs. This suggests that while fishing remains a preferred livelihood, some men face structural constraints in diversifying their income sources.

Occupational Differences

Disaggregating by primary occupation shows consistent emphasis on commerce and culture, with some variation:

Figure 14 Motivations for Fishing Reported by Respondents



3.2.11 Seasonal and Species Patterns

In Light House (N = 70), fishing activity largely aligns with the seasonal patterns observed throughout the Mahuva block. The August–October period was favored by 43 respondents (61.4%), corresponding to the peak post-monsoon fishing returns, which typically bring higher yields. This strong preference underscores the community's reliance on this period for the majority of their fishing activities.

The May–July window, chosen by 25 respondents (35.7%), also holds significance as a secondary fishing season, although it is less predominant than the post-monsoon period. In contrast, the November–February and March–April periods were selected by just 1 respondent each (1.4%), indicating either minimal fishing activity or perceived low returns during these months.

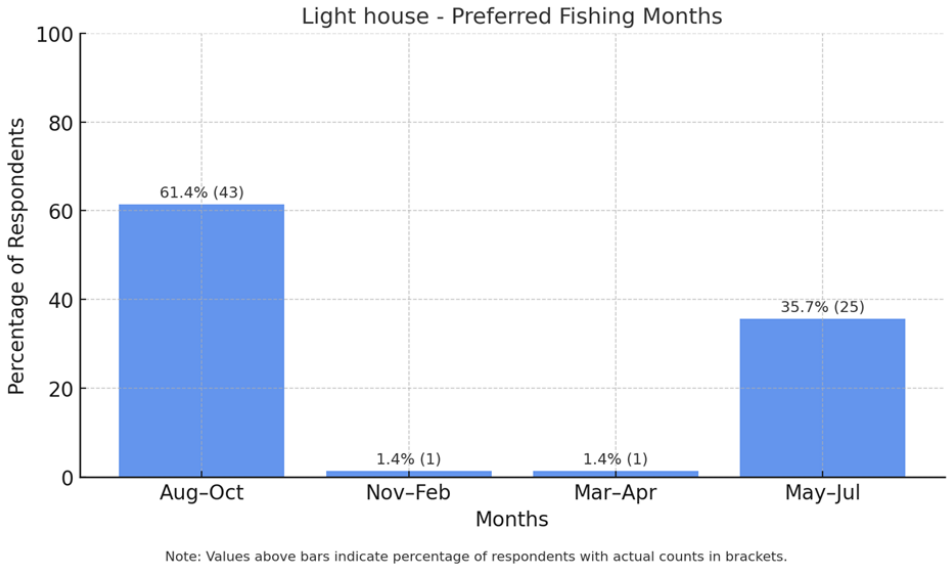


Figure 15 Seasonal Fishing Periods Reported by Respondents

Species composition

Pagadiya fisherfolk

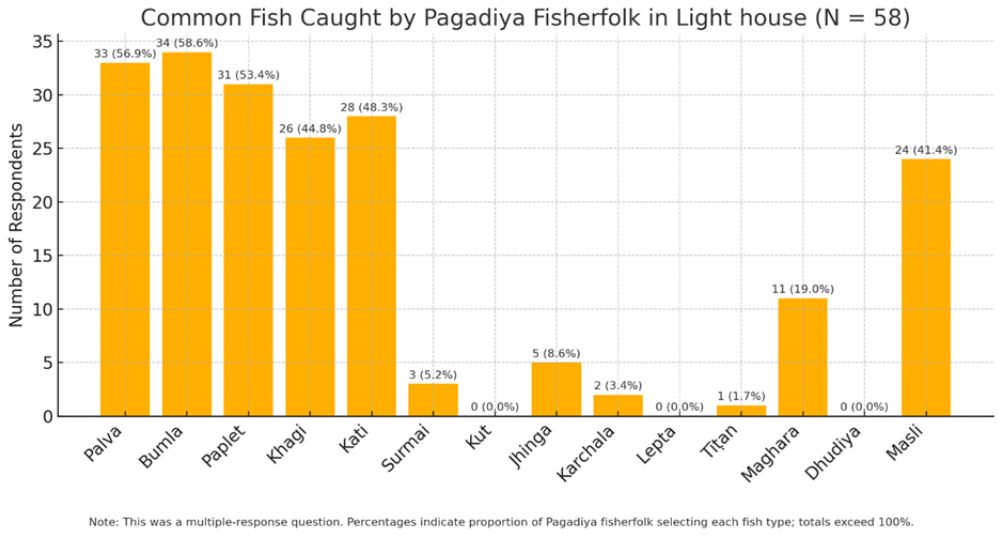
Pagadiya fisherfolk in Light House report significant diversity in fish catches. The most commonly caught species were Palva (56.9%, 33 respondents), Bumla (58.6%, 34 respondents), and Paplet (53.4%, 31 respondents). Other frequently caught species included Kati (48.3%, 28 respondents) and Khagi (44.8%, 26 respondents), indicating a reliance on a range of mid-value species.

Species such as Maghara (19.0%, 11 respondents), Masli (41.4%, 24 respondents), and Jhinga (8.6%, 5 respondents) were less common. Kut, Karchala, Lepta, and Dhudiya were rare or unreported, suggesting selective fishing practices or ecological factors. Interestingly, although only 1 respondent (1.7%) reported catching Tīṭan, its marginal presence across villages may warrant further ecological monitoring.

Small Boat owners

In Light House, the distribution of fish catches among boat owners is more evenly spread across species. Palva (Pomfret), Paplet (Indian Mackerel), Khagi (White Croaker), and Bumla (Catfish) were each mentioned by 18.2% of respondents (4 mentions). Kati (Kingfish) (13.6%) and Maghara (Indian Salmon) (9.1%) were also noted, while Surmai (Seer Fish) appeared only once (4.5%).

Figure 16 Species Composition of Catch Reported by Pagadiya Fishers



3.2.12 Income from Fishing

In the **Light house village**, the analysis of daily income across different primary occupations provides valuable insights into the economic conditions of the community.

1. **Fishing - Own Small Boat**:
    - The average daily income for those involved in fishing with their own small boats is ₹237.44. The income ranges from ₹164.38 to ₹273.97, with a standard deviation of ₹63.27.

2. **Pagadiya Fishing**:
    - The average daily income for those involved in Pagadiya fishing is ₹270.40. The income ranges from ₹219.18 to ₹328.77, with a standard deviation of ₹28.65.
3. **Selling of Fish**:
    - The average daily income for those involved in selling fish is ₹273.97. The income ranges from ₹273.97 to ₹273.97, with no variability in this group.

The overall trend indicates that most people in Light house village earn close to ₹273.97 daily, with some variability depending on occupation. Fishing with small boats shows greater income disparity, while Pagadiya fishing offers more stable earnings.

Figure 17 Distribution of Daily Fishing Income by Occupation

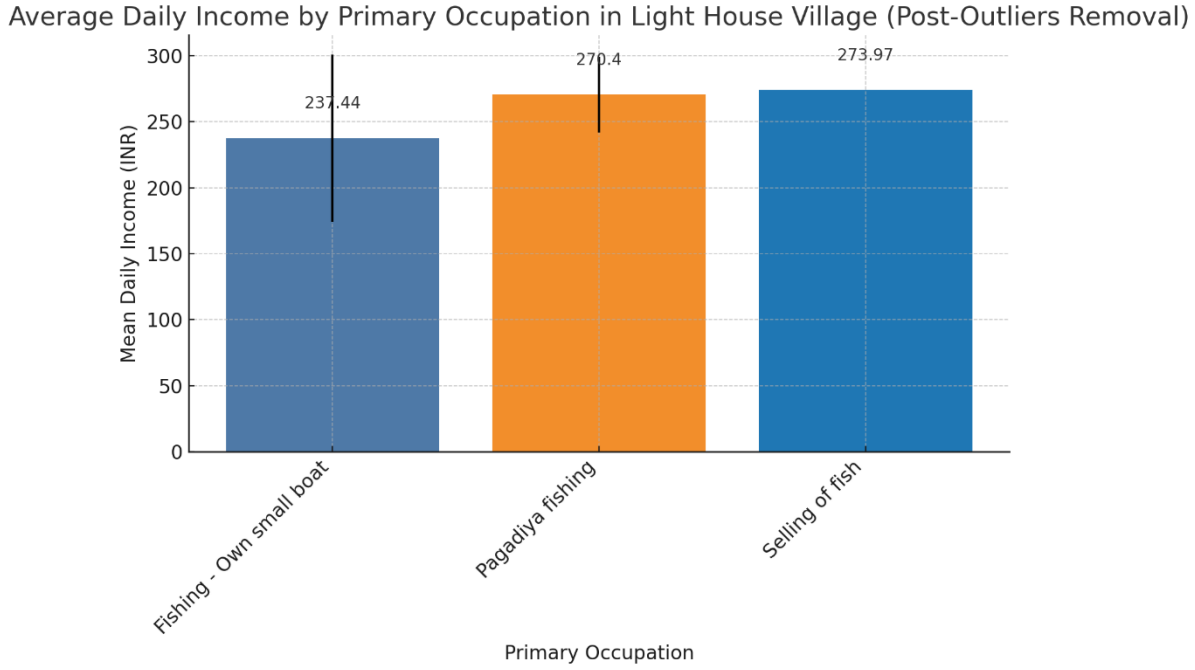


Figure 24. Average Daily Fishing Income by Occupation and Gender

In Light house village, the analysis of daily income by gender, after removing outliers, provides a clearer picture of the economic conditions for men and women in the community.

The data reveals that women have a higher mean daily income of ₹326.28, compared to men, whose mean daily income is ₹263.54. However, this difference is primarily due to greater variability in women's incomes, as reflected in a higher standard deviation of ₹64.20. This suggests that while a small number of women earn considerably more, the income for most women in the village is within a narrower range.

In contrast, men's income is more consistent, with a standard deviation of ₹27.03. Their daily income ranges from ₹164.38 to ₹328.77, and their median income is ₹273.97, which is the same as that of women.

Despite the difference in mean income, the median daily income for both genders is identical at ₹273.97, indicating that the majority of both women and men earn similarly. The narrower

income range for men suggests more stability in their earnings, while women show a broader range, reflecting some higher-income outliers.

In conclusion, while women in Light house village on average earn more than men, the data shows a more stable and consistent income for men, with both groups having a similar median income. This highlights that, for most respondents, the daily earnings are close to ₹273.97, regardless of gender.

3.2.13 Expenditure on Fishing

The small boat owners reported a mean expenditure of ₹1,000 per fishing trip, with a median also at ₹1,000, indicating a central tendency. The costs ranged from ₹200 to ₹2,000, reflecting both low-intensity and high-intensity operations. Lower costs likely correspond to smaller, localized trips, while higher values indicate more resource-intensive ventures. Despite this variability, ₹1,000 remains the normative benchmark for trip costs in the village.

3.2.14 Market and Selling Practices

82.9% of respondents (n = 58) reported the presence of a local market within 10 km. Fish were sold through various channels: 75.7% (n = 53) via retail within the village, 14.3% (n = 10) at local markets, and 10.0% (n = 7) through village fish traders. Bonded sales were almost absent, with 98.6% (n = 69) denying participation. Quality assurance practices were strong, with 94.3% (n = 66) segregating varieties and 98.6% (n = 69) using weighing scales. Among fisher households (n = 62), 96.8% (n = 60) sold directly to villagers, while only 3.2% (n = 2) relied on the market.

Women play a key role in direct sales, particularly in door-to-door and stall-based retail. This arrangement provides flexibility and contributes to women's income within the household economy. However, limited participation in external markets restricts women's ability to capture higher prices and expand their sales volumes.

3.2.15 Seasonal Migration

In Light House village, 5.71% of households reported migration. These households indicated that migration involved the entire family, with both the respondent and their family members participating. The primary destinations for migration included Bhavnagar (50% of migrant households), Mahuva (25%), and Rajkot (25%). The number of individuals migrating per household ranged from two to six, with two being the most common. This suggests that migration from Light House typically involves multiple members of the household, with destinations mainly being nearby urban centres and fishing hubs.

While this data suggests limited migration, discussions during the 2025 village assembly highlighted that fisherfolk are increasingly engaging in different forms of movement and livelihood shifts, which they do not recognize as "migration." This indicates a broader shift in the types of mobility occurring within the village, beyond traditional definitions of migration, reflecting changes in work patterns and mobility for economic opportunities.

Summary of Section 3.2: Livelihood System

In Light House village, fishing is the primary livelihood for most households, anchoring their income and identity. However, fishing alone is rarely sufficient, with households diversifying into secondary occupations like wage labor, small-scale trade, farming, and livestock rearing. These secondary sources of income help families cope with the seasonal fluctuations of fishing and rising household costs.

A pronounced gender division exists in the village's labor structure. Men are predominantly engaged in capture fishing, while women play crucial roles in post-harvest activities, fish

marketing, and unpaid domestic and care work. Despite their significant contributions, these roles are under-recognized in formal economic assessments.

The data also highlights migration patterns in Light House, with a small proportion of households (5.71%) reporting migration. However, this migration is not categorized as "migration" by the fisherfolk themselves, as they increasingly engage in mobility for new livelihoods and occupational shifts, reflecting broader changes in work patterns.

Secondary occupations serve as a resilience strategy for the village, though the scope of diversification is relatively shallow. Women are more likely to engage in secondary occupations, often combining flexible, low-barrier activities with domestic responsibilities, reinforcing their role as economic shock absorbers within households.

Fishing licenses, which are essential for economic autonomy, are limited in Light House, with many households lacking the formal licensing necessary for boat ownership and fish selling. The relationship between license ownership and household fishing involvement indicates that households with more licenses tend to have more members engaged in fishing activities, which strengthens the local fishing economy.

Overall, the section provides insights into the strategies employed by fisherfolk households in Light House, the gendered nature of their work, and the adaptive strategies they employ to maintain economic stability in a changing fishing landscape.

Section 3.3: Economic Conditions

Economic conditions of small-scale fisherfolk households are critical for understanding their vulnerabilities and resilience. These conditions are shaped by income, expenditure, debt, access to credit, asset ownership, and housing security, which determine their capacity to invest and recover from shocks.

In Gujarat's coastal villages, where livelihoods are seasonal and informal, income fluctuates due to climatic changes, fishing bans, and market access. Financial services are uneven, particularly for women and marginalized groups.

This section looks at:

- Primary income sources and income ranges
- Access to credit and loans
- Debt burdens and repayment issues
- Housing quality and security

By analyzing these factors by gender and livelihood role, the findings point to opportunities for improving financial inclusion, housing, and livelihood support.

3.3.1 Livelihoods and Income Sources

In Light House (N=70 households), the primary income source for most households is Pagadiya fishing, with 85.7% (60 households) relying on it as their main livelihood. Smaller proportions of households engage in other activities: 10% (7 households) own small boats, and 4.3% (3 households) sell fish. No households reported relying on boat labor. The overwhelming dependence on Pagadiya fishing, coupled with minimal income diversification, underscores the vulnerability of households to fluctuations in fish stocks and environmental changes.

Primary Income Source of Households

The primary income source for most households is Pagadiya fishing, with 85.7% of households (60 out of 70) relying on it. The annual incomes for Pagadiya fishing households range from ₹35,000 to ₹100,000, with a mean income of ₹68,000 and a median income of ₹65,000. This reflects the subsistence nature of fishing, with households largely depending on this activity to meet their basic consumption needs.

Table 8 Primary Income source of the household

Primary income source of the family	Mean Income (Rs)	Median Income (Rs)	Min Income (Rs)	Max Income (Rs)
Pagadiya fisherfolk	68000	65000	35000	100000
Boat owners	115000	110000	90000	140000
Fish sellers	60000	58000	55000	65000
Agricultural/Labour	45000	43000	40000	50000

Boat-based fishing provides a higher income, though fewer households engage in it. Boat owners report a mean income of ₹115,000 and a median income of ₹110,000, reflecting the higher income potential of mechanized fishing. However, the number of households involved in boat-based fishing remains limited, indicating restricted access to capital and assets.

Other income sources, such as fish selling, contribute less, and agricultural or daily labor households earn modest incomes, averaging ₹40,000 to ₹50,000 annually. These findings underscore Light House's heavy reliance on artisanal fishing, with limited diversification into other income-generating activities.

3.3.2 Aggregate Household Annual Income Sources

In Light House village, fishing remains the primary source of income, contributing ₹4.52 million annually. This is the core economic activity for most households. In addition, other sources of income, including informal activities such as casual labor, remittances, and small-scale engagements, contribute ₹2.15 million. Fish selling adds ₹0.245 million, while boat labor generates a modest ₹10,000 annually. Livestock and agriculture contribute minor amounts, with ₹500 and ₹5,000 respectively, reflecting the marginal role of land-based livelihoods.

This income breakdown underscores the village's heavy reliance on marine resources, while also indicating emerging, though informal, diversification into secondary activities.

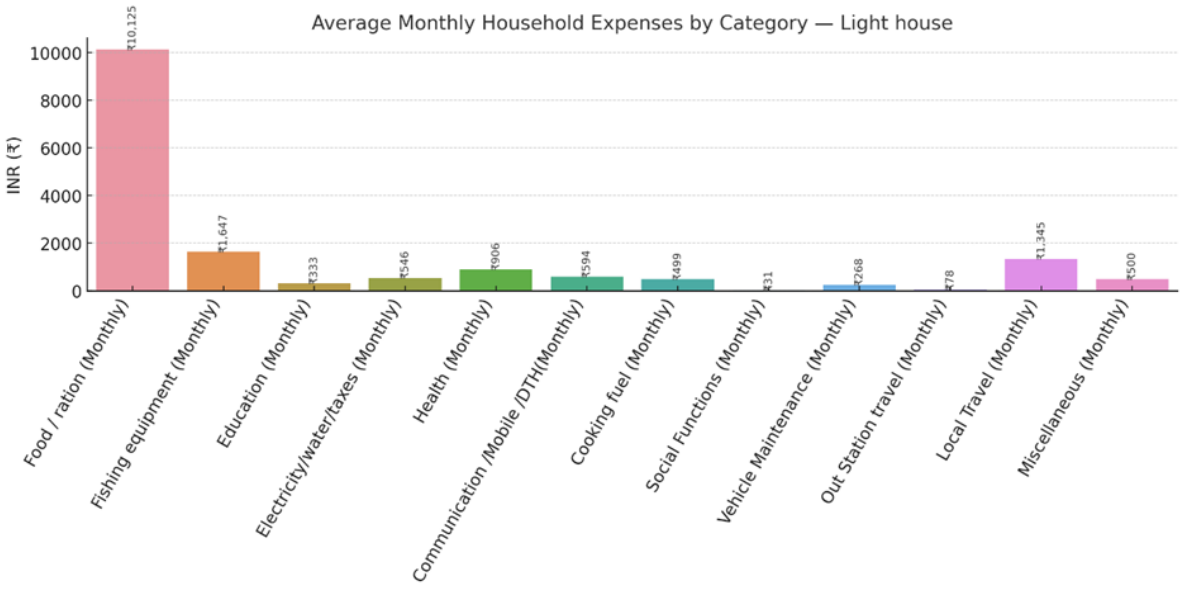
3.3.3 Household Debt and Borrowing

In Light House village, only 3 households reported taking loans: 2 households for fishing nets, and 1 household provided conflicting information regarding a house/land purchase. Overall, 95.7% of households (67 out of 70) reported no ongoing loans, with only 1 household borrowing from neighbours, friends, or relatives. This suggests a preference for informal, social-network-based lending due to easier access and trust.

3.3.4 Household Expenditure Patterns

In Light House village, the average monthly food expenditure is ₹10,125, the highest among the three villages, indicating significant reliance on food spending

Figure 18 Average Monthly Household Expenditure



. This may reflect larger household sizes, higher staple commodity costs, or tighter economic constraints. Fishing equipment (₹1,647) and local travel (₹1,345) are the next highest expenses, underscoring the dependence on fishing livelihoods and related mobility. Other monthly expenditures are more moderate: health (₹906), utilities (₹546), communication (₹594), and cooking fuel (₹499). Spending on social functions is minimal at ₹31, suggesting limited

participation in community or ceremonial activities due to economic pressures. The expenditure pattern in Light House reflects a primary focus on food and fishing-related costs, with little flexibility for discretionary spending, highlighting economic constraints.

3.3.5 Financial Inclusion

61.4% (43 households) reported having a Jan Dhan account, while 38.6% (27 households) lacked coverage. However, all households (100%) confirmed having their own bank account. This reflects universal access to individual banking, but uneven coverage under Jan Dhan Yojana, which limits full access to welfare entitlements linked to the scheme. In a community dependent on Pagadiya fishing, this gap increases vulnerability, as families without Jan Dhan accounts are excluded from key state-provided financial support.

3.3.6 Housing Tenure and Quality

Housing conditions in Bandar reflect both high levels of asset ownership and persistent vulnerabilities in tenure and structural quality.

Ownership and tenure security.

In Light House village, all 70 households (100%) own their homes, indicating full housing security. This universal homeownership reduces exposure to housing insecurity and suggests strong local entitlements and rooted settlement patterns. Secure tenure allows families to invest in housing improvements and diversify livelihoods, bolstering resilience to economic and climatic disruptions. However, Light House also faces a paradox: while all households own their homes, none have pattas (land titles). This highlights the gap between de facto ownership and de jure land rights, limiting legal protection and reducing the community's ability to make long-term investments in housing and infrastructure.

Housing materials.

Regarding roofing, Light House (N=70) shows a reliance on thatched roofs, with 61.4% (43 households) using thatch. Meanwhile, 31.4% (22 households) have cement/concrete roofs, and a smaller number rely on tin or mud-bamboo roofs. While some households have invested in more durable roofing materials, the majority still rely on thatch, making roofing a vulnerability for the community.

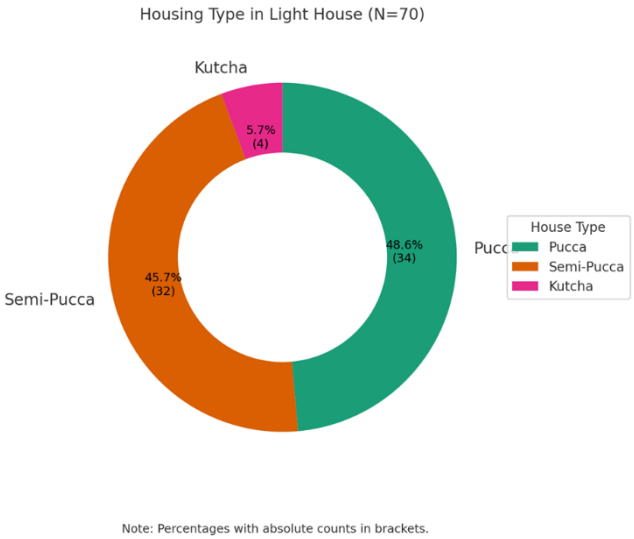
Differentiation by occupation.

Light House village (N=70) presents a more polarized housing scenario. Among Pagadiya fisherfolk (N=55), 38.2% (21 households) live in Pucca houses, 54.5% (30 households) in Semi-Pucca, and 7.3% (4 households) in Kutcha dwellings. This makes Light House the village with the highest proportion of Kutcha homes, highlighting the vulnerability of Pagadiya fisherfolk to inadequate housing.

In contrast, fish sellers (N=10) show more resilience, with 70.0% (7 households) living in Pucca houses and 30.0% (3 households) in Semi-Pucca. No fish sellers live in Kutcha housing. Other small occupational groups also report living in Pucca or Semi-Pucca houses, indicating better housing conditions.

This disparity within Light House highlights intra-village inequalities, with fish sellers demonstrating greater resilience and Pagadiya fisherfolk facing more significant structural vulnerabilities.

Figure 19 Housing type



3.3.7 Agricultural Land Ownership

The land ownership is minimal, with only 2 households (2.9%) owning agricultural land. The remaining 68 households (97.1%) are completely landless. The total land owned by these 2 households is less than 2 acres, with an average holding of under 1 acre. All of this land is reported as cultivable, with no non-cultivable areas. This near-total landlessness highlights the village's exclusive dependence on fishing, leaving households highly vulnerable to fluctuations in marine resources.

3.3.8 Livestock Ownership

In Light House village (N=70), livestock ownership is minimal. Only 3 households (4.3%) own goats, with a total of 4 goats (mean 1.3 per household). Cows and buffaloes are owned by 2 households each (2.9%), with 2 animals per household (mean 1.0). This indicates that livestock is nearly absent in the village, reinforcing the community's exclusive reliance on marine fishing. The lack of even small ruminants limits adaptive flexibility during lean fishing periods, increasing household vulnerability.

3.3.11 Insurance Coverage

In Light House village (N=70), insurance coverage is almost non-existent. Only 1 household (1.4%) reported holding a private insurance policy, while 69 households (98.6%) had no insurance coverage. No households have insurance for boats, equipment, nets, health, or personal accidents, highlighting the community's high vulnerability. The lack of government-linked insurance schemes further exposes households, who are heavily dependent on Pagadiya fishing, to marine risks and occupational hazards. This absence of insurance options underscores the gap between available policies and the community's access to them.

The complete absence of insurance leaves the community entirely exposed to both routine risks—such as gear damage or health expenses—and extreme shocks, including cyclones, accidents at sea, and the sudden loss of productive assets. Without formal risk transfer mechanisms, households are compelled to depend on informal coping strategies, such as borrowing from relatives or liquidating small assets, which further erodes long-term resilience.

3.3.12 Fishing Grounds and Distance

Pagadiya fisherfolk show more variation, with distances ranging from 3.00 km to 20.00 km. fisherfolk who own small boats travel an average of 25.00 km, reflecting their reliance on fishing grounds within a set range.

Summary of Section 3.3: Economic Conditions

Household economies in Light House are predominantly reliant on Pagadiya fishing (85.7%), with smaller contributions from boat ownership (10%) and fish selling (4.3%). Income diversification is minimal, as most households depend solely on fishing, while boat owners enjoy higher but more volatile incomes, with fish sellers earning significantly less. Median annual incomes for Pagadiya fishers are around ₹65,000, reflecting the subsistence nature of their livelihood.

Expenditure in Light House is heavily focused on food (₹10,125/month), leaving little room for health, education, or savings. Fishing equipment (₹1,647) and local travel (₹1,345) are the next highest expenses, highlighting the village's reliance on fishing-related costs. No households reported formal borrowing; instead, small loans are typically obtained through informal networks of relatives or friends.

While financial inclusion is relatively high, with 61.4% of households having Jan Dhan accounts, all households have individual bank accounts, suggesting broad access to banking. However, these accounts remain underutilized for credit and welfare schemes, limiting the community's access to formal financial support.

Housing ownership is universal (100%), but no households have land titles (pattas), indicating legal insecurity despite de facto ownership. A significant portion of the village (61.4%) still uses thatched roofing, making them vulnerable to climate risks. Agricultural land ownership is minimal, with 97.1% of households landless, and livestock ownership is almost non-existent, further emphasizing the village's dependence on fishing.

Insurance coverage is almost non-existent, with only 1.4% of households having private insurance, and no households have insurance for boats, fishing equipment, or health. This leaves households highly vulnerable to both everyday risks and extreme climate events.

Overall, Light House's economy is heavily dependent on fishing, with limited diversification, legal housing insecurity, and a lack of risk protection. These factors heighten the community's vulnerability to ecological changes and climate shocks.

3.4 Social Capital

Social capital is the foundation of strength and resilience in fishing communities, influencing household interactions, involvement in local organizations, and access to state entitlements. In resource-constrained economies like Light House, where financial and physical assets are limited, social networks and institutional ties become essential safety nets.

For women, federations and collective platforms offer crucial opportunities for representation, advocacy, and negotiation with local governance systems. The availability of identity documents, participation in social protection schemes, and awareness of fisheries-related institutions reflect the extent of integration into the state's welfare and regulatory systems.

This section evaluates the social capital of Light House households across various dimensions:

- Membership in women's federations and community-based organizations.
- Participation in public employment schemes like MNREGA.
- Possession of identity and entitlement documents.
- Access to welfare schemes and infrastructure.
- Engagement with fisherfolk-specific programmes.
- Awareness and involvement with fisheries institutions.

These indicators highlight both the strengths and limitations of Light House's social capital, revealing how gendered participation, limited outreach of welfare programs, and inconsistent institutional engagement affect the community's ability to mobilize resources and assert their rights.

3.4.1 Membership in Women's Federations

In Light House, 100% of women (n = 11) reported membership in the Shakti Mahila Sangathan Federation membership demonstrates the strong reach of *Shakti Mahila Sangathan* promoted by Utthan as a women-focused platform.

3.4.2 Absence of a Fisherfolk Munch

While women's federations in Light house achieve near-universal membership, the village has no fisherfolk munch, cooperative, or collective body to represent the occupational interests of fishers. The absence of such an institution constrains the community's ability to organise around shared challenges, negotiate market access, demand infrastructure, or secure entitlements under state and central schemes.

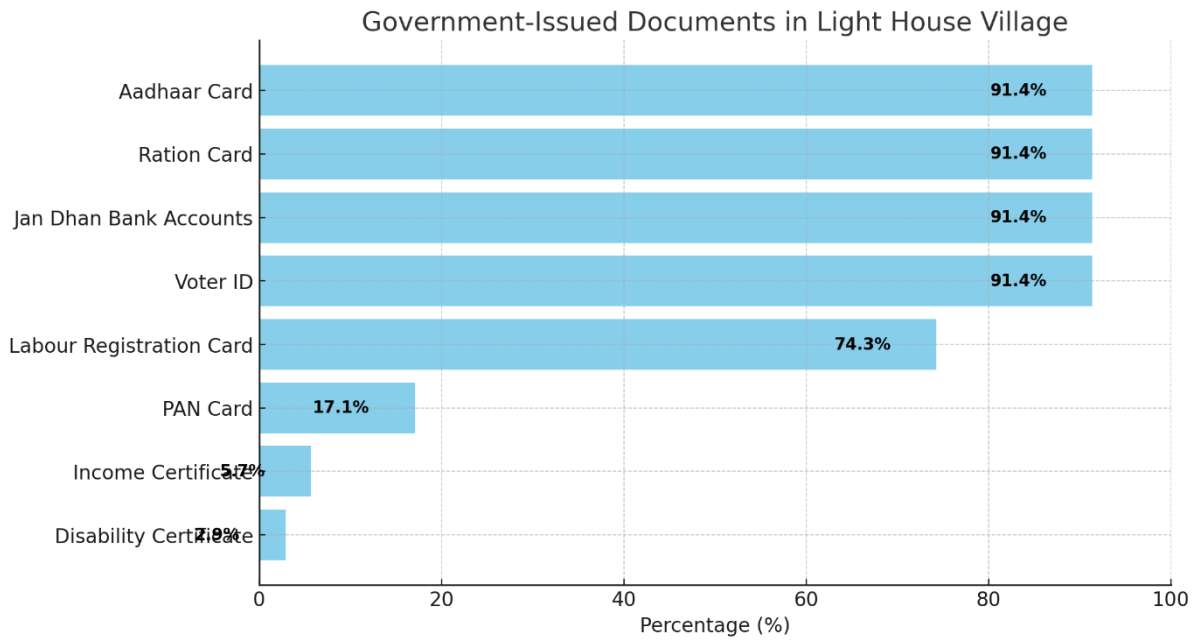
3.4.3 Access to MNREGA

All surveyed women (100%, n = 11) and men (100%, n = 59) reported not receiving **MNREGA** work. This complete lack of access to the scheme underscores a significant gap in the delivery of government welfare in the village, leaving households without the safety net of wage-based employment. Without this entitlement, the community remains reliant on the unstable marine livelihoods, further increasing their vulnerability to economic shocks and seasonal fluctuations in fishing.

3.4.4 Possession of Identity and Entitlement Documents

In Light House, all respondents (100%, n = 70) reported possession of at least one government-issued identity or entitlement document. The most common documents were Aadhaar Cards (91.4%, n = 64), Ration Cards (91.4%, n = 64), Jan Dhan Yojana Bank Accounts (91.4%, n = 64), Voter Identity Cards (91.4%, n = 64), and Labour Registration Cards (74.3%, n = 52). Secondary documents were less common, including PAN Cards (17.1%, n = 12), Income Certificates (5.7%, n = 4), and Disability Certificates (2.9%, n = 2). No respondents reported possession of MNREGA Job Cards, Caste Certificates, Kisan Credit Cards.

Figure 20 Possession of Identity and Entitlement Documents



3.4.5 Access to Social Welfare Schemes

Access to government welfare schemes was limited. The most frequently reported scheme was Manav Garima Yojana, accessed by 10.0% of households (n = 7). Smaller proportions reported coverage under the Ayushman Card (5.7%; n = 4) and e-Shram Card (4.3%; n = 3). A small number of households also reported access to the Widow Pension (1.4%; n = 1). *No households reported access to other programs, such as Elderly Pension, Palak Mata Pita Yojana, Vahali Dikri Yojana, Kuvarbainu Mameru, Sukanya Samruddhi Yojna, Ghar Divada Yojna, Sankat Mochan Yojna, Saat Pagla Yojna, or the PM Vishwakarma Scheme.* The absence of uptake across most schemes reflects significant barriers in translating entitlements into practice. Expanding facilitation and outreach efforts could improve household-level access to welfare schemes, enhancing livelihood security for the community.

3.4.6 Access to Fisherfolk-Specific Government Schemes

In Light House (N = 70 households), no households reported access to any fisherfolk-specific schemes. This includes programs such as the Pradhan Mantri Matsya Sampada Yojana (PMMSY), Diesel VAT Relief Scheme, Matsya Udhyog Awas Yojana (Housing), Khedut Akasmat Vima Yojana (Accident Insurance), the Gujarat Fishermen Welfare Fund Scheme, and the Kisan Credit Card (KCC) for fisherfolk. Access to these schemes in Light House is entirely absent, indicating a significant gap in the community's ability to benefit from fisheries-specific support. The lack of uptake suggests potential barriers in awareness, eligibility, or facilitation, leaving the majority of

households excluded from formal mechanisms of risk management, financial inclusion, and infrastructure support.

3.4.7 Infrastructure Support through Government Schemes

Access to fishing-related infrastructure through government schemes was very limited. Only five households (7.1%) reported receiving fishing nets, while two households (2.9%) received boats with diesel/petrol engines and one household (1.4%) reported having an insulated icebox. No households received support for cold storage facilities, fish holding tanks, GPS equipment, quality testing laboratories, or non-motorised boats. This suggests that infrastructure provisioning in Light House has been confined to a small number of households and basic equipment, leaving significant gaps in post-harvest facilities, safety equipment, and value chain infrastructure.

3.4.8 Awareness of Fisheries Institutions and Engagement with the Department

In Light House (N = 70 households), awareness of fisheries-related institutions was narrowly concentrated. Only 20% of households (n = 14) reported knowledge of the Fisheries Research and Training Centre, Mahuva, while no respondents identified any other fisheries-related institutions. This localized awareness indicates that fisherfolk in Light House primarily associate institutional engagement with the Mahuva Training Centre, with little to no connection to state, national, or international fisheries organizations.

Summary of Section 3.4: Social Capital

Social capital in Light House is shaped by strong women's federation membership but remains weak in occupational collectives, programme participation, and institutional linkages. Membership in Shakti Mahila Sangathan is universal among women (100%), providing a vital platform for support and advocacy. However, there is no fisherfolk-specific collective, limiting the community's ability to organize around shared challenges, negotiate market access, and secure entitlements under state and central schemes.

Access to public employment is absent, with no households reporting participation in MNREGA. Identity coverage is high, with nearly all households possessing Ration Cards, Jan Dhan accounts, Voter IDs, Aadhaar, and Labour Registration Cards. However, secondary documents such as PAN Cards, Income Certificates, and Disability Certificates are less common. Engagement with social welfare schemes is limited, with only 10% of households accessing Manav Garima Yojana. Smaller proportions report coverage under Ayushman Card (5.7%) and e-Shram Card (4.3%). Access to fisherfolk-specific schemes is entirely absent, with no households benefiting from PMMSY, Diesel VAT Relief, or the Gujarat Fishermen Welfare Fund Scheme.

Infrastructure support is minimal, with only fishing nets (7.1%) and a small number of households receiving boats with diesel/petrol engines (2.9%) and insulated iceboxes (1.4%). No households received support for cold storage, fish holding tanks, GPS equipment, or quality testing laboratories. Awareness of fisheries institutions is limited, with only 20% of households aware of the Fisheries Research and Training Centre in Mahuva, and no awareness of other fisheries-related institutions.

Overall, Light House shows strong women's social capital but faces significant gaps in programme participation, welfare access, and institutional engagement, leaving the community with limited support systems and reduced access to government resources.

3.5 Physical Capital / Household Infrastructure

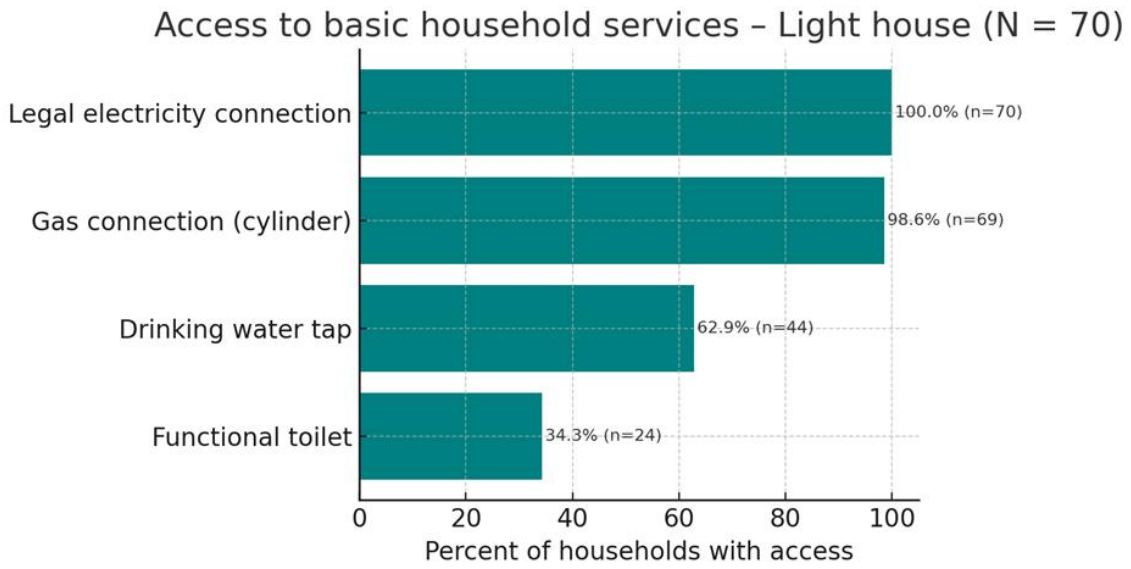
Physical Capital refers to the material resources and infrastructure that shape household living conditions and livelihood sustainability. In coastal villages like Light House, small-scale fisherfolk are highly dependent on reliable access to essential services such as water, sanitation, energy, and housing. These resources are crucial not only for daily well-being but also for effective participation in both social and economic life. Adequate infrastructure reduces health risks, supports productivity, and improves overall quality of life, while infrastructural deficits can perpetuate exclusion and increase vulnerability.

This section examines access to essential household services in Light House, focusing on key aspects such as sanitation, water supply, electricity, and cooking fuel. These indicators reveal the critical infrastructural foundations that contribute to the well-being and resilience of the community.

3.5.1 Access to Basic Household Services

Access to basic services showed a similar pattern to Mahuva Bandar, with slight improvements in water coverage. All households (100%, n = 70) had a legal electricity connection, and nearly all households (98.6%, n = 69) had gas connections. Access to drinking water taps was reported by 62.9% of households (n = 44), which, while not universal, was significantly higher compared to Bandar. However, only 34.3% of households (n = 24) had access to a functional toilet, highlighting consistent sanitation gaps across the village.

Figure 21 Access to Basic Services



Summary of Section 3.5: Physical Capital / Infrastructure

ALL households have electricity connections, and nearly all have gas connections, ensuring reliable energy access. However, only a third of the households have a functional toilet, reflecting a significant gap in sanitation infrastructure. However, the lack of universal access to clean water and sanitation facilities has important implications for public health and quality of life. These infrastructure gaps limit the village's resilience to health risks and undermine overall community development, highlighting the need for targeted interventions in water and sanitation services.

3.6 Natural Capital / Environment & Climate

Natural Capital in Light House refers to the ecological resources and environmental conditions that sustain the livelihoods of its fishing community. Small-scale fisherfolk in Light House rely on marine ecosystems for subsistence, but these same ecosystems also present significant vulnerabilities. Changes in fish populations, climate variability, and exposure to natural hazards directly impact household security and community well-being.

At the same time, local ecological knowledge plays a crucial role in helping fishers anticipate weather patterns and adapt to environmental stresses. This section explores household perceptions of ecological changes, climate risks, and adaptive practices in Light House, emphasizing both the environmental pressures faced by the community and the strategies they employ to maintain resilience.

3.6.1 Observed Decline in Fish Diversity and Population

In Light House (N = 70), respondents were more evenly divided in their perceptions of ecological decline compared to other sites, though a majority still recognized it. 62.9% (n = 44) reported a decrease in fish diversity and population, while 37.1% (n = 26) did not observe such a change. Gendered differences were notable: 71.8% of men (n = 28 out of 39) perceived a decline, compared to 51.6% of women (n = 16 out of 31). This suggests that women, who are often more involved in post-harvest activities, may experience and interpret resource pressures differently from men, who are directly engaged in fishing.

3.6.2 Perceptions on Juvenile Fish Capture and Species Scarcity

In Light House (N = 70), 67.1% (n = 47) of respondents agreed that capturing juvenile fish reduces overall fish catch, while 32.9% (n = 23) did not share this view. Men were more likely to report this perception, with 74.4% (n = 29 out of 39) agreeing, compared to 58.1% of women (n = 18 out of 31). Regarding species scarcity, respondents commonly cited the decline of Hilsa (Modar/Palva), Pomfret (Paplet), and Bombay duck (Bombil). Additionally, a few mentioned the scarcity of small pelagic fish varieties (Nano Machhliyo) and Prawns (Jhinga), reflecting concerns about the depletion of vital marine resources.

3.6.3 Household Experiences of Natural Calamities

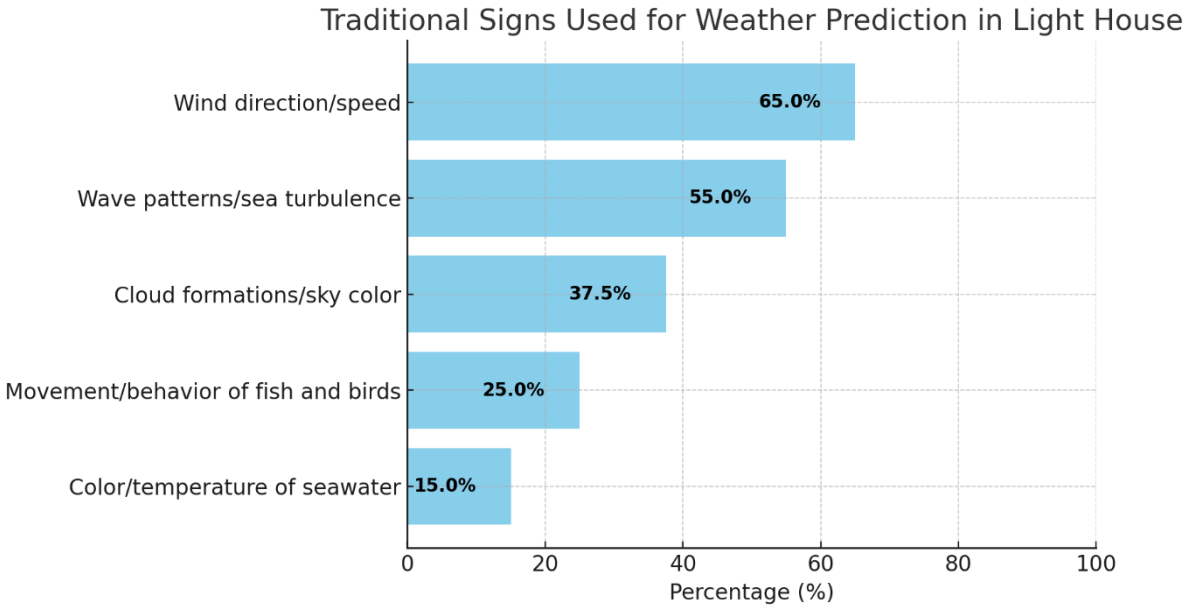
Among the respondents, 55.7% (n = 39) of households reported being affected by cyclones or climate change in the past five years, while 44.3% (n = 31) indicated no such experience. Gender differences were notable: 66.7% of men (n = 26 out of 39) reported being affected, compared to only 41.9% of women (n = 13 out of 31). This suggests that men, who are more directly engaged in fishing at sea, may experience or perceive the risks of natural calamities more acutely than women.

Within the 39 households affected by calamities, the impacts were somewhat dispersed. The most significant issues were economic loss (69.2%, n = 27) and disruption of fishing activities (61.5%, n = 24). Loss of catch (41.0%, n = 16) and damage to boats (25.6%, n = 10) were also reported. Fewer households mentioned damage to houses (12.8%, n = 5), damage to equipment (7.7%, n = 3), and emotional distress (7.7%, n = 3). As with other areas, there were no reports of crop loss, cattle death, displacement, or injuries.

3.6.4 Traditional Weather Prediction

57.1% (n = 40) reported being able to predict the weather, while 42.9% (n = 30) did not. Gender differences were pronounced: 71.8% of men (n = 28 out of 39) claimed predictive ability, compared to only 38.7% of women (n = 12 out of 31). This suggests a weakening of traditional weather-observation practices, particularly among women in this settlement. Among the 40 respondents who reported predictive ability), reliance on traditional signs for weather prediction was more modest. The most frequently mentioned indicators were changes in wind direction or speed (65.0%, n = 26) and wave patterns or sea turbulence (55.0%, n = 22). Cloud formations or sky colour (37.5%, n = 15) and the movement or behaviour of fish and birds (25.0%, n = 10) were reported less frequently, while colour or temperature of seawater (15.0%, n = 6) was the least common. No respondents mentioned other unique indicators.

Figure 22 Traditional Signs Used for Weather Prediction



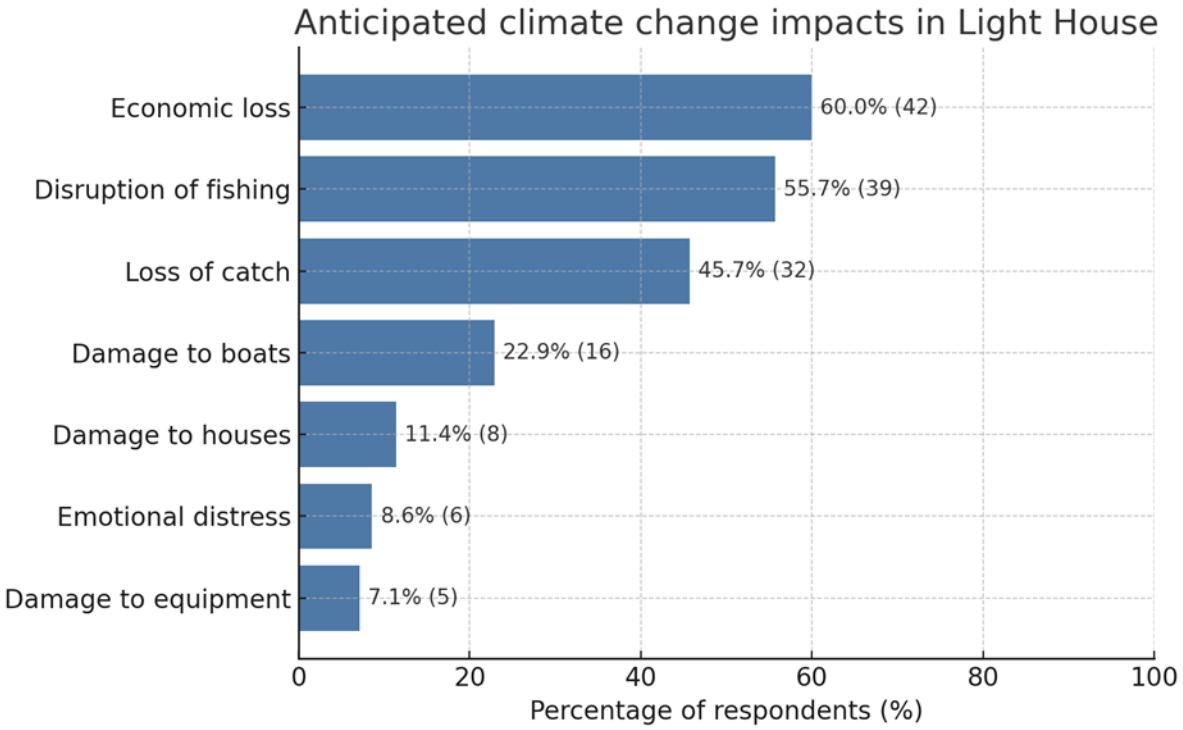
3.6.5 Belief in Climate Change

97.1% of respondents (n = 68) reported observing changes in climate, while 2.9% (n = 2) did not. All women (100%, n = 11) reported noticing changes, compared to 96.6% of men (n = 57 out of 59). This indicates complete awareness among women and near-complete awareness among men regarding climate changes in the area.

3.6.6 Anticipated Impacts of Climate Change

Future expectations in Light House were more cautious but still significant. The most common concerns were economic loss (60.0%, n = 42) and disruption of fishing activities (55.7%, n = 39). Nearly half of the respondents anticipated loss of catch (45.7%, n = 32), while fewer pointed to damage to boats (22.9%, n = 16) or damage to houses (11.4%, n = 8). Only small numbers mentioned emotional distress (8.6%, n = 6) and damage to equipment (7.1%, n = 5). As in other sites, no respondents foresaw displacement, injury, crop loss, or cattle death. These results suggest that households expect climate change to exacerbate financial and fishing-related challenges rather than cause direct destruction to homes or personal safety.

Figure 23 Anticipated Impacts of Climate change



3.6.7 Perceived Vulnerability Within the Fishing Community

Respondents in Light House (N = 70) identified women (40.0%, n = 28) and widows (20.0%, n = 14) as the most vulnerable groups, followed by the elderly (18.6%, n = 13). Smaller shares mentioned children (11.4%, n = 8) and youth (10.0%, n = 7). No respondents highlighted persons with disabilities.

In terms of fishing types, Pagadiya fishers (61.4%, n = 43) were considered the most vulnerable, followed by small-scale fishers with non-mechanized boats (Hathiyari naav machhimar) (22.9%, n = 16) and mechanized boat fishers (Engine wali naav machhimar) (15.7%, n = 11).

These findings suggest that while vulnerability is recognized across various groups, respondents in Light House were more likely than those in other villages to acknowledge the risks faced by different types of fishers.

3.6.8 Sources of Support During Fishing Losses

In Light House (N = 70), support systems were notably weak. The largest proportion of respondents reported no help received (38.6%, n = 27), followed by family and relatives (31.4%, n = 22). Only 5.7% (n = 4) reported receiving help from the local community and fellow fishers, while 2.9% (n = 2) acknowledged some level of government support. Additionally, 21.4% (n = 15) claimed they had not been affected by climate-related events.No households identified cooperatives, NGOs, financial institutions, religious groups, or private companies as sources of support. These findings point to a significant gap in external assistance, leaving the community vulnerable and lacking support during climate-related disruptions.

Summary of Section 3.6: Natural Capital / Environment & Climate

Households in **Light House** demonstrate a strong dependence on marine ecosystems while facing increasing ecological stress and climate risks. A majority (62.9%) observed a decline in fish diversity and population, with 67.1% acknowledging the negative effects of juvenile fish capture.

Species such as **Hilsa**, **Pomfret**, and **Bombay duck** were identified as increasingly scarce, reflecting growing concerns over resource depletion.

Climate shocks have been a significant concern in recent years. More than half of households (55.7%) reported being affected by **cyclones** or **climate change** in the past five years, with the most common impacts being **economic loss** (69.2%) and **disruption of fishing activities** (61.5%). **Loss of catch** (41.0%) and **damage to boats** (25.6%) were also noted, but **damage to houses** (12.8%) and **emotional distress** (7.7%) were less frequent. No households reported **crop loss**, **livestock death**, or **displacement**.

Local ecological knowledge continues to play a critical role in adaptive practices. Over half of the households (57.1%) reported the ability to predict weather, with reliance on **wind direction**, **wave patterns**, and **cloud formations**. However, **men** were more likely than **women** to report this ability, indicating a gendered division in traditional weather-observation practices. **Awareness of climate change** was nearly universal (97.1%), and anticipated future impacts were centered around **livelihood disruptions** and **financial insecurity**.

Perceptions of vulnerability were both **gendered** and **occupational**. **Women** (40.0%) and **widows** (20.0%) were seen as the most vulnerable social groups, while **Pagadiya fishers** (61.4%) were identified as the most vulnerable occupational group. This suggests that while vulnerabilities are recognized across different groups, **fishing-based vulnerability** is especially high among those most dependent on the marine environment.

Coping mechanisms, however, reveal significant gaps. While some households turned to **family** (31.4%) for support, only a small proportion (5.7%) received assistance from the **local community** and fellow **fishers**, and only 2.9% accessed **government support**. Importantly, 38.6% of households reported receiving **no help** during climate-related fishing losses, highlighting the lack of institutional safety nets and the community's reliance on informal networks for support.

Overall, **Light House's** natural capital profile is defined by **ecological decline**, widespread **awareness of climate change**, and **resilience strategies** rooted in traditional knowledge and family support. However, the community faces significant challenges due to the lack of institutional support and external assistance during times of climate-related stress.

3.7 Institutional & Governance

Institutional and governance arrangements play a vital role in shaping how fishing communities access rights, comply with regulations, and seek support during vulnerable periods. In Light House, these arrangements encompass both formal systems—such as government departments, regulatory frameworks, and legal provisions—as well as informal mechanisms like community negotiation and mutual support. The effectiveness of these governance structures determines whether households receive recognition, protection, and inclusion in welfare measures, or remain excluded, vulnerable, and at risk of conflict.

This section examines household awareness of fishing regulations, perceptions of destructive practices, access to legal aid, and experiences with conflict and extension services. Together, these insights shed light on how community livelihoods interact with the institutional frameworks that govern their rights, resource use, and resilience.

3.7.1 Fishing Practices and Awareness of Regulations

In Light House, fishing practices predominantly involve the use of medium-mesh nets (20–30 mm), which are employed by the majority of respondents. A smaller proportion of households use small-mesh nets (10–20 mm), mainly for catching prawns and smaller fish species. Very few respondents reported using large-mesh nets (above 40 mm). When asked about catches with small-mesh nets, prawns and small fish species were the most frequently mentioned, highlighting the economic significance of these resources for the community.

3.7.2 Legal Aid and Conflict with Industrial Fishing

With respect to legal support, the situation in Light House mirrors that of Bandar and Katpar. The vast majority of respondents reported no regular access to legal aid, with only isolated cases indicating any access or awareness of such services. This lack of legal recourse severely limits the fisherfolk's ability to address rights violations, conflicts with industrial operators, or disputes related to fishing regulations. This highlights a critical gap in the community's capacity to seek justice and resolve conflicts effectively.

Figure 24 Participatory mapping exercise

In Light House, experiences of net damage caused by trawlers and large ships were widely reported, with more than half of the respondents confirming such incidents. This highlights ongoing tensions between small-scale fishers and industrial fleets, where competition for marine resources is further exacerbated by the physical destruction of artisanal gear.

Community Voices on Vessel Violation & Harassment:

"The vessel ship's route is not fixed. It runs on the direction of the wind," explained a villager.

"It runs depending on the wind. If there's a lot of wind, it runs closer to the shore," said another.

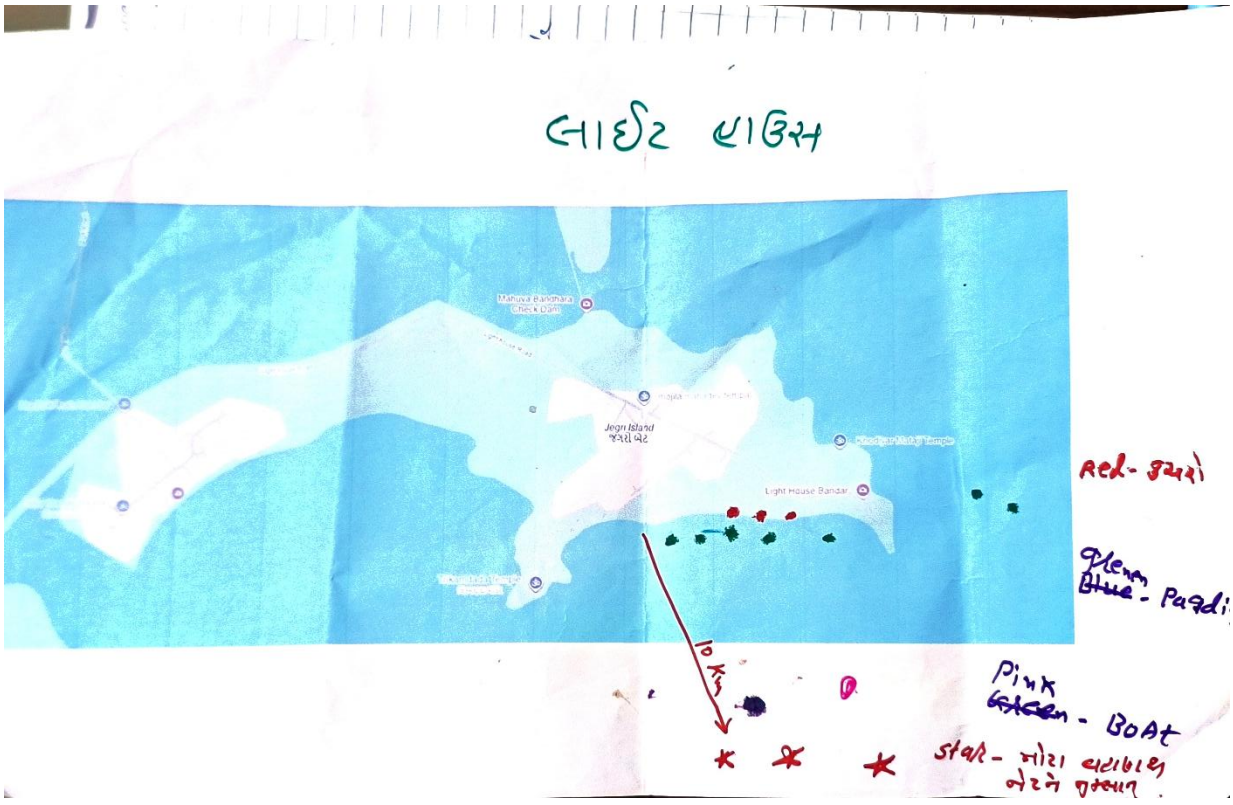
"They do this to save diesel and petrol," a third villager shared.

"And they harass us. Nothing else," expressed a fisherfolk from the community.

In terms of legal awareness, Light House fisherfolk demonstrated relatively strong knowledge. A large majority were aware that traditional fishing is legally permitted up to 9 nautical miles from the shore, and many recognized that Gill nets with a mesh size of less than 150 mm are prohibited. However, a small but significant minority indicated lack of awareness or uncertainty, suggesting that while outreach on legal norms has reached most of the community, informational gaps still persist for some segments.

Taken together, these findings reveal a fisherfolk community in Light House that depends heavily on medium-mesh nets, has substantial awareness of legal frameworks, but remains structurally disadvantaged due to lack of legal support and recurrent conflicts with trawlers. The mismatch between knowledge and enforcement capacity continues to undermine the security of artisanal fishing livelihoods.

Figure 25 Participatory Map of Fishing Grounds and Net Damage Areas



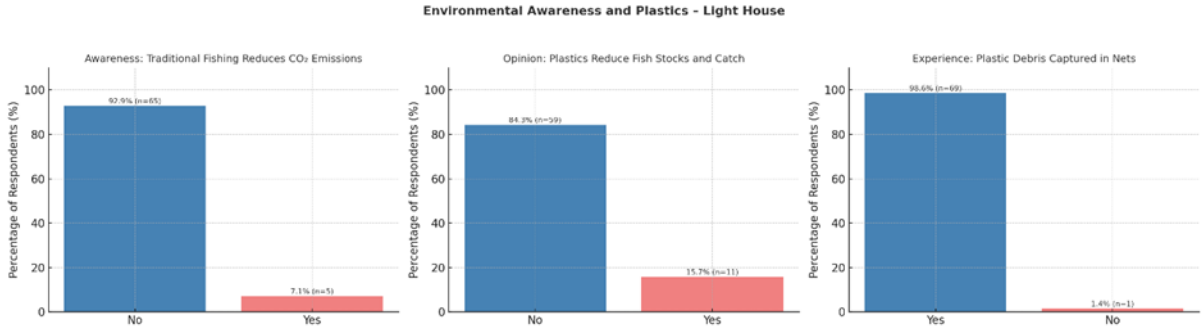
This participatory map, prepared during discussions with fisherfolk in Light house, illustrates critical fishing areas and the zones where nets are most frequently damaged by trawlers and large mechanized vessels. The mapping exercise confirms household survey findings on gear destruction and highlights the direct spatial overlap between artisanal fishing zones and industrial intrusion. Such overlaps not only reduce catch availability for Pagadiya fishers but also impose recurrent economic losses through gear replacement costs.

Source: *Participatory mapping exercise, Village Assembly discussion, Light house (2025).*

3.7.3 Environmental Awareness and Plastic Issues

In Light House, 7.1% (n = 5) of respondents reported awareness that traditional fishing reduces CO_2 emissions, while the vast majority (92.9%, n = 65) disagreed with this statement. Unlike in Bandar and Katpar, no respondents explicitly chose the "Not aware" option, suggesting a stronger certainty in the rejection of this idea.

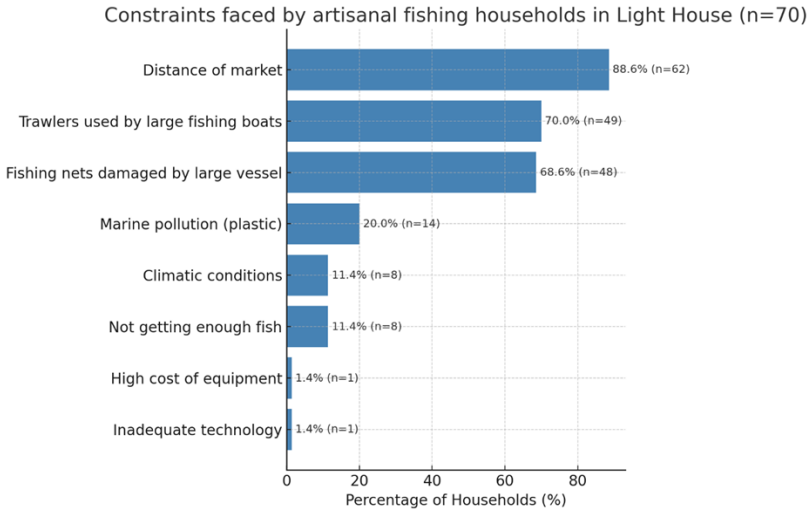
Figure 26 Environmental awareness and plastics



Regarding plastics, 15.7% (n = 11) believed that plastics are reducing fish stocks, while 84.3% (n = 59) disagreed. Despite this, plastic capture in nets was nearly universal, with 98.6% (n = 69) of respondents reporting encounters with plastic debris, and only 1.4% (n = 1) denied this. This indicates that while Light House residents have strong experiential awareness of plastic pollution, they have limited recognition of its broader impact on ecological decline or its role in climate dynamics.

3.7.4 Conflicts and Governance Challenges

Figure 27 Constraints faced by fisherfolk



In Light House, constraints were primarily concentrated around mechanization and structural barriers. The most widely reported issue was the distance to the market, cited by 88.6% (62 households), the highest proportion across the three villages. This highlights how geographical isolation severely limits market access and increases vulnerability to exploitative intermediaries.

Mechanization pressures were also significant, with trawlers operated by large fishing boats identified by 70.0% (49 households) and fishing nets damaged by large vessels reported by 68.6% (48 households). These findings indicate the systemic marginalization of artisanal fishers in the face of industrial operations. While environmental and ecological challenges were noted, they were less prominent: marine plastic pollution was identified by 20.0% (14 households), and climatic variability and declining fish catch were each reported by 11.4% (8 households). Isolated mentions of high equipment costs (1.4%, 1 household) and inadequate technology (1.4%, 1 household) suggest that capital- and technology-related issues, though relevant, are not as widely recognized as the more structural and ecological constraints.

Overall, the Light House results emphasize how spatial marginality and mechanization-driven displacement dominate local concerns. Ecological degradation, while acknowledged, plays a secondary role in the community's perception of constraints. These findings reinforce the idea that artisanal fishers are structurally disadvantaged in their access to markets and marine resources, facing systemic challenges that hinder their livelihoods.

The traditional livelihood of Pagadiya fishermen in Light House has been significantly disrupted by infrastructural and environmental changes. Fishing, once the primary occupation in the area, relied heavily on a tidal creek, locally referred to as the Baandhan or Bandharan, where seawater would flow in, creating a rich and productive fishing ground. However, the deterioration of this natural resource due to changing environmental conditions and inadequate infrastructure has led to the collapse of this traditional livelihood, leaving the community vulnerable to the loss of their primary source of income.

Summary of Section 3.7: Institutional & Governance

Institutional and governance arrangements in Light House reveal a similar imbalance: while fisherfolk demonstrate significant awareness of regulatory provisions, their ability to claim rights or access institutional support remains weak.

Fishing practices in Light House are dominated by medium-mesh nets (65.0%), with only a small proportion of respondents identifying their catch composition, suggesting partial gaps in ecological and regulatory awareness. Knowledge of legal norms is relatively strong, with most respondents aware that traditional fishing is permitted up to 9 nautical miles from shore and that Gill nets with a mesh size smaller than 150 mm are prohibited. However, this contrasts sharply with the lack of legal aid, with the vast majority (95.7%) of households reporting no access to legal support, and frequent conflicts with industrial operators, with more than half of the respondents (55.7%) reporting damage to nets by trawlers and large ships.

Environmental awareness in Light House reflects a similar disconnect. Nearly all households (98.6%) reported encountering plastic debris in their nets, but only 15.7% recognized plastics as contributing to declining fish stocks, and just 7.1% were aware of the low-carbon benefits of traditional fishing methods. This suggests a limited understanding of broader environmental risks beyond direct, lived experiences.

Broader governance challenges were highlighted by reported constraints. Distance to markets (88.6%) was the most significant concern, followed by mechanization pressures (70.0%) and net damage (68.6%). Environmental issues, such as plastic pollution (20.0%) and climatic variability (11.4%), were noted, along with smaller concerns such as equipment costs and inadequate technology. These findings place fisherfolk in a context shaped by structural barriers, industrial competition, and ecological pressures.

The collapse of traditional Pagadiya livelihoods due to infrastructure changes, such as the drying of tidal creeks, has further exacerbated the situation. Many community members, once reliant on fishing, have turned to wage labour or khalasi work, as reflected in a community member's statement: "Earlier fishing was our main profession, but now we don't get enough, so I am working as an agricultural labourer."

Overall, Light House's institutional landscape is characterized by regulatory awareness but weak enforcement, limited legal and environmental support, ongoing conflicts with industrial fishing, and underdeveloped extension services. These issues leave households highly vulnerable to ecological and economic challenges, with minimal institutional mediation to bolster resilience.

3.8 Gendered Dimensions of Livelihoods and Governance

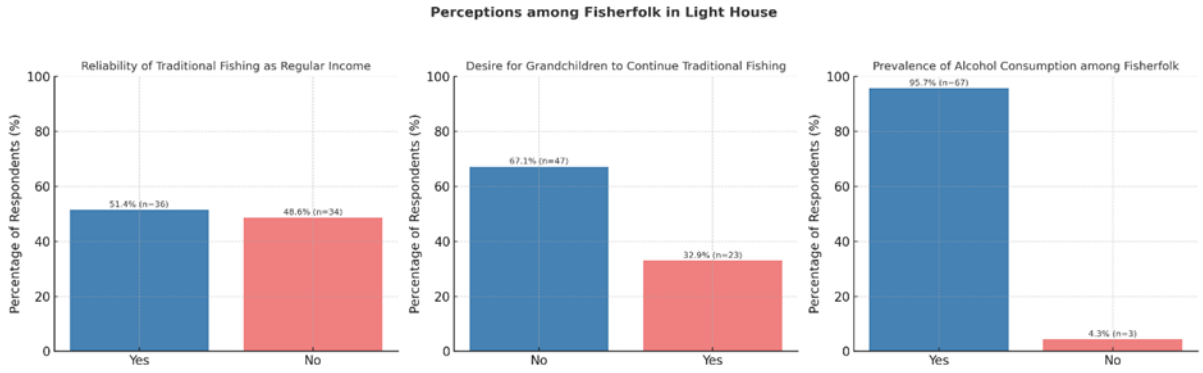
3.8.1 Challenges Faced by Women Fisherfolk

Women fisherfolk overwhelmingly identified low or unstable income as their primary challenge. Nearly all respondents (96.2%; n = 25) cited livelihood insecurity, while only one woman (3.8%) reported facing no challenges. These findings highlight how women's concerns are framed almost exclusively in economic terms, with livelihood precarity emerging as the defining feature of their participation in fishing and fish selling.

3.8.2 Perceptions of Traditional Fishing and Social Issues

Responses from Light House were closely divided on the sustainability of traditional fishing as a livelihood. A narrow majority of 51.4% (n = 36) considered traditional fishing a reliable source of income, while 48.6% (n = 34) disagreed. However, intergenerational perspectives were less favourable: 67.1% (n = 47) expressed a desire for their grandchildren not to continue in traditional fishing, while only 32.9% (n = 23) supported its continuation. Additionally, alcohol consumption was reported as highly prevalent, with 95.7% (n = 67) of respondents confirming its presence in the community, and only 4.3% (n = 3) denying it. These findings suggest that while there is some ambivalence regarding fishing as a current livelihood, there is widespread reluctance to promote it for future generations, along with an acknowledgment of social challenges within the community.

Figure 28 Perceptions among the fisherfolk on traditional fishing and social issues



3.8.3 Health Issues Reported in the Past Year

In Light House, health concerns were predominantly centered around occupational and oral health issues. Joint and muscle pain affected 58.6% (n = 41) of respondents, making it the most prevalent condition. Tooth and gum problems were reported by 45.7% (n = 32), indicating the ongoing significance of oral health challenges among the fisherfolk population.

Skin problems were also common, affecting 30.0% (n = 21) of respondents, likely linked to prolonged exposure to seawater, limited access to protective gear, and inadequate sanitation infrastructure. A smaller proportion reported diabetes (11.4%, n = 8) and mental health issues (4.3%, n = 3), highlighting the presence of chronic and psychosocial stressors, although these were less widespread.

Compared to Bandar, cardiovascular conditions were less evident in Light House, but the burden of occupational and oral health issues remained high. These findings suggest that Light House fisherfolk face a dual health burden, marked by physical strain and dermatological conditions, with an emerging recognition of chronic and mental health risks.

3.8.4 Livelihood and Skill Development Preferences

Figure 29 Livelihood/Skill development preferences

22.9% (n = 16) of households did not express interest in any livelihood or skill development program, the lowest proportion across the villages. Among those who did, rope making dominated (75.7%, n = 53), with only one household choosing broom making (1.4%). Community discussions revealed that this concentration in preference was due to limited exposure to other opportunities and a cautious approach shaped by gaps in training support and the uncertainty of new skills. The findings indicate a clear demand for structured facilitation and sustained support, highlighting the need to provide better exposure to a range of livelihood options and ensure continued assistance after training.

Summary of Section 3.8: Gendered Dimensions of Livelihoods and Governance

Gendered vulnerabilities in Light House are deeply influenced by economic precarity, social issues, health burdens, and limited opportunities. Women fisherfolk overwhelmingly identified low and unstable incomes as their primary challenge, with minimal recognition of other barriers. This underscores the acute livelihood insecurity that women face, which shapes their day-to-day existence. Skepticism about the future of traditional fishing was widespread, with 67.1% of respondents unwilling to encourage their grandchildren to continue in the occupation, reflecting a lack of faith in its reliability as a long-term livelihood.

Health issues are dominated by occupationally induced conditions, particularly joint and muscle pain, oral health problems, and skin diseases. Chronic illnesses like diabetes and mental health issues were reported but were less prevalent. Skill development preferences further highlight systemic gaps: 22.9% of households expressed no interest in alternative training programs, citing the lack of logistical support, post-training follow-up, and exposure to viable alternatives. Rope making emerged as the only significant skill option identified by the community.

Importantly, women's contributions extend beyond income generation to working in highly precarious conditions. Women continue night fishing despite low returns and increased risks, such as encounters with predators, illustrating the intersection of gender, livelihood insecurity, and environmental challenges.

Together, these findings depict a community where women's roles are crucial but severely constrained, with livelihood insecurity, social risks, and health burdens reinforcing gendered inequalities in coastal fishing livelihoods.

Chapter 4: Conclusions and Recommendations

The need assessment of Mahuva Light House reveals a fishing community whose identity and livelihoods are deeply tied to artisanal Pagadiya fishing, but whose economic and social security remain fragile in the face of ecological change, industrial pressures, and institutional neglect.

Across the different dimensions studied—livelihood systems, economic security, social networks, physical infrastructure, environmental and climate conditions, governance structures, and gender dynamics—the findings underscore that while households demonstrate resilience through cultural continuity, informal networks, and modest diversification, systemic barriers prevent them from translating this resilience into sustainable and secure livelihoods.

4.1 Conclusions

1. **Livelihood Dependence and Limited Diversification**

   Fishing remains the primary livelihood in Mahuva Light House, with 85.7% of households relying on Pagadiya fishing. However, diversification is limited, with small proportions engaged in secondary occupations like fish selling (4.3%) or boat ownership (10%). This highlights a heavy dependence on marine-based livelihoods and a lack of income diversification, which increases vulnerability to fluctuations in fish stocks and market conditions.

2. **Economic Fragility**

   Household incomes are modest, with Pagadiya fishers earning a median annual income of ₹65,000. Expenditure is primarily focused on food, leaving little room for reinvestment or savings. The absence of formal credit and insurance coverage leaves households unprotected from health crises, disasters, or fishing-related risks, exacerbating their economic fragility.

3. **Social Capital Asymmetry**

   While women are actively engaged in the Shakti Mahila Sangathan, the village lacks a fisherfolk-specific collective body to advocate for their occupational interests. Access to welfare schemes is limited, with only 10% of households benefiting from social welfare programs. The absence of such schemes, particularly for fisherfolk, undermines social capital and community cohesion.

4. **Physical Infrastructure Gaps**

   While 100% of households have access to electricity and gas, sanitation and drinking water remain significant gaps, with only 34.3% of households having functional toilets and 62.9% reporting access to drinking water taps. The absence of essential infrastructure such as cold storage, boats, and fish holding tanks further limits the community's ability to preserve and market their catch effectively, contributing to post-harvest losses.

5. **Environmental Stress and Climate Risks**

   The majority of respondents (62.9%) reported a decline in fish diversity and population. Most households (97.1%) perceive climate change as a direct threat, with common concerns including economic loss and disruption of fishing activities due to natural calamities. Despite traditional knowledge being widely used to predict weather, the

community faces significant challenges from environmental stressors, including plastic pollution and loss of marine biodiversity.

6. **Governance and Institutional Gaps**

   Although awareness of fishing regulations is strong, enforcement and legal support are weak. Only 4.3% of households own a fishing vessel license, and 95.3% report no access to legal aid. This lack of institutional support, combined with conflicts with industrial fishing, hampers the community's ability to access their rights and protect their livelihoods.

7. **Gendered Vulnerability**

   Women identified livelihood insecurity as their primary challenge, with 96.2% of women reporting concerns about income instability. Despite contributing significantly to post-harvest activities and even engaging in night-time fishing under hazardous conditions, women remain excluded from markets and institutional support, reinforcing their marginalization within the community.

4.2: Recommendations

The findings of this assessment underscore the multidimensional vulnerabilities faced by fisherfolk households in Mahuva Light House, shaped by precarious livelihoods, weak institutional support, and environmental stress. The following recommendations aim to strengthen resilience, equity, and sustainability. These recommendations are directly grounded in the survey data and complemented by solutions identified through community consultations.

4.2.1 Licensing and Regulatory Support

- **Decentralised licensing:** Organise block-level or mobile licensing camps to reduce transaction costs and ensure timely renewals.
- **Simplified processes for widows and elderly fishers:** Introduce fast-track renewals and exemptions from repeated documentation.
- **Legal aid facilitation:** Establish community-based legal support cells to handle net damage claims and conflicts with trawlers.
- **Awareness drives:** Disseminate clear information on the 9 nautical mile limit, mesh size rules, and renewal procedures through federations and local schools.
- **Mobilise fisherfolk as Munch:** Collectivising the fisherfolk at village level and establishing the coordinating committee among the Katpar, Bandar and Lighthouse.

4.2.2 Financial Inclusion and Scheme Access

Although households hold foundational identity documents, their access to fisherfolk-specific schemes is negligible. Community consultations revealed deep dissatisfaction with opaque selection processes and low awareness.

- **Transparent enrolment**: Display beneficiary lists for government schemes at the panchayat level and ensure grievance redress mechanisms are in place.
- **Village-level enrolment camps**: Facilitate pensions and social welfare schemes, particularly for widows, elderly, and disabled individuals.
- I**nsurance penetration**: Introduce low-cost group insurance for boats, nets, and fisherfolk health linked to fishing licenses.

- **Strengthen credit linkages**: Use SHGs and federations as intermediaries to access Kisan Credit Cards and Matsya Sampada loans.

4.2.3 Training, Skill Development, and Livelihood Diversification

Despite an interest in ropemaking, most households opted out of training due to poor past experiences and lack of travel/handholding support.

- **Compensated training**: Provide stipends and travel allowances to offset wage loss during training periods.
- **Handholding support**: Offer post-training mentoring and follow-up support to ensure new skills translate into income opportunities.
- **Exposure and demonstration**: Organize practical sessions in aquaculture, pond culture, rope making, and fish processing.
- **Youth engagement**: Promote awareness of sustainable fishing practices and marine ecology among youth to ensure intergenerational continuity in the fishing occupation.
- **Women-focused skilling**: Prioritize skills in rope making, tailoring, food processing, and collective marketing to support women's livelihood diversification.

4.2.4 Infrastructure and Market Systems

Fishing in Light House is constrained by poor cold chain facilities, auction platforms, and limited market linkages. Additionally, high costs for diesel, ice, and fishing equipment further reduce profitability.

- **Strengthen market linkages and processing units**: With significant catches of freshwater fish being sold at low prices, better market linkages and the introduction of value-added processing methods, such as solar dryers, can increase the profitability of these fish, improving fisherfolk livelihoods.
- **Digital market access**: Pilot mobile platforms to connect fishers directly with local and regional buyers, reducing dependence on intermediaries and ensuring better prices for their catch.
- **Cold chain investments**: Develop community-managed cold storage, insulated boxes, and fish holding tanks to prevent post-harvest losses and improve product quality.
- **Improved auction infrastructure**: Develop transparent auction yards with weighing facilities, price boards, and allocate dedicated spaces for women sellers in local markets.
- **Subsidized input support**: Strengthen diesel VAT relief and subsidized ice supply, ensuring timely delivery of these essential inputs to small-scale fishers.

4.2.5 Social Protection and Welfare

Social safety nets are weak, with negligible coverage of pensions, health insurance, or calamity compensation, leaving households highly vulnerable to economic and health shocks.

- **Universal pension enrolment**: Ensure that all eligible households, including widows, elderly, and disabled fisherfolk, are enrolled in existing pension schemes.
- **Ayushman Bharat and health scheme facilitation**: Strengthen coverage and awareness of health insurance cards to improve access to medical care.

- **Inclusion of fisherfolk in the Kisan Samman Nidhi Scheme**: Include fishermen in the Kisan Samman Nidhi scheme, ensuring they receive direct financial support similar to other farmers, which would improve their economic security.
- **Child and girl-focused welfare**: Promote awareness of schemes like Sukanya Samriddhi, Vahali Dikri, and educational scholarships to support the next generation of fisherfolk.

4.2.6 Climate and Environmental Resilience

Light House faces acute risks from cyclones, declining fish diversity, and plastic pollution. While local ecological knowledge remains strong, the institutional response to these challenges is weak.

- **Plastic interception**: Install filtering systems at key locations, such as Malan Bandhara, to capture plastic waste before it enters the sea, complemented by community and school awareness drives on reducing plastic use.
- **Warning system for net damage**: Implement an early warning system via SMS/WhatsApp notifications to alert fisherfolk about water releases from dams and other environmental threats that could damage fishing nets.
- **Net damage due to large vessels**: Ensure large industrial vessels, such as those operating in Pipavav and Alang, strictly adhere to designated routes to minimize disruptions to artisanal fishing areas.
- **Sustainable fishing education**: Raise awareness within the community on the impact of juvenile fish capture through fisherfolk federations and local training centers.
- **Disaster management plan**: Given the recurring cyclones, implement a comprehensive disaster preparedness plan to secure fishing equipment, boats, and nets. This should include safe storage and cyclone shelters, along with post-cyclone recovery plans that provide financial support, supplies, and infrastructure rehabilitation.
- **Habitat restoration**: Promote mangrove replantation and creek rehabilitation to buffer storm surges and support breeding grounds for marine life.

4.2.7 Governance, Institutions, and Gender

- **Fisherfolk collectives (Manch)**: Establish a fisherfolk cooperative or collective in Light House to address occupational concerns, drawing from successful SHG federation models.
- **Gender equity in fisheries governance**: Ensure women's representation in village-level committees, such as disaster management and fisheries consultations, to integrate their voices in decision-making processes.
- **Inclusion of fisherfolk needs in village development plans (GPDP)**: Incorporate fisherfolk issues, such as clean beaches, disaster shelters, livelihood support infrastructure, healthcare, and education, into the village development plan. Additionally, include coastal resource management and safety measures for nighttime beach activities related to fishing.
- **Extension services**: Strengthen the outreach of the Fisheries Research and Training Centre with regular village-level training and awareness camps in Light House.

4.8 Additional Policy Directions

To further enhance resilience, the following cross-cutting actions should be considered in addition to the community-driven solutions:

- **Digital Empowerment for Documentation:** Support the integration of Aadhaar, ration cards, and streamline the online process for government schemes through local federations, ensuring that these services are more accessible and efficient for all members of the community.
- **Infrastructure Focused on Gender Equity:** Prioritize the creation of secure and accessible toilets and resting areas for women in markets, complemented by solar-powered lighting for those involved in night-time fishing, ensuring safer working conditions for women in the community.
- **Mobile Health Outreach:** Establish mobile health clinics to target common occupational health issues such as joint pain and dental problems, offering accessible and immediate care to fisherfolk who may otherwise face barriers to health services.
- **Local Monitoring Systems for Resource Distribution:** Set up community-based systems at the village level to monitor access to social welfare programs, insurance, and training opportunities, ensuring that resources are distributed equitably and transparently.

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Resilience and Vulnerability in India's Coastal Communities

This needs assessment examines the socio-economic, institutional, and environmental realities of small-scale fisherfolk in Mahuva Light House, Bhavnagar. By analyzing the intersection of traditional knowledge, climate stress, and economic instability, this study identifies the systemic barriers—including land tenure insecurity and declining biodiversity—that hinder community prosperity.

Drawing on rigorous household surveys and community assemblies, the report provides a strategic framework for sustainable empowerment. It offers actionable, policy-driven recommendations focusing on financial inclusion, livelihood diversification, and gender-equitable governance. This is an essential resource for policymakers, researchers, and development practitioners seeking to transform institutional neglect into long-term coastal resilience.

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