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Sustainable Aquaculture as a mechanism for Development: the India story



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Sustainable growth of aquaculture can unleash greater social, economic and environmental benefits among the global population

Key Indicators of India's Fisheries Sector

1st in Inland capture fish production

2nd Largest Aquaculture Producer

2nd Largest Fish Producer

4th Largest Capture Fish Producer

3rd Largest Marine Capture Fish Producer

8% of Global Share of Fish Production

9%

Average Annual Growth Rate of Fisheries Sector

7%

Average Annual Growth Rate of Fish Production

15%

Average Annual Growth Rate of Fisheries Exports

~1%

Contribution to National GVA

~7%

Contribution to Agriculture GVA

17.54 Million Tonnes

Record Fish Production in 2022-23

Per capita Fish Consumption of India is 5 to 6 Kg

India's Commitment to International Covenants for Responsible Fisheries



United Nations Convention on the Law of the Sea (UNCLOS)



Indian Ocean Tuna Commission (IOTC)



Commission for Conservation of Antarctic Marine Living Resources (CCAMLR)



South Indian Ocean Fisheries Agreement (SIOFA)



Bay of Bengal Inter-Governmental Organization (BOBP-IGO)



Bay of Bengal Large Marine Ecosystem (BOBLME)



Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)



FAO-COFI

Code of Conduct for Responsible Fisheries (CCRF)

- IPOA – Sharks
- IPOA – Fishing Capacity
- IPOA – IUU Fishing



World Trade Organisation (WTO)



Indian Ocean Rim Association (IORA)



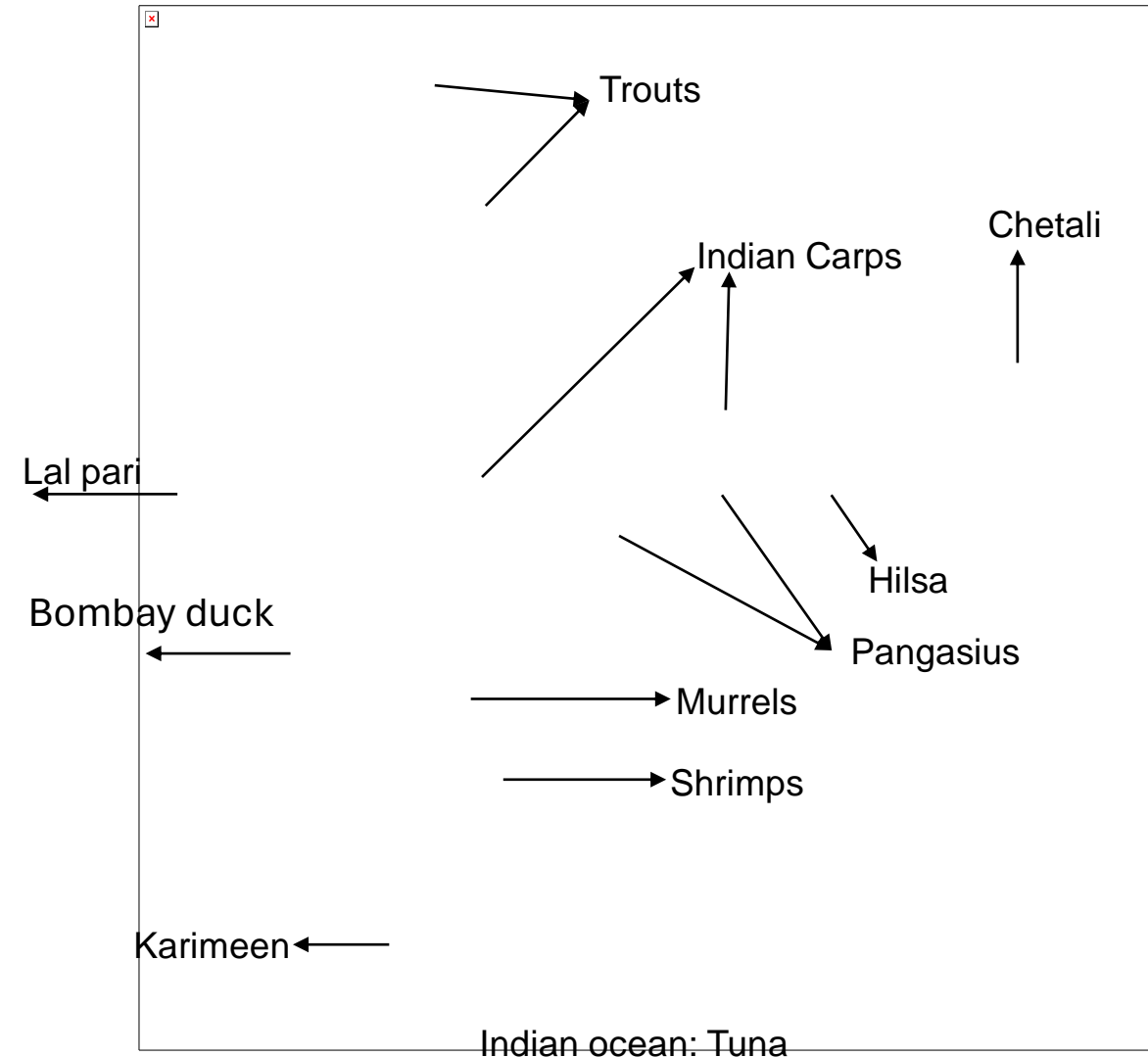
International Maritime Organisation (IMO)



International Labour Organisation (ILO)

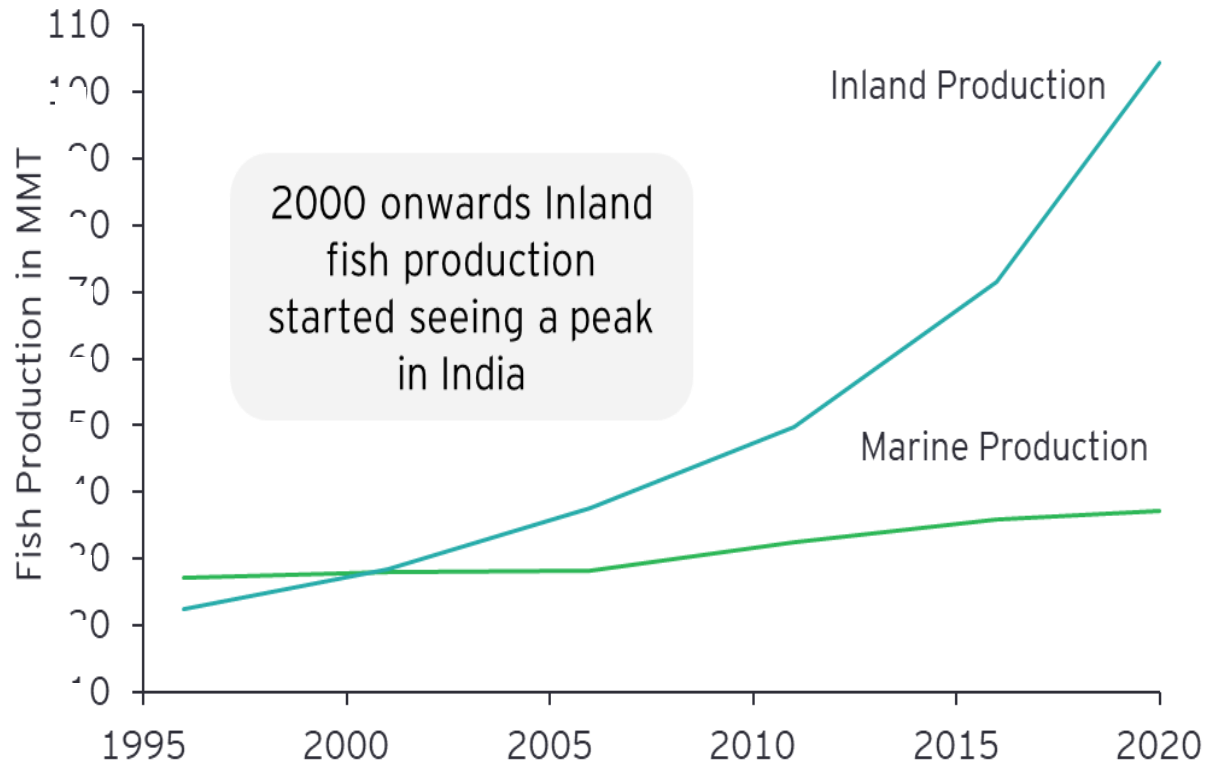
India's Fisheries Sector: Enormity

- Culture fisheries: contributes 2/3 fish production
 - Fresh water Aquaculture (85%)
 - Brackish water Aquaculture (15%)
 - Saline water Aquaculture (0.5%)
 - Mariculture (negligible)
- Capture fisheries: contributes 1/3 fish production
 - Marine
 - Inland
- 28 million directly depend on fisheries for livelihoods and several million along the value chain
- 5 million traditional marine fishers- only livelihood is capture fisheries
 - 1.5 to 2 million fishermen are daily out at sea in 3.35 lakh fishing boats 'hunting' fish
- Artisanal and Small-Scale fishers – majority
- Economic Wealth valued > Rs.92,000 Cr.



Inland and Marine Potential: Current scenario

Sectoral growth trend



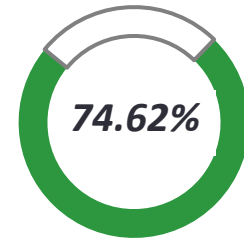
2000 onwards Inland fish production started seeing a peak in India

Marine Fisheries: Progressing slowly and steadily



- 70%** Potential harnessed
- 1547** Fish Landing Center
- 3477** Coastal Fishing Villages

Flourishing Inland Fisheries



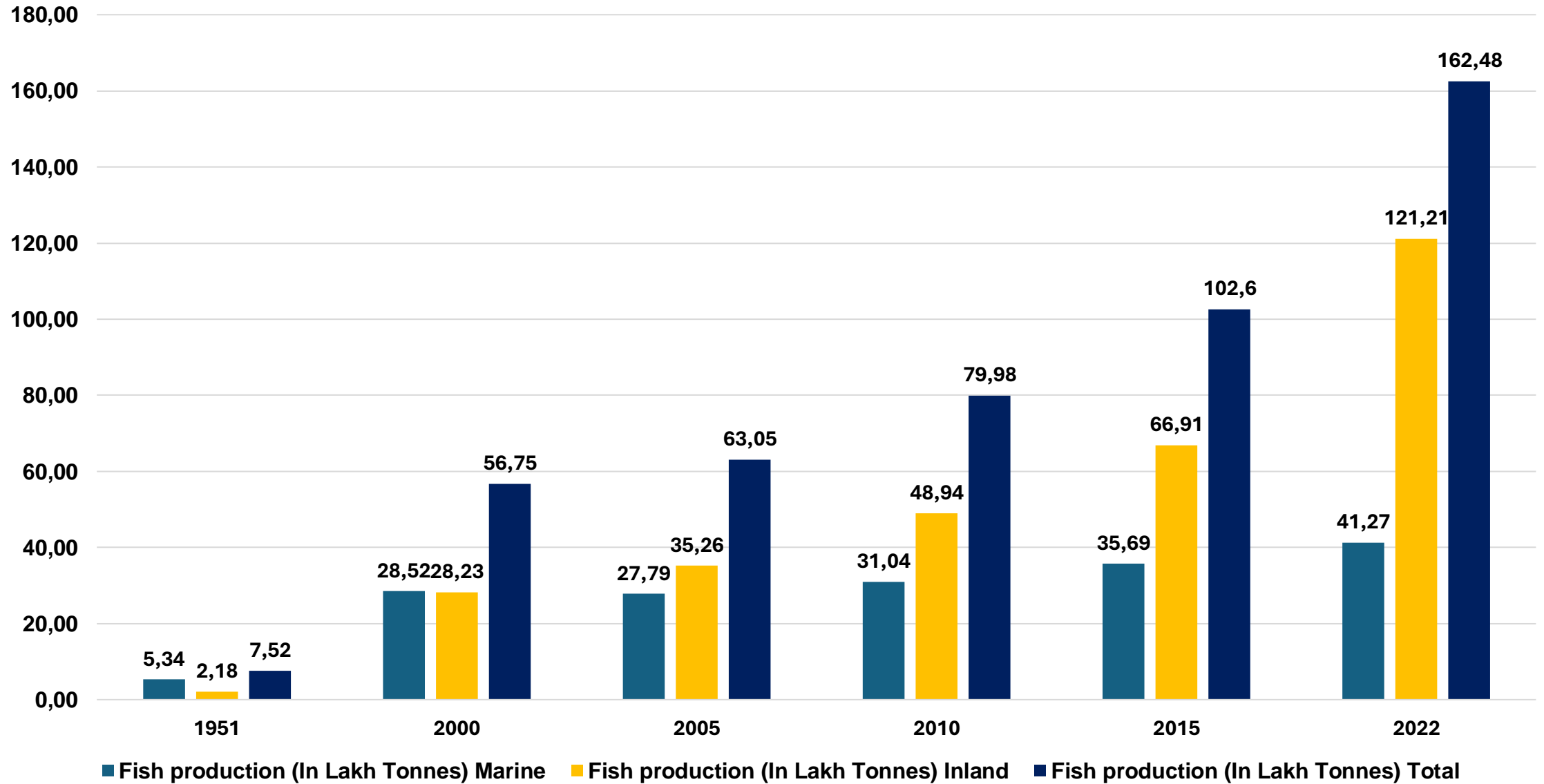
74.62% Indian production is from Inland side

In India 28 million directly depend on inland and marine fisheries for their livelihoods and several million along the value chain
 5 million are traditional marine fishers whose only livelihood is capture fisheries
 1.5 to 2 million fishermen are daily out at sea in 3.35 lakh fishing vessels hunting fish
 Artisanal and Small Scale fishers: only asset being boat and net

India's Inland fisheries production	11.25	Million tonnes (2020-21)
	12.08	Million tonnes (2022-23)

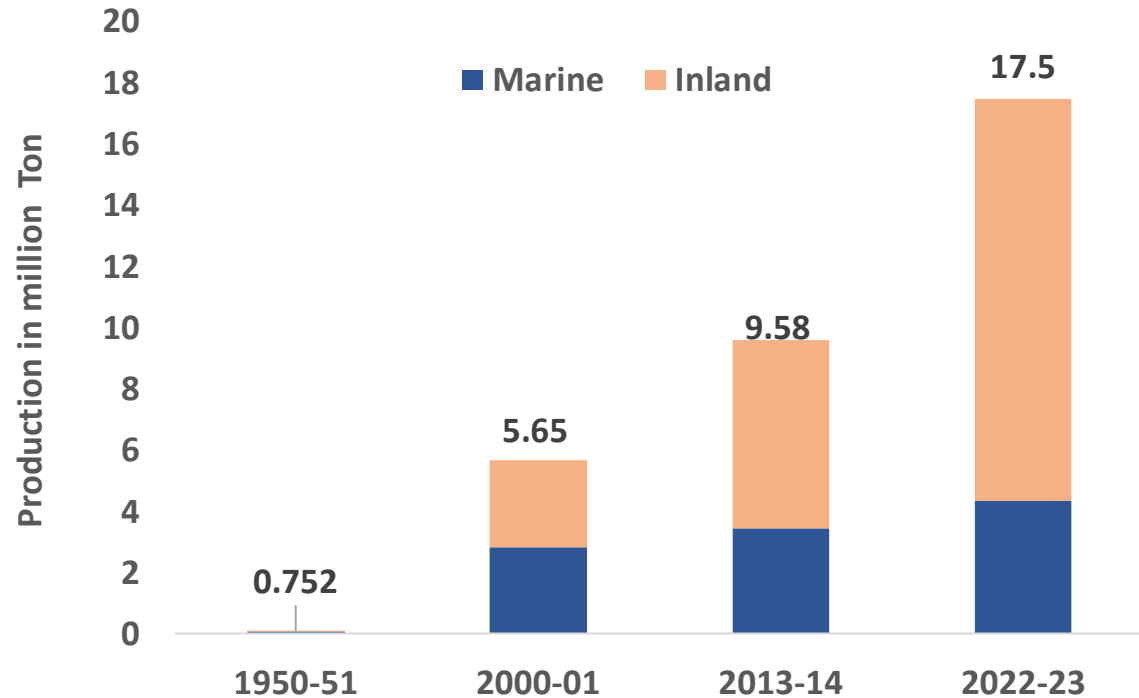
FISH PRODUCTION TRENDS IN LAKH TONS

**Stagnation in marine capture fisheries
– Focus in Aquaculture**



Fisheries Production Trends

More than 23-fold increase in fish production since Independence



India's last two decades performance of fish production (2001 to 2023)

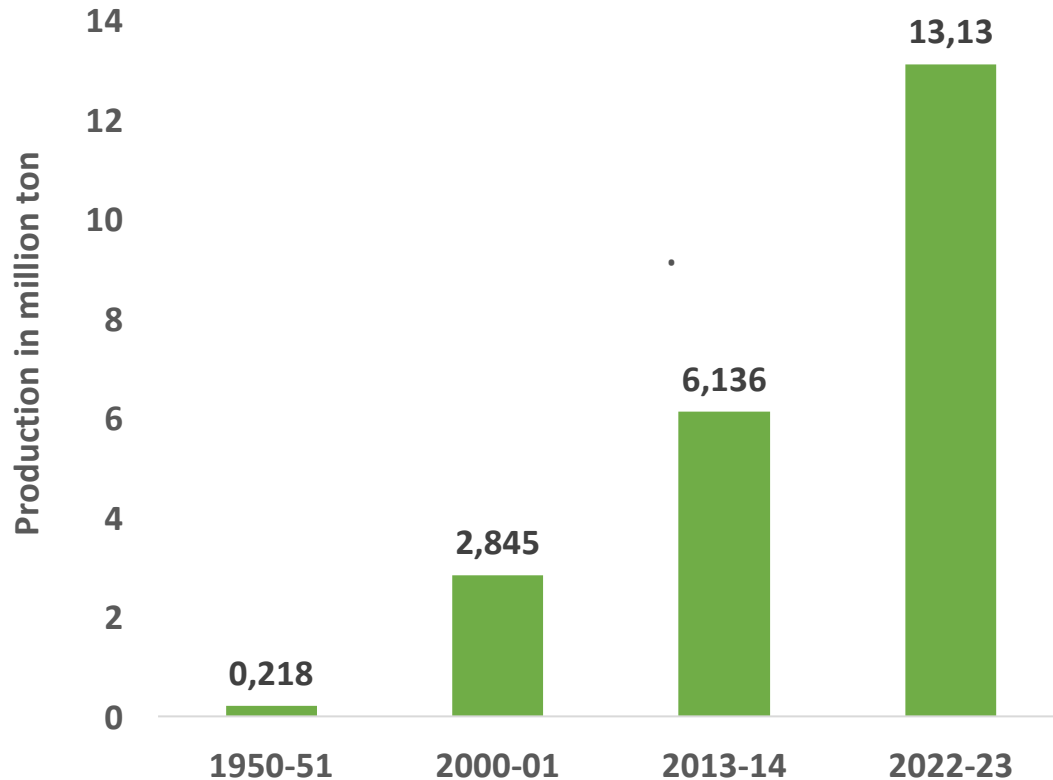
- a) Increase of **11.8 million ton** of fish production since 2001
This increase is more than twice the increase achieved in 50 years from 1951-2001
- b) From year 1950-51, there has been **17.3 million ton increase**. Out of this, 68% increase happened during last two decades
- c) Largely propelled by Inland fishers and Aquaculture

8% Growth in Fish Production in 2022-23



Inland fisheries and aquaculture production trend

More than **56-fold increase** in inland fisheries and aquaculture fish production



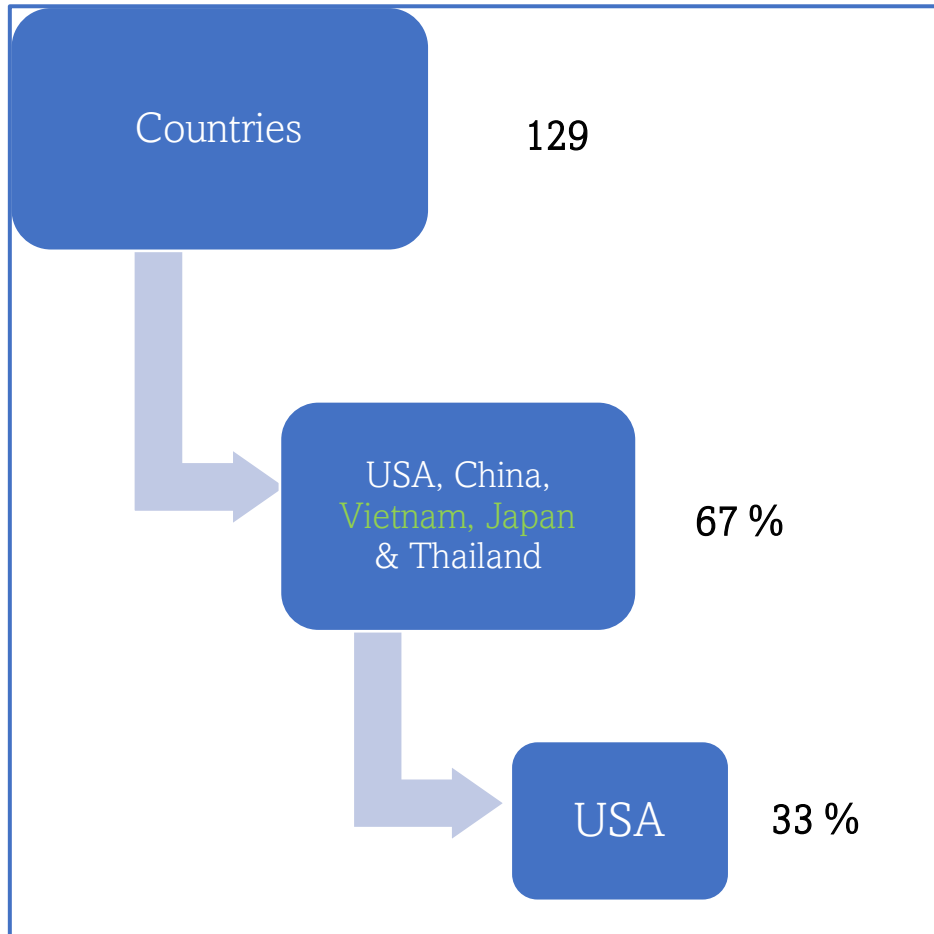
Last two decades performance of inland fisheries and aquaculture production (2001 to 2023)

- a) Since the year 2000-01, **10.285 million ton increase** of inland fisheries and aquaculture production. **More than thrice that was achieved in 50 years from 1950 to 2001**
- b) From the year 1950-51, there has been **11.841 million ton increase** of inland fisheries and aquaculture production. **Out of 13.13 million ton, 12.9 million tons i.e. 78 % increase happened during last two decades**
- c) **Aquaculture contributes nearly 85-90 % to the total Inland fisheries and aquaculture production.**



EXPORT PERFORMANCE

2023 – 8068 USD million [USD 8.09 bln (+4.3 %)]



Share: Fr. Shrimp : 68 %, Fr. Fish - 8.5 %
Surimi: 4 %, Squid: 6 %

Trade

- World USD 189 Billion
- India share 4.07 %
- World Shrimp trade USD 22.53 Billion
- India 21 %

CAGR-10yrs GROWTH

- World 3.9%
- India 8.4%

Particulars	2023
Exports	US\$ 8.09 billion i.e 8068 US\$ million
Registered Exporters	1,322
No of seafood processing Plants	612
Total installed capacity (MT /day)	35,853
Marine production (MMT)	3.5
Aquaculture shrimp production (MMT)	1.16*

Targets Projected –
2024-25: USD 12.5 Bln
2029-30: USD 18 Bln (12 % CAGR)

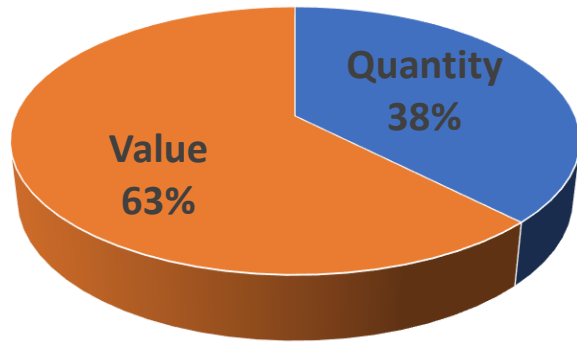
* estimated



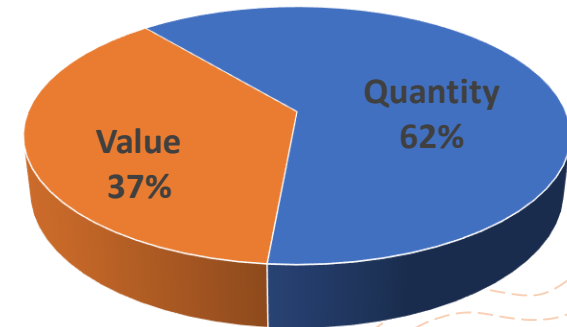
AQUACULTURE AND CAPTURE FISHERIES % SHARE IN EXPORTS: 2022-23¹¹

Year	Aquaculture (%)		Capture (%)	
	2021-22	2022-23*	2021-22	2022-23*
Qty	49%	38%	51%	62%
Val in Rs	69%	63%	31%	37%
Value in US \$	70%	63%	30%	37%
US\$/KG	8.15	7.72	3.33	2.79

Aquaculture 2022-23* % share



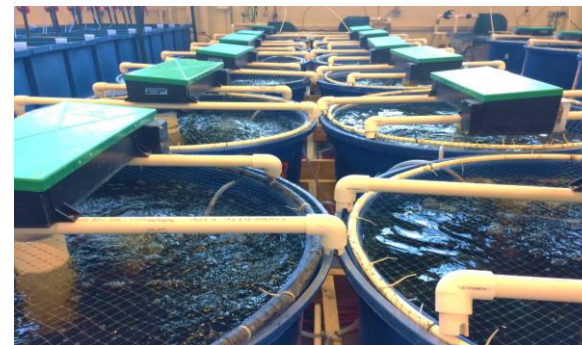
Capture Fisheries 2022-23* % share



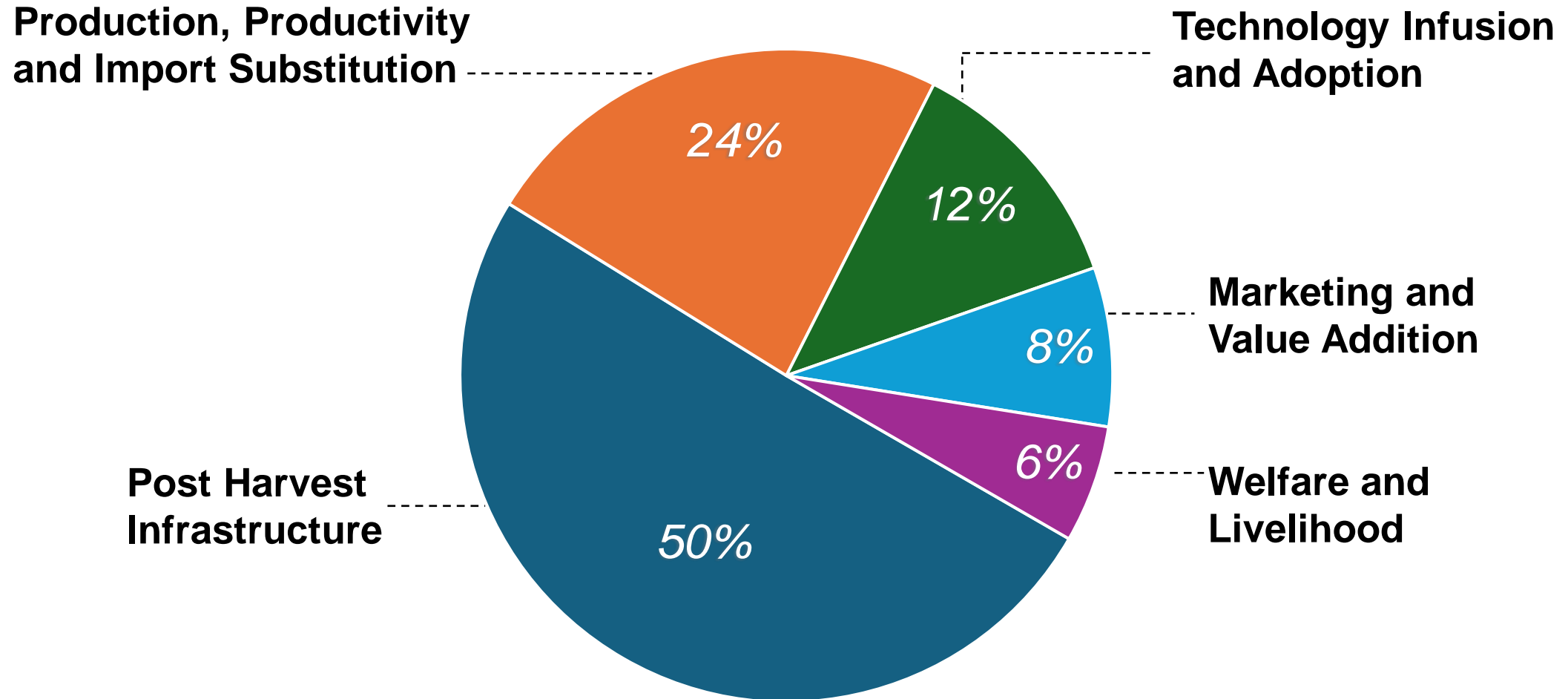
Investment in Fisheries Sector

The Government of India invested USD 5.31 Billion since 2015 for sustainable development of fisheries and aquaculture through following schemes:

- **Blue Revolution:** Integrated Development and Management of Fisheries (2015-20)
- **Fisheries and Aquaculture Infrastructure Development Fund(FIDF)** (2018-2026)
- **Pradhan Mantri Matsya Sampada Yojana** – A scheme to bring about Blue Revolution through sustainable and responsible development of fisheries sector in India (2020-25)
- **Pradhan Mantri Matsya Kisan Samridhi Sah-Yojana** (2023-27)



Distribution of Investment across Components



Focus areas under flagship scheme: Pradhan Mantri Matsya Sampada Yojana (PMMSY)

Harnessing of Fisheries Potential in a Sustainable, Responsible, Inclusive and Equitable Manner

Enhancing of Fish Production and Productivity through Expansion, Intensification, Diversification and Productive Utilization of Land and Water

Modernizing and Strengthening of Value Chain - Post-harvest Management and Quality Improvement

Doubling Fishers and Fish Farmers Incomes and Generation of Employment

Enhancing Contribution to Agriculture GDP and Exports

Social, Physical and Economic Security for Fishers and Fish Farmers

Robust Fisheries Management and Regulatory Framework



Farming systems in India

Major group approx. % contribution to Aquaculture	Major Species	% contribution approx. in group	Culture practice/Farming Method	Production systems
Finfishes (80%)	Indian Major Carps (IMCs)	75%	Ponds Tanks cages pens Raceways RAS Biofloc etc.	<ul style="list-style-type: none"> ✓ Traditional extensive to Intensive. ✓ (Extensive: 40 %, Semi-intensive 40 %, Intensive:20%) ✓ Polyculture/ Mixed culture and Monoculture
	Exotic Carps (EC)	5%		
	Catfishes (pangasius, Magur etc)	5%		
	Tilapia	5%		
	Asian Sea bass	2		
	Trout & other cold water spp.	< 2		
	Others	6 %		
Crustaceans (12-15%)	White leg shrimp (<i>L. vannamei</i>)	90%	Ponds Tanks	<ul style="list-style-type: none"> ✓ Traditional extensive to Semi-intensive ✓ Traditional extensive (10 %) and Semi-intensive (90%)
	Black Tiger shrimp (<i>P.monodon</i>)	5%		
	Fresh water prawn (<i>M. rosenbergii</i>)	3 %		
	Other Shrimps/Prawns /Crabs	2%		
Mollusc (5%)	Green Mussel	50 %	Rafts On-botton culture	<ul style="list-style-type: none"> ✓ Extensive farming (100%)
	Oysters	20 %		
	Clams/others	30%		
Ornamental fish (<3%)	Marine Ornamental Fishes	10%	Glass Aquarium/ Tanks /ponds	-
	Freshwater Ornamental Fishes	90%		

Institutes/Bodies under Fisheries Department, Govt of India

- National Fisheries Development Board (NFDB), Hyderabad
- Fishery Survey of India (FSI), Mumbai
- Central Institute of Fisheries, Nautical & Engineering Training (CIFNET), Kochi
- Central Institute of Coastal Engineering for Fishery (CICEF), Bengaluru
- National Institute of Fisheries Post-Harvest Technology and Training (NIFPHATT), Kochi
- Coastal Aquaculture Authority (CAA), Chennai
- National Federation of Fishers Cooperatives Ltd. (FISHCOPFED), New Delhi

R&D and Development/Promotional Organizations in Fisheries sector

ICAR –Fisheries Research Institutes:

- i. Central Marine Fisheries Research Institute (CMFRI)
- ii. Central Institute of Fisheries Technology (CIFT)
- iii. Central Inland Fisheries Research Institute (CIFRI)
- iv. Central Institute of Freshwater Aquaculture (CIFA)
- v. Central Institute of Brackish water Aquaculture (CIBA)
- vi. Directorate of Cold Water Fisheries Research (DCFR)
- vii. National Bureau of Fish Genetic Resources (NBFGR)
- viii. Central Institute of Fisheries Education (CIFE)

Others:

1. Marine Products Export Development Authority (MPEDA)
2. Rajiv Gandhi Centre for Aquaculture (RGCA)
3. National Institute of Ocean Technology (NIOT)
4. Centre for Marine Living Resources and Ecology (CMLRE)
5. Zoological Survey of India (ZSI)
6. National Institute of Oceanography (NIO)
7. Fisheries Universities (3) and Fisheries Colleges (26)

National legal frameworks/policies

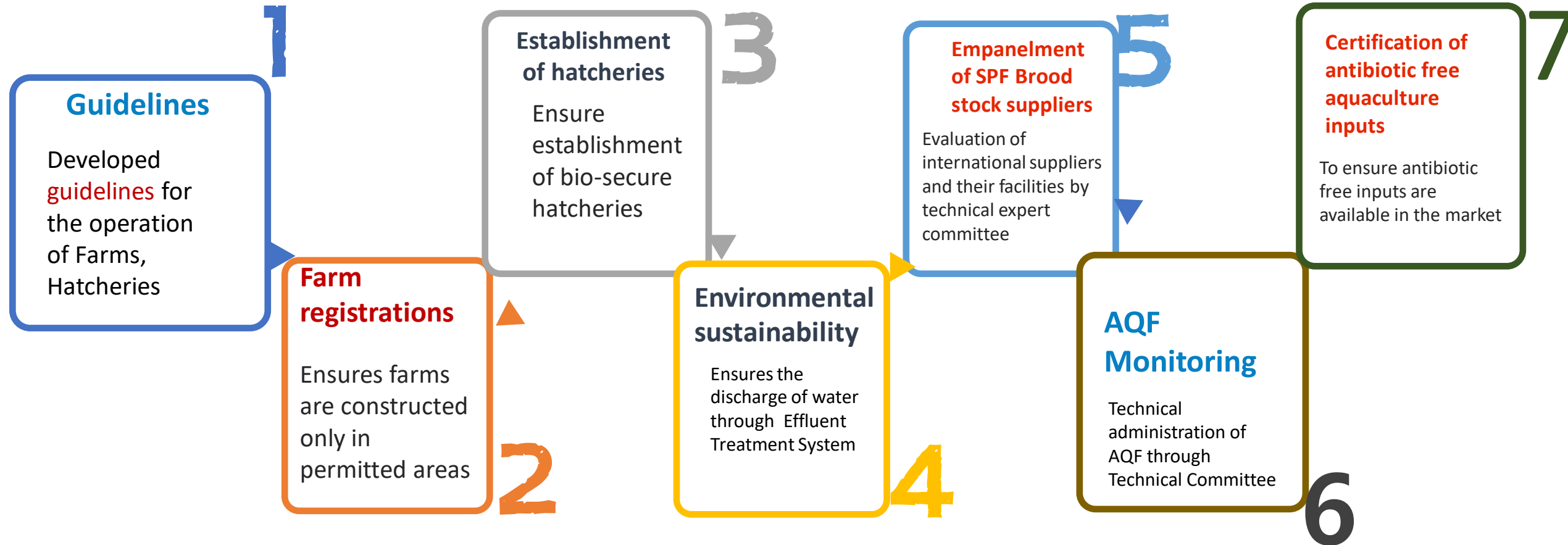
- ❑ Marine Fisheries Regulation Acts
- ❑ Coastal Aquaculture Authority Act, 2005
- ❑ Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981
- ❑ National Action Plan on Climate Change- NAPCC (2008)
- ❑ Energy Conservation Act (2001)
- ❑ BIS Notification (2017)

- ❑ Wildlife (Protection) Act, 1972
- ❑ Biological Diversity Act, 2002
- ❑ Environment (Protection) Act, 1986
- ❑ Water (Preservation and Control of Pollution) Act, 1974
- ❑ National Green Tribunal- NGT (2010)
- ❑ Renewable Energy Policies
- ❑ Plastic Waste Management Rules (2016)





Main activities of CAA which has ensured sustained aquaculture development and environment protection



New Guidelines

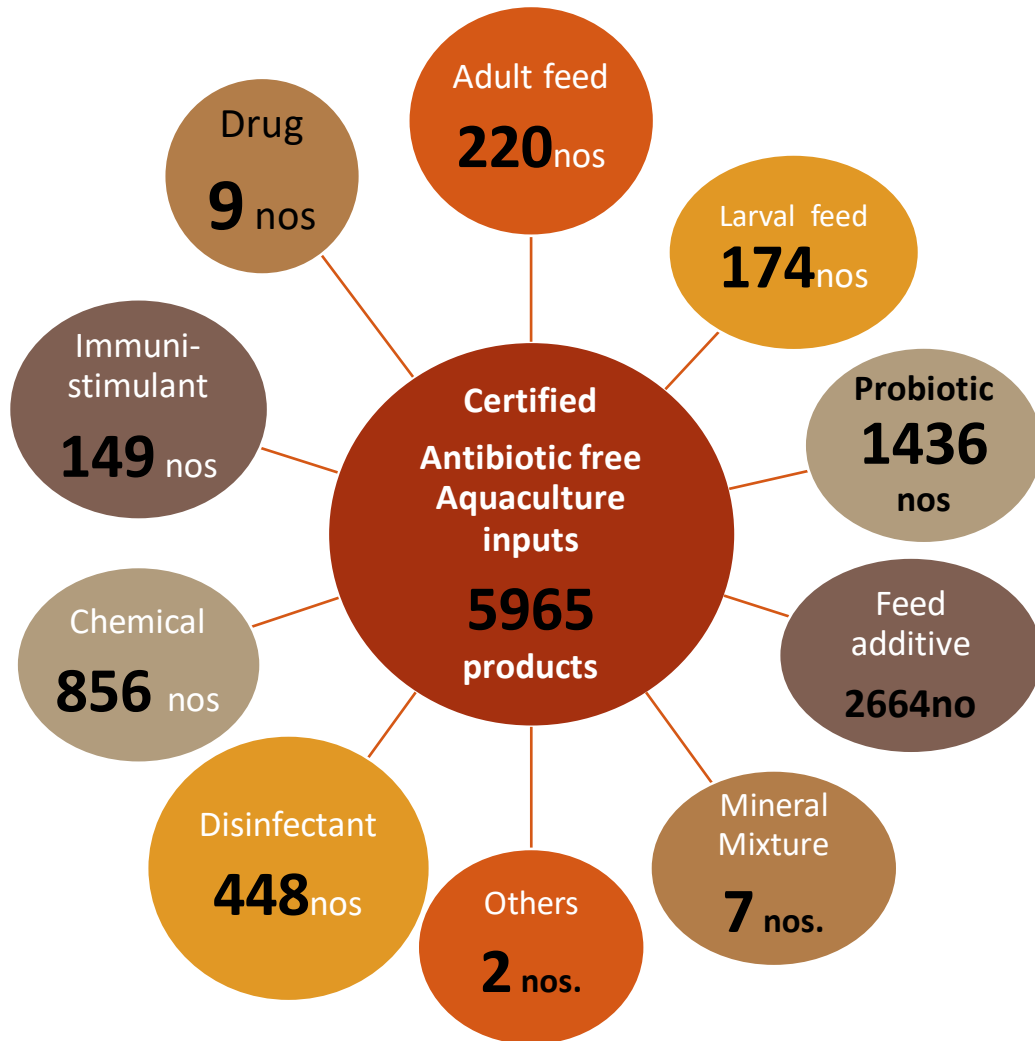
- In order to cover the remaining coastal aquaculture activities including mariculture activities as per the provisions contained under the CAA (Amendment) Act, 2023, the ICAR-CIBA, ICAR-CMFRI, CSIR-CSMCRI, MPEDA, NCSCM, NIOT were requested on 15-4-2024 to draft and communicate the (12) new guidelines

Sl. No.	New Guidelines to be developed	Institutions/ organisations requested
1	Guidelines for Regulating Hatcheries and Farms for Seed Production and culture of marine finfishes (See Section 2(1)(c) and 2(1)(db) of CAA (Amendment) Act, 2023, Rule 2(1)(f) of CAA Rules, 2024)	ICAR-CIBA, ICAR-CMFRI & MPEDA
2	Guidelines for Regulating Hatcheries and Farms for Seed Production and culture of crab (See Section 2(1)(c) and 2(1)(db) of CAA (Amendment) Act, 2023, Rule 2(1)(f) of CAA Rules, 2024)	ICAR-CIBA, ICAR-CMFRI & MPEDA
3	Guidelines for Regulating Hatcheries and Farms for Seed Production and culture of bivalves (See Section 2(1)(c) and 2(1)(db) of CAA (Amendment) Act, 2023, Rule 2(1)(f) of CAA Rules, 2024)	ICAR-CMFRI
4	Guidelines for Regulating bio-floc, RAS and nursery management (See Rule 9(2)(a) and Rule 10(1)(a) of CAA Rules, 2024)	ICAR-CIBA
5	Guidelines for Regulating production and supply of live feed (See Section 2(1)(c) and 2(1)(db) of CAA (Amendment) Act, 2023, Rule 2(1)(f) of CAA Rules, 2024) (Polychaete, rotifers, artemia, algae and other species)	ICAR-CIBA, ICAR-CMFRI & CSIR-CSMCRI
6	Guidelines for seaweed culture (Brackishwater and marine) (See Section 2(1)(c) and 2(1)(db) of CAA (Amendment) Act, 2023, Rule 2(1)(f) of CAA Rules, 2024)	ICAR-CIBA, ICAR-CMFRI & CSIR- CSMCRI

New Guidelines

Sl. No.	New Guidelines to be developed	Institutions/ organisations requested
7	Guidelines for Regulating Hatcheries and Farms for Seed Production and culture of marine Ornamental fish (See Section 2(1)(c) and 2(1)(db) of CAA (Amendment) Act, 2023, Rule 2(1)(f) of CAA Rules, 2024)	ICAR-CIBA & ICAR-CMFRI
8	Guidelines for Regulating pen culture and cage culture in coastal waters (See Section 2(1)(c) and 2(1)(db) of CAA (Amendment) Act, 2023, Rule 2(1)(f) of CAA Rules, 2024)	ICAR-CMFRI & NIOT
9	Guidelines for Regulating Hatcheries and Farms for Seed Production and culture of <i>P. indicus</i>, <i>Penaeus semisulcatus</i> and other indigenous species (See Section 2(1)(c) and 2(1)(db) of CAA (Amendment) Act, 2023, Rule 2(1)(f) of CAA Rules, 2024)	ICAR-CIBA
10	Guidelines for Assessment of Cost for the damage to environment and cost of demolition and Utilization of Environmental monitoring fund (See Section 12 of CAA (Amendment) Act, 2023 and Rule 17 of CAA Rules, 2024)	ICAR-CMFRI, NCSCM & NIOT
11	Guidelines for notifying the aqua zones and aqua mapping (See section 11(1)(da) of CAA (Amendment) Act, 2023 and para 16 & 17 of Rule 3(a) of CAA Rules, 2024)	ICAR-CIBA & NCSCM
12	Guidelines for Regulating Hatcheries and Farms for Seed Production and culture of marine shrimp (See Section 2(1)(c) and 2(1)(db) of CAA (Amendment) Act, 2023, Rule 2(1)(f) of CAA Rules, 2024)	ICAR-CMFRI

Issuance of Certificate of Compliance for antibiotic free aquaculture Inputs



GUIDELINES ON CERTIFICATION NOTIFIED

Companies to submit antibiotic-free status of the products for obtaining COC

- **Health Certificate** from the country of origin which ensures antibiotic free status (for the products/ingredients imported)
- **ISO certificate for process and products/GMP/HACCP Certificates**

International Seafood Certifications

- Most popular – Capture Fisheries
 - MSC – Marine Stewardship Council
 - Suitable for high value exports (e.g. tuna, oil sardine (for fish meal))
- Most popular – Aquaculture
 - BAP – Best Aquaculture Practices (US & China market)
 - ASC – Aquaculture Stewardship Council (Europe market)
 - Global GAP – (UK, not popular in India)

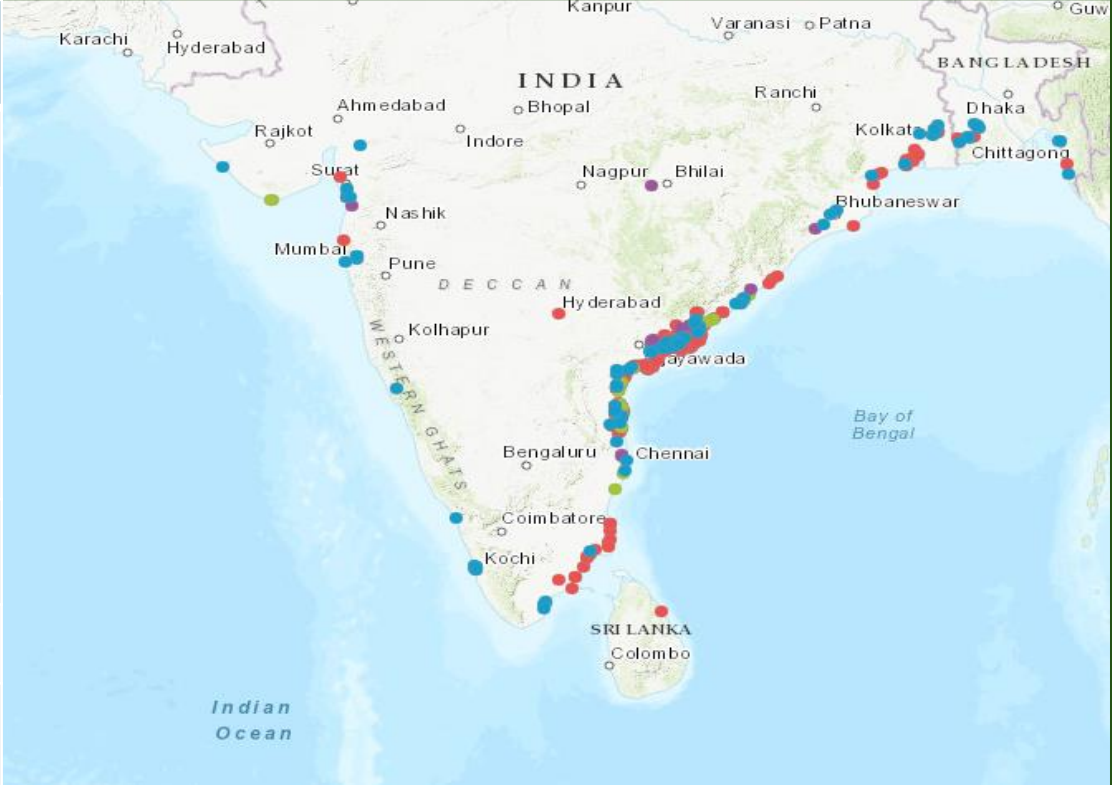
BAP: Best Aquaculture Practices (old name ACC – Aquaculture Certification Council)

- Most popular in India, as we export mainly to US & China
- Consumers & retailers demand for BAP Certification
- Do not recognise local standards like Thai GAP, Indo GAP, Viet GAP etc.
- Helping the primary producers (farms & hatchery) to get BAP or ASC Certification will benefit in the export market



BAP Certified Aquaculture facilities in

Facilities	Facility Growth				
	2017	2018	2019	2020	2022
Farm	176	252	354	476	517
Hatchery	24	27	31	36	46
Feed Mill	14	16	20	22	21
Processing Plant	85	87	92	97	111
Total	299	382	497	631	695
Growth	-	28%	30%	27%	11%



Ongoing initiatives

1

Development of **disease monitoring and surveillance** program

- Use of SPF varieties
- Anti-microbial campaigns

2

Genetic improvement of fish species including native fish species

3

Development of **fisheries infrastructure** including cold chains, markets etc

4

Development of **quality standards framework** for safe fish and consumer preference

5

Increase access to low-cost **institutional credit**

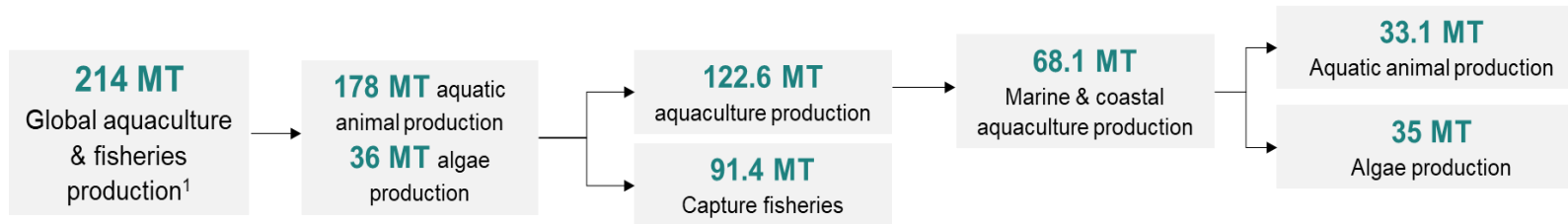
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Fisheries **innovations** in *value chain, products & markets*



Mariculture, a sunrise sector for India

Importance of Mariculture



Species

Bivalves (clams, oysters, mussels), Crustaceans (crabs, lobsters, shrimp), Finfishes etc.

Mode

Majorly cage farming and pond-based mariculture is negligible in fishes
 3911 No. of sea cages installed w/CMFRI's technical input (Dec 2023)

Potential Area

46,824 ha (5.7% of the 1 km offshore stretch along 8000 km coastline)

Welfare of Stakeholders

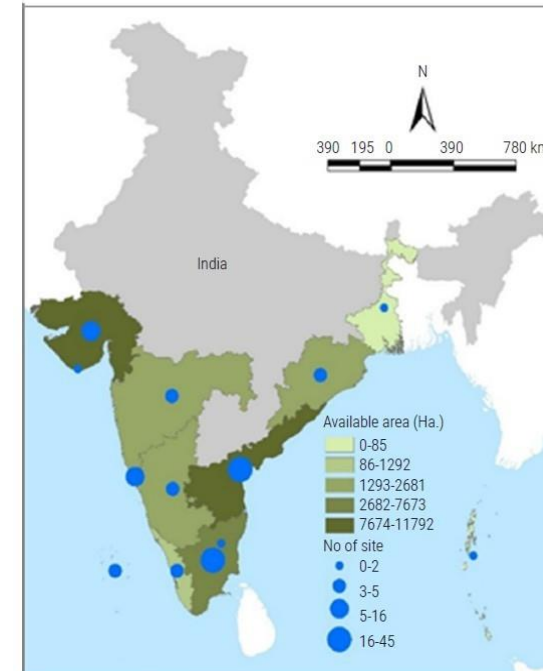
Fosters Sustainable Fishing Practices

Provides source of Livelihood

Promotes Economic Upliftment

Supports Gender Equality

Potential States/UTs for Mariculture



Developments in Seaweed

Production	~72000 T (2023)
Potential	~ 9.6 Million T
Technology	Bamboo rafts, Monolines, Tubenets
Location	317 sites identified of 23,950 Ha potential area

- ❑ Seaweed sequesters CO₂ which results in mitigation of adverse effects of climate change.
- ❑ Seaweed Business viable for all stakeholders and provides sustainable livelihood opportunity for the coastal community
- ❑ Research and development have been undertaken for selecting suitable sites for production

46095

Rafts approved for seaweed cultivation

65,330

Monoline tube net approved for seaweed culture seaweed cultivation



Projected Mariculture Production: 2047

CURRENT PRODUCTION: Food-fish: 0.012 million t
Shellfish: 0.04 million t
Seaweed: 0.072 million t
Ornamentals: 26 species

0.124 million t

POTENTIAL AREA: Seaweed ~ 24,000 ha; Cage farming: ~ 47,000 ha

FOOD-FISH

- Production: 3.5 million t /year
- Area required: ~ 0.08 million ha
- Seed required: 35,000 million
- Feed: ~ 5.5 million t

SHELL-FISH (BIVALVES)

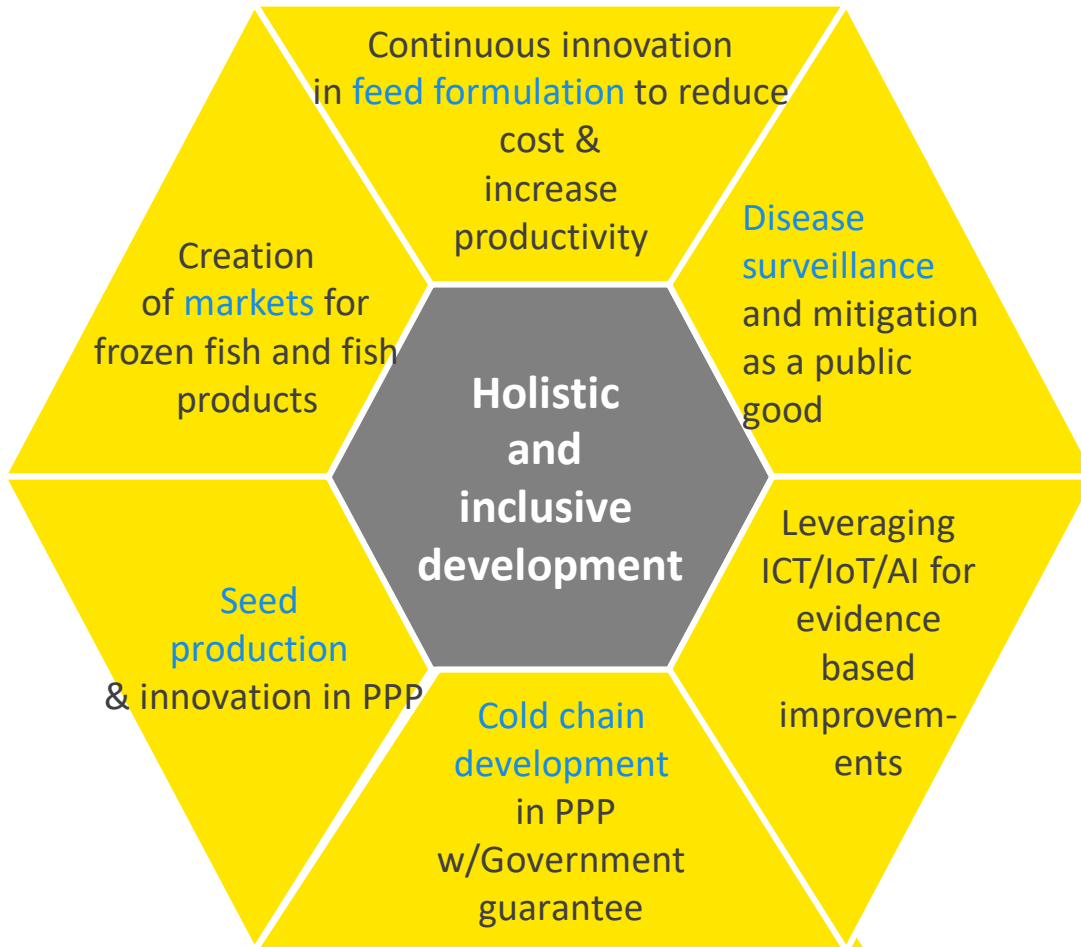
- Production: 0.6 million t /year
- Area needed: 6000 ha
- Rafts needed: 6,00,000

SEAWEED

- Production: 4 million t /year
- Area required: 8000 ha
- Number of rafts: 32,00,000

- Diversified Mariculture
- Offshore Precision Mariculture
- Climate-Smart Mariculture Systems
- AI based genome editing
- Nutrigenomics
- One-health aquaculture
- Cellular Mariculture
- PUFA rich marine micro-algae
- Land-based mariculture including seaweeds

Aspirations for development for aquaculture transformation in India



PPP = Public Private Partnership

*Policy interventions, schemes and projects are supported through promotion of **extension services, outreach, capacity building, convergence, entrepreneurship, ease of doing business** among others*



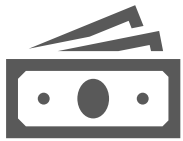
India's priority action areas for transformation of the fisheries sector

India aims to transformation of the aquaculture sector through *policy interventions, R&D, promoting sustainable aquaculture practices and strategic partnerships*



162.48 Lakh tons

FY 2022-23 fish production



USD 3.37 billion

Sector investment in FY 2020-25

Scaling Production-Productivity

- Use of technology interventions
- Brood improvement
- Disease prevention

Increasing accessibility

- Scaling up inputs supply and markets
- Reducing cost of fish feed

Creating inclusive ecosystem

- Focus on small scale aquaculture
 - Focus on freshwater aquaculture
- Increasing accessibility to credit for small farmers

Sector sustain-ability

- Energy efficient innovations across fisheries value chain
- Resource mapping & optimally harnessing fisheries resources

Challenges

- 1 Climate change and natural calamities, finite land and water resources, quality water
- 2 Strengthening production chain (seed and feed quality, markets, traceability, quality produce, value addition)
- 3 Pollution, Habitat and Biodiversity concerns
- 4 Emerging pathogens and epizootic diseases
- 5 Geographical constraints: scattered landholdings, difficult terrains, turbulent offshore waters

THANK YOU

