

**A Business Case for
Co-Management Arrangements
for the
Yellowfin Tuna Fishery
in the
Union Territory of Puducherry**



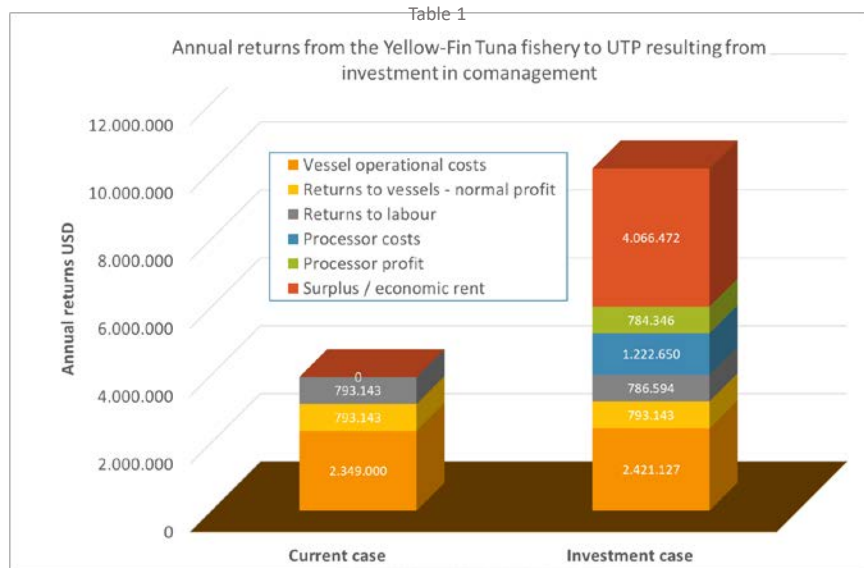
**A component of the
World Bank and Global Environmental Fund (GEF)-funded
Oceans Partnership Programme in the
Bay of Bengal (OPP-BOB)**

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EXECUTIVE SUMMARY

This report presents the business case for investment in co-management arrangements in the yellowfin tuna (YFT) fishery in the Union Territory of Puducherry (UTP), South India. It suggests that an investment of around 3.8 million US\$ in such arrangements would significantly increase the value created by fishing for YFT in the UPT, generating benefits and returns for investors, fishers, fish processors and for the wider community (see Fig 1).

To achieve these returns, the quality of fish being landed must be improved to command higher prices at landing, and processing facilities must be able to maintain this quality through to the market. But such investment into an improved YFT value chain will depend on investors (including fishers) being confident that the creation of additional value in the fishery can be sustained into the future.



The key to this is in creating effective **co-management arrangements**.

Co-management is a negotiated distribution of rights, roles and responsibilities between government and the private sector involved in the fishery. The arrangements agreed upon may vary from one place to another, but international experience has shown that certain principles must be observed, partial implementation does not usually work, and the correct phasing of interventions is critical.

Tuna fisheries are not well-developed to date in India as tuna is not a preferred species, but high-quality YFT is in demand on international markets and increasingly in Indian urban markets. YFT is generally targeted by gillnet fisheries on the Bay of Bengal coast of India but some fishers in Puducherry seek larger fish in deeper waters at the edge of the continental shelf which, particularly on the coast adjacent to Puducherry, is readily accessible to small-scale operations.

Fisheries management arrangements in the UTP are weak and there are currently limited incentives for fishers to improve their YFT fishing operations as they have no exclusive rights to the fishery and the processing and marketing facilities available once they land their catches do not guarantee premium prices for quality fish. However, pilot activities in the UTP by small-scale processors accessing high-value urban markets with low-volumes of high-quality fish suggest that there is an opportunity for this to situation to change.

The Government of the (UTP) and its Department of Fisheries and Fisherman Welfare (DFFW) have also created an opportunity, and taken an important first step, by committing themselves to the development of a fisheries co-management system. This process is in its infancy and requires external support as familiarity with different approaches and strategies for co-management and exposure to worldwide experience is limited. Part of this investment (US\$ 1,000,000) will build on what has been achieved so far in UTP, introducing the DFFW to new and innovative approaches to co-management and build their capacity to create an enabling environment for future development of these

arrangements. The creation and maintenance of an appropriate information and knowledge management system to support co-management will be an important element in this.

At the same time, another stream of investment (US\$ 1,808,200) will focus on building the skills and capacity of fishers involved in the YFT fishery, improving their fishing operations and the quality of their catches. They will be supported in creating an appropriate form of organization that will enable them to receive and manage future investment, assume the role and responsibilities associated with the allocation of exclusive rights to the fishery, and manage the benefits that will flow from this including using surplus profits to pay for management costs and distribute a portion of profits to the wider community and to government as a return on their rights-holding. Improvements in the capacity of fishers and their fishing craft to land and handle high-quality YFT and regular replacement and upgrading of their operations over 20 years will be included in this investment.

The process of facilitating multi-stakeholder negotiations to agree on the distribution of rights, roles and responsibilities will be complex and will require the involvement of a dedicated agency that will have the skills required and command the trust of all stakeholders involved. An investment of US\$ 1,000,000 in this facilitation role will be key to ensuring a successful outcome to the process.

The investment will be over a time-period of 20 years and the Return on Investment (RoI) over this period has been calculated at 1,216% with an Internal Rate of Return (IRR) of 23%. The pay-back period for the investments would be 6 years (see Table 1).

This investment in co-management arrangements will be complementary to and dependent on other investments in:

- improvements in YFT processing facilities and marketing arrangements in the UTP (OPP-BOB Business Case 1);
- the establishment of effective monitoring, control and surveillance (MCS) mechanisms (OPP-BOB Business Case 3).

Taken together these three business cases demonstrate that investment in YFT fisheries has the potential to make a substantial sustainable contribution to both fisheries in the UTP and to India's economy in general.

Table 2. Investment in Co-Management Arrangements for Line Fisheries for Yellowfin Tuna, Union Territory of Puducherry

Location	Union Territory of Puducherry
Time horizon	0-20 years
Total Investment	USD 3,808,200 (INR 262,423,062)
Capital utilization	Capacity building of DFFW + Facilitation support to co-management process + Capacity-building of stakeholders, establishment of a stakeholder-based organization and training and hardware for improved fishing operations + Information and knowledge management system establishment and operation
Scope	0-20 years: tuna line fisheries in UT Puducherry: 150 fishing operations
Financing cost	9.5% (Years 2-7)
Annual Profits for Fishing Vessels	Increase from US\$ 793,143 to US\$ 4,859,615 (including normal and surplus profit)
Capital Value of the Fishery after 6 years	US\$ 50,830,906
Payback period	6 years
NPV	US\$ 15,756,317
RoI	1,219%
IRR	23%
Sensitivity analysis	Investment performance (NPV) still positive with \pm 40% changes in landed price of YFT, investment costs and supply.
Key assumptions	Investments made in value-chain improvements + effective MCS mechanisms established

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This disclaimer governs the use of this report. The information provided herein is a preliminary and first attempt to undertake an investment appraisal for tuna enterprises in India. You must not rely on the information in the report as an alternative to more detailed financial advice from an appropriately qualified professional.

Without prejudice to the generality of the foregoing paragraph, we do not represent, warrant, undertake or guarantee that the use of guidance in the report will lead to any particular outcome or result. We will not be liable to you in respect of any business losses, including without limitation loss of or damage to profits, income, revenue, use, production, anticipated savings, business, contracts, commercial opportunities or goodwill. The information provided and views expressed represent those of the ITC team alone, and not those of the BOBP-IGO or the many stakeholders interviewed and consulted.

PHOTOGRAPHS

The photographs included in this report have been provided by: Front page (left) - Philip Townsley (IDDRA Ltd.); Front page (right) - S.Jayaraj (BOBP-IGO); Page 7: *Beachfront Fishing Community Puducherry* - Philip Townsley (IDDRA Ltd.); Page 8: *Gillnetters and Ringseiners Puducherry* - Philip Townsley (IDDRA Ltd.); page 11 – *Higher quality of yellowfin tuna landed and processed in India can produce sustainable benefits if the fishery is managed* - S.Jayaraj (BOBP-IGO).

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ACRONYMS AND ABBEVIATIONS

BC	Business Case
BOB	Bay of Bengal
BOBP-IGO	Bay of Bengal Programme Inter-Governmental Organisation
CCRF	Code of Conduct for Responsible Fisheries
CDRRP	Coastal Disaster Risk Reduction Project
CMFRI	Central Marine Fisheries Research Institute
DAHDF	Department of Animal Husbandry, Dairying and Fisheries (Central level)
DFFW	Department of Fisheries and Fishermen Welfare (Government of Puducherry)
DLC	District-Level Committee
DPR	Detailed Project Report
EEZ	Exclusive Economic Zone
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FEDECOOP	Federación Regional de Sociedades Cooperativas de la Industria Pesquera Baja California
FIMSUL	Fisheries Management for Sustainable Livelihoods Project
FMZ	Fisheries Management Zone
FRP	Fibre-Reinforced Plastic
FT	Financial Times
GEF	Global Environment Fund
GO	Government Order
INR	Indian Rupees
IO	Indian Ocean
IOM	Isle of Man
IOTC	Indian Ocean Tuna Commission
IUU	Illegal, Unreported and Unregulated (fishing)
MCS	Monitoring, Control and Surveillance
MFRA	Marine Fisheries Regulation Act
MFPO	Manx Fisheries Producers Organization
MoA	Ministry of Agriculture (Central level)
MoEF	Ministry of Environment and Forests (Central level)
MPEDA	Marine Products Exports Development Authority
MSC	Marine Stewardship Council
MSY	Maximum Sustainable Yield
NGO	Non-Governmental Organization
NPV	Net Present Value
OPP-BOB	Oceans Partnership Programme – Bay of Bengal
PMNFRA	Puducherry Marine Fisheries Regulation Act

PS	Private Secretary
ROI	Return on Investment
TAC	Total Allowable Catch
TN	Tamil Nadu
TNMFRA	Tamil Nadu Marine Fisheries Regulation Act
TOR	Terms of Reference
UK	United Kingdom
ULC	Union-Level Committee
USA	United States of America
USD	United States Dollars
UTP	Union Territory of Puducherry
VG-SSF	Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries
VLC	Village-Level Committee
WB	World Bank
YFT	Yellowfin Tuna

CURRENCY AND EXCHANGE RATES (August 2018, FT quoted)

Indian Rupee (INR) 1 = United States Dollar (USD) 0.014

USD 1 = INR 68.61

UNITS (SI)

Metric ton (or tonne) (mt) 1 = Kilogram (kg) 1,000

Million (M) = 1 million (1,000,000)

Billion = 1 thousand million (1,000,000,000)

1. WHAT IS THE OBJECTIVE OF THIS BUSINESS CASE

Key points
<ul style="list-style-type: none">• This section sets out the objective of this business case report;• The objective is: to identify and assess opportunities for establishing a fisheries co-management system for line-fisheries for yellowfin tuna in Puducherry, attractive to public investors with possible scope for private impact investors as well;• The business case will underpin complementary business case aimed at developing improved yellowfin tuna processing enterprises in the UTP and ensure the sustainability of those investments.• The piloting of co-management arrangements for the targeted YFT fishery will enable fisheries stakeholders and concerned institutions to familiarize themselves with different approaches and options in fisheries co-management.• Potential for future replication of appropriate co-management approaches to other fisheries in Puducherry and elsewhere in India will be significant.

The objective of this business case report is:

To identify and assess an opportunity for investment in the establishment of fisheries co-management arrangements for fisheries for high-value tuna in the Union Territory of Puducherry.

The work which underpins this business case has been undertaken as part of the World Bank and GEF-funded Oceans Partnership Programme for Bay of Bengal (OPP-BOB), implemented by the Bay of Bengal Inter-Governmental Organisation (BOBP-IGO) between 2016 and 2018.

Based on preliminary assessments conducted by the OPP-BOB, involving extensive consultations with stakeholders in tuna fisheries, processing and marketing at the local, national and international levels, there is potential for India to improve the performance of its tuna fisheries. At present, there is growing demand for high-quality tuna in both domestic and international markets, tuna catches in India are characterized by low quality and low value. Traditionally tuna have not been a sought-after species among Indian consumers and there is not a long history of tuna fisheries in the country, in spite of the close proximity of valuable tuna resources in the surrounding Indian Ocean. However, with demand for high-quality fish growing, particularly in urban areas in the country, and the sustained demand internationally for tuna, there has been a growing awareness in recent years that tuna fisheries could represent an important resource for fishers and fish trading businesses which could generate wealth, taxable revenues, employment and trade in goods and services for the Indian economy as a whole.

Specifically, the OPP-BOB team has identified potentially viable business opportunities for fisheries and fish processing activities targeting yellowfin tuna (YFT) caught with lines, long-lines and trolling gear by small-scale craft operating along the edge of the continental shelf. These fishing activities would aim to catch low-volumes of high-quality YFT for high-value urban and export markets.

While the potential financial returns from investment in these proposed enterprises are likely to be significant, their long-term sustainability depends on the establishment of effective fisheries management arrangements that will ensure that new fishing activities targeting tuna do not overexploit the resource or dissipate the significant stock of natural capital that it represents for the country.

The opportunity that is the focus of this business case is to increase the benefits and the value created by fishing for YFT in the UTP through the establishment of a co-management arrangement for this

fishery. This investment opportunity would be complementary to, and underpin the sustainability of, the business case for a small-scale tuna processing enterprise (OPP-BOB Business Case 1) focused on developing a value-chain for low-volumes of high-quality tuna to high-value markets, an enterprise that is already being piloted in Puducherry.

This initial investment has the potential for providing a basis of experience and practice on which wider co-management arrangements addressing the needs of other fisheries in the UTP could also be built in the future. Co-management arrangements developed within the UTP could have wider relevance for fisheries all along the Coromandel Coast of the Bay of Bengal (covering both the UTP and Tamil Nadu), where the fishing communities and the fisheries have broadly similar characteristics. A successful pilot activity could also have important wider implications for Indian fisheries in general, where the need for innovative approaches to fisheries management is widely recognized.

It should be noted carefully that all investment carries some degree of risk, and there is no guarantee of a successful outcome. A careful identification and analysis of the risks involved will be a central part of the business case development approach and some of these risks are discussed at greater length below.

2. HOW WAS THE BUSINESS CASE DEVELOPED AND THEN PRESENTED?

Key points
<ul style="list-style-type: none">• In this section, a definition and outline methodology for the business case development is presented consisting of.• Key steps in the business case methodology consist of:<ul style="list-style-type: none">○ Describing the setting and context;○ Identifying and describing the opportunity for investment;○ Identifying potential investors;○ Analyzing the different options taken into account for the business case;○ Describing the timescale and level of investment required;○ Describing the expected performance of the investment;○ Identifying the risks and assumptions underpinning the investment;○ Laying out overall conclusions and recommendations.

To start, the business case methodology² focused on two key definitions, as follows:

- *A business case is a document which sets out the justification for the undertaking of a 'project' (or intervention) based on the estimated cost of development (investment) and the anticipated benefits to be gained (returns and outcomes).*
- *The business case is used to say why the forecasted effort and time will be worth the expenditure.*

In the context of the OPP-BOB project, the methodology was implemented the following a set of steps:

1. The setting and context were described and the key issues and factors relevant to the future design and implementation of the business case were examined;
2. The specific business case or opportunity for investment was identified and described;
3. The investors who are likely to be interested in the opportunity were also identified;
4. The development options for the business case opportunity were also identified and compared, and the most viable alternative was chosen to take forward;
5. The probable time-scale and level of investment required was considered, including a description of what the eventual utilization of invested funds;
6. Crucially, for investors trying to decide whether they should invest their capital in the opportunity proposed, or in an alternative, the expected performance of the investment. This analysis will focus on the role of this investment in underpinning the sustainability of other investments in the fisheries sector and the wider economic, social and environmental returns on an investment in fisheries co-management;

² The methodology is coherent with the following set of guidelines: Viteri C., Yoshioka J., Castrejón M. (2016). *Bankable Business Case Guidelines and Investment Criteria for Sustainable Production Seascapes*. Conservation International's consulting report for the World Bank. pp.30.

7. The assumptions and risks associated with the proposed investment opportunity were identified and then evaluated.
8. The overall conclusions and recommendations for the business case were summarized.

For potential investors who are interested in the business case presented here, the next step would be work with appropriate experts to develop a detailed business plan, with reference to the specific goals of the institutions or entities involved.

3. WHAT IS THE SETTING AND CONTEXT OF THE BUSINESS CASE?

Key points
<ul style="list-style-type: none">• In this section, the setting and context of the business case will be described.• Key characteristics of the fisheries and fishing communities in Puducherry are described. The relatively narrow continental shelf in the Bay of Bengal adjacent to the UTP means that YFT resources in deeper waters along the edge of the shelf are potentially accessible to small-scale fishing operations.• The current institutional and policy context for fisheries in Puducherry. The institutional environment affecting fisheries is complex with overlapping mandates and responsibilities. While important first steps have been taken by the government of the UTP towards establishment of a fisheries co-management system, familiarity with worldwide co-management practice and experience, and with alternative options and strategies is limited.• Key characteristics of current fisheries management arrangements in the Union Territory of Puducherry are described. Capacity within mandated institutions to enforce existing regulations is limited and fisheries is effectively open-access, both in the UTP and along the surrounding coast of Tamil Nadu.

3.1. Overview of the Setting and Context of the Business Case for Co-Management in the UTP

The government of the Union Territory of Puducherry, recognizing that current management arrangements in fisheries have severe weaknesses, is in the process of establishing a fisheries co-management system for the UTP. While this process is still in its infancy, it represents an important opportunity. A basic structure for co-management arrangements has been defined in a Government Order (GO) that will be approved in the near future³ but the agency that will play a key role in implementing this GO, the Department of Fisheries and Fisherman Welfare (DFFW), has no experience with co-management or familiarity with the different approaches and strategies for co-management that could be considered. Similarly, for fishers and fish processors the idea of “co-management” is new, and they have little exposure to what co-management can mean in terms of their rights, roles and responsibilities.

Therefore, there is a critical window of opportunity at this early stage of the development of fisheries co-management in the UTP to provide inputs of knowledge and experience to help the stakeholders involved to develop a practical, functioning system that will benefit both fishers and those involved in fisheries activities, the wider communities concerned, and the institutions tasked with implementing new management arrangements. Applying new approaches to co-management to the developing fishery for high-value tuna will provide critical experience and promote innovative thinking that could have significant wider benefits in the future.

3.2 Tuna Fisheries in India and the Bay of Bengal

The coastline of India faces onto the Indian Ocean, which accounts for 20% of global tuna landings (about 1 million metric tonnes per year). Landings of yellowfin tuna (YFT) in the Indian Ocean are 429,800 mt (2014), compared to an estimated Maximum Sustainable Yield (MSY) of 421,000 mt. YFT stocks are currently considered overfished, and subject to overfishing and management measures are being considered by the Indian Ocean Tuna Commission (IOTC) and its members. The potential sustainable gross annual landed value of YFT is estimated at USD 1 billion, with an annual economic

³ Government of Puducherry (2018). *Draft Government Order for establishment of fisheries co-management regime in the Union Territory of Puducherry.*

value of over USD 400 million. These are significant values for the economies of the coastal states. Further information is provided in Appendix 1⁴.

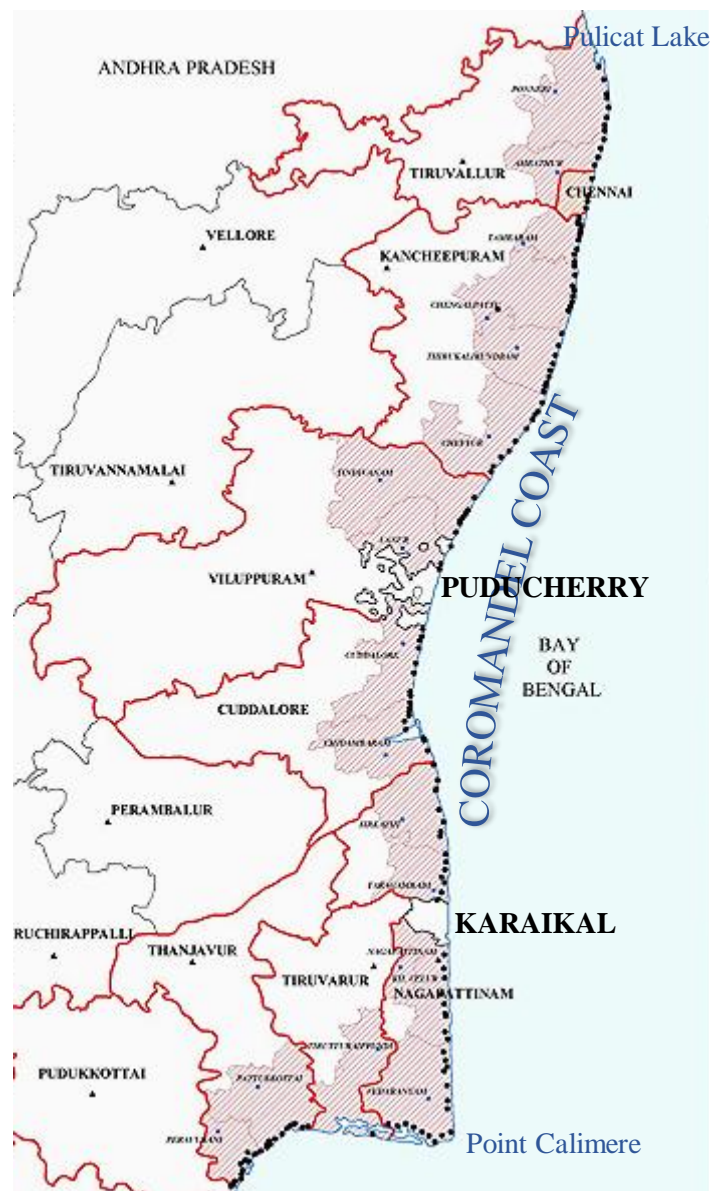
The IOTC catch data indicate that Indian catches of tuna have been increasing steadily over the past decades to around 187,000 mt of tuna in 2014, of which 33,427 mt is made up of YFT. Tuna fisheries do not have a long history in India, as tuna (except in some areas) is not a preferred fish among Indian consumers. Until relatively recently, fishing activity in India was primarily focussed on shallow coastal waters fished by a large fleet of small-scale fishing operations including line fishing, gillnetting, ring seining and trawling. With growing population and demand for fish coupled with technological innovations, these coastal waters have come under increasingly intense fishing pressure and are now seriously overexploited.

Fishing for YFT in the Bay of Bengal is carried out near the coastline and within the Indian Exclusive Economic Zone (EEZ). A large proportion of the fleet consists of small-scale, open-deck fishing vessels that utilize hand-lines, long-lines and/or gillnets. Fishing trips range from 1 to 3 days (depending on the fishing region), with a crew of 4 to 5 fishermen. Most of the vessels have two outboard 9 horsepower (hp) engines (or equivalent inboard engine) and a sail (photographs below). The vessels carry no ice and have no onboard preservation equipment; catches are generally left on the open deck after capture. Other larger motorised vessels operate out of ports such as Chennai, Visakh and Puducherry.

3.3 Tuna Fishing in the Union Territory of Puducherry

The Union Territory of Puducherry covers two distinct areas – Puducherry proper and Karaikal located further to the south (see map)⁵. The coastline of the UTP

Map of Puducherry, Karaikal and the Coromandel Coast



⁴ OPP-BOB (2016). *Characterisation of the Fisheries Sector in the Indian Ocean with particular reference to tuna fisheries in the Bay of Bengal: Environmental and Economic Aspects*. BOBP/WB/OPP/REP 07. BOBP-IGO, Chennai, 2016. 58p.

⁵ Two further districts under the administration of the UTP are found in Yanam, in the Cauvery Delta area of Andhra Pradesh State, and Mahé, located in northern Kerala on the Arabian Sea. These two districts are not included in the areas taken into consideration under this business case.

covers a total of 41.2 kms – 23.9 kms in Puducherry and 17.3 kms in Karaikal. Both portions of the UTP are surrounded to the north, south and west by the State of Tamil Nadu.

There are 27 fishing communities in the UTP (17 in Puducherry and 10 in Karaikal) and 24 fish landing sites (15 in Puducherry and 10 in Karaikal) as well as two fishing harbours, one in each part of the UTP. Fisheries living and working in these communities mostly operate small motorized and unmotorized vessels that can operate through the surf that characterized Fishers have diverse fishing strategies adapted to seasonal changes in fish availability with the most common fishing gear being various forms of gillnet,

longlines and lines, operated from 26’-30’ open-decked FRP craft powered by diesel or petrol outboard engines. Some sail-powered traditional or FRP *kattumaram* also continue to be used in some locations while in some villages, larger ring-seine vessels, owned by consortiums of local fishers, also operate seasonally, mostly targeting oil sardine. Trawlers also operate out of the fishing harbours in both Puducherry and Karaikal.

Beachfront Fishing Community, Puducherry



The social and institutional structure of the fishing communities is similar to that of other fishing communities in the neighboring state of Tamil Nadu along the Coromandel Coast, the coastline running between Pulicat Lake in the north and Point Calimere in the south. Most of the fishers in these communities belong to the *pattinavar* fishing caste which has well-developed traditions and institutions and a long tradition of self-governance in relation to fisheries which has persisted to this day side-by-side with formal structures of government and administration.

The whole Coromandel Coast is characterized by a relatively narrow continental shelf with the drop-off located between 20-40 nautical miles offshore, enabling small-scale fishing operations in relatively deep waters along the shelf area. The potential for catching larger tunas, including YFT, in deeper waters along the edge of the continental shelf has been recognized in recent years by a limited number of fishers along this coast who have started to use longline, line and trolling to catch larger fish in these areas.

3.4 Fisheries management in the Union Territory of Puducherry

Mandates for the management of marine fisheries resources in India is divided between State and Union Territory Fisheries Departments (in territorial waters up to the 12 nautical mile limit) and the Federal Government (in waters beyond 12 nautical miles but within the country’s EEZ up to 200 nautical miles). A range of fisheries management measures are in place, including licensing arrangements, zoning for different types of fishing activity, closed seasons, restrictions on certain fishing gear and methods (see Appendices 4 and 5). Traditional and community-level mechanisms for

Gillnetters and Ring Seiners, Puducherry



resolving conflicts in fisheries also continue to play a role in fishing activities and are still strong in some areas⁶.

However, overlapping institutional responsibilities, lack of recognition and support to community-level institutions, and limitations in the capacity of the formal institutions concerned to implement and enforce management measures have led to the progressive over-capitalization of the fisheries sector and the uncontrolled expansion of fishing

effort. This has been coupled with a strong policy orientation in the fisheries sector towards poverty alleviation in fishing communities and various forms of welfare support that have encouraged fishers to remain within the sector even when returns on fishing are often marginal. As a result, coastal fisheries are recognized as being severely overexploited in most areas and barriers to entry into the sector are limited.

3.5 Fisheries management in the Union Territory of Puducherry

The Government of the UTP, recognizing the shortcomings of past management approaches, has recently taken the decision to establish a fisheries co-management regime throughout the Union Territory. A Government Order (GO) has been prepared laying out key features of a co-management system and some underlying principles, including that this system should be based on “[a] *participatory approach for sustainable fisheries development, which will foster dialogue, power-sharing and leading to good management and governance of the marine fisheries sector*”⁷. The key output of the GO is the establishment of fisheries co-management committees at village, district and Union levels. While this represents an important first step, exposure to and understanding of the potential range of approaches and strategies that might be applied as part of a co-management arrangement is still very limited and the process is in its infancy. Relationships between mandated institutions such as the DFFW and those directly involved in fishing and fish handling are strongly biased towards the maintenance of a flow of benefits from Government to fishing communities, in the form of subsidies, welfare schemes, and various forms of financial and material support. The process of changing this relationship so that co-management can become a genuine partnership between institutions and local stakeholders is likely to be long.

Traditional *panchayats* organized among the *pattinavar* caste fishing communities that predominate all along the Coromandel Coast of the Bay of Bengal have historically played an important role in decision-making within and between fishing communities and particularly in resolving conflicts among and between fishers and fishing communities⁸. The role of *panchayats*, and the ways in which they interact with formal administrative structures and with new forms of fisher organization, is

⁶ Bavinck, M (2001). *Caste panchayats and regulation of fisheries in Tamil Nadu*. Economic and Political Weekly 36 (13): 1088-1094.

⁷ Government of Puducherry (2018). *Draft Government Order for establishment of fisheries co-management regime in the Union Territory of Puducherry*.

⁸ Bavinck M (2001) *ibid*

constantly evolving and varies from community to community. Current moves towards fisheries co-management in the UTP do not explicitly identify any role for the caste *panchayat*.

4. WHAT IS THE BUSINESS OPPORTUNITY?

Key Points
<ul style="list-style-type: none">• The business opportunity concerns the development and establishment of fisheries co-management arrangements for line fisheries of YFT in the Union Territory of Puducherry.• The investment would support the implementation of current fisheries policy in the UTP, build the capacity of concerned stakeholder and institutions in supporting fisheries co-management, and establish a pilot scale example of co-management of line fisheries for YFT in the UTP.• A successful initial investment in this pilot would create opportunities for the wider development of co-management regimes relating to other fisheries in the UTP and in India more generally.• The investment would establish the critical conditions required to secure and render sustainable complementary investments on the improvement of the YFT value chain in the UTP.• Investment capital utilization would focus on: intensive capacity-building of concerned stakeholders and institutions; establishment and strengthening of a supporting Fisheries Co-Management Unit within the Department of Fisheries; supporting processes of consultation among the key concerned stakeholders and institutions; supporting the establishment of an investable entity among rights-holders in the fishery; the establishment of an effective information and knowledge exchange and management mechanism to support the co-management process.• Key benefits would include: sustainable revenues, profits and returns on investment from improved YFT value-chain enterprises; wider benefits to the economies of fishing communities in the UTP and the UT in general; improved ecosystem health; stronger stakeholder organization and fisheries institutions.

The business opportunity is to increase the benefits and the value created by fishing for yellowfin tuna in the UPT through better management of the fishery.

Very significant additional value can be created in this fishery if the quality of the fish landed is improved leading to higher prices at the landing place. A limited number of fishers and fish processors have already recognized this opportunity and specifically target larger YFT found at greater depth further offshore. Investment in improving this fishery will generate important benefits, and will represent an attractive investment, if management arrangements are established that limit the numbers of fishers involved and give them secure rights to the fishery. This in turn will ensure a steady supply of high-quality fish for fish processors encouraging them to improve their handling and marketing arrangements (as identified in the OPP-BOB Business Case 1). Given the levels of profit that these well-managed fisheries could generate, there is also potential for a proportion of these profits to be captured for the benefit of society at large through payments by fishers for their fishing rights.

This business case is about how to sustain the creation of the additional value generated from tuna fisheries in the UTP into the future. As already correctly identified by legislators in the UTP, the key to this is in creating effective co-management arrangements.

Key features of the business opportunity

- It builds on existing developments in policy in the UTP and in the fisheries sector
- The business opportunity involves three distinct streams of investment:
 - Investment in strengthening the capacity and functions of the DFFW to support fisheries co-management;
 - Investment in the effective facilitation of the process of developing appropriate co-management arrangements and determining the rights, roles and responsibilities of the different stakeholders involved;

- Investment in the fishing operations involved in the YFT fishery in UTP and in their organization so as to be able to manage their rights to the fishery, manage investment in the improvement of the fishery and manage the benefits it will generate.
- The proposal entails investment in the capacity of the government agency with mandated responsibility for fisheries management, the DFFW, to support the process of co-management effectively.
- The DFFW's capacity to facilitate the multi-stakeholder process of co-management will be strengthened along with its ability to identify different co-management strategies, communicate and evaluate those options together with the stakeholders concerned, and to review and adjust the policy and legislative framework to create an enabling environment for co-management.

Higher quality of yellow-fin tuna landed & processed in India can create sustainable benefits if the fishery is managed



- The investment would also support analysis of the DFFW's management and functions with a view to undertaking appropriate reforms to strengthen its enabling role.
- The process of facilitating the different stakeholders involved in identifying and assessing options for co-management and determining how rights, roles and responsibilities might be distributed among the actors involved will receive targeted investment. Given the political sensitivities involved in this process, the involvement of a “neutral” facilitating organization is proposed.
- This will support the complex negotiation process involving different stakeholders – the DFFW; the recently established fisheries co-management committees at village, district and union levels; traditional authorities within the fishing communities; fish processors and buyers; and the rights-holders to the YFT tuna fishery themselves.
- A key output of this facilitation process would be definition of the rights to exploit the YFT fishery and limit access to that fishery and the roles and responsibilities of fishers that would underpin their detention of those access rights, as well as their relationships and interactions with other stakeholders.
- Fishers would be supported in evaluating and selecting an appropriate form of organization to receive and manage those rights, receive investment into the fishery and manage the returns and benefits that these limited rights would generate. Examples of possible forms for this organization could be a cooperative, a producer association or a shareholder corporation, but the form and membership of this organization will be the result of a negotiated process involving fishers, fish processors and the competent authorities

- Once these appropriate mechanisms and relationships have been agreed and established, a process that would typically involve several years of preliminary training, support, mentoring and hand-holding of the different sets of actors involved, private sector investment would have the opportunity of investing through the rights-holders' organization in improvements in fishing operations that will enable the landing of high-value YFT to supply improved processing facilities developed along the lines of OPP-BOB's Business Case 1.
- A key factor underpinning these investments will be the capacity of fishers to ensure the highest quality in their YFT catches enabling them to command premium prices at landing, and the capacity of fish processors to guarantee these premium prices through adherence to transparent and agreed criteria for establishing those quality standards. Enforcement of these quality standards will also constitute a limit through the market on the quantities of fish being landed and an incentive for fishers to catch fewer, better quality fish.
- Further investments would establish a functioning information and knowledge management system enabling access of all the concerned stakeholders to key information required to inform their decisions regarding their roles in co-management. It is envisaged that this would include collection and dissemination of information on fish catches and sales, reports and reviews of progress in the establishment of co-management arrangements and access to wider knowledge and experience on co-management world-wide.

Potential benefits and beneficiaries

The potential benefits generated by this investment, and the respective beneficiaries, would be as follows:

1. The long-term sustainability of the significant financial benefits (in the form of revenues, profits and returns on investment capital) generated by new fishing and fish handling enterprises targeting high-value YFT in the UTP. Beneficiaries would include: local fishing enterprise owners, their staff and their households (sustainable increased revenues and profits); fish processors and their households (sustainable increased revenues and profits); other actors in the YFT value chain (sustainable increased revenues and profits); and investors and their shareholders (secured repayment on investment capital and returns on that investment capital).
2. The demonstration of effective co-management arrangements that can provide an example for other fisheries in the UTP, in neighboring fisheries along the Coromandel Coast and in South India, and potentially, in India in general. This can generate potential benefits on a much wider scale within the fisheries sector in India where the need for alternative solutions to management issues is widely accepted.
3. Sustainable benefits to the wider economy, particularly in fishing communities but also in the UTP in general, generating employment opportunities and incomes, economic profits with the potential of a surplus to be invested in the wider economy, and tax revenues for government to invest in services such as education, health and infrastructure.
4. Improved ecosystem health through the promotion of sustainable fisheries practices, in the first instance in the fisheries ecosystem linked to tuna fisheries but with the potential for wider marine ecosystem improvements should fisheries co-management arrangements be effectively demonstrated and taken up on a wider scale.
5. Strengthening of fisheries stakeholder and key fisheries institutions with improved knowledge, skills and capacity in fisheries co-management and improved levels of organization within the fisheries sector, with resulting improvement in fisheries governance and capacities to manage natural resource use.

5. WHO ARE THE LIKELY INVESTORS?

Key points
<ul style="list-style-type: none">• Potential investors in fisheries co-management arrangements in UTP are identified.• Public investment is likely to play a key role in initial investments in establishing fisheries co-management arrangements in UTP.• The creation of a stakeholder-based investable entity would create the conditions for future access to private investment in the fishery.• International donors and, particularly, impact investors would also represent a potential source of investment given the wider social, economic and environmental impacts of establishing effective fisheries co-management in UPT.

Co-management is a negotiated distribution of rights, roles and responsibilities between government and the private sector involved in the fishery. The business opportunity involves an important role for investments from both these sectors, targeting three distinct strands of investment.

Public sector investment

Under current legislation and the constitution of India the Department of Fisheries and Fisherman Welfare (DFFW) has a mandated role in the management of fisheries resources. Co-management mechanisms recently established by the Government of the UTP envisage a complementary role for local resource-users and those with acquired or traditional use-rights.

Public investors are therefore likely to be attracted by elements in the proposed investment that make it complementary with new policy initiatives undertaken by the Government of the UTP and will involve the strengthening of the key government agency (DFFW) involved in the co-management process.

Several key aspects of the investment make it attractive for public investment:

1. The investment will contribute to building the capacity of the DFFW to effectively support the development of the fisheries sector and perform their mandate of ensuring sustainable fisheries.
2. It will also build the DFFW's capacity to act as an enabling agency in support of the fisheries sector, helping it to generate improved earnings and employment, as well as potentially significant revenues through payment for fishing rights, taxes and cost recovery that can be reinvested in services for the sector and society as a whole.
3. The investment is aimed at improving the sustainability of common-pool resources, representing an important contribution to the long-term health of the marine ecosystem in waters under the jurisdiction of the Government of India.
4. The investment in fisheries co-management would help to underpin commercial investments in the fisheries sector, both in the specific case of improved tuna fishing operations and potentially more widely in other fisheries enterprises in the UTP. This would support UTP and Government policy on providing a more enabling environment to private-sector development and sustainability.

Public investments would principally target the DFFW and would focus on:

1. Supporting and strengthening the capacity of the DFFW to implement the current policy of the Government of the UTP to develop co-management arrangements in fisheries;
2. Building understanding and appreciation within the DFFW of the different options and strategies for fisheries co-management through exposure to wider international practice in the field;

3. Building the capacity within the DFFW to act as a facilitator and enabler of the fisheries co-management process;
4. Supporting the DFFW in reviewing and evaluating the policy and legislative framework for fisheries co-management and proposing appropriate adjustments in order to align this framework with requirements on the ground;
5. Supporting the DFFW in reviewing and evaluating its own management and functional arrangements and develop more effective structures and processes in order to support co-management;
6. Building the capacity of the DFFW to manage information and knowledge and ensure its dissemination among key stakeholders involved in the co-management process.

Mixed public sector investors / international donors

The facilitation of the multi-stakeholder process that will evolve an effective co-management arrangement for YFT fisheries in UTP is particularly important and particularly sensitive. Changes in access rights in fisheries are always politically sensitive and the engagement of a neutral organization, trusted by all the key stakeholders involved, with specific responsibilities for facilitation of consultations and negotiations is therefore an important element in this business opportunity.

This investment would be potentially attractive to public sector investors or international donors as it would:

1. Underpin public investments in the capacity of the DFFW in the development of co-management arrangements;
2. Underpin private investments in establishing an appropriate organization of fishery rights-holders and ensure the clear definition of rights, roles and responsibilities within the co-management process;
3. Address possible conflicts arising in negotiations between the stakeholders involved;
4. Provide an example of effective facilitation for the development of co-management.

Investments would be channeled towards:

1. Preparation and capacity-building of different stakeholder groups to prepare them to engage in the discussion of co-management;
2. The organization and facilitation of multi-stakeholder meetings and negotiations on the establishment of co-management arrangements;
3. Reflection on the process to identify critical issues and adapt facilitation strategies.

Private sector investors

Private sector investors will have the opportunity of realizing significant returns on investment from improved tuna fishing enterprises in the UTP, operating within a well-managed fishery that will ensure the sustainability of those returns. Impact investors, concerned with social responsibility and ecological sustainability, will also be attracted by the wider social and economic benefits that this investment will generate.

Key factors attracting private sector investors will include:

1. Potentially high returns on investment in YFT fishing underpinned by good management practices;
2. Opportunities to link investment in the capture sector to investments in improved processing and value chains for YFT.

For impact investors, the attractions of this investment would include:

1. Potentially high returns on investment in YFT fishing underpinned by good management practices;
2. The opportunity to demonstrate effective fisheries co-management and provide an example for other fisheries, both in the UTP and in neighboring areas of South India and potentially in India as a whole.
3. High levels of social and wider economic benefits including: increased earnings for fishers, and associated fish processors; improved livelihoods for their households; employment opportunities in ancillary occupations including fish processing, the manufacture, repair and maintenance of fishing boats, engines and fishing gear; transport; ice-making; and services to fishing operations.
4. The opportunity to capture a proportion of the significant profits generated to both finance on-going management efforts and invest in improvements for the wider community and services for the population of the UTP as a whole such as healthcare, transport facilities and education.
5. The investment will also contribute to the building of a more professional and dynamic fisheries sector in the UTP.

Private sector or impact investment will be required for:

1. Building the capacity of fishers involved in line fisheries for YFT in UTP to catch and land high-quality tuna through training in appropriate methods and handling procedures;
2. Supporting fishers in identifying, analyzing and selecting appropriate means of organizing themselves as rights-holders for the fishery;
3. Supporting the establishment of an appropriate rights-holders' organization;
4. Supporting and facilitating fishers as they negotiate with the DFFW, other fisheries stakeholder groups, traditional and local authorities in defining the roles, rights and responsibilities associated with their organization;
5. Providing capital for improved equipment for conserving fish on-board, appropriate fishing gear and any necessary improvements to fishing craft to ensure their capacity to consistently land high-quality YFT feeding into improved value-chains and marketing channels.

6. WHAT ARE THE INVESTMENT OPTIONS CONSIDERED?

Key points
<ul style="list-style-type: none">• Two alternative options relative to investment in fisheries co-management in the UTP were considered and assessed.• A baseline option representing no additional investment in support of current initiatives by the Government of the UTP to develop co-management arrangements. Assessment of this option suggests that in its current form this may not be able to establish effective co-management arrangements in the UTP.• A larger-scale and more sustained investment, involving stakeholders at multiple levels, over a more extended period in support of the new co-management system. This would ensure that more innovative options for co-management are considered and enable more effective support to identifying and establishing viable co-management strategies.• The last of these options was selected as providing the most effective guarantee of establishing an effective fisheries co-management regime in the UPT.

Two options for investment in fisheries co-management arrangements for line-fisheries for YFT in the UTP are presented:

1. A baseline option representing no additional investment in support of current initiatives by the Government of the UTP to develop co-management arrangements.
2. A larger-scale and more sustained investment, involving stakeholders at multiple levels, over a more extended period, with investments in intensive capacity-building support, the establishment of appropriate institutional and organizational mechanisms including a stakeholder-based investible entity, support to consultation processes and the establishment of an information and knowledge management mechanism.

A profile of each option is presented in detail in Appendix 6 (Table 6 below provides a summary).

Baseline case (without additional investment but with government supported co-management initiatives on-going)

The baseline option envisages that no additional investment would be provided to support current efforts by the Government of the UTP to establish a fisheries co-management regime. The establishment of fisheries co-management committees at the village, district and Union Territory levels would continue, supported by the recent Government Order currently. The definition under this GO of the rights, roles and responsibilities of these co-management committees is limited. While this leaves considerable scope for developed and flexibility in defining these rights, roles and responsibilities, it requires appropriate guidance in identifying options and assessing which options are likely to be most effective. The lack of knowledge and experience about co-management among DFFW staff and stakeholders in the sector is likely to lead to a set of roles and responsibilities that largely mirror existing experience in the sector. From the point of view of the DFFW, the co-management committees represent an important channel for consultation with fishers and ensuring that their concerns and priorities are taken into account. From the point of view of fishers, the committees seem to be regarded as, above all, a means of ensuring access to on-going welfare schemes and government assistance.

Lack of exposure and knowledge of the possibilities for actually managing the fisheries means that discussion of management and the development of practical management measures on the ground is likely to be limited. This option would likely lead to little change in the current management situation for fisheries in

the UTP with access to fisheries, including the YFT fishery essentially uncontrolled and open-access. This would discourage further investment in the fishery as there would be no guarantees of sustainability of the resource and long-term returns on investments in the fishery.

Larger and more sustained support to a fishery co-management process leading to the development of better-defined co-management arrangements, more enabling institutional support and innovative approaches to determining the rights, roles and responsibilities of different actors involved in the process

This option is for more significant and sustained support to the fishery co-management process, including:

- support to the DFFW in reforming its policies, structures and functions in order to better support co-management;
- a major capacity-building effort targeting a wide range of fisheries stakeholders and concerned institutions;
- investment in the process of facilitating consultations involving concerned stakeholders and institutions to identify alternative co-management options with inputs on wider global experience and reach agreement on the distribution of rights, roles and responsibilities;
- the establishment of a stakeholder-based organization with well-defined rights, roles and responsibilities to hold and distribute rights to the fishery, take the lead in its management, receive and distribute investments in the fishery, and manage the distribution of returns on investment and benefits;
- support to the establishment of an information and knowledge management system to support fisheries co-management decision-making.

The last of these options was selected with the following reasons in mind:

- First of all, the potential returns on investment and increase in benefits flowing from a well-managed YFT fishery in Puducherry will be very significant;
- Secondly, for the stakeholders involved at all levels in the co-management represents a very new set of concepts and approaches. If it is to be effective, it requires new forms of institutions and important changes in existing institutions. The relationships between and the respective roles of key actors also need to be transformed compared to those currently in place. Achieving these changes has been demonstrated to be possible in other parts of the world and investment in establishing a precedent in the Indian context will require significant investment. As shown, the potential returns would justify this investment.
- Thirdly, the sizeable investment in building capacity involved in the second of these investment options has the potential for creating wider impacts across fisheries in the UTP and more widely in India. Particularly in coastal fisheries, major problems of overcapitalization and overexploitation are faced in all coastal areas of India and there is a recognized need for new approaches to addressing these problems. A working example of an alternative approach would respond to a widely perceived need for appropriate models for fisheries management that are currently lacking⁹.

⁹ **World Bank (2010).** *India Marine Fisheries: Issues, Opportunities and Transitions for Sustainable Development.* World Bank. © World Bank. <https://openknowledge.worldbank.org/handle/10986/3002> License: CC BY 3.0 IGO.

7. WHAT IS THE TIME-SCALE AND LEVEL OF INVESTMENT?

Key points
<ul style="list-style-type: none">• A time horizon of 20 years is used for the investment schedule in fisheries co-management arrangements in UTP;• Investments in strengthening the capacity of the DFFW would amount to USD 1,000,000 and be concentrated in first 5 years of the proposal.• Investments in process facilitation by a third-party organization would require USD 1,000,000 spread over 20 years but with an intensive period of facilitation between years 2 and 6 when key agreements over rights, roles and responsibilities of different stakeholders would need to be reached.• Investments in the rights-holders' organization would also be most significant during the early part of the proposed time-scale, up to year 6 of the investment, but some on-going financial support throughout the 20-year period is allowed for as well as periodic investments in replacement of fishing craft, fishing equipment and training in improved fishing techniques. The total investment in the fishers will be in the order of USD 1,808,200.• The overall investment for the business case is USD 3,808,200

A timescale of 20 years for the establishment of effective fisheries co-management arrangements in the UTP is envisaged. Three separate streams of investment are described below: the first targeting capacity-building and strengthening of the supporting institution concerned (DFFW); the second targeting support to a third-party organization facilitating the process of negotiating, assessing and establishing appropriate co-management arrangements among the different stakeholders involved; and finally investment channeled to the fishers directly involved in the fishery to support them in understanding management options, identifying and establishing an appropriate form of organization among potential rights-holders, defining their rights, roles and responsibilities, and investing in the improvement of their fishing operations and the value of their catches.

The discussion below outlines the timeframes and levels of investment over this 20-year timespan in the three key groups that would be recipients of investments: the DFFW, the third-party facilitating organization, and the fishers and their eventual organization.

Investments in DFFW capacity

Investments in building the capacity of the DFFW would be concentrated in the first 5-year period where their role in supporting the development of co-management arrangements, and their review and reform of the policy and legislative framework would be particularly important. Investment would be in training activities, policy reviews, a management and functional review (MFR) of the DFFW and the associated costs for high quality consultancy skills to support these processes. The establishment of an effective information and knowledge management system in support of co-management would be part of this, with government playing an important role initially but eventually leaving the management of this mechanism to private operators with full cost recovery from the profits generated by the fishery. The total investment in these DFFW would be **USD 1,000,000**.

Investment in a third-party facilitating organization

Investment in the important role of facilitator of the multi-stakeholder negotiations aimed at identifying a appropriate allocations of rights, roles and responsibilities around the YFT fisheries would also be concentrated in the initial years of the proposal, with particularly intense facilitation being required from Years 3 to 6 in the lead-up to the establishment of the rights-holders' organization and the early phases of its operation. However, some additional support to external facilitation is provided for throughout the period of the proposal. The total investment in process facilitation would be in the region of **USD 1,000,000**.

Investment in the establishment of a rights-holders' organization

Investment in the establishment of a rights-holders' organization to manage the YFT fishery will be concentrated in the period from Year 3 of the investment up until Year 6 (yearly investments of USD 250-300,000) but it is envisaged that some level of on-going support to this organization might be required throughout the lifetime of the proposal (USD 50,000 yearly). The objective would be to enable this organization to be self-supporting making use of the profits generated by the fishery they would be managing but some continuous hand-holding, mentoring and training is likely to continue to be required for some time. Total investment in the establishment of this rights-holders' organization would be **USD 1,600,000**.

In addition, periodic investment in the upgrading of boats, fishing gear and training of fishing crews for members of the rights-holders' organization is envisaged in Years 1, 6, 11 and 16 of the investment period. This will amount to **USD 208,200** overall.

The total investment foreseen in establishing fisheries co-management arrangements for the tuna fishery in the UTP would be **USD 3,808,200** over the 20-year period.

8. WHAT IS THE EXPECTED PERFORMANCE OF THE INVESTMENTS?

Key points
<ul style="list-style-type: none">• On the basis of the investment performance appraisal exercise, investment in co-management arrangements for YFT fisheries in the UTP showed sizeable profits, with a pay-back period of 6 years, a positive Internal Rate of Return (IRR) of 23% and a very significant Return on Investment (RoI) of 1,216%.• Assuming operations by 150 vessels, supplying catches of 18 mt of high quality YFT per year to 1 large and 12 small processing units, and receiving in return a premium price of INR 200/kg (US\$ 2.92/kg) investment in co-management arrangements for the YFT fishery in UTP would generate significant returns compared to the 'without investment' scenario (and no processing of high quality YFT)• With investment to establish functioning co-management to underpin improved fishing and fish processing activities, profits beyond normal crew wages and operating profit for vessel owners would increase from US\$ 0 to US\$ 4,066,472 creating opportunities for improved earnings for owners and crew as well as good returns on investment capital, recouping of costs for management and the generation of surplus profits (rents) that can be distributed to the wider community for investment as appropriate.

The performance of the investment in co-management arrangements for the YFT fishery in the UTP takes into account both the returns that would be realized by the fishing operations that would be the focus of co-management arrangements. These returns however assume that opportunities for securing higher value at the landing point either from the development of post harvesting activities in UTP or adjacent landings in Tamil Nadu, or through improved access to high value market chains more generally commanding premium prices from the fishery. The investment in co-management arrangements would underpin the activities of both fishers and fish processors and therefore the performance of both of these is taken into account in the following appraisal. Key parameters included in the investment appraisal are:

- Vessel operational costs
- Returns to vessels – normal profit
- Returns to labor
- Processor costs
- Processor profits
- Surplus / economic rent

The investment was then assessed using standard investment appraisal metrics including:

- Annual returns to crew
- Annual fleet profit
- Annual processor profit
- Payback Period (years)
- Net Present Value (NPV) of Investment
- Return on Investment (RoI)

The results of this analysis are presented in figure below and accompanying table.

Key assumptions made for assessing the investment were as follows:

- Calculations were based on current performance of small-scale line fishing operations for YFT, catching 18 MT of YFT per year;
- The fishery was modeled as containing a total of 150 fishing craft (based on current numbers of motorized handline, longline and trolling operations in the UTP);
- The base case, with no investment, assumes that no investment would be made in either improved processing, improved on-board handling or co-management arrangements and prices obtained for

land fish would be INR 100/kg (US\$ 1.457) (based on extensive stakeholder consultations held by OPP-BOB during the course of the project).

- The ‘with investment’ case assumes investment in improved processing facilities creating a demand for higher quality YFT to target high-value markets, and incorporates costs and profits for processors into the calculation;
- Based on the analysis of the OPP-BOB Business Case 1 for investment in improved YFT value chains, it has been assumed that the 150 fishing operations would be supplying 13 small processing units (4 craft each) and 1 larger unit (served by c. 100 craft);
- A key assumption underpinning the ‘with investment’ case is that YFT fishing operations landing high quality YFT to supply this improved value chain would command a landed price of INR 205/kg (US\$ 2.99).

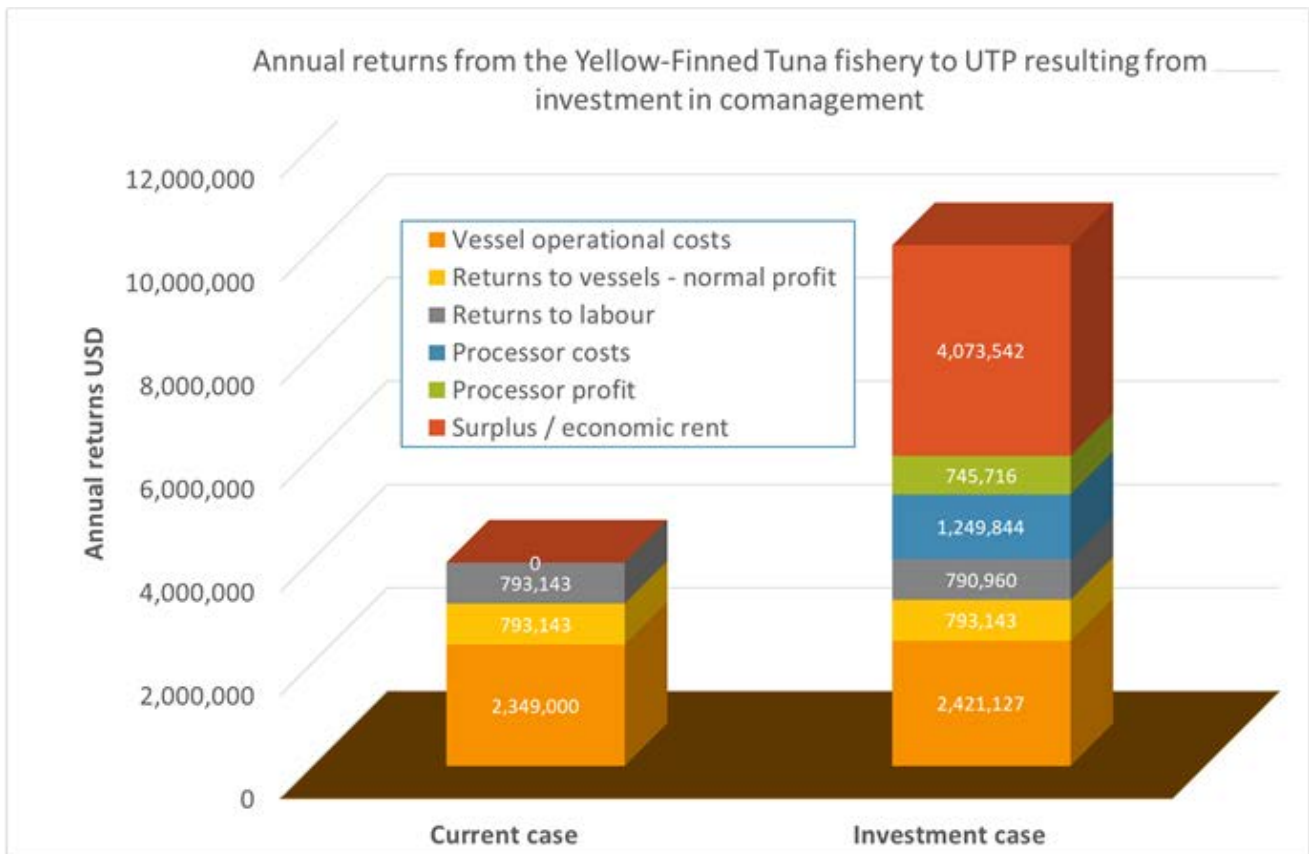
Total investment in co-management would be **US\$ 3,808,200**.

Total revenue to fishing vessels in the YFT fishery in UTP would increase from US\$ 3,935,286 to **US\$8,067,337**, taking into account additional costs for improved handling.

Assuming broadly constant levels of remuneration for fishing crew and “normal” profits for vessel owners compared to the base scenario, a “surplus” of US\$ 4,066,472 for vessels would be generated under the ‘with investment’ scenario. It is anticipated that this surplus would be achieved after 10 years representing a capital value for the fishery, assumed to be zero under the based scenario, of **US\$50,830,906** with investment for the co-management for YFT in UTP.

This would give a Return on Investment (RoI) for the investment in co-management of **1,219%** over the 20-year period with a Internal Rate of Return (IRR) of **23%** and a payback period of 6 years.

The Net Present Value (NPV) of the investment in co-management after 20 years would be **US\$ 15,756,317**.



Puducherry Comanagement Investment	No Investment			With investment		
	Total	Per vessel	Per tonne	Total	Per vessel	Per tonne
Catch by UTP line fleet (kgs)	2.700.000	18.000	1	2.700.000	18.000	1
Number of YFT line boats (no.)	150	1		150	1	
Total revenue to UTP fishery (USD)	3.935.286	26.235	1.458	10.074.333	67.162	3.731
Processor costs (USD)	0	0	0	1.222.650	8.151	453
Processor profit (USD)	0	0	0	784.346	5.229	290
Revenue to UTP vessels (USD)	3.935.286	26.235	1.458	8.067.337	53.782	2.988
Vessel operational costs including capital costs (USD)	2.349.000	15.660	870	2.421.127	16.141	897
Returns to labour (USD)	793.143	5.288	294	786.594	5.244	291
Returns to vessels - normal profit (USD)	793.143	5.288	294	793.143	5.288	294
Surplus / economic rent (USD)	0	0	0	4.066.472	27.110	1.506
Economic rent or capital value (USD)				50.830.906		18.826
Economic rent generated as % of landed value	0	0	0	50%	50%	50%
Investment cost in comanagement (USD)	0			3.808.200		
Internal Rate of Return (IRR) for comanagement investment	0			23%		
Return on Investment (RoI) for comanagement investment	0			1216%		
Payback period (YRS)	0			6		
NPV of investment (USD)	0			15.756.317		
Discount rate				8,0%		

	Variance	Baseline
Catch of fleet (kg)	2.700.000	2.700.000
Price received by boat	205	
Investment cost	0	-3.808.200

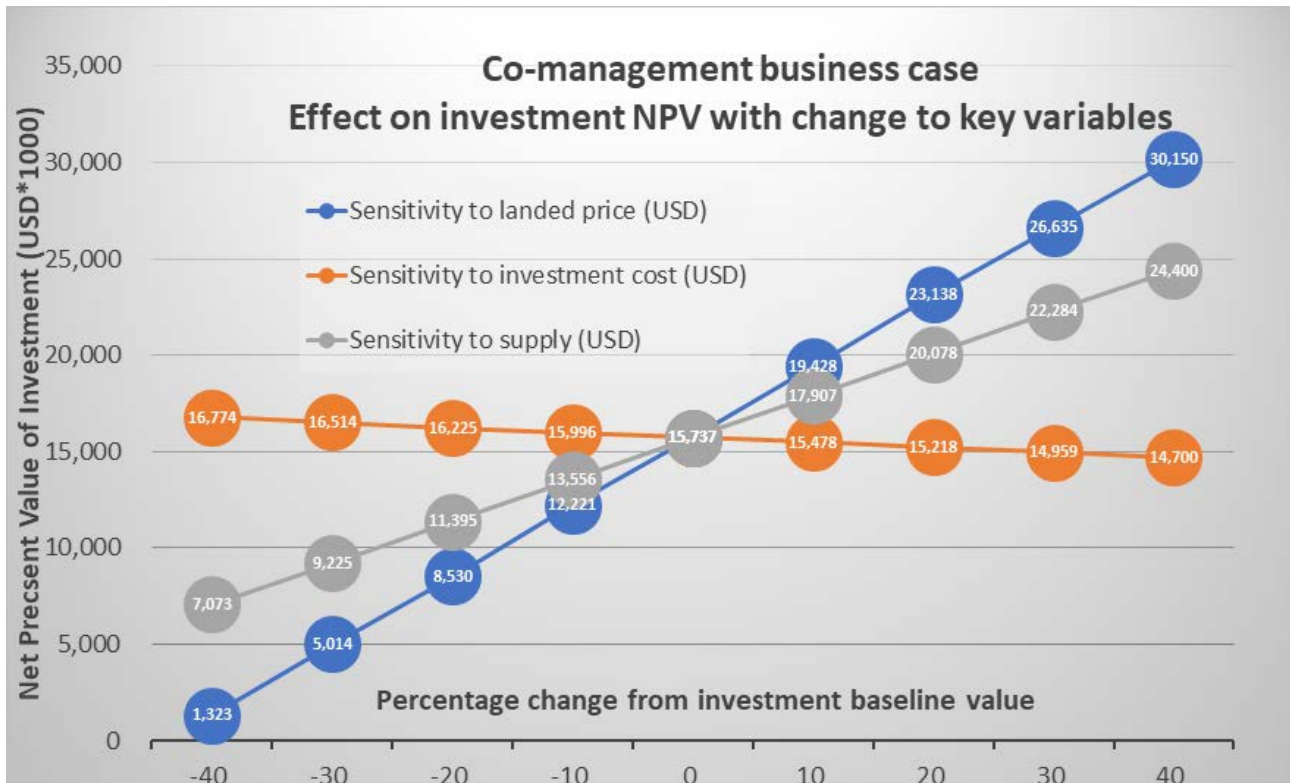
9. WHAT ARE THE ASSUMPTIONS AND RISKS ASSOCIATED WITH THE INVESTMENT?

Key points

- A sensitivity analysis was carried out for the investment case examining the following key variables:
 - Landed price of YFT;
 - Investment costs;
 - Supply of YFT.
- The Net Present Value (NPV) of the investment over 20 years remained positive even with changes of $\pm 40\%$ in all three of these variables. Sensitivity to investment cost is limited while sensitivity to supply and landed price is more marked.
- In addition, a series of broader assumptions that need to be taken into consideration by potential investors were also identified relating in particular to the broader institutional, political and social context of the business case. These assumptions include:
 - That investment in an improved value chain for YFT in Puducherry is forthcoming;
 - Complementary investments in the establishment of effective monitoring, control and surveillance mechanisms throughout the India Exclusive Economic Zone of the Bay of Bengal are also forthcoming;
 - In the long-term, that co-management measures undertaken in the UTP will also be taken up in the neighboring state of Tamil Nadu;
 - That the YFT resources in deeper waters prove to be sufficient to sustain this investment;
 - That demand for high-quality YFT, both domestically and internationally, remains strong;
 - That new co-management arrangements in the UTP are able to find an appropriate space in an already crowded institutional environment.
- Several more specific risks were identified including:
 - Changes in policy focus in the UTP;
 - Lack of political will in the face of reluctance to initiate change within the sector;
 - Partial implementation of required interventions or mistakes in the sequencing of interventions;
 - Changes in key personnel or institutions involved lead to loss of key champions of change, loss of focus and reduction in momentum, and loss of long-term perspective on key changes;
 - That diverse interpretations of the term “co-management” could lead to conflicting expectations and undermine the progress of the investment.

The sensitivity analysis shown below analyzes the effects of changes in landed price of YFT, investment costs and supply of YFT on the performance of the proposed investment in co-management arrangements in the UTP.

The analysis shows that sensitivity to investment costs is limited, while sensitivity to changes in landed price and supply are more significant but that the investment NPV remains positive with changes of $\pm 40\%$ in both of these two parameters.



Beyond this sensitivity analysis, understanding the wider assumptions on which the business case is based is important for investors in assessing the viability of their investment and the risks it faces. This is particularly the case given the timeframe of 20 years envisaged for the establishment of effective fisheries co-management arrangements.

Assumptions

Key assumptions that underpin this investment are outlined below.

1. The viability of the investment in co-management for the YFT fishery in UTP is dependent on complementary improvements in the YFT value-chain as this will ensure that fishers with rights to the YFT fishery have the appropriate incentives to land low volumes of high-quality fish for which they would receive premium prices.
2. Co-management arrangements also need to be underpinned by strong and effective Monitoring, Control and Surveillance (MCS) systems that can ensure that fishing regulations introduced as part of co-management can be enforced and that sufficient information regarding fishing activities and the observance of rules and regulations is available to inform management decisions.
3. The YFT fishery in UTP is nested within the broader context of the YFT fishery along the entire Coromandel Coast, most of which lies within the neighboring state of Tamil Nadu. Fishing operations for YFT overlap with those in Tamil Nadu and there is significant interaction between fishers from the two states who have essentially similar characteristics. While the establishment of co-management arrangements in the UTP is seen as a pilot activity that will demonstrate potential returns from appropriate forms of fisheries management, it is assumed that these will be identified

and imitated by the institutions and stakeholders operating in Tamil Nadu. Failure to do so could undermine the success of management arrangements in the UTP in the long term.

4. Estimates of YFT resource potential accessible to the fishers who are the focus of this proposal are assumed to be adequate to support a limited increase in exploitation, provided this is managed and carefully targeted.
5. It is also assumed that current trends in demand for YFT, including an increase in the still limited demand for fresh, high-quality YFT in domestic urban markets and strong international demand for high-quality YFT will continue.
6. The institutional environment in coastal UTP is characterized by a multiplicity of organizations and institutions, often with overlapping responsibilities and mandates, which means that new fishery co-management arrangements will have to locate an appropriate “institutional space” in which they can be effective and respond to the demands of the stakeholders involved. It is assumed, in this proposal, that this space will be identified and that the new institutional arrangements being proposed will respond to needs for better fisheries management in coastal communities in the UTP.

Risks

Several important risks that investors need to be aware of are also identified.

1. It is self-evident from the descriptions of underlying assumptions that the highest risk to investment would be combination of supply and price reductions driven by failure to establish secure access rights, fish stock sustainability and high value markets.
2. While current fisheries policy in the UTP has placed an emphasis on the development of a co-management arrangement system for fisheries, there is a risk that political changes in the future could lead to this policy being abandoned in favor of other priorities.
3. The designation of limited use rights for any fishery in the Indian context is likely to meet significant opposition in some quarters and is politically very sensitive. During the preparation of this business case some recognition of the need for new approaches to fisheries management was encountered suggesting that this opposition can be overcome provided that sufficient political will is present among politicians and key stakeholders. However, there is a risk that political will in support of significant changes in access to fisheries could fail in the face of opposition.
4. In line with experience globally in fisheries management, this business case foresees a 20-year timeframe for firmly establishing functioning co-management arrangements in the UTP. Over an extended time period like this, there are risks that interventions required may be only partially implemented, or that the importance of correct sequencing of interventions may not be appreciated. Failure to implement all the required steps in the correct order could prove detrimental to the overall outcome.
5. Similarly, the long timeframes involved in establishing co-management means that the personnel and stakeholders involved will inevitably change over time. This can result in a loss of “champions” who may have played a key role in supporting and promoting change and the loss of the “long-term” perspective that can be important in undertaking important reforms in institutions and institutional arrangements. This risk also highlights the importance of continuing support to the key stakeholder groups involved in order to maintain focus and momentum over time.
6. The term “co-management” is inherently open-ended and can be interpreted in many different ways. An essential part of the co-management process is the reinterpretation and adjustment of “co-management” to fit with local circumstances and the local institutional context. However, based on global experience, certain underlying principles need to be maintained and there is always a risk that,

in the course of the evolution of set of co-management arrangements, these principles can be forgotten or assumed to be unimportant. This creates the risk of the failure of co-management arrangements to meet the expectations of the stakeholders involved.

10. WHAT ARE THE CONCLUSIONS AND RECOMMENDATIONS FOR THIS INVESTMENT?

Key points
<ul style="list-style-type: none">• Key conclusions and recommendations for the business case are outlined.• Well-managed tuna fisheries in UTP can generate significant and sustainable benefits.• Investment in co-management arrangements offers important returns and would underpin complementary investments in improved value chains for YFT.• By providing a successful example of working co-management, the investment would have the potential for generating very significant wider benefits in Indian fisheries.• The success of the investment would be dependent on complementary investments in improved value chains and the establishment of monitoring, control and surveillance (MCS) system. Continued commitment of the Government of the Union Territory of Puducherry to fisheries co-management would also be critical.

[1] **POTENTIAL FOR SUSTAINABLE BENEFITS FROM WELL-MANAGED TUNA FISHERIES:** Tuna fisheries in India are currently not well-developed and current tuna landings are largely of low-quality and low-value fish. With fishing practices and on-board handling supplying improved processing and marketing systems, there is potential for the value of catches being significantly enhanced, generating benefits for fishers, processors and other value-chain actors.

[2] **BUSINESS CASE:** The **sustainability** of these benefits, and the returns on investment from an improved value chain, will be depend on the fishery being effectively managed. This can be achieved by a collaborative effort between the key institutions currently mandated to manage fisheries in the Union Territory of Puducherry (DFFW), YFT fishers and the wider fishing community including processors. Some of the basic structures for co-management arrangements in Puducherry are already in the process of being established (co-management committees) but knowledge of alternative approaches to co-management and implementation strategies is still limited. Key steps will include: capacity-building of the mandated agency to effectively support and create an enabling environment for co-management; dedicated facilitation of the negotiation process among stakeholders to determine how rights, roles and responsibilities will be allocated; and capacity-building of YFT fishers to improve their fishing operations, organize themselves into an appropriate form of producer organization; manage their rights of access to the fishery and redistribute surplus value to benefit investors, stakeholders, management mechanisms and wider society.

[3] **FISHERIES DEVELOPMENT and WIDER APPLICATION:** The establishment of functioning co-management arrangements in the UTP will provide an important example of innovative approaches to management. If these can be demonstrated to be effective, there is potential for similar processes being initiated for other fisheries in the UTP, along the Coromandel Coast of South India and more widely in Indian fisheries in general.

Establishment of effective management for one fishery will also have the potential for demonstrating how co-management can be applied to other fisheries, including those in coastal waters where the livelihoods of fishers are under threat from over-exploitation and habitat degradation.

[4] **RISKS AND ASSUMPTIONS:** There are several risks and assumptions effecting the viability of these investments in co-management, operating at several different levels.

- Investments in co-management arrangements are dependent on complementary investments in the value chain for high quality YFT and in the establishment of a Monitoring, Control and Surveillance (MCS) system;

- Given the long-term nature of the investment in co-management arrangements, sustained commitment from the government of the Union Territory of Puducherry will be essential.

Recommendations:

Investment in co-management arrangements in Puducherry have the potential for generating significant returns and ensuring sustainable benefits for fishers and fisheries value chains for YFT. Investments in co-management arrangements will therefore be worthwhile, provided that the associated risks and assumptions are fully taken into account.

APPENDIX 1

OCEANS PARTNERSHIP PROGRAMME – BAY OF BENGAL

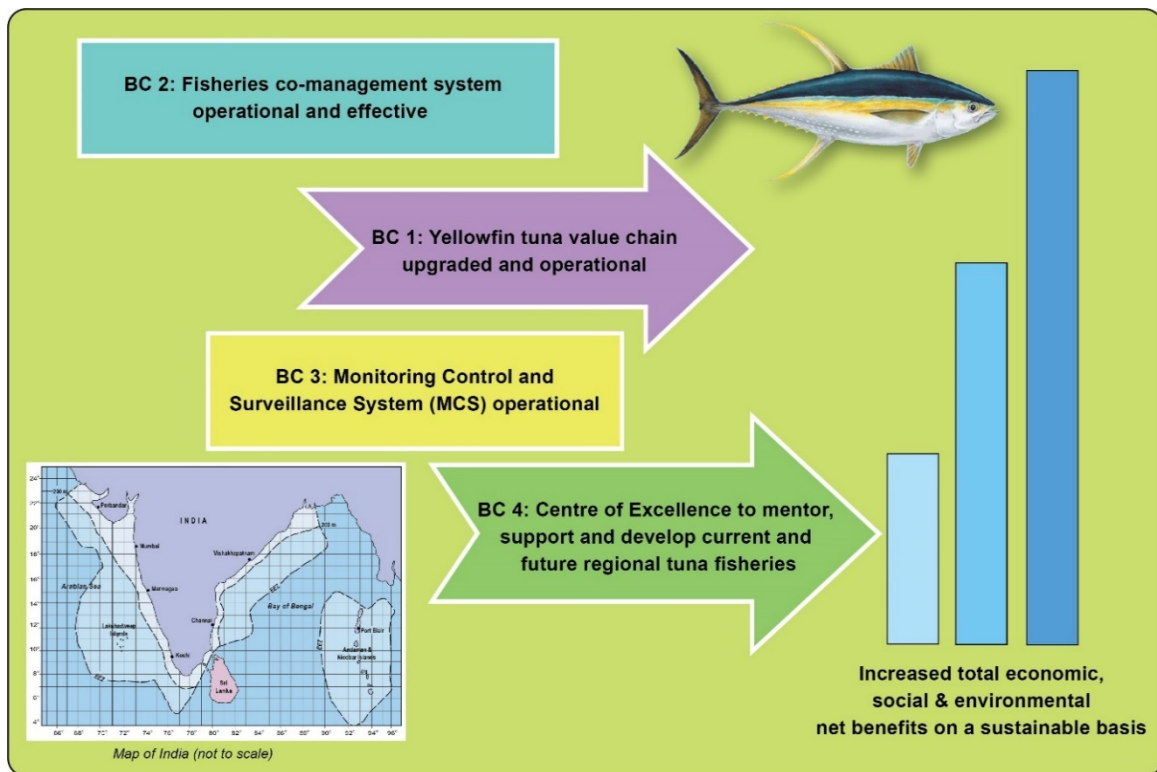
FOUR BUSINESS CASES

BRIEFING NOTE: Oceans Partnership Project – Bay of Bengal (TF 018233)

Four business cases (BC) are currently under development, with a final delivery date of 31 December 2018.

The underlying process has involved widespread stakeholder consultations and detailed analysis in India and the Bay of Bengal (BoB) Region. The likely performance of the investments involved – with reference to triple bottom line outcomes (economic, social and environmental net benefits) – has been examined using a cost-benefit analysis framework. Furthermore, careful attention has been paid to possible investment opportunities from both national and international sources. The relationships between the BC, as part of an integrated approach to fisheries development, are illustrated below.

It should be noted that the upgrading and future operation of the **tuna value chain** will be dependent on the establishment and operation of an effective fisheries **co-management system** and an **MCS system**. In the long-run, it is planned that regional tuna fisheries and value chains will be supported, mentored and developed with the assistance of a **Regional Centre of Excellence** offering, in particular, a wide range of dedicated capacity-building opportunities and services for the institutions and stakeholders involved.



OPP-BOB: Inter-relationships between the Four Business Cases

BC 1: Fish Quality Business Case for Yellowfin Tuna (YFT)

Increasing the supply of consistent high quality longline and handline caught YFT will provide a solid framework to support the sustainable development of existing and future YFT processing operations to meet current and future domestic and export market needs. Investments will result in strengthening the current value chains. The increased supply of high quality YFT will originate from the existing small-scale fishing vessels and will be supported via fishermen/processor driven training programmes for improved onboard handling and fish preservation

practices, accompanied by price premiums paid for high quality fish. Options for investment will be provided.

BC 2: Co-Management for Line Fisheries for Yellowfin Tuna (YFT) in Puducherry

Investment in a co-management mechanism for line-caught fisheries for YFT in Puducherry will establish means for local actors in the YFT value chain to manage their fishery in close consultation with concerned institutions, researchers and local co-management committees. Supported by the other related business cases, this investment will establish an example of functioning co-management where the benefits from improved fishing activities are captured by producers and local handlers, as well as other actors further up the value chain. The sustainability of these fisheries activities will be ensured through a combination of incentives for quality production and traceability of product. This will provide an example of co-management in practice to support both the Government of India's National Policy on Marine Fisheries (NPMF), 2017 and the Government of the Union Territory of Puducherry in their efforts to establish co-management of fisheries. A positive example of alternative approaches to fisheries management could be extended to adjacent coastal areas where there are similar conditions and opportunities.

BC 3: MCS for Yellowfin Tuna (YFT) for the EEZ of India in the Bay of Bengal

The Monitoring, Control and Surveillance (MCS) investment will increase sustainable economic returns recovered from YFT fishing in the Indian Exclusive Economic Zone (EEZ) of the BoB to 50% of their estimated potential value within ten years [to USD220 million]. The dedicated MCS investment in the YFT fishery will provide a stable investment and operating environment for the profitable and sustainable use of YFT and implement measures to improve fisher economic opportunities and resilience against environmental and economic shocks. The MCS investment will be designed to support value chain development and co-management initiatives. Building on the Government of India's NPMF, 2017, the investment will enhance new policy initiatives in MCS directly and through integration with value chain development programmes. Options for investment in the development of MCS systems for sub-regional application will also be provided. Target investors will encompass international and national government agencies as well as private sector interests. An investment of [USD 25 million] over 10 years will provide a high Return on Investment of [over 200%]. *(Figures in brackets may change based on on-going work during development of the BC)*

BC 4: Centre of Excellence for regional cooperation in sustainable management of SHMFS

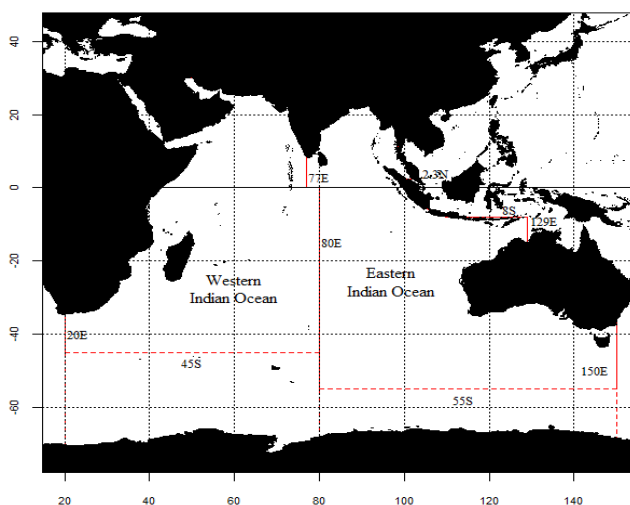
This final business case will draw upon project outputs and business cases (above) to propose the establishment of a new Centre of Excellence for fisheries management and development in the BoB region under the *aegis* of the BOBP-IGO. The business case will be underpinned by three key elements – the opportunity to build upon the high-quality work of the OPP-BOB project, the strong and wide-ranging links forged by the project at all levels (local-national-regional-international) concerning Straddling and Highly Migratory Fish Stocks (SHMFS), and the solid and well-respected reputation and institutional base provided by the BOBP-IGO. A focus on 'capacity-building for future fisheries management and development' and 'knowledge management' will be the key themes. The target investors, in the first instance, will be the government and associated partners.

APPENDIX 2:

TUNA RESOURCES AND LANDINGS IN THE INDIAN OCEAN

Fig. 1. Indian Ocean – FAO Statistical Areas 51(Western) and 57 (Eastern)

The IOTC Areas are represented in



Source: IOTC (2013)

Tuna stocks:

- Principal market species are [1] Yellowfin, [2] Bigeye, [3] Skipjack [4] Albacore and [5] Southern Bluefin
- Another important species – Southern Bluefin - occurs mainly in the southerly IO Convention Area
- Other species of tuna and tuna-like fish include: Neritic tunas, Billfishes.
- Stock distribution: Based on catch distribution and catch-and release programmes
 - [1] Yellowfin: Western IO (Off Somalia, Area R2)
 - [2] Bigeye: Western IO (A1) and Eastern IO (A2)
 - [3] Skipjack: Western IO (R2) and Eastern IO (R1)
 - [4] Albacore: Mainly South of 10°S
 - [5] Southern Blue-fin: Southern waters between 30 and 50°S

Stock Assessment:

- [1] Yellowfin: MSY: 421,000 - Overfished, overfishing (2015 stock assessments);
- [2] Bigeye: MSY: 132,000 t - Not overfished, no overfishing (2013 stock assessment);
- [3] Skipjack: MSY: 684, 000 - Not overfished, no overfishing (2014 stock assessment)
- [4] Albacore: MSY: 33,300 t - Not overfished, no overfishing (uncertainty relating to this assessment) (2014)
- [5] Southern Bluefin: MSY: 33,000 Heavily overfished, no overfishing (2014 stock assessment) (rebuilding plan in place).

Landings

- Indian Ocean accounts for 20% of World tuna catch (2nd after WCPO)
- Total catch of four principal commercial species were 1,003,400 t (2014) (2% increase from 2013)

- Total catch has declined since a peak in 2005 (1.2 million tonnes)
- Total catch weight (2010-14): 915,000 t.

Catch Composition and regulation

- Total catch composition by weight (2010-14): Skipjack (44%), Yellowfin (41%), Bigeye (11%), Albacore (4%)

[1] Yellowfin catch: 429,800 (2014) (6% increase since 2013 but 19% decline since 2004 level, 530,000 t)

[2] Bigeye catch: 100,200 t (2014) (12% decrease since 2013);

[3] Skipjack catch: 432,500 t (2014) (similar level to 2013);

Management: IOTC has not established conservation measures for the above species or quota allocation (despite advice from the Scientific Committee, Resolution 14/02); (Resolution 15/06 discard ban by purse-seine vessels)(some other mitigation measures, but monitoring is weak);

[4] Albacore catch: 49,900 t (2014) (22% decrease since 2013)

Management: There are no conservation and management measures adopted by IOTC for albacore.

[5] Southern Blue-fin catch: 11,900 t (2014) (1% increase since 2013)

Management: Annual TAC (to rebuild stock to 20% of unfished level by 2035) est. 2011; 2015-2017 TAC is 14,647t

Catch by nation

- There are some 50 countries which currently record some landings of tuna and tuna-like species from the IO
- Largest annual catch (2014): Indonesia, Iran, the EU (Spain, France and others), India, Sri Lanka and the Maldives. All of these countries have shown an increased level of annual catch since the early 1980s.

Catch by gear types

- Total catch by gear (2010-14): Purse-seine vessels (36%), longline (19%), gillnets (18%), pole-and-line (11%)
- [1] Yellowfin catch: Purse-seine (35%), longline (20%), gillnet (15%), Misc. (24%), Pole-and-line (5%)
Gillnet and Misc. Gears increasingly important (purse-seine and longline decreasing, pole-and-line stable);
- [2] Bigeye catch: Longline (55%) (decreasing catch overall, pirate areas avoided recently), purse-seine (28%) (stable);
- [3] Skipjack catch: Purse-seine (41%), gillnets (25%), pole-and-line (20%) (all catches falling since 2000);
- [4] Albacore catch: Drifting longlines (almost 100%);
- [5] Southern Blue-fin: Longlines (60%) and purse-seine (40%) (currently at 15% of peak in 1961);

Small-scale fishing

High diversity of coastal tuna fisheries involving neritic tunas (Longtail, Frigate, Bullet, Kawakawa, Spanish Mackerels), wide range of gears involved, both target and by-catch species. Most significant for Indonesia and India.

Economic valuation – preliminary results – Indian Ocean tuna fisheries

- The estimated *potential* sustainable economic value of both the principal and neritic tuna stocks in the Indian Ocean is **USD 2.06 billion** (therefore, the capitalized asset value of the fish stocks @ 8% [reasonable return, long term] is **USD 26 billion**).
- By comparison: India GDP (USD 2, 067 billion), Tamil Nadu (USD 167 billion), Kerala (USD 77 billion), Sri Lanka (67 billion), Maldives (2.3 billion).
- The actual (current) economic value of the tuna stocks in the IO is not known (in terms of the current levels of resource rent being generated). However, it seems unlikely any of the fisheries involved is generating economic rents at a level close to the potential value (above) under current management arrangements.
- Improved economic performance in the future could come from three routes: (1) critically from improved management at the harvesting level, (2) from increased catch up to MSY and (3) from improved performance throughout the value chain (but 2 and 3 depend on 1 of course). It should be noted that these results are at the resource level, but the results at country level will depend on how the resources or the economic benefits from their exploitation are shared.

Reference: Neiland (2016)

APPENDIX 3:

CURRENT YELLOWFIN TUNA RESOURCES AND LONGLINE/HANDLINE FISHERIES IN THE BAY OF BENGAL (INCLUDING DESCRIPTION OF THE BASE CASE/BUSINESS AS USUAL)

Yellowfin Tuna (YFT) Resources in the Bay of Bengal

The tuna resources in the Bay of Bengal are part of the YFT stock of the entire Indian Ocean. The Indian Ocean Tuna Commission (IOTC), the regional international tuna management organization for the Indian Ocean, has indicated that the YFT stock may be fully exploited already. For the purpose of this analysis, the Maximum Sustainable Yield (MSY) for YFT in the Bay of Bengal has been estimated at 35,000 metric tons (based on discussions with BOBP-IGO experts). The current catch is 24,770 mt. It is proposed for the current BC that catches should be set at 17,500 mt (50% MSY). This catch limit would be subject to management within the IOTC framework, and national rules and regulations.

The Small-scale Longline and Handline Yellowfin Tuna (YFT) Fishery

Fishing for YFT in the Bay of Bengal is carried out near the coastline and within the Indian Exclusive Economic Zone (EEZ). The fleet is composed of small-scale, open-deck fishing vessels that utilize hand-lines, long-lines and/or gillnets. These vessels engage in fishing trips that range anywhere from 1 to 3 days (depending on the fishing region), with a crew of 4 to 5 fishermen. Most of the fishing vessels have two outboard 9 horsepower (hp) engines (or equivalent inboard engine) and a sail. The vessels carry no ice and have no onboard preservation equipment; catches are generally left on the open deck after capture.

The typical one-day fishing trip entails leaving in the late afternoon/early evening, catching bait (which is kept alive in a special well with circulating sea water) and then travelling to the fishing grounds in the early hours of the morning. The vessels travel approximately 35 miles (but occasionally up to 60 miles) to the fishing grounds, where they set the long-lines. Once the long-line is recovered and the catch retrieved, the vessel heads back home to arrive while there is still daylight. The catches of these vessels average about 100 kilograms of fish (not only YFT but other tunas and tuna-like species (i.e. skipjack, billfishes, seer fish). The size of YFT caught by these vessels vary and could range from a few kilograms up to 35 kg per fish.

While tuna is present throughout the year in the Bay of Bengal, the small-scale hand-line/long-line fleet operates for about 9 months (270 days) a year, due to weather and other factors. Of this period, these vessels tend to focus on tuna about 180 days per year (i.e., an average of 180 one-day trips per year), while also potentially catching other commercial varieties of fish, such as seer fish, mahi mahi, sail fish and groupers.

The approximate capital cost of the typical fishing vessel is US\$ 5,000 for the vessel, US\$ 6,000 for two 9hp outboard engines (or US\$ 2500) and US\$ 2,000 for the fishing gear. The main operating costs are as follows:

- Fuel (estimated at US\$ 60.66 per one-day trip),
- Provisions (estimated at US\$ 14.71 per one-day trip),
- Water (estimated at US\$ 4.41 per one-day trip), and
- Crew costs.

The 4 to 5-member crew split the crew share, which is equal to 50% of the total value of ex-vessel sales after the above operating costs have been subtracted. The remaining 50% goes to the boat owner, who is responsible for the original investment/depreciation, and maintenance.

The majority of the fish is landed in the local fishing communities, because the local fishermen do not allow boats from other regions to land their catch (except in Kochi, Kerala on the southwest coast of

India, where local customs allow fishermen from other regions to land their fish in the harbor). The vessels' lack of adequate onboard handling and preservation practices results in very poor-quality fish and low prices. Based on stakeholder consultations and interviews conducted with fishermen during field visits, the landed prices received for the fish currently ranges between about 60 and 100 INR/kg (US\$ 0.88 to US\$ 1.48/kg). The fish is sold to traders at these low prices, who in turn re-sell the fish to retailers for sale in local markets or directly ship the product (by truck) to processors located mainly in the Kochi (Kerala) region.

Fishermen complain that the prices they get for their YFT are low. Buyers, on the other hand, complain that the fish quality is poor due to inadequate onboard handling and preservation systems and hence they are not willing to pay higher prices. An unknown volume of the YFT catch may be wasted due to poor quality (although it is suspected that, in fact, all landed fish is sold). In addition, high levels of histamine in the fish (caused by lack of refrigeration shortly after the fish dies) can result in a health hazard to consumers who may be sensitive to histamines and/or spoiled fish.

The continuation of the present situation (inappropriate onboard handling and preservation practices) would not result in improvements in the quality of long-line and hand-line YFT caught, which would limit the availability of appropriate quality raw material for processing. This constitutes a significant risk to YFT processors, from both economic and health hazard perspectives. This also represents a major constraint for the expansion of domestic and/or export markets. If current onboard and preservation practices persist in the fishery, economic returns from the valuable YFT resources found in the Bay of Bengal will continue to be severely limited.

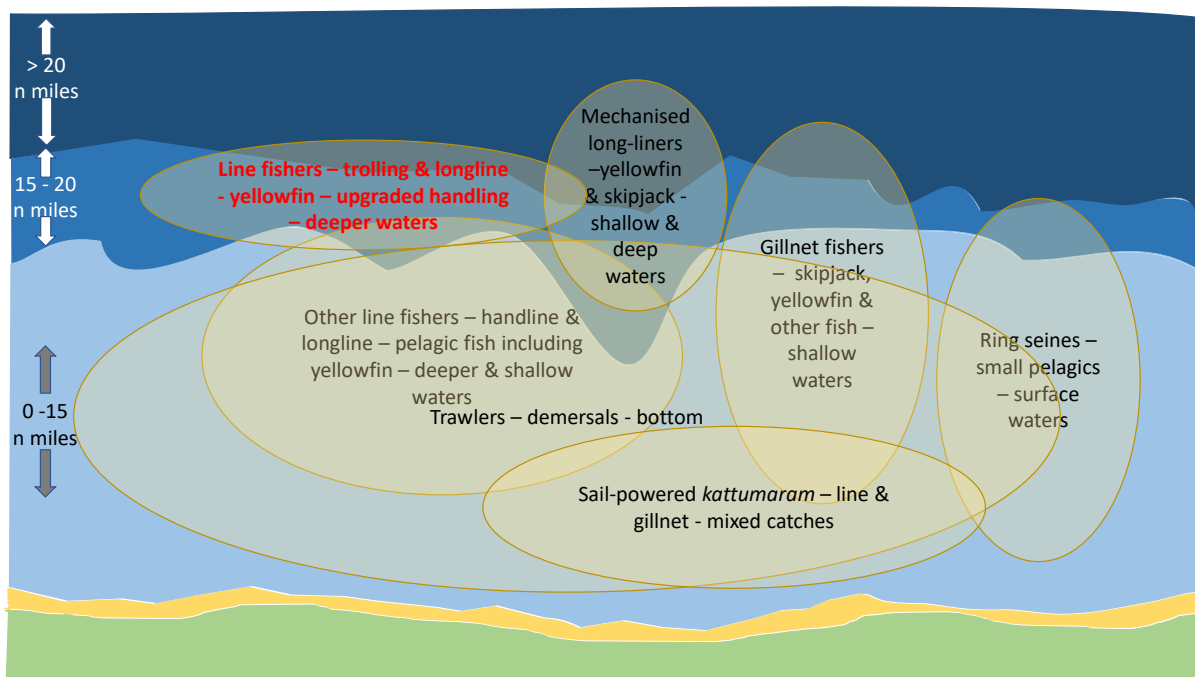
APPENDIX 4:

**CONTEXT AND TRENDS IN FISHERIES FOR YELLOWFIN TUNA IN THE
UNION TERRITORY OF PUDUCHERRY**

This Annex aims to review key contextual information regarding the line fishers targeting YFT in the UTP that would be the principle subjects of the investment proposed in the business case presented above. This will allow investors to understand more about the fisheries context, including some of the historical developments in fisheries in the area, and trends in policy and fisheries management.

The Geographical Context

- Fisheries in the UTP nested within the broader context of the Coromandel Coast of South India.
- c.700-km coastline between Pulicat Lake, located on the border between the states of Andhra Pradesh and Tamil Nadu just north of the city of Chennai, down to Point Calimere in the south, after which the coastline turns westwards into Palk Bay.
- Characterized by a relatively narrow continental shelf (15-40nm).
- Continental shelf particularly narrow adjacent to the District of Puducherry in the UTP (c. 15nm).
- Open beaches subject to heavy surf.
- Some river estuaries providing shelter.
- Increasing harbour development.
- Significant industrial development in coastal areas with attendant issues of pollution and habitat degradation.



Fisheries Context and Trends

- High levels of interaction and occasional conflict between different fisheries, particularly in coastal waters.
- Previously fishing from traditional sail-powered and motorized *kattumaram* – line and gillnet in inshore waters (now in decline although with rising petrol costs, occasional use of sail-powered *kattumaram* continues in some areas).
- 26’-30’ outboard-powered decked FRP boats now constitute largest part of small-scale fleet: gillnetting and line fishing in coastal waters up to the edge of the continental shelf: major increase since 2004 Indian Ocean *tsunami*. Also gillnet fishing for skipjack tuna (*Katsuwonus*

pelamis), seer fish (*Scomberomorus spp.*) and barracuda (*Sphyraena spp.*) along edge of continental shelf at shallow depths. Some catch of yellowfin tuna (*Thunnus albacares*).

- Trawlers, introduced in 1970s and steadily increasing in numbers since. Responsible for most of the catch in coastal waters and frequently in conflict with smaller-scale fishing operations.
- Mechanized gillnetters and longliners (including some converted from trawlers in recent years) fishing in deeper waters.
- Ringseiners fishing seasonally for oil sardine (*Sardinella longiceps*).
- Limited number of large-scale mechanised longliners operating from larger harbours (Chennai, Visakhapatnam) in deeper waters.
- In recent years some specialised line fishers using handline, longline and trolling to fish deeper along the edge of the continental shelf to catch larger yellowfin tuna.

Fisheries Profitability

- Since 1990s, increasing evidence of widespread overfishing, falling catch rates and declining profitability of fisheries.
- Early 2000s trawler sector in crisis.
- Levels of underutilized fishing craft increasing (gradually increasing ban periods for mechanized fishing activities widely accepted as welfare payments during ban are preferable to unprofitable fishing operations).
- Also in small-scale fishing, profitability apparently falling (highly sensitive to fuel prices – recent changes in economic climate and rising fuel prices have apparently seriously affected fishers).

Landings and Processing

- Landings increasingly concentrated at harbours where fish buyers congregate.
- Small-scale vessels still land on beaches for sale to agents and local fish dealers (often women from fishing communities).
- In UPT, landings of lower value species for local consumption handled by women fish vendors and processors.
- Higher value species purchased by agents for higher-value markets (restaurants) and distant urban markets.
- Increasing demand for fresh fish as opposed to dried fish (important in the past).
- Ice available (quality variable) but not always used on-board fishing vessels (particularly small scale).
- Quality of handling and hygiene generally low.
- For tuna catches from gillnetters and longliners, quality of landed catches, and prices, are generally low.

Conflicts and Conflict Resolution

- Long-standing conflicts between ‘artisanal’, small-scale fishers and mechanized sector, particularly trawlers.
- Trawlers widely perceived by other fishers as destructive to the ecosystem and too efficient.
- Zoning in place for trawlers (no operations within 3nm offshore) but frequently not enforced.
- Local arrangements arrived at by fishers themselves such as alternate day fishing (or 3-day/4-day arrangements) between mechanised and small-scale sectors. Often facilitated by Departments of Fisheries.
- Conflicts between ringseiners and small-scale fishers (although small-scale fishers are also often shareholders in local corporations that have invested in ringseiners in order to diversify fishing activities).

- Traditional caste *panchayats* still play role in some places in resolving conflicts in the fisheries.

Trends in Policies and Institutions.¹⁰

- Policy orientation in fisheries in India from Independence to 1970s – increased production, increased fishing capacity, technological development.
- Investments from public sector, foreign donors (technical innovations) and private sector.
- 1980s-2000s – increasing conflict and falling profitability of fisheries leading to increase in welfare provision to fishing communities – subsidies, schemes, welfare support.
- 2004 Indian Ocean *tsunami* – replacement of lost fishing equipment leads to significant increase in numbers of fishing craft and fishing effort.
- Recent policy trends – encouraging fishers to re-equip to take up fishing in deep-sea; conversion of trawlers to longliners and gillnetters; maintenance of stream of welfare payments to the fisheries sector.
- UTP – range of subsidies to fisheries and fishing communities. Welfare provision by the UTP to fishing communities regarded as particularly generous.¹¹

Implications for Future Management in India and the UTP

- Limited responses to declining performance of fisheries, in UTP and elsewhere in India.
- Attempts to shift fishing effort into deeper waters offshore.
- Unwillingness among concerned institutions and agencies to address fisheries management issues due to political sensitivity (particularly in the small-scale sector). Strong ideological commitment to the ‘right to fish’ for members of the fishing community.
- Some evidence that fishers are looking beyond the sector for the future – greater emphasis on education for children to exit the sector; diversification of income and employment.
- Value of continuing to be identified as a “fisher” to ensure right to obtain welfare and relief payments.
- Some evidence of greater professionalism among some fishers: identifying specific fishing opportunities and markets; refining fishing strategies to target new opportunities.
- Opportunities for introducing fisheries management, with engagement of stakeholders, in the face of declining profitability of the sector.

Key Developments in the UTP

The Chief Secretariat (Fisheries) of the Union Territory of Puducherry has responded to earlier work carried out by the Fisheries Management for Sustainable Livelihoods (FIMSUL) project working Tamil Nadu and Puducherry from 2010-12 and the subsequent Sustainable Fisheries component of the Coastal Disaster Risk Reduction Project (CDRRP), both implemented with World Bank support, by drafting a Government Order (GO) on Co-Management of Fisheries.

Both the previous projects developed proposals for introducing co-management arrangements for fisheries and the Government of the UTP has been the first state government to take these proposals and initiate the process of turning them into practice. The GO was developed between 2017 and 2018

¹⁰ FIMSUL (2011d). *Fisheries Management Options for Tamil Nadu and Puducherry*. (Authors: Vivekanandan V. and H.M. Kasim). A Report prepared for the Fisheries Management for Sustainable Livelihoods (FIMSUL) Project, undertaken by the FAO in association with the World Bank, the Government of Tamil Nadu and the Government of Puducherry. Report No. FIMSUL/R20. FAO/UTF/IND/180/IND. New Delhi, Chennai and Puducherry. 76p.

¹¹ FIMSUL (2011d). *Ibid.*

based on consultations with officers in the sector and with advice from the BOBP-IGO and sets in place a framework for fisheries co-management.

Essentially the GO lays out a set of guiding principles regarding fisheries co-management and establishes a structure for co-management arrangements, based on a 3-tier arrangement of village (VLC), district (DLC) and UT-level (UTC) co-management committees. The composition of these committees is defined along with a broad Terms of Reference (ToRs) shown below.

The precise roles and responsibilities defined here indicate a largely advisory role for the VLCs and DLCs where actual fishers and fisheries value-chain actors make up the bulk of the membership. Key decision-making roles appear to continue to be concentrated at the UTC level.

However, the GO commits the government to a process based on “dialogue, power-sharing and leading to good management and governance of the marine fisheries sector”. This creates an important opportunity to assist the DFFW and the Government of the UTP to think more carefully about how rights, roles and responsibilities might be distributed within this new system and how new types of organization and private sector operators could be given a more substantial role. “Co-management” as presented in the GO, seems to focus primarily on enforcing existing regulations but at the DLC level there is scope to “deliberate, evolve and recommend strategies for fisheries management and development”.

Current Terms of Reference for Co-Management Committees, Puducherry

Village-Level Committee (VLC) ToR

- a. Deliberate, evolve and recommend strategies for fisheries management and development and other allied activities pertaining to the operational area of the VLC.
- b. Recommend options for fisheries conservation and improvement of livelihoods of fishers belonging to the village.
- c. Assist in implementation of the provisions of the 1995 Code of Conduct for Responsible Fisheries (CCRF) of the FAO-UN, the 2014 FAO-UN Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (the VG-SSF Guidelines) and the national legislations and policies pertaining to fisheries, conservation of biodiversity and maintenance of the health and integrity of the ecosystem.
- d. Adopt best practices/standards in harvest, post-harvest, asset creation/management and other fisheries related activities in the village.
- e. Ensure occupational safety and disaster preparedness of stakeholders in the village.
- f. Cooperate in decision-making on issues which are of inter and intra-VLC nature.

District-Level Committee (DLC) ToR

- a. Deliberate, evolve and recommend strategies for fisheries management and development and other allied activities pertaining to the operational area of the DLC.
- b. Implement fisheries management and conservation measures in the areas under the jurisdiction of DLC.
- c. Assist VLCs in implementation of livelihoods and social security-related programmes and in adoption of best practices/standards in harvest, post-harvest, asset creation/management and other fisheries related activities in the village
- d. Recommend options for UT-wide fisheries management and conservation programmes to the UT-level Committee.
- e. Assist VLCs in implementation of the provisions of the 1995 CCRF of the FAO-UN, the 2014 FAO-UN VG-SSF Guidelines and the national legislations and policies pertaining to fisheries, conservation of biodiversity and maintenance of the health and integrity of the ecosystem.
- f. Coordinate with the other DLC to ensure implementation of fisheries management and conservation decisions at the UT-level.
- g. Ensure compliance of various Acts/Rules/Regulations and policies notified from time to time by Central and UT Governments with regard to regulation/management of fishery resources, biodiversity, health and integrity of the coastal and marine ecosystems, occupational safety of fishermen and disaster risk reduction.
- h. Assist implementation of coastal security measures undertaken by relevant security agencies.
- i. Settle inter and intra VLC-level disputes and promote integration and smooth functioning of different stakeholders.
- j. Any other issue which is brought to the DLC either by the VLC or the UT-level Committee or any other Government agency or public that necessitates the attention of the DLC.

Union Territory-Level Committee (UTC) ToR

- a. Deliberate, evolve and recommend strategies for fisheries management and development and other allied activities pertaining to the operational area of the UTC and provide necessary funds to the DLCs and VLCs for their implementation.
- b. Evolve policies for sustainable development of fisheries in the marine waters of the UT that complement and supplement the fisheries/environmental policies of the Central Government.
- c. Ensure implementation of fisheries management and conservation measures in the operational areas under UTC that are consistent with the 1995 CCRF of the FAO-UN, the 2014 FAO-UN VG-SSF Guidelines and the national legislations and policies pertaining to fisheries, conservation of biodiversity and maintenance of the health and integrity of the ecosystem.
- d. Prepare policies and programmes for implementation of livelihoods and social security-related activities and support adoption of best practices/standards in harvest, post-harvest, marketing and trade, asset creation/management, capacity building, knowledge management and other fisheries related activities in the UT of Puducherry.
- e. Coordinate with the neighbouring States and the Central Government towards harmonisation and implementation of national-level fisheries rules and regulations and policy directives, especially with regard to the sustainable exploitation of resources, conservation of biodiversity and ensuring that the fishing vessels of the UT of Puducherry do not engage in Illegal, Unreported and Unregulated fishing within the Indian Exclusive Economic Zone or in the waters of other countries.
- f. Support implementation of coastal security measures undertaken by relevant security agencies.
- g. Settle DLC-level disputes and promote integration and smooth functioning of different stakeholders.
- h. Ensure compliance of the binding and non-binding resolutions/policies/guidelines emanating from specialised agencies of the UN and Regional Fisheries Bodies such as the FAO-UN, International Maritime Organisation, International Labour Organisation and Bay of Bengal Programme Inter-Governmental Organisation for occupational safety and good working conditions of fishermen and disaster risk reduction.
- i. Recommend specific needs of the UT of Puducherry for development of sustainable fisheries to the Central Government and seek assistance for implementation of programmes that contribute to the sustainable fisheries development in general and establishment of the co-management regime in particular.
- j. Support and facilitate research and surveys undertaken by R&D institutions and academic bodies in support of fisheries development and management in the area.
- k. Undertake monitoring and evaluation of the implementation and adaptation of the co-management process in the UT and also ensure seamless flow of information and feedback mechanism amongst the VLCs, DLCs and the UTC.
- l. Any other issue which is brought to the UTC either by the VLC or the DLC or any other government agency or public that necessitates the attention of the UTC.

APPENDIX 5:

**FISHERIES OF THE EAST COAST OF INDIA (TAMIL NADU AND
PUDUCHERRY) – SOME KEY CHARACTERISTICS**
**A Synopsis of Selected Reports on Fisheries Management from the Fisheries
Management for Sustainable Livelihoods Project (FIMSUL**

The text below has been extracted (and modified) from two publications produced under the FIMSUL Project (google.fimsul).

FIMSUL (2011) Fisheries Management for Sustainable Livelihoods (FIMSUL) Project in Tamil Nadu and Puducherry, India. FINAL REPORT. Delhi: Food and Agriculture Organization of the United Nations. FAO Office, Lodi Estate, Delhi, India. FAO/UTF/IND/180/IND. (Volume I – Key Findings and Recommendations; and Volume II - Summary of FIMSUL Process and Outcomes under each Work Package) – Focusing on the contributions by Mr. V. Vivekanandan (Fisheries Management expert)

FIMSUL (2011). Fisheries Policy in Tamil Nadu and Puducherry : Part I : A Preliminary Analysis of Current Status and Future Options. (Authors: Neiland, A.E., V. Sampath and R. Srinivasan). A report prepared for the Fisheries Management for Sustainable Livelihoods (FIMSUL) Project, undertaken by the UN FAO in association with the World Bank, the Government of Tamil Nadu and the Government of Puducherry. Report No. FIMSUL/R8C. FAO/UTF/IND/180/IND. New Delhi, Chennai and Puducherry, India.

[1] Sector and Fleet Structure and Operations

Small-scale fishing operations (beach based, community-based fisheries):

Near shore (up to 50m depth) using a variety of nets and gear

- Small scale operations—small gill nets, handline operations (mostly Kanyakumari) and the widely used trammel nets (for shrimp) used by catamarans now increasingly replaced by FRP boats with a long tail engine, traps for lobsters and fish, and also mini trawls.
- Bulk catching methods—such as (i) Shore seines where 30-40 people go after a shoal of fish, (ii) Boat seines where the nets used include *thurivala* and *thattumadi*, (iii) Lift nets where four catamarans come together to use a lift net when a shoal passes, and (iv) Ring seines targeting mainly oil sardines (but now banned i.e. illegal).

Fishing operations may use different nets depending on the season and target species.

Fishing further off shore (50-200m)

- Going offshore up to the edge of the shelf with large drift nets. This category targets seer fish, tuna and barracuda. Here also, it could be seasonal or dedicated (e.g. Vallam fishing with gillnets in Tuticorin).
- Longlining in offshore areas, up to the edge of the shelf (Kanyakumari fishermen). Motorized craft go seasonally (Jan-Mar) to deeper waters, often to known reef areas, for longlining operations. Rest of the year, the same units undertake small-scale, near-shore operations with gillnets, handlines and trammel nets.

Mechanized sector operations:

The mechanized sector (5,000-6,000 trawlers) operate from fishing harbors. Earlier vessels (32 ft) operated as day-fishing boats (still the norm in the Palk Bay). However, most trawlers have been upgraded or replaced by larger boats undertaking multi-day fishing (4-5 days). Post tsunami trawlers are made of steel and also undertake multi-day fishing.

Most trawlers from Tamil Nadu target shrimp, but also catch finfish. They carry ten to twelve types of fishing nets (in addition to the shrimp nets). These include nets to catch crabs and “roller nets” to roll over rocks. They compete with other vessel types for all resources, often fishing in shallow waters.

There are about 600 boats (50-60 feet) operating offshore from Thoothoor, Kanyakumari, using gill nets for tuna and seer fish, bottom long lines for shark on the continental shelf, and surface lines for yellowfin tuna

and shark beyond the shelf. This is an indigenous self-developed deep-sea fleet, essentially designed for gillnets, but now adapted to longlines, which go for voyages of 2-4 weeks. Mostly based in Kochi (Kerala), along with Karnataka and Gujarat, they are often considered 'Kerala' fishers. There is significant seasonal migration (boats and labor) associated with these operations in Kerala and also to the Gulf countries.

An odd assortment of boats that are difficult to classify are the so-called gillnet boats, which are small boats with in-board diesel engines. CMFRI tends to classify all boats with in-board as "mechanized" while the TN fisheries Department uses a 15 hp cut-off to decide whether a boat is "motorized" or "mechanized". Such boats are found in a few centres like Chinna Muttom, and Puducherry. Even if their in-board technology forces them to operate with the trawlers in harbors, they are mostly comparable to motorized artisanal boats in terms of scale and fishing methods.

[2] Fisheries Management

Institutions

The current system to manage fisheries is fragmented and composed of a number of actors including: (i) State Department of fisheries, (ii) Department of Animal Husbandry, Dairying and Fisheries (DAHDF) in the Union Ministry of Agriculture (MoA), (iii) Union Ministry of Environment and Forests (MoEF), (iv) State Forests Department and (v) Fishing community organizations including the village based traditional governance system and the new mechanized boat owners associations.

The State fisheries department is responsible for fisheries management up to a distance of 12 nautical miles from the shore while the DAHDF is responsible for the rest of EEZ. The MoEF and the State Forests Department have intervened with fisheries regulations as part of their mandate to protect "endangered" species and habitats—both terrestrial and aquatic.

The traditional village institutions of the fishing community have been historically involved in managing various aspects of fishing—though not strictly resource management—and continue to do so with lesser clout and weaker internal coordination and coherence.

The mechanized boat associations represent the interests of the mechanized boats and have also some regulations and exercise as certain degree of control over their members.

Policy

Current fisheries policy in TN/PC focuses on increasing fish production and uplifting the socio-economic status of fishers.

While official statistics indicate that fish production is increasing each year (albeit very slowly), it is difficult to determine whether the socio-economic conditions of fishers and their communities are improving (since there is no baseline data). There is a strong perception in general that coastal communities are highly vulnerable to impoverishment.

Policy implementation in TN/PC focuses largely on programmes which distribute welfare payments to fishers and other stakeholders in coastal areas.

In terms of the indicators of success (funds spent and number of beneficiaries), policy appears to be performing well. However, by contrast, other information and indicators seem to indicate that current policy is not performing well – in terms of contribution to sustainable development - for example, there is little or no generation of economic rent (economic dimension), there is conflict between fishers and a high

dependency on government welfare and low literacy (social dimension), and a majority of fish stocks are overexploited (environmental dimension).

The current public (government) investment in the fisheries sector in TN alone is Rs 19,881 lakh (or USD 44 million) from State sources, with additional sums from central government.

About 80% of this is channeled through welfare payments. Fisheries management receives less than 2%. In comparison, if the fisheries of TN/PC were better managed, the potential economic rent generated each year would be in the order of Rs. 67,200 lakh (or USD 160 million).

Legal instruments

The Marine Fisheries Regulations Act, implemented by the DoF, is the most important legal instrument. The regulations under MFRA, now in place, are registration and licensing, a three nautical mile zone for exclusive use by artisanal fishermen, 45 day ban on mechanized fishing in Apr-May, ban on night fishing by trawlers, ban on certain gears and some mesh size regulations.

The implementation of the Act, except for the 45-day ban, has been patchy with significant regional variations; success in implementation has largely depended on community cooperation • So far no restriction has been made on the number of boats or fishing capacity.

The TNMFRA, despite being an enabling act that gives the Government powers to bring in regulations, is being interpreted in a manner that requires amendment in the Legislative Assembly, every time a new regulation becomes necessary.

The absence of any legislation covering the EEZ by the MoA creates a legal vacuum and all fishing beyond the 12 nautical miles (and TN has a lot of that) is unregulated and could be affected by any future regulatory regime brought in by the MoA.

The Wild life Protection Act under which the MoEF has powers to ban fishing of endangered species, to protect specific habitat and to establish national parks, has been used to ban fishing of some shark varieties, many gastropods and sea cucumbers. The scientific basis of the bans and the total absence of any consultation with fisheries stakeholders (and fisheries research institutes) has been questioned by many and the livelihoods of many fishermen are affected by these. The Gulf of Mannar National Park set up to protect 21 coral islands is proving to be an area of contention with severe restrictions on fishing that mainly affect small fishermen in the area who have historically fished in the area.

Community based management

All boats and fishermen, in principle, come under the control of community organizations.

The traditional village self-governance system that controlled the entire fishery prior to state-promoted mechanization, still exists, but its control is only over artisanal fisheries.

The village governance system is also fragmented due to the decline of higher tiers of governance and hence it is not easy to have regulations that are common to long stretches of the coast. This makes it difficult to ensure coherence between different village regulations.

The mechanized boats, though reluctant to abide by controls, also come under different boat associations and many have their own controls on operations. Some of them like the Chennai boat association have even gone to the extent of “freezing” the fleet size and put restrictions on horse power.

Overall, the community-based management systems appear to be more effective than management by the DoF/DFFW. Both the DoF/DFFW and community institutions have their own sources of power and pull in different directions, making fisheries management weak.

Self-governing nature of fishing villages

Every fishing village is a self-governing entity in all aspects. This even includes control over who they vote for in the general elections. The Hindu community is closely knit and the extent to which their traditions exist is seen to be inversely proportion to the distance from Chennai. The *Parava* and *Mukkuva* fishers are generally governed by the Church. Fishing and non-fishing activities come under the control of the parish councils or church committees.

Intra- and inter-village conflict resolution is also undertaken by the village organizations. At higher levels, the system has broken down, especially among the Hindu fishers, due to the split between mechanized and non-mechanized sectors. Traditionally, the village organizations had federations covering 64 villages among the Hindu fishermen. Now, federation boundaries tend to mirror district boundaries but their influence is reduced. In Christian communities, the role of the federation is played by diocesan structures that oversee the parishes.

So, there is a traditional system of management of fisheries by village organizations and their higher-level federations. But looking closer, one sees what kind of management is being undertaken by the traditional system. It sets rules governing access, including going for fishing, who goes and when, and decisions about not going fishing (fishing holiday in case of an important function or event). Historically, fishing (at low levels of intensity) did not require regulation in relation to the resource potential or sustainability. Moreover most of the resources are not amenable to management by a local community as the resource is shared over a long coastline. As a result, the system that has emerged historically has been to manage conflicts: between individuals, groups and gear groups.

Monsoon or the seasonal ban

As far as the government system is concerned, the one important regulation that works at the all-India level is the seasonal ban (6 weeks in April-May in Tamil Nadu) applicable to mechanized boats. This has a long history and over the years a strong consensus has been built among administrators, scientists and large sections of the fishing community in favor of the ban. That is why it works.

It must be mentioned that the communities of Puducherry (including Karaikal) are basically the same as Tamil Nadu's Coromandel Coast. The borders are mainly from an administrative/political point of view with Puducherry being more generous in their welfare doles (payments) for their relatively smaller fisher population.

APPENDIX 6:

**KEY PRINCIPLES FOR FISHERIES CO-MANAGEMENT BASED ON
INTERNATIONAL BEST PRACTICE AND EXPERIENCE & CASE STUDIES OF
FISHERIES CO-MANAGEMENT WORLDWIDE**

Key Principles for Fisheries Co-Management based on International Best Practice and Experience

Practical experience around the world and economic theory have demonstrated conclusively that unregulated fisheries end up overfished from both biological and economic perspectives. As a result, Governments have sought to regulate their fisheries, usually by attempting to control the activities of fishers using a variety of systems. This kind of “top-down” control has not generally achieved the desired results and Governments are increasingly seeking alternatives.

The most promising broad approach has been termed “co-management” which simply means the sharing of responsibilities for fisheries management between Government and the resource users. Clearly there are many ways in which such sharing may be done.

In designing a co-management system, the key features required for success are:

- Fishers are given secure exclusive use rights defined in an appropriate way so as to give them a clear interest in maintaining and improving the condition of the fish resource
- Government sees its role in terms of oversight, especially establishing the conditions that must be met when fishers exercise their rights
- Government reviews the services that are required to manage fisheries and considers the best way to deliver such services, for instance using tendering to identify the best option for MCS, in order to deliver these services at least cost

When well-designed, a co-management system will avoid the confrontation between Government and fishers that is typically found in a top-down system. A successful system will function in such a way that the fishers deliver Government goals (especially concerning the state of the resource) as an outcome of their fishing activity, i.e. objectives will be aligned.

Fish resources are inherently very valuable and well-designed systems will enable this value to be generated on a sustainable basis.

Some Examples of Fisheries Co-Management Arrangements in Operation Worldwide.

The Manx Fish Producers Organization

Ramsey Bay in the Isle of Man (IOM) has traditionally supported a small, but locally economically important, king scallop (*Pecten maximus*) dredge fishery. It is a small part of a broader king scallop fishery within the IOM’s territorial sea (outside of Ramsey Bay). Prior to 2009, the whole fishery was managed by a system of licences supported by scallop size limits and gear and temporal restrictions. Any vessel under 221 kW with a valid UK licence that applied and paid the nominal licence fee was allowed to enter the fishery, a system commonly called “regulated open access (ROA)”.

Prior to 2007, landings per unit effort (LPUE) were similar in the Ramsey Bay fishery and the other Isle of Man scallop fisheries but as shown in the Table below from 2007 to 2009 LPUE declined substantially in Ramsey Bay. Faced with this severe overfishing, the fishers asked for the fishery to be closed in December 2009.

In October 2011 Ramsey Bay was designated as a Marine Nature Reserve (MNR) with five zones covering an area of 94.5 km² and protecting priority habitats.

In 2013, the Isle of Man Government granted a 5-year lease to the Manx Fish Producers Organization (MFPO) with gave them the exclusive right from 2013 to 2018 to harvest king scallops in a Fisheries Management Zone (FMZ) (47.5 km²) within the MNR.

Ramsey Bay Scallop Fishery Isle of Man								
<i>Year</i>	<i>Landings per unit of effort (one hour dredge)</i>	<i>TAC (kg)</i>	<i>Total days fishing</i>	<i>Total Rev (£)</i>	<i>Total Cost (£)</i>	<i>Rent (£)</i>	<i>Dividend per member</i>	<i>Rent as a % of total revenue</i>
2007	7.4	nd	nd	nd	nd	Nd	0	nd
2008	5.7	nd	nd	nd	nd	Nd	0	nd
2009	3.3	nd	nd	nd	nd	Nd	0	nd
2013	49.6	23,200	6	63,144	11,630	51,514	1,776	81.6%
2014	36.8	28,776	17	73,320	24,175	49,145	1,695	67.0%
2015	32.5	37,470	23	104,356	28,340	76,016	2,621	72.8%

Once the FMZ was re-opened, it became to MFPO's responsibility to decide when, where and what quantity of scallops to catch subject to a requirement imposed by the Manx Government in the lease that they must submit for Ministerial approval an annual Fishery Management Plan and that they must maintain the "ecological integrity" of the FMZ. To this end, they were required to take scientific advice in setting the annual Total Allowable Catch from the zone and to monitor exploitation levels.

Following the first Annual Scientific survey, the MFPO decided to concentrate fishing activity on a 9.1 km² area with the highest scallop density, the remainder of their FMZ was left unfished.

When the FMS fishery re-opened in 2013, the fishers waited until December before fishing and landings per unit of effort were 49.6kg. At the same time, the ROA fishery continued with its "typical" landings per unit of effort figures of about 6.8kg.

There were 2 reasons for this dramatic increase in performance in the FMZ fishery. First, the scallop stock had improved due to the closure and as noted the fishers concentrated on the most productive of their grounds. Second, and more importantly, the exclusive right generated by the lease gave the fishers as a group the incentive to reduce their fishing effort substantially.

The fishers agreed that not all 29 members of the MFPO needed to go fishing to take the TAC; in fact, only 3 vessels fishing 2 days each were all that was needed. The MFPO organized a tendering system wherein interested fishers quoted their price to do some of the fishing. Three fishers were thus selected and, under intense monitoring by both the organization and their fellow fishers, went fishing. The scallop catch was landed to and sold by the MFPO on behalf of all its members, who then shared the profits in the form of a dividend payment.

Moreover, they decided to fish their TAC in December because prices were higher that month compared with the month of May when the fishery had traditionally opened. This turned out to be an excellent decision because in December 2013 king scallop prices were £13.50 per kg whereas they had only been £9.50 per kg in the preceding May.

In 2013, the 6 days fishing in the FMZ gave a total revenue of £63,143. Fishing costs were £11,630 giving a profit of over £50k, from which each member of the MFPO received a dividend of £1,766, regardless of whether they had fished or not (which most had not of course).

For reasons based partly on a lack of trust and partly a feeling that those doing the fishing had been overpaid to do it, the system evolved in the subsequent years. Each member had an individual transferable quota and they could decide how it was fished. In 2014, one vessel was contracted to fish about 6 tonnes of the TAC and the remainder was fished by the individual quota holders, using either their own vessel or combining their quota with another vessel. In 2015, only the latter system was used.

As a result, the number of vessels fishing increased from 3 in 2013, to 17 in 2014 and 19 in 2015.

The selling system did not change and all scallops were sold by the MFPO which distributed the net proceeds as a dividend.

The TAC increased (whilst continuing to meet the ecological constraint imposed by the lease) from 23.2 tonnes in 2013 to 28.8 tonnes in 2014 and 37.5 tonnes in 2015. Gross revenue followed suit increasing from £63k in 2013, to £73k in 2014 to £104k in 2015. However, because of extra (unnecessary) vessels doing the fishing, fishing costs also increased so that the dividend per member fell from £1,776 in 2013 to £1,695 in 2014 although it increased again in 2015 to £2,621.

If the system used in 2013 had been maintained, it is estimated that the dividend per member in 2014 and 2015 would have been higher by over £300 per member, which might be considered to be the cost of having a trustworthy system.

In addition to these economic advantages, the lease system also has ecological advantages, not least the reduce impact on the sea-bed because of the very low level of dredging. The members of the MFPO are also now actively seeking ways in which they can increase the long-term biological productivity of their FMZ.

Although there is clearly a big difference between a fishery targeting shell-fish and one targeting yellowfin tuna, the fundamental issue that must be resolved is the same: how can an entity be designed that will give the private sector an incentive to exploit the resource in a rational manner?

The deep-water shrimp fishery in Senegal, West Africa

The fishery for deep-water shrimp (*Parapenaeus longirostris*) has a long history with most of its product being sold in lucrative export markets in Europe, especially in Spain.

The Senegalese fisheries law of 1998 requires that fisheries be managed on the basis of fishery management plans. After some delay in adopting the implementing provisions of this law, the Government decided in 2007 to pilot the planning process by developing the first such plan for the deep-water shrimp fishery.

Prior to beginning work on the plan, a preparatory phase was organized. The first step involved bringing together representatives of the Ministry, the Research institute and the fishing industry to develop jointly a bio-economic model of the fishery. The main purpose of this model was to underpin discussions of the stakes in improving management in the fishery.

The modelling showed that the fishery was biologically overexploited: fishing effort was well in excess of the level needed to take the Maximum Sustainable Yield. It was also economically overexploited in that no resource rent was being earned: instead such rents were funding excess capacity in the fishery. Despite this poor performance, the fishery still produced an annual revenue at first landing in excess of 10 million euros per annum of which about €4m was value-added (essentially wage payments to crew and company profits), which shows that these indicators have to be used very carefully in the case of fishing activity.

The model suggested that if fishing effort were reduced, the shrimp stock would recover allowing higher sustainable catch to be taken increasing annual revenue to some €12.7 million. More importantly, fishing costs would be reduced. As a result, value added would increase substantially with about €2million in wages and profits and some €7.5 million as resource rent (i.e. about 59% of the total revenue).

Resource rent represents what the World Bank has called an “investable surplus”. It arises from the inherent value of the resource and is an amount which is in excess of that needed to keep fishers in operation. It can therefore (in principle at least) be invested in other activities in the economy.

The challenge is first to generate this amount and second to sustain it.

Because these ideas are difficult to grasp, the next stage in the process was to organise some training again involving Government officials, researchers and fishing industry representatives. A series of seminars were

held in 2009 which enabled all parties to begin to develop a common understanding of the issues to be resolved in the fishery management plan and the potential gains.

Over 2009 and 2010, work was undertaken to develop the Fishery Management Plan itself again in a participatory process involving Government, Research and the Fishing Industry.

The key element was the decision of the Government to grant an exclusive concession under tightly defined conditions to a Fishery Management Company. This company represented a new structure, the requirement being that the 6 existing companies had to become members of this new management company.

It was the new company's responsibility to propose a company structure to the Ministry with the requirement that the six member-companies had to agree unanimously on the proposed structure. Note that the fisheries management company simply formalized the current situation in the fishery. If other companies or individuals wish to enter the fishery in the future, they are free to do so provided that they purchase a company or a shareholding in one, in much the same way that companies or individuals are free to begin farming, for example, provided they obtain some land or a farm.

It is a requirement that the company make an annual payment to the Government in return for the concession, thereby ensuring that all Senegalese citizens obtained some benefit from the fish resource.

The Plan was adopted by Decree in 2013. It then took the 6 member-companies 2 years to negotiate a unanimous structure for the fisheries management company. The proposed structure was agreed by the Ministry and a 3-year transitional period during which no fee is payable began in 2016.

The calculation of the fee is complicated but the principle is to share the resource rent between the Government and the fishing industry. The Government does not seek to tax away all resource rent because this is not a fixed amount but can be increased in the future through innovations on the marketing and catching side. Clearly, the industry will have no incentive to make such innovations if the profits will simply be taxed away. On the other hand, the Senegalese fisheries law makes it clear that the fish resources belong to all citizens and it seems logical therefore that they should receive a return on these resources.

During the transitional period, the management company is funding a programme of observers on board the vessels and an annual scientific working group that establishes the Total Allowable Catch.

The Government's role is one of oversight and rent collector. The industry through its management company has a clear incentive to ensure that the resource is maintained in good shape so that its rents can be maximised. However, the Management Plan provides for a review of the performance of the fisheries management company every 5 years.

Spiny Lobsters of the Baja California Peninsula, Mexico

(NOTE: This section is based and draws heavily on: MSC 2ND RE-ASSESSMENT FINAL REPORT)

Mexico Baja California Red Rock Lobster Fishery Prepared for: Federación Regional de Sociedades Cooperativas de la Industria Pesquera de Baja California, F.C.L. (FEDECOOP) 2016 – available on the Marine Stewardship Council website)

The exploited species is the red rock lobster (*Panulirus interruptus*). The fishery is in Baja California, located on the northern Mexican Pacific Coast.

The Government's objective is mainly to ensure that the ecological constraint is met: "guarantee the sustainable exploitation of the resource, safeguarding the reproductive capacity at a level allowing sufficient recruitment to the fishery".

Subject to this constraint, the fishery harvest strategy is based on limiting access by granting area-based concessions that can last up to 20 years and are renewable (supported by some standard regulations such as minimum size, temporal closures and protection of berried females).

Twenty-six fishing cooperatives exploit the fishery. Of these, nine form the Federación Regional de Sociedades Cooperativas de la Industria Pesquera Baja California, F.C.L (FEDECOOP) and together catch approximately 80% of the total red rock lobster in the region. The legal exploitable area for the nine cooperative group members covers approximately 2,400 km² along the coast of Mexico.

Each concession includes a clear description of the exclusive fishing zone issued to each cooperative. This scheme is rigorously controlled by cooperatives and ensures a limitation on fishing effort within concessions and also creates a strong incentive to prevent illegal fishing by poachers.

Fishing effort is regulated based on a process that starts with an internal evaluation of fisher performance in each cooperative. Fishers (a captain and his crew of one or two members) are allowed to participate in the next fishing season by observing their productivity during the last 5 fishing seasons. All fishers have to be members of the Cooperative and have to show a positive level of production to continue their participation. Next, the harvesting level for the following season is planned based on the analysis of the last five fishing seasons taking into account stock size, biological, economic indicators and all other recommendations by INAPESCA. This information is used to determine if it is necessary to modify the number of boats and gear or fishers that will participate in the fishing season.

When changes are deemed necessary, communication between the fishers and the authority takes place in workshops and regular sessions of the Lobster Fishery Committee to produce official agreements and communications. Documentation was provided to demonstrate a process that led to changes to duration of the fishing season due to environmental variability which caused changes in the lobster reproductive behaviour (SAGARPA 2014).

Due to the high value of the lobster fishery and in order to maintain the stock size and the conservation of the resource, the cooperatives developed an inspection and surveillance system inside their concession area to eliminate illegal fishing. This system represents a high cost of around \$ 2.5 million dollars per year to the 9 cooperatives together, for operation and an investment cost of around \$ 1.5 million dollars for communication equipment, vehicles, boats, etc. The system is legally recognized as a Community Surveillance Committee. Its implementation has had positive results minimizing illegal fishing along the central region. The Surveillance Committee also participates in the enforcement of the legal minimal size by double checking catch with the Quality Control group of the Cooperatives during the landing process. In the case of deception by a fisher member, economic sanctions or fishing activity suspensions could be applied including the potential exclusion of membership from the cooperative.

Based on this co-management approach, this highly valuable fishery is certified as sustainable by the MSC.

APPENDIX 7:

**ANALYSIS OF THE RETURNS ON INVESTMENT FOR BUSINESS CASE 2: FISHERIES
CO-MANAGEMENT IN THE UNION TERRITORY OF PUDUCHERRY**

The performance of the investment in co-management arrangements for the YFT fishery in the UTP takes into account the returns that would be realized by the fishing operations that would be the focus on co-management arrangements. These returns however assume that opportunities for securing higher value at the landing point either from the development of post harvesting activities in UTP and in adjacent areas of Tamil Nadu or through improved access to high value market chains more generally commanding premium prices from the fishery. The investment in co-management arrangements would underpin the activities of both fishers and fish processors and therefore the performance of both of these is taken into account in the following appraisal. Key parameters included in the investment appraisal are:

- Vessel operational costs
- Returns to vessels – normal profit
- Returns to labor
- Processor costs
- Processor profits
- Surplus / economic rent

The investment was then assessed using standard investment appraisal metrics including:

- Annual returns to crew
- Annual fleet profit
- Annual processor profit
- Payback Period (years)
- Net Present Value (NPV) of Investment
- Return on Investment (RoI)

The results of this analysis are presented in figure below and accompanying table.

Key assumptions made for assessing the investment were as follows:

- Calculations were based on current performance of small-scale line fishing operations for YFT, catching 18 MT of YFT per year;
- The fishery was modeled as containing a total of 150 fishing craft (based on current numbers of motorized handline, longline and trolling operations in the UTP);
- The base case, with no investment, assumes that no investment would be made in either improved processing, improved on-board handling or co-management arrangements and prices obtained for land fish would be INR 100/kg (US\$ 1.457) (based on extensive stakeholder consultations held by OPP-BOB during the course of the project).
- The ‘with investment’ case assumes investment in improved processing facilities creating a demand for higher quality YFT to target high-value markets, and incorporates costs and profits for processors into the calculation;
- Based on the analysis of the OPP-BOB Business Case 1 for investment in improved YFT value chains, it has been assumed that the 150 fishing operations would be supplying 13 small processing units (4 craft each) and 1 larger unit (served by c. 100 craft);
- A key assumption underpinning the ‘with investment’ case is that YFT fishing operations landing high quality YFT to supply this improved value chain would command a landed price of INR 205/kg (US\$ 2.99).

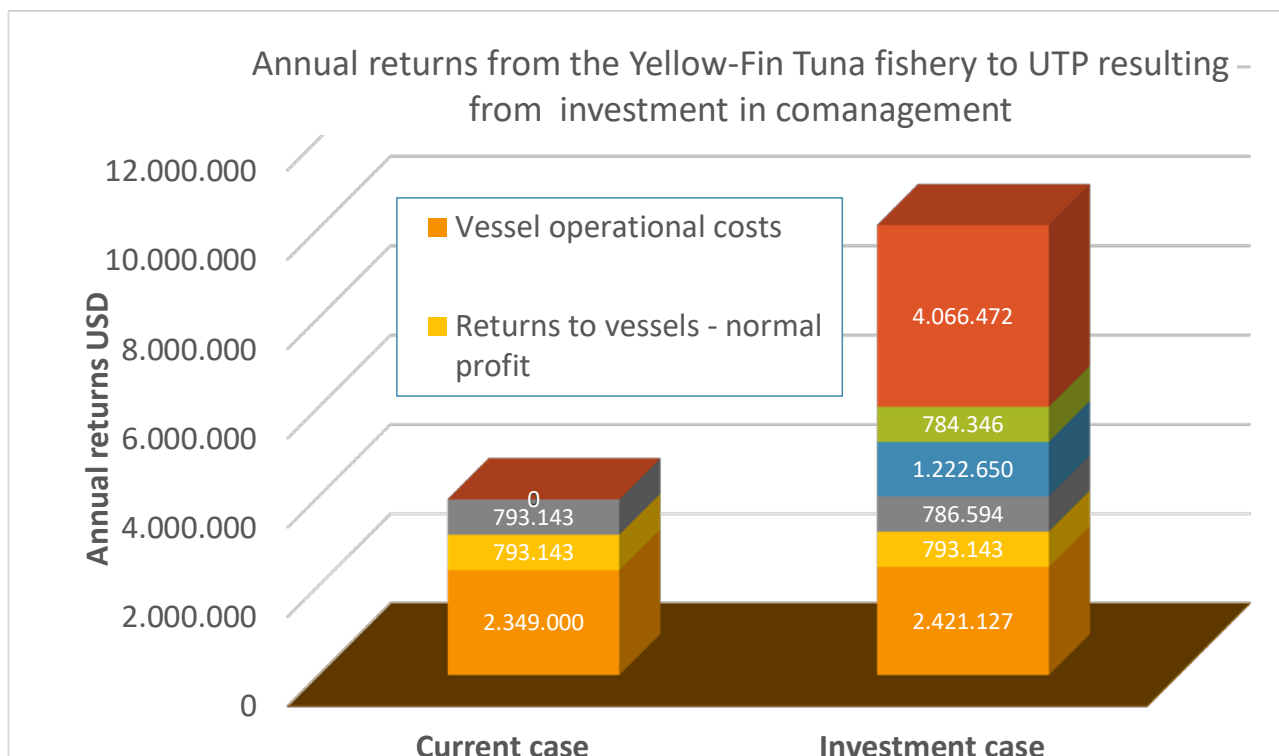
Total investment in co-management would be **US\$ 3,808,200**.

Total revenue to fishing vessels in the YFT fishery in UTP would increase from US\$ 3,935,286 to **US\$8,067,337**, taking into account additional costs for improved handling.

Assuming broadly constant levels of remuneration for fishing crew and “normal” profits for vessel owners compared to the base scenario, a “surplus” of US\$ 4,066,472 for vessels would be generated under the ‘with investment’ scenario. It is anticipated that this surplus would be achieved after 10 yeears representing a capital value for the fishery, assumed to be zero under the based scenario, of **US\$50,830,906** with investment for the co-management for YFT in UTP.

This would give a Return on Investment (RoI) for the investment in co-management of **1,219%** over the 20-year period with a Internal Rate of Return (IRR) of **23%** and a payback period of 6 years.

The Net Present Value (NPV) of the investment in co-management after 20 years would be **US\$ 15,756,317**.



Puducherry Comangement Investment	No Investment			With investment		
	Total	Per vessel	Per tonne	Total	Per vessel	Per tonne
Catch by UTP line fleet (kgs)	2.700.000	18.000	1	2.700.000	18.000	1
Number of YFT line boats (no.)	150	1		150	1	
Total revenue to UTP fishery (USD)	3.935.286	26.235	1.458	10.074.333	67.162	3.731
Processor costs (USD)	0	0	0	1.222.650	8.151	453
Processor profit (USD)	0	0	0	784.346	5.229	290
Revenue to UTP vessels (USD)	3.935.286	26.235	1.458	8.067.337	53.782	2.988
Vessel operational costs including capital costs (USD)	2.349.000	15.660	870	2.421.127	16.141	897
Returns to labour (USD)	793.143	5.288	294	786.594	5.244	291
Returns to vessels - normal profit (USD)	793.143	5.288	294	793.143	5.288	294
Surplus / economic rent (USD)	0	0	0	4.066.472	27.110	1.506
Economic rent or capital value (USD)				50.830.906		18.826
Economic rent generated as % of landed value	0	0	0	50%	50%	50%
Investment cost in comangement (USD)	0			3.808.200		
Internal Rate of Return (IRR) for comangement investment	0			23%		
Return on Investment (RoI) for comangement investment	0			1216%		
Payback period (YRS)	0			6		
NPV of investment (USD)	0			15.756.317		
Discount rate				8,0%		

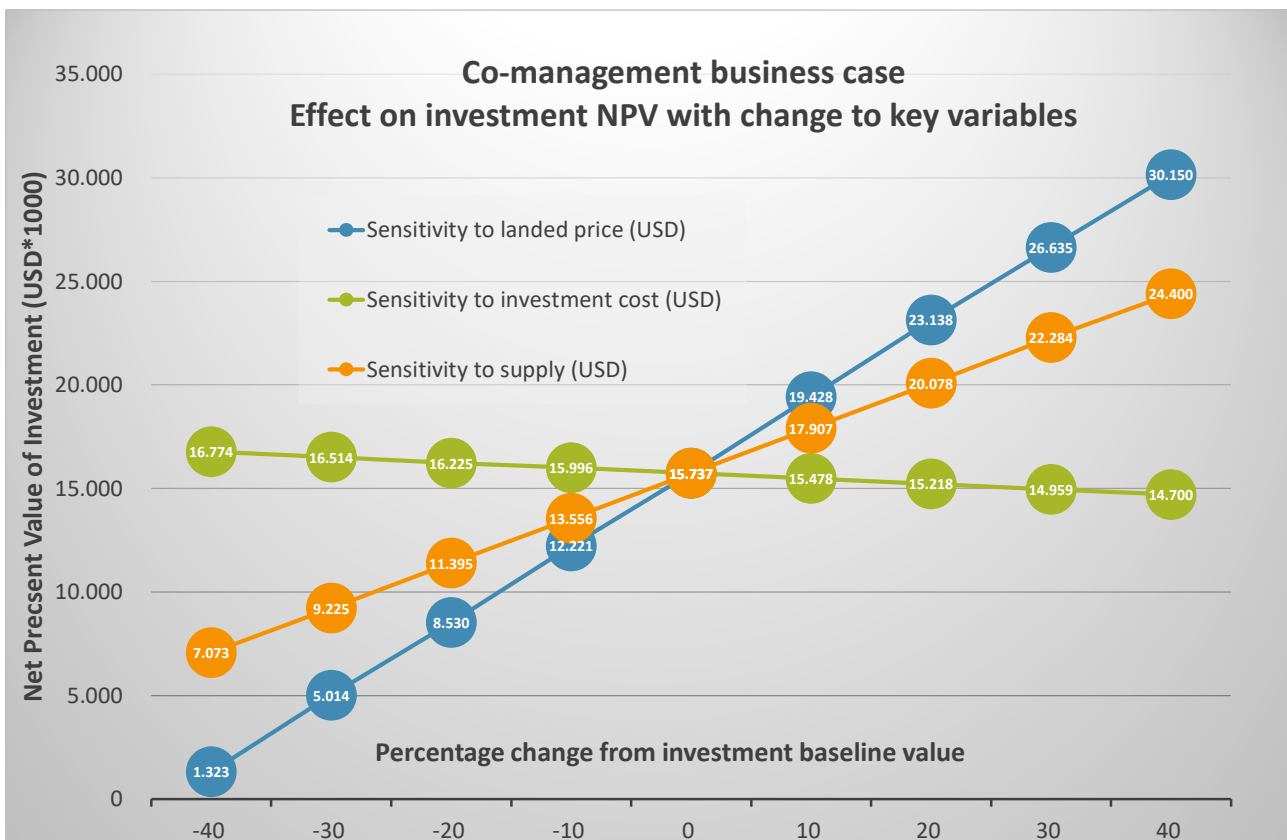
	Variance	Baseline
Catch of fleet (kg)	2.700.000	2.700.000
Price received by boat	205	
Investment cost	0	-3.808.200

APPENDIX 8:
RISK ANALYSIS

The sensitivity analysis shown below analyzes the effects of changes in landed price of YFT, investment costs and supply of YFT on the performance of the proposed investment in co-management arrangements in the UTP.

The analysis shows that sensitivity to investment costs is limited, while sensitivity to changes in landed price and supply are more significant but that the investment NPV remains positive with changes of $\pm 40\%$ in both of these two parameters. Although not shown, it is apparent that the highest risk to investment would be a combination of supply and price reductions driven by failure to establish secure access rights, fish stock sustainability and high value markets.

Puducherry Co-Management Sensitivity Analysis				Baseline	205	INR	2.99	USD	
Sensitivity to landed price (USD)	113%				2700000				2276
Sensitivity to landed price (USD)	1.323	5.014	8.530	12.221	15.737	19.428	23.138	26.635	30.150
Sensitivity to investment cost (USD)	16774	16514	16225	15996	15.737	15478	15218	14959	14700
Sensitivity to supply (USD)	7073	9225	11395	13556	15.737	17907	20078	22284	24400
Summary									
% increase / decrease	-40	-30	-20	-10	0	10	20	30	40
Sensitivity to landed price (USD)	1.323	5.014	8.530	12.221	15.737	19.428	23.138	26.635	30.150
Sensitivity to investment cost (USD)	16.774	16.514	16.225	15.996	15.737	15.478	15.218	14.959	14.700
Sensitivity to supply (USD)	7.073	9.225	11.395	13.556	15.737	17.907	20.078	22.284	24.400



APPENDIX 9:

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Business Case 2: A Business Case for Co-Management Arrangements for the Yellowfin Tuna Fishery in the Union Territory of Puducherry

Annex 9: Environmental and Social Safeguards

1.0 Overarching environmental risks

Addressing the need for proper management of yellowfin tuna resources in the Bay of Bengal is the principle objective of the 4 Business Cases developed under the ‘Ocean Partnerships for Sustainable Fisheries and Biodiversity Conservation – Models for Innovation and Reform Project (OPP-BOB)’ by the Implementing Agency, the Bay of Bengal Programme Inter-Governmental Organisation (BOBP-IGO). Any investment in the yellowfin tuna (YFT) fishing sub-sector, including the investment in improved value chains for high-quality, high-value YFT in South India proposed in Business Case No.1, creates the potential for encouraging increased fishing effort that could, without effective management, lead to the degradation of the resources on which these investments depend.

The OPP-BOB has addressed this issue by supporting the Business Case 1 with 3 other Business Cases, the principle purpose of which is to ensure that investment in improved YFT value chains are nested within improved measures and institutional arrangements for the proper management of YFT resources. These include:

- Investment in the development of co-management arrangements for YFT fisheries in the Union Territory of Puducherry, with a view to creating a model for fisheries co-management that could be adapted and developed upon in other areas of the east coast of India. A key feature of this investment includes the engagement of all stakeholders in YFT value chains in the management process, including private sector producers and operators in processing and marketing, community-based mechanisms for decision-making and distribution of benefits generated from improved management of the resource, inclusion of existing community actors such as the caste, Panchayat and community-based decision-making structures in the process, engagement with existing government institutions, and the development of a third-party intermediary organization(s) to facilitate the long-term process of hand-holding and developing appropriate management arrangements;
- Investment in a Monitoring, Control and Surveillance (MCS) mechanisms that will provide essential support to the implementation of more effective management arrangements at the local, state and, eventually, national levels; and
- Investment in a Centre of Excellence in International Fisheries Development to provide long-term support to the process of developing effective fisheries management for YFT resources in the Bay of Bengal as well as advice and direction to institutions in the region regarding future investment and development of YFT fisheries.

The four OPP-BOB business cases are presented separately as they each deal with distinct levels of intervention, involving different scales of investment that are likely to be of interest for different types of investors. However, the OPP-BOB has emphasized that these four investments are highly **interdependent** and should **not** be considered in isolation from one another and the dangers involved in considering any of these investments in isolation are highlighted.

Investment in improved YFT value chains (Business Case No.1) must be nested within wider investments in the development of the management arrangements (Business Cases 2, 3 and 4) that would ensure a sustainable environmental and institutional framework that would underpin the sustainability, and positive economic returns, from Business Case No.1.

The focus of investment in Business Case No.1 on low-volume, high-quality landings of YFT tuna, with close attention to the monitoring of quality and sustainability in fishing methods would

also serve, within a framework of better management arrangements, to limit the potential for overexploitation of the resource.

2.0 Overarching social risks

The introduction of new fisheries management arrangements, particularly in a context of *de facto* open-access fisheries with limited effective regulation of fishing activity, may generate short-term risks for the livelihoods of those currently involved in fisheries. This is certainly the case with regard to fisheries for YFT on the Bay of Bengal coast of India. Currently, access to these fisheries is effectively open with no limitations imposed on fishing effort by the mostly small-scale fishing fleet beyond the access of fishers to the technology and skills required to exploit this fishery. Currently, specific targeting of YFT by small-scale fishers is limited to a few operations such as those that are identified as having potential for development in Business Case No.1. As a result, YFT catches are largely limited to YFT harvested by drift gillnets by small-scale operations operating in coastal waters and along the edge of the continental shelf that land mixed tuna catches (mostly skipjack tuna) of low quality and generating low returns.

The proposed investments in improved value chains for high-quality YFT in Business Case No.1 would be underpinned by management arrangements proposed in the Business Cases 2 and 3 that would place limits on the fishing operations, specifically targeting YFT while capturing a proportion of the added value generated by these fisheries through improved handling and marketing. An important feature of the co-management arrangements proposed in Business Case No.2 would be to establish mechanisms by which a part of this added value would be channeled to the wider fishing community to compensate for the limitations imposed on the numbers of fishing operations targeting this particular resource. The MCS arrangements proposed in Business Case No.3 would ensure that these limitations, that would be essential for ensuring the sustainability of the investments, are enforced.

As with any set of new fisheries management arrangements, the OPP-BOB proposals recognize the social issues involved and lay out a long-term, inclusive process of consultation, negotiation and community-based monitoring and control that would serve to identify and deal with potential social risks associated with these arrangements. The proposal of an independent, third-party institution in Business Case No.2 to take the lead in mediating and negotiating arrangements that satisfy all the stakeholders involved is important in this respect. All the proposals foresee key roles for key mandated government institutions in supporting the process and overseeing its implementation and ensuring that they are aligned with government's social development and distributive priorities.

The long-term time-frames envisaged for all the proposed Business Cases recognize that the processes involved in establishing fisheries management arrangements are complex and require a long-term perspective. Recognition of this is essential in order to develop inclusive arrangements that accommodate the concerns and priorities of different stakeholders while ensuring the sustainability of the resource base on which fisheries livelihoods depend.

In addition to these overarching social and environmental concerns, specific risks associated with each of the OPP-BOB Business Cases are addressed below.

3.0 Specific environmental risks and their management

Management of the environmental risks associated with the development and investment in improved yellowfin tuna (YFT) value chains is the principle rationale behind Business Case No.2. The establishment of co-management arrangements in the Union Territory of Puducherry would aim to provide a robust management framework within which target fisheries for YFT can develop without overexploiting the resource and so ensuring that investments in this fishery generate sustainable benefits.

The management of risks of overfishing would be dependent on the development of these co-management arrangements, involving key actors in the value chain for YFT, supported by the mechanisms for Monitoring, Control and Surveillance (MCS) proposed under Business Case No.3.

4.0 Specific social risks and their management

The successful establishment of co-management arrangements for YFT fisheries in the Union Territory of Puducherry depends on the capacity of the actors concerned – fishers, fish processors and marketers, fishing community representatives, sectoral associations, and the key mandated institutions involved such as the Department of Fisheries and Fishermen’s Welfare – to arrive at negotiated, consensual arrangements that establish clear rules for making use of the resource, capturing and distributing the benefits that implementation of these rules will generate, paying for the costs of management and enforcement, and sharing decision-making roles and responsibilities.

The process of arriving at these negotiated arrangements is inevitably long-term and requires a significant amount of facilitation and support. Adopting co-management arrangements is likely to involve significant attitudinal and behavioural changes among the actors involved and these changes cannot be simply imposed. There are, therefore, significant social challenges facing any process of establishing co-management arrangements.

Several key steps will be key to addressing these challenges:

- Establishing mechanisms that can support and facilitate the long-term process involved, helping to deal with the numerous issues and obstacles that are likely to emerge during the process while still maintaining a vision of the long-term objectives of the process, is critical. The introduction of a third-party, independent organization to support this process is, therefore, a key element within the Business Case. The mandate of such an organization, and establishing its legitimacy would clearly be key in order for it to undertake this delicate task.
- Ensuring that consultative processes are inclusive of all key stakeholders. Particular attention needs to be paid to the inclusion of women involved in fisheries value chains, involvement of the many ancillary trades and occupations that support fishing operations and fish processing and handling, and involvement of both formal and informal organisations and institutions at the community and local levels.
- Engagement with existing and traditional mechanisms for decision-making about fisheries. In the fishing communities of Puducherry this includes caste-based mechanisms for resolving conflicts between fishing groups and communities that extend laterally along the entire Coromandel Coast of both Puducherry and the surrounding State of Tamil Nadu. The strength and precise role of these mechanisms can vary from community to community and is in constant evolution, particularly in the light of the dramatic changes that have taken place in fishing communities in the area since the 2004 Indian Ocean *tsunami* and rapid economic growth in South India in general, but they are likely to continue to play a role in the immediate future. Balancing the roles and responsibilities between such traditional institutions and new arrangements such as community co-management committees is particularly important.
- Capacity-building among all the stakeholder groups involved will constitute an important part of the Business Case. In a setting such as Puducherry where notions of “managing” fisheries resources are relatively new, exposure visits for key stakeholders to communities and countries where fisheries management has been implemented successfully, and particularly where co-management arrangements are already developed, is likely to play an important role. Facilitation of lesson-learning from such visits to the wider community will also be important. Where appropriate there might be opportunities for using new forms of digital communications and social media to link local fishing communities to peers worldwide facing similar challenges or with valuable experience to be shared.

- Establishing mechanisms involving key stakeholders to periodically monitor and review the process of co-management development and implementation will also be critical to ensure that potential social risks are identified and addressed as soon as they arise.
