Republic of Maldives
Ministry of Fisheries and Agriculture

REPUBLIC OF MALDIVES
PROJECT FOR THE FORMULATION OF MASTER PLAN FOR SUSTAINABLE FISHERIES (MASPLAN)

Final Report

January 2018

Japan International Cooperation Agency
INTEM Consulting, Inc.
Fisheries & Aquaculture International Co., Ltd.

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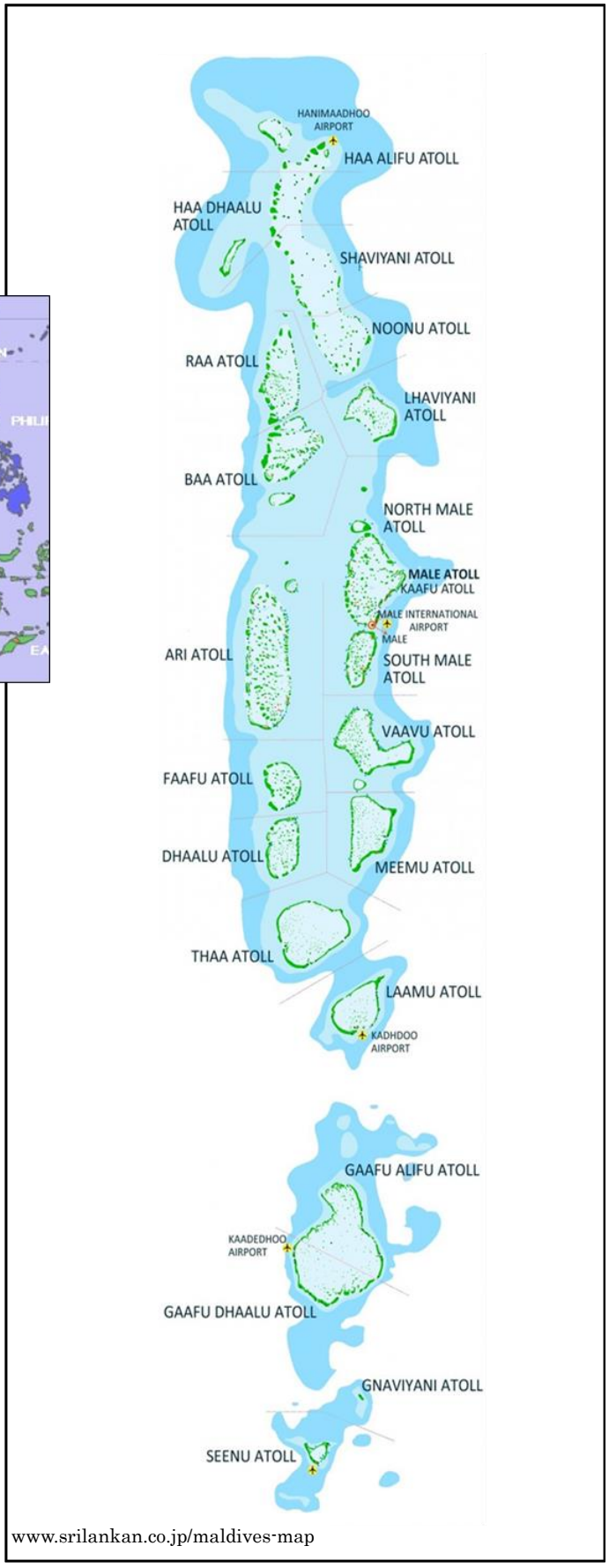


LIST OF ACRONYMS

Aw	Water activity
DBS	Diamondback Squid
EEZ	Exclusive Economic Zone
FAD	Fish Aggregation Device
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Production
GOM	The Government of Maldives
IFAD	International Fund for Agricultural Development
IOTC	Indian Ocean Tuna Commission
IUU	Illegal, Unreported and Unregulated (fisheries)
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
KOG	Kandu Oiy Giri island
MASPLAN	Project for the Formulation of Master Plan for Sustainable Fisheries
MEDeP	Mariculture Enterprise Development Project
MEE	Ministry of Environment and Energy
MFDA	Maldives Food and Drug Authority
MIFCO	Maldives Industrial Fisheries Company
MNDF	Maldives National Defence Force
MNU	The Maldives National University
MoFA	Ministry of Fisheries and Agriculture
MOT	Ministry of Tourism
MRC	Marine Research Centre
MSC	Marine Stewardship Council
MTDF	Mariculture Training and Demonstration Facility
ODA	Official Development Assistance
PCM	Project Cycle Management
PDM	Project Design Matrix
PP	Pilot Project
R/D	Record of Discussions
SAP	Strategic Action Plan
SEA	Strategic Environmental Assessment
SEAFDEC	South East Asian Fisheries Development Center
SFDPIS	Sustainable Fisheries Development Plan of the Important Sub-sectors in the Maldives 2016-2025, - Goals, Objectives and Projects
SKJ	Skipjack Tuna
SPDC	Sector Plan Drafting Committee
SSWG	Sub-Sector Working Group
SWOT	Strengths, Weaknesses, Opportunities and Threats (Analysis)
TC	Total count of Bacteria
UNDP	United Nations Development Programme
VMS	Vessel Monitoring System
YFT	Yellowfin Tuna

SUMMARY

1. Outline of the Project

The Project has been implemented for 3 years from November 2014, based on the Record of Discussion (R/D) exchanged between Ministry of Fisheries and Agriculture (MoFA), Maldives and JICA in July 2014. The outline of the Project agreed upon R/D is shown below.

A. Title of the Project: "Project for the Formulation of Master Plan for Sustainable Fisheries (MASPLAN)"

B. Expected goals which will be attained after the Project completion

(1) Goal of the proposed plan

- The Master Plan formulated by the Project is officially adopted by the Government of Maldives as the Fisheries Sector Development Plan for achievement of national development goals.
- Relevant fisheries policy/management measures and/or related projects are implemented based on the Master Plan.

(2) Goal which will be attained by utilizing the proposed plan

Through implementation of fisheries policy/management measures and/or related projects, which are evolved from the Master Plan, sustainable and efficient use of fisheries resources is further promoted.

C. Outputs:

- Master Plan for Fisheries Development which reflects the results of pilot projects is formulated.
- Capacity of counterpart personnel (staff members of MoFA and other organizations) to plan and implement fisheries policy/management measures is enhanced during the course of the Project.

For the project implementation, JICA contracted out its technical cooperation and project management to the consortium "INTEM Consulting Inc. and Fisheries and Aquaculture International".

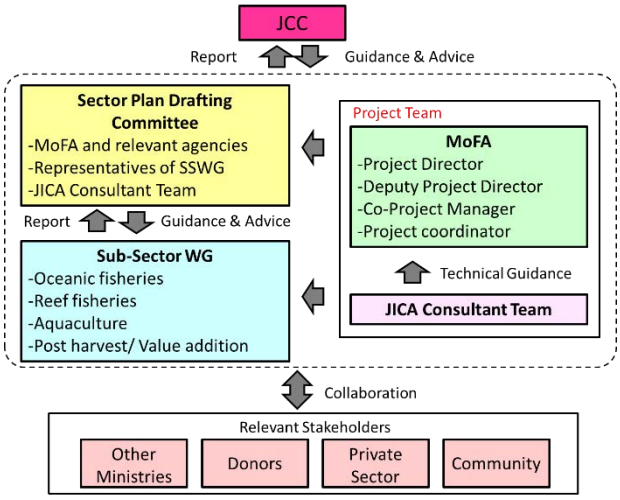


Figure 1. Joint implementation structures of the Project

2. Framework of the Project and Work Flow

As an implementation structure of the Project, MASPLAN established the "Joint Coordination Committee (JCC)" which is the top decision-making body of the Project, "Sector-Plan Drafting

Committee (SPDC)" whose role is to prepare a draft of Master Plan and four "Sub-sector Working Groups (SSWGs)" which lead the discussion towards the identification of the technical issues and implement the pilot projects (Figure 1).

The Project was implemented during two JICA's fiscal periods, i.e. the first fiscal period from November 2014 to December 2015 and the second fiscal period from January 2016 to January 2018 (Figure 2).

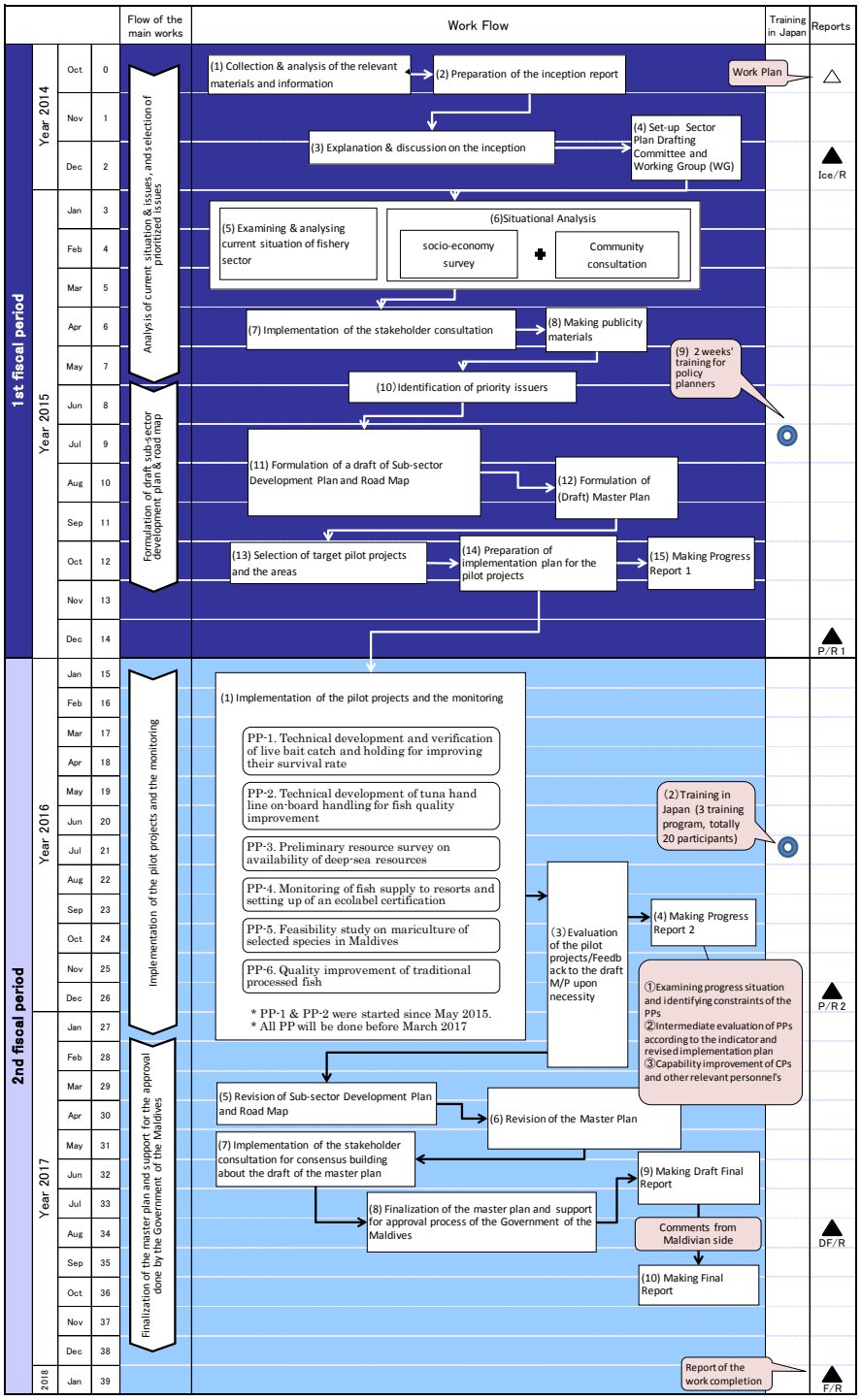


Figure 2. Work flow of the implementation plan

3. Current situation and issues of the Fisheries Sector in Maldives

(1) Outline of the Fisheries Sector

Maldives is an oceanic island country with rich fisheries resources. Tuna species, which are the major targets, become important commodities for export as well as for domestic consumption. Although the contribution of the fisheries sector in the GDP tends to decrease (3.8% in 2014) due to the recent drastic development of the tourism sector, it is still the second most important economic sector.

Fish catch trend of Maldives is shown in Figure 3. It is characterized by dominant catches of two tuna species, i.e. skipjack tuna and yellowfin tuna, corresponding to more than 90% of the national total fish catch.

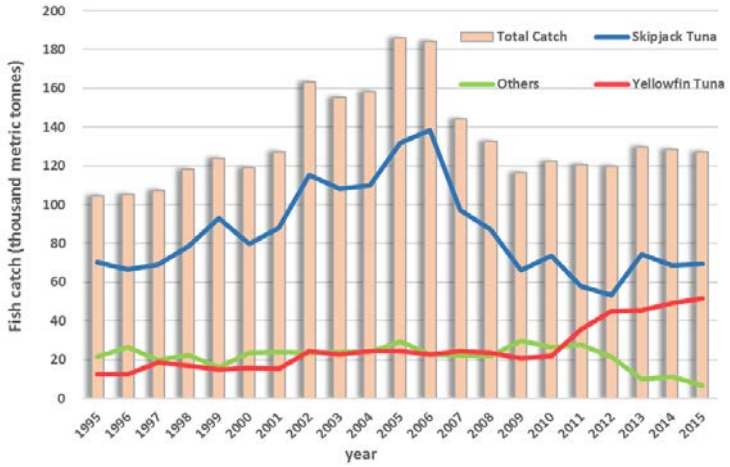


Figure 3. Trend of fish catch in Maldives

A large proportion of skipjack tuna and almost all yellowfin tuna is exported. In terms of export value, yellowfin tuna amounts to 53.3% of the total fisheries export value in 2014, exceeding the 37.7% for skipjack tuna. Yellowfin tuna is exported as chilled or frozen forms, mainly to Europe, on the other hand, large quantities of frozen skipjack tuna is exported mainly to Thailand where it is processed into cans. Besides, the traditional dried/smoked skipjack (*Hikimas* and *Valhoamas* in Dhivehi) are produced actively in Maldives and mostly exported to Sri Lanka.

(2) Outlook and Issues of each Sub-sectors

Major observations in each Sub-sector at the beginning of the Project are summarized hereafter.

1) Oceanic Fisheries SSWG

The pole-and-line fishery is the most important one, which depends on the catch of live bait fish such as sprats (*Spratelloides spp.*). In recent years, the need for adequate management of bait resources has emerged to address the declining tendency of these resources. The catch ratio of high quality fish

(Sashimi quality) is still low. Improving fish quality is still an important issue in order to increase the income of fishers without increasing the yellowfin tuna catch. Resource management of yellowfin tuna is currently strengthened internationally.

The discovery of deep-sea fisheries resources expected to have a high potential and the fishery diversification are significant issues. Besides, although MoFA has been struggling to enhance the capacity of fisheries management, further development of activities such as disseminating VMS and strengthening measures against IUU fishing are required.

On the one hand, the technical and infrastructure development are needed to increase fishing efficiency and fish quality. The design of the current fishing vessels needs further improvement in terms of survival rate of bait fish, cooling capacity and fuel efficiency. Construction and regular maintenance of ice plants and fishers' marinas should be ensured.

2) Reef Fisheries SSWG

It appears that the catch trend of reef fishes has been increasing lately, due to the flourishing tourism sector and the increase of the export of grouper to China market. However, regular survey about reef fish catch has not being conducted and the implementation of a data collection and analysis system is an urgent need to ensure proper resource management of reef fish. Establishing the adequate quality control and food hygiene management system is crucial, in particular at resort level.

3) Aquaculture SSWG

The Government of Maldives addresses aquaculture development by targeting grouper (*Epinephelus fuscoguttutus*) and sea cucumber (*Holothuria scabra*), but a feasibility study is required to divulgate these activities. Besides, the technical development targeting other potential species is expected. In the future, the dissemination of developed aquaculture technology for the private sector, as well as for local residents is expected. Seed production system needs to be established and the capacity of MRC staff needs to be improved.

4) Post-Harvest/ Value Addition SSWG

Traditional processed skipjack tuna is very important for local consumption and for export to Sri Lanka. However, there are many cases where fish is produced on a large scale under unsanitary conditions. To resolve this food safety and quality control issue, the formulation of standard and the diffusion of quality inspection technology are essential.

Although yellowfin tuna has become the most important export commodity, its selling price is low because of its low quality. Technical development for quality improvement of harvested fish is necessary. Furthermore, establishment of the quality control measures of reef fishes and the ice supply system in whole Maldives are also urgent issues.

4. Pilot Projects

To address some of the identified issues, 6 pilot projects were implemented by developing and verifying methods for the solution of the priority issues and for reflecting the results of pilot projects in the Master Plan. Their outline is summarized hereafter.

(1) PP-1. Technical development and verification of live bait catch and holding for improving their survival rate

An improved live bait tank designed based on the tank used in Japanese fishing vessels as well as Japanese style water scoop net were introduced. Researches have been conducted to monitor the effectiveness of those devices. It was not possible to draw out quantitative results clearly through this experimental method, but the captains of the experimental vessels evaluated those were effective qualitatively. It is necessary to continue the monitoring research to assess the effects quantitatively, as well as to promote to introduce those devices and extend them.

(2) PP-2. Technical development of tuna hand line on-board handling for fish quality improvement

The Japanese "Irabu method" for Yake prevention was introduced as a quality improvement measure, together with tuna electric shockers and improved cooler boxes; monitoring researches were carried out to assess their effects in PP-2. The "Irabu method" showed effectiveness on the quality (grade) improvement of tuna caught, but the tuna electric shocker didn't perform clearly on the other. As the cooler boxes showed high performance as cold storage capacity, more positive effects would be expected by using both the cooler boxes and the "Irabu method". Therefore, diffusion of "Irabu method" with the cooler boxes could be undertaken. The monitoring research should be continued in order to get more reliable information, as the number of the research was less than planned.

(3) PP-3. Preliminary resource survey on availability of deep-sea resources

In this pilot project, the existence of unused resources which have high commercial value in worldwide, e.g. Diamondback squid (DBS), and deep-sea fish could be confirmed. However, the full potential of the resource in terms of seasonal fluctuations, amount of the resources, fishing grounds and consumption demand were not assessed. Together with surveys to evaluate these points, the implementation of technical development and training for fishery management will be needed in the future.

Figure 4. Diamondback squid which 1st caught by the project.

(4) PP-4. Monitoring of fish supply to resorts and setting up of an ecolabel certification

In this pilot project, with the cooperation of resorts and fishery products supplier/fishers in North Malé, a data collection research method was established to assess the reef fish catch supplied to resorts and to develop the introductory guidelines for the preservation of reef fish resources and quality control

methods. Involving more resorts is needed to improve the fishery statistical collection and therefore ensure proper fishery resources management. The preparation of an eco-label was not pushed through in this pilot project, but it is still desirable to develop it to motivate resorts and fishers to take part in resources management.

(5) PP-5. Feasibility study on mariculture of selected species in Maldives

In the pilot project 5, the profitability of mariculture of Brown-marbled grouper and sandfish was confirmed, and the verification test of sandfish mariculture and technical training were implemented. As a result, Sandfish mariculture appeared feasible; the profitability of Brown-marbled grouper was verified for medium or large scale facilities. Extension of mariculture for both species and simultaneously capacity building of MRC are necessary in the future.

(6) PP-6. Quality improvement of traditional processed fish

In the pilot project 6, the sterilization effect of vacuum-packaged *Valhoamas* was confirmed and the techniques of quality inspection method were transferred to the processing factory. In addition, a strong potential demand for heated vacuum-packaged *Valhoamas* was confirmed through its sales test. The extension of quality improvement of traditional processed fish such as vacuum-packaged *Valhoamas* and the formulation of national standards for it is needed in the future.

Based on the aforementioned results of pilot projects, following priority projects were proposed and included in the Master Plan or SFDPIS (refer to 5. Formulation of Master Plan).

Table. 1 Proposed priority projects based on the results of pilot projects

Pilot project	Priority project proposed to Master Plan (SFDPIS)	Responsible Sub-Sector
PP-1. Technical development and verification of live bait catch and holding for improving their survival rate	OF4. Extension of improved live bait stocking system in pole-and – line fishery	Oceanic Fisheries
PP-2. Technical development of tune hand line on-board handling for fish quality improvement	PV1. Extension of improved on-board handling techniques for tuna hand line fishery	Post-harvest and Value Addition/ Oceanic Fisheries
PP-3. Preliminary resource survey on availability of deep-sea resources	OF7. Development of new deep-sea fisheries (Diamondback squid and other fishes)	Oceanic Fisheries
PP-4. Monitoring of fish supply to resorts and setting up of an ecolabel certification	RF1. Improvement of biological, socio-economic and statistical data collection and analysis system	Reef Fisheries
PP-5. Feasibility study on mariculture of selected species in Maldives	AQ5. Training and demonstration capacity building of MTDF/MRC	Aquaculture
	AQ6. Extension of potential mariculture techniques	Aquaculture
PP-6. Quality improvement of traditional processed fish	PV3. Extension of quality improving methods for traditional processed fish of Maldives	Post-harvest and Value Addition
	PV6.Development of the minimum national standards and rules of fish products	Post-harvest and Value Addition

5. Formulation of the Master Plan

(1) Formulation process

1) Problem analysis and situational analysis

In the first fiscal period, the four sub-sector working groups carried out the problem analysis using the Project Cycle Management method and identified the issues of each sub-sector for further development. At the same time, the Situation-Analysis was planned and implemented in 8 islands in 7 different atolls in order to identify problems regarding local fisheries and fish processing activities. Also, in May 2015, the 1st Stakeholder Consultation was held in Malé to explain the outline of the Project's activities and to collect stakeholder's opinions about the Master Plan. The invited stakeholders included local fishers from remote islands.

2) Drafting the Draft Master Plan

The Draft Master Plan was prepared based on the above activities. It was submitted to the SPDC in August 2015 and then consulted in October 2015.

3) Implementation of the pilot projects

In parallel with the preparation of the Draft Master Plan, the pilot projects were implemented to verify or develop technologies which may solve or mitigate priority issues of the fisheries sector.

4) Revising the Draft Master Plan

Based on the SPDC's consultation (see point 2 above) and the results of the pilot projects (see point 3 above), the Draft Master Plan was revised and submitted again to SPDC in February 2017.

5) Compilation of SFDPIS

In the 3rd JCC meeting in March 2017, both MoFA and JICA sides discussed the remaining procedures for finalization of Draft Master Plan including confirmation of the roles of both parties. In the course of the discussion, the title of the Master Plan was determined as "Sustainable Fisheries Development Plan of the Important Sub-sectors in the Maldives 2016-2025, - Goals, Objectives and Projects" (SFDPIS), and it was agreed that SFDPIS would be an official Government document. Thereafter, the 2nd Stakeholder Consultation was held in May 2017, and the 1st SFDPIS draft was prepared based on their comments to the latest version of the Draft Master Plan.

6) Finalization and formalization of SFDPIS

The 1st SFDPIS draft was submitted to the Fisheries Technical Committee of MoFA in May 2017, and then revised into the final draft, reflecting the comments from the committee, in early August. It would be approved by the Minister of MoFA after his review and subsequent revision by SPDC members accordingly.

It was submitted to the Minister of MoFA for his approval. However, it was difficult to complete all the approval process by the end of project period. Therefore, the procedures of approving SFDPIS will be continued by MoFA.

(2) Contents of the Master Plan (SFDPIS)

The SFDPIS is based on the following seven guiding principles:

- It supports the implementation of the SAP
- It encourages stakeholder involvement
- It promotes community development
- It enhances human resource development
- It enhances partnership with other sectors
- It gives due consideration to environment protection
- It promotes gender equality

In a concise way, SFDPIS analyzes problems and issues of 4 fisheries sub-sectors, presents important policies and approaches based on this analysis and proposes priority projects and roadmap under each approach (Figure 6). This is because SFDPIS, a policy paper will be announced widely.

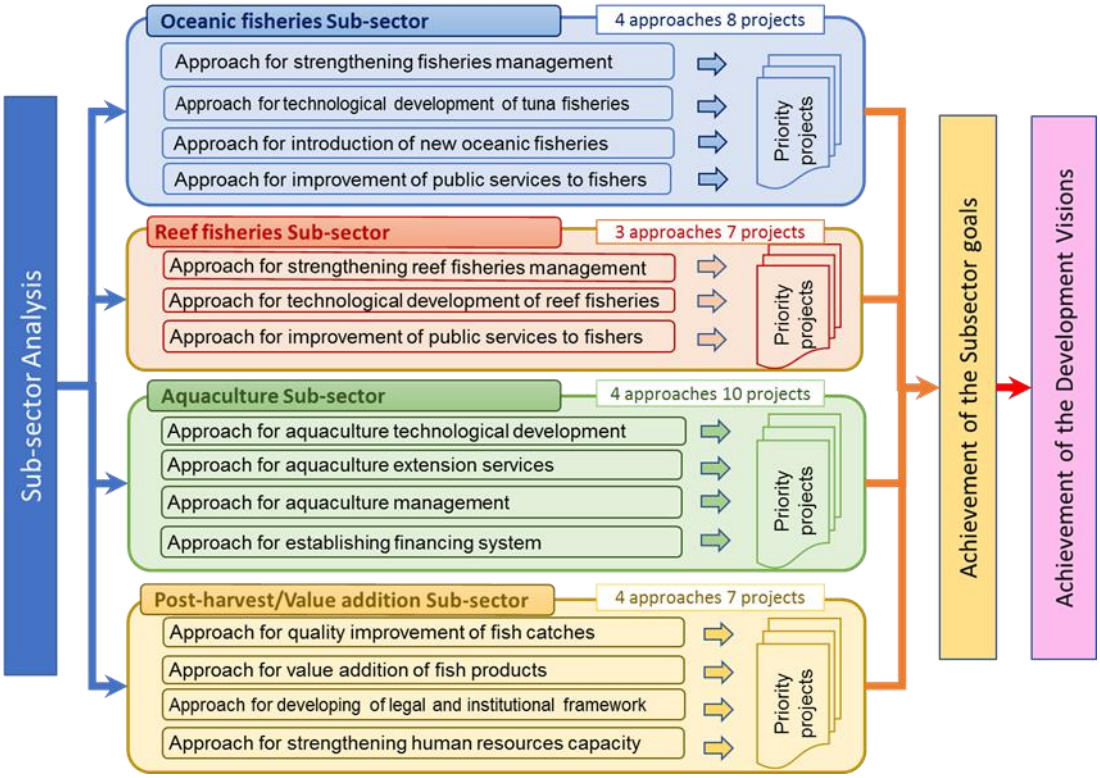


Figure 6. Fundamental policy to achieve a goal of SFDPIS

Goals and outline of the sub-sector plans are summarized as follows:

1) Oceanic Fisheries

Goal: "The opportunities to benefit from the Oceanic fisheries resources are fully taken advantage of".

- Strengthening of fisheries management, with the projects i) Improvement of MCS system, ii) Training on fishery resource management and iii) Review and implementation of bait fish management plan.
- Technological development of tuna fisheries, with the projects i) Extension of improved live bait stocking system in pole-and-line fishery and ii) Development of new masdhoni design.
- Development of new Oceanic fisheries, with the projects i) Development of new deep-sea fisheries (Diamondback squid and other fishes and ii) Promotion of private investment.
- Improvement of public services to fishers, with the project "Establishment of Fisher's Marinas".

2) Reef Fisheries

Goal: "The reef resources are exploited in an ecologically and economically sound manner"

- Strengthening of reef fisheries management, with the projects i) Improvement of biological, socio-economic and statistical data collection and analysis system, ii) Improvement of relevant legislation about reef fisheries, iii) Enhancement of fisheries compliance/ enforcement, iv) Design and implementation of reef fisheries management plans and v) Capacity enhancement on fishery resource management.

- Technological development of reef fisheries, with the projects i) Improvement of boat design and equipment for reef fishery and ii) Awareness on fishing and fish handling techniques in reef fishery.

- Improvement of public service to fishers, with the projects i) Establishment of fisher's marinas and ii) Strengthening capacity of ice making plants.

3) Aquaculture

Goal: "The aquaculture industry is fully developed in Maldives".

- Aquaculture technological development, with the projects i) Establishment of multi-species hatchery, ii) Establishment of milkfish seed production facilities to provide bait, iii) Development of domestic fish feed using by-product of fish processing, iv) Refinement of existing aquaculture techniques and v) Training and demonstration on capacity building of MTDF/MRC.

- Aquaculture technical extension, with the projects i) Extension of potential mariculture techniques and ii) Promotion of aquaculture through formal education system.

- Management of Aquaculture sub-sector, with the projects i) Improvement of aquatic animal health management and ii) Strengthening institutional mechanism on aquaculture activities.

- Establishing financing system, with the project "Development of financing system for aquaculture".

4) Post-harvest and Value addition

Goal: "The quality of fish catch and fish products is optimized"

- Quality improvement of fish catches, with the projects i) Extension of improved on-board handling techniques for tuna hand line fishery and ii) Strengthening capacity of ice making plants.

- Value addition of fishery products, with the projects i) Extension of quality improvement methods for traditional processed fish, ii) Improvement of fish marketing system and iii) Development of Katsuobushi processing technology and facility.

- Development of legal and institutional framework, with the project "Development of the minimum national standards / regulations for fishery products".

- Strengthening of human resources capacity, with the project “Establishment of a training system for fish quality assurance”.

(END)

Introduction

The Project for the Formulation of Master Plan for Sustainable Fisheries (MASPLAN) is being implemented by the Ministry of Fisheries and Agriculture (MoFA) and the Japan International Cooperation Agency (JICA) based on the Record of Discussion (R/D) exchanged on July 24, 2014. For the project implementation, JICA has contracted out its technical cooperation and project management to the consortium "INTEM Consulting and Fisheries and Aquaculture International", and the consortium dispatches consultant team (hereinafter called as JICA consultant team) according to the contract.

This report presents the progress of MASPLAN activities for the period, November 2014 to January 2018.

Chapter 1. OUTLINE OF THE PROJECT

1.1 Requests and background

Maldives is a seafaring country which consists in 1,190 islands covering 90,000 km^2 and whose economy depends mainly on the tourism industry and fisheries. The tourism industry has been growing rapidly since the second half of the 1970's and is presently the main industry, accounting for about 28% of real GDP (source: Maldives Country Program Agency, 2014). But the country is highly vulnerable to external factors (natural disasters, fluctuation of oil prices, currency exchange and economic trends, terrorist attacks etc.). Linked to the rise of the tourism industry, the importance of fisheries tends to decline (3.8% of real GDP), but it is still one of the main industries of Maldives and fishery products represent 97% of the total export value (source: Maldives Customs, 2015). Although the citizens of Maldives rely much on imported foods, their sources of protein mainly come from domestic fishery products (the fish consumption per capita per year is 144 kg (source: FAO)), i.e. one of the highest in the world. The Fisheries Sector is still significant in terms of foreign currency and food self-sufficiency. A lot of workforce engaged in the fishery in the isolated islands except for capital Malé, The Government of Maldives pays special attention to the promotion of fisheries in order to create jobs, in particular in isolated islands.

The fishery of Maldives highly depends on specific fish species, skipjack tuna and yellowfin tuna representing 56% and 35% respectively in the total fish catch in 2013 (source: MoFA). Since the 1980's, the catch of skipjack tuna increased significantly and reached a peak in 2006 (with138,000 tons), then declined rapidly to about 70,000 tons at present. As skipjack tuna is mainly exported as frozen one, the Government of Maldives is implementing a policy in order to promote value-addition to increase export earnings.

Under such circumstances, the Government of Maldives requested to Japan a study aimed to formulate a Master Plan which specifies the strategies, approaches and activities for sustainable and effective utilization of fishery resources.

After accepting the requests, JICA posted a survey mission for detailed planning on May 2014 and exchanged the Record of Discussion (R/D) with the Ministry of Fisheries and Agriculture on July 2014.

This project (the project for the formulation of Master Plan for Sustainable Fisheries or MASPLAN) was implemented in accordance to the R/D by the consortium "INTEM Consulting Inc. and Fisheries and Agriculture International" which was entrusted by JICA.

1.2 Outline and basic policy of the project

1.2.1 Outline of the project

The outline of the project which agreed in the R/D between JICA and MoFA is shown as following.

A. Title of the Project: "Project for the Formulation of Master Plan for Sustainable Fisheries (MASPLAN)"

B. Expected Goals which will be attained after the Project completion

(1) Goal of the proposed plan

- The Master Plan formulated by the Project is officially adopted by the Government of Maldives as the Fisheries Sector Development Plan for achievement of national development goals.
- Relevant fisheries policy/management measures and/or related projects are implemented based on the Master Plan.

(2) Goal which will be attained by utilizing the proposed plan

Through implementation of fisheries policy/management measures and/or related projects, which are evolved from the Master Plan, sustainable and efficient use of fishery resources is further promoted.

C. Outputs:

- Master Plan for Fisheries Development which reflects the results of pilot projects is formulated.
- Capacity of counterpart personnel (staff members of MoFA and other organizations) to plan and implement fisheries policy/management measures is enhanced during the course of the Project.

1.2.2 Basic policy of the Project

(1) Structure and basic principle of the Project

In accordance with the agreement on R/D, this Project was implemented over a period of three years in total: the first fiscal period is from November 2014 to December 2015 and the second fiscal period is from January 2016 to January 2018.

In the first fiscal period, collection/analysis of existing information was carried out, a baseline survey

was conducted and a fisheries stakeholder consultation was held. A master plan and a road map were also drafted through discussions in the Sub-sector Working Groups and the Drafting Committee for the fisheries sector development plan. In the second fiscal period, the pilot projects were implemented and the Master Plan was finalized with supporting to formalize it as an official document of the Government.

This project was implemented under five basic principles.

A. The utilization of existing results

A number of information was collected from existing surveys or projects in the Maldives fisheries sector, e.g. Outlook Study (2007) by the World Bank, basic information collection and verification by JICA (2012), Grouper Management Plan (2011), Baitfish Management Plan (2013) etc. This Project made a point to use the existing information and avoid overlapping with other activities.

B. The strengthening of fishery resources management

Maldives fisheries sector has not been necessary to manage their fishery resources in the long history since it was highly dependent on the highly migratory fish (Tunas). But, large scale fishing is presently carried out by large vessels, which calls for proper resources management. In addition, the yield from coastal resources (reef fish) tends to increase to address tourism development. The introduction of an appropriate resources management system is therefore a must for sustainable development of the Maldives fisheries sector. The all project activities were considered regarding to the fishery resources management.

C. Participatory promotion of the person involved in fisheries sector

For the effective realization of fishery resources management, it is important to fully involve all stakeholders of the fisheries sector in the whole process, from the planning to the implementation stage. Participation of and information sharing with the persons involved in the fisheries sector was sought during the Master Plan formation process through stakeholder consultation and implementation of pilot projects.

D. Promotion of decision-making based on the information

In this Project, in order to promote the decision-making process based on information, a wide range of information was gathered and analyzed, e.g. on present situation and trends on fishery resources and fishing, socio-economics of the fisheries communities etc.

E. Sub-sector Approach

Generally, the sub-sectors which constitute the fisheries sector have their own features and issues; therefore, a specific approach for each sub-sector was followed and discussed in the respective sub-sector working groups, which was defined as “sub-sector approach”.

(2) Positioning of the Master Plan

It was agreed between Maldives and Japan side in the detailed planning survey that the Master Plan proposed in the MASPLAN would be adopted and used as a formal policy document of the Government of Maldives. The Master Plan was named as "Sustainable Fisheries Development Plan of the Important Sub-sectors in the Maldives 2016-2025 – Goals, Objectives and Projects" (SFDPIS) by the result of a series of discussions including in the 3rd JCC in March 2017.

(3) Implementation Structures of the Project

In addition to the "Joint Coordinating Committee (JCC)", which was established in order to facilitate inter-organizational coordination and was the top decision-making body of the Project, MASPLAN established a "Sector-Plan Drafting Committee" and a "Sub-sector Working Group" of each sub-sector. The positioning of the Sector-Plan Drafting Committee and the Sub-sector Working Groups are as follows.

A) Sector-Plan Drafting Committee

The main function of the Sector-Plan Drafting Committee was to compile the draft Master Plan by consolidating inputs such as documents/roadmaps from each Working Group. The Committee also ensured that the contents of the documents were compatible with relevant laws and regulations in Maldives. The SPDC was chaired by the Project Director, and consisted in members of MoFA.

B) Sub-sector Working Groups

In the Sub-sector Working Groups, technical discussions were carried out in each sub-sector, and the related parts of the Master Plan and draft roadmap were formulated. The Working Groups also carried out the drawing up, implementation, monitoring, evaluation/analysis of the pilot projects. The Working Group members were selected not only from the Government of Maldives, but also from the fisheries association and the process/export companies, so as to formulate a plan that would reflect widely the opinions of participants. Four Sub-sector Working Groups were set up as follows.

- Oceanic Fisheries SSWG
- Reef Fisheries SSWG
- Aquaculture SSWG
- Post-harvest/Value addition SSWG

Chapter 2. PREPARATORY WORK

2.1 Discussion and agreement about the Inception Report

On the basis of the principles agreed upon in the R/D, the JICA Consulting Team prepared a draft Inception Report outlining the project activities and discussed it with MoFA. As the result of discussion, the following parts were revised based on the requests of MoFA:

- A part of the "Analysis of the current situation of the fisheries sector" and the methodology and targeted atolls of "Situation analysis".
- The name of the sub-sector and the Sub-sector Working Group (for example, from "Improvement of value-added fisheries products" to "Post-harvest/Value addition")
- The implementation schedule of pilot projects (Ahead of schedule of PP.1 and PP.2)

MoFA agreed with the report, which was presented in the 1st Joint Coordination Committee (JCC) held on December 24, 2014, and approved formally (See the Annex 3).

2.2 Establishment of the joint implementation structures

As shown in the Inception Report and explained in the 1st JCC, MASPLAN is to be carried out by forming a joint implementation structures (Fig 2.2.1). In addition to JCC, which is established in order to facilitate inter-organizational coordination and is the top decision- making body of the Project, MASPLAN establishes a national-level drafting committee named "Sector-Plan Drafting Committee" (SPDC) and four Sub-Sector Working Groups (SSWGs) for different fisheries activities (see hereafter).

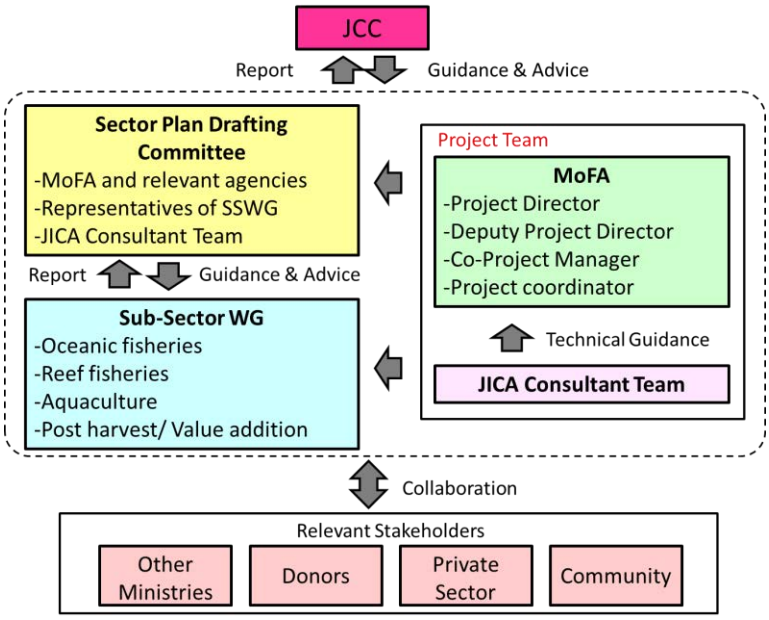


Figure 2.2.1 Joint implementation structures

Remarks: simplified Project Organization Chart shown in R/D

2.2.1 Sector Plan Drafting Committee

The main function of the Sector Plan Drafting Committee (SPDC) as determined in the R/D is to compile the draft Master Plan by consolidating inputs from each Working Group. The committee also ensures that the contents of the document are compatible with relevant laws and regulations in Maldives. The SPDC is chaired by the Project Director.

The members of SPDC are determined as shown in Table 2.2.1. For the SPDC meetings, JICA consultant team attends as members whenever they are on assignment in Maldives. In addition to those members, personnel from the World Bank office participates as observers whenever they are available.

Table 2.2.1 Members of the Sector Plan Drafting Committee at the initial stage

Role in MASPLAN	Name	Position
Project Director	Zaha Waheed	Minister of State, MoFA
Deputy Project Director	Abdulla Naseer	Permanent Secretary, MoFA
(only as a member of SPDC)	Abdulla Fairooz	Para-legal Officer, MoFA
Co-Project Manager (Leader of Oceanic Fisheries SSWG)	Mohamed Shiham Adam	Director General, MRC, MoFA
Co-Project Manager (Leader of Reef Fisheries SSWG)	Hussain Sinan	Director, MoFA
Co-Project Manager (Leader of Post-Harvest/Value Addition SSWG)	Adam Manik	Deputy Director General, MoFA
Co-Project Manager (Leader of Aquaculture SSWG)	Shafiya Naeem	Senior aquatic pathologist, MRC, MoFA

In August 2015, the Deputy Project Director Mr. Abdulla Naseer resigned MoFA and Ms. Mariyam Simla was appointed to the position since 2016. The official position of Ms. Zaha Waheed, Project Director, was changed the Minister of State to the Executive Coordinator of MoFA since September 2015.

2.2.2 Sub-Sector Working Groups

Based on one of the guiding principle of the R/D i.e “sub-sectorial approach”, the following four thematic SSWGs were established at the start of the Project:

A) Oceanic Fisheries SSWG
B) Reef Fisheries SSWG
C) Aquaculture SSWG
D) Post-Harvest/Value Addition SSWG

Thus, technical examination and discussions towards the formulation of a draft Master Plan have been carried out by each SSWG, under guidance by a Maldivian leader and in cooperation with members of JICA consultant team. Members of the SSWGs identified at the time of the Inception report are shown in Table 2.2.2. In order to discuss inter-connected topics, some members participate in various SSWGs. During the course of SSWG discussions, stakeholder other than those mentioned in Table 2.2.2 or alternative persons from the identified entities also joined whenever deemed necessary.

Table 2.2.2 List of SSWG members

	Name	Designation	Organisation	Department
<1> Oceanic Fisheries Working Group				
1	Mohamed Shiham Adam (L)	Director General	MRC	Pelagic Fisheries
2	Adam Ziyad (DL)	Senior Research Officer	MOFA	Fisheries Compliance
3	Hussain Sinan	Director	MOFA	Fisheries Management
4	Riyaz Jauharee	Senior Research Officer	MRC	Pelagic Fisheries
5	Mohamed Ahusan	Senior Research Officer	MRC	Pelagic Fisheries
6	Raufiyya Abdulla	Senior Statistical Officer	MOFA	Fisheries Management
7	Maizan Ahmed Manik	Chairman	Fishermen's Association	
8	Adnan Ali	President	MSPEA	
9	Ibrahim Naeem	Director General	EPA	
10	Ilham Atho Mohamed	Assistant Director	MEE	
11	Mohamed Waseem,	Managing Director	ENSIS Fisheries	
12	Adlee Ismail	Chief Executive Officer	MIFCO	
13	Representative		Transport Authority	
14	Representative		Maldives Police Service	
15	Representative		MNDF Coast Guard	
<2> Reef Fisheries Working Group				
1	Hussain Sinan (L)	Director	MOFA	Fisheries Management
2	Riyaz Jauharee (DL)	Senior Research Officer	MRC	Pelagic Fisheries
3	Khadeeja Ali	Senior Research Officer	MRC	ETP
4	Fahmeeda Islam	Senior Research Officer	MRC	Reef Fisheries
5	Ahmed Shifaz	Senior Research Officer	MOFA	Fisheries Compliance
6	Nihad Ali	Assis. Fisheries Extension Officer	MOFA	Fisheries Management
7	Raufiyya Abdulla	Senior Statistical Officer	MOFA	Fisheries Management
8	Maizan Ahmed Manik	Chairman	Fishermen's Association	
9	Adnan Ali	President	MSPEA	
10	Ibrahim Naeem	Director General	EPA	
11	Mariyam Gasim	Deputy Director General	Ministry of Tourism	
12	Ilham Mohamed	Assistant Director	MED	
13	Adam Hussain	Managing Director	Reef Fish Exporter	
14	Mohamed Ibrahim	Superintendent	Maldives Customs Service	
15	Representative		Maldives Police Service	
<3> Aquaculture Working Group				
1	Shafiya Naeem (L)	Aquatic Pathologist	MRC	Mariculture
2	Hussain Sinan (DL)	Director	MOFA	Fisheries Management
3	Hassan Shakeel	Senior Biologist	MRC	Mariculture
4	Aminath Lubna	Senior Aquaculture Officer	MRC	Mariculture
5	Hussain Ahmed	Aquaculturist	MRC	Mariculture
6	Adam Ziyad	Senior Research Officer	MOFA	Fisheries Compliance
7	Ibrahim Naeem	Director General	EPA	
8	Ilham Mohamed	Assistant Director	MEE	
9	Ahmed Ibrahim		Barakathul Bahr	
10	Adlee Ismail	Chief Executive Officer	Mifco	
11	Mohamed Adam	Superintendent	Maldives Customs Service	
12	Representative		Maldives Police Service	
<4> Post-harvest/Value addition Working Group				
1	Adam Manik (L)	Deputy Director General	MOFA	Fisheries Training, Extension And Promotion
2	Ahmed Rashid (DL)	Senior Research Officer	MOFA	Fisheries Training, Extension And Promotion
3	Mohamed Shiham Adam	Director General	MRC	Pelagic Fisheries
4	Hussain Sinan	Director	MOFA	Fisheries Management
5	Aminath Nazima	Director	MOFA	Fisheries Logistics And Administration
6	Moahmed Ahusan	Senior Research Officer	MRC	
7	Ahusan Mohamed	Programme Officer	MOFA	Fisheries Infrastructure Development
8	Satheesh Moosa	Micro Biologist	Maldives Food and Drug Authority	
9	Mohamed Waseem,	Managing Director	ENSIS Fisheries	
10	Adlee Ismail	Chief Executive Officer	MIFCO	
11	Maizan Ahmed Manik	Chairman	Fishermen's Association	
12	Representative		Ministry of Economic Development	
13	Representative		Maldives Police Service	
14	Adnan Ali	President	MSPEA	
15	Mohamed Adam	Superintendent	Maldives Customs Service	
16	Representative		LGA	
17	Representative		Sea Treasure Maldives (exporter)	

Remarks: MSPEA: Maldives Seafood Processors and Exporters Association, EPA: Environment Protection Agency, MEE: Ministry of Environment and Energy

2.3 Work flow and schedule

The outline of the work flow and its time schedules of the project are shown in the next figure.

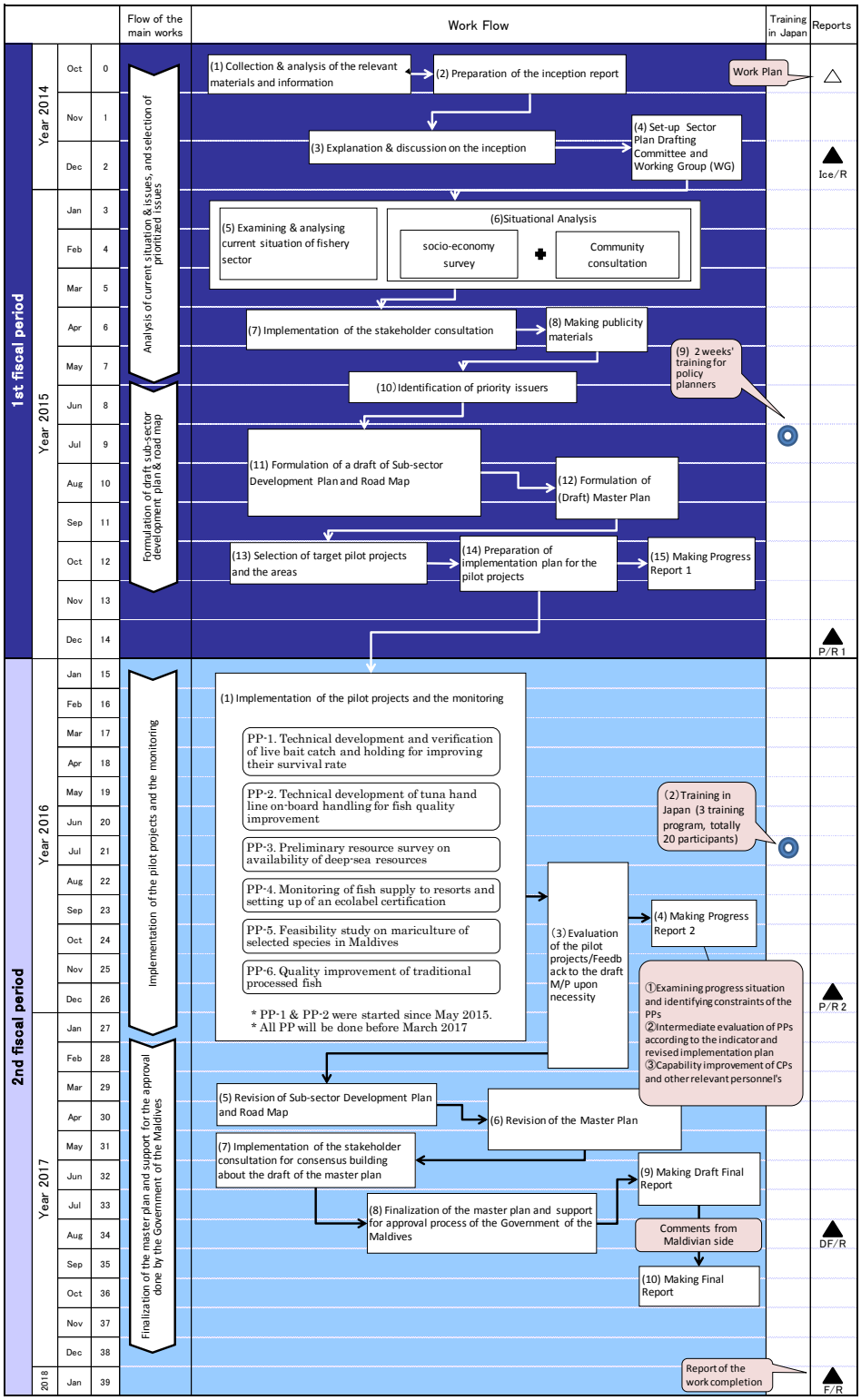
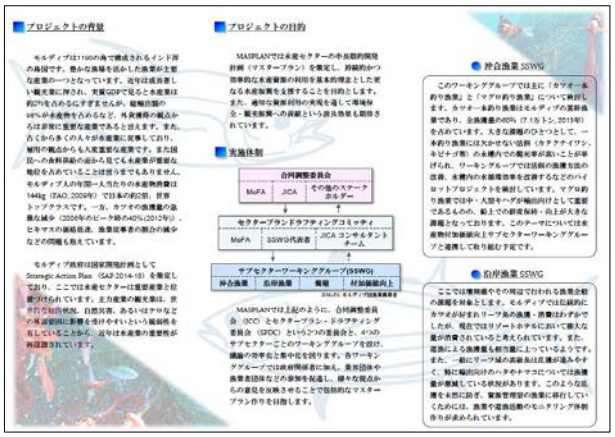
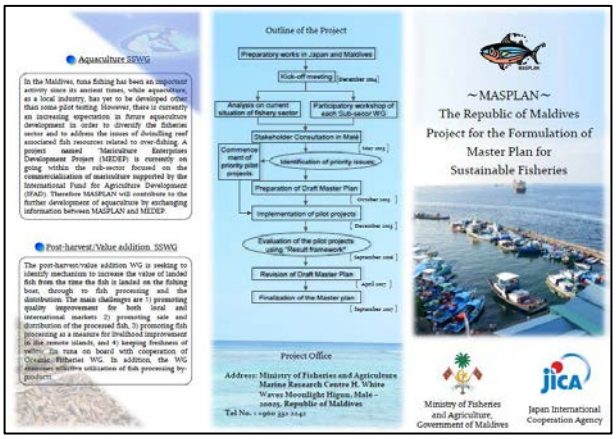


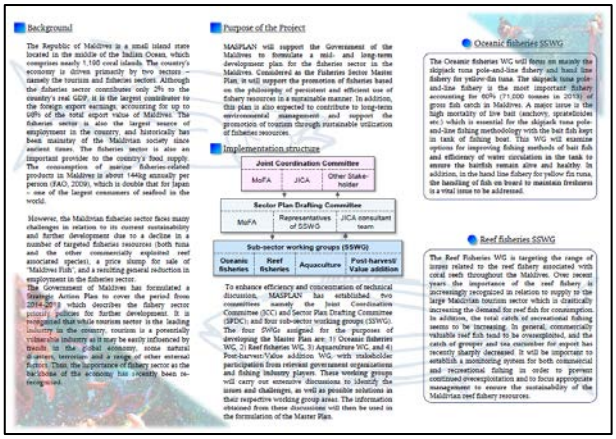
Figure 2.3.1 Work flow of MASPLAN

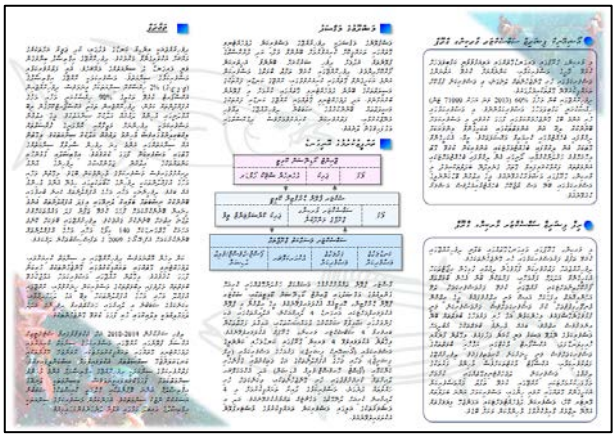
2.4 Preparation of information materials

During inception stages of the Project brochures providing information about the project were prepared in English, Japanese and Dhivehi and distributed among stakeholders and relevant organizations. Samples of the prepared materials are shown below.









Chapter 3. FISHERIES IN MALDIVES

3.1 Fish catch trend

The sea around Maldives is rich in marine resources and Maldivians have made use of these resources for several centuries. The exploitation of these marine resources and the development of fisheries sector have contributed significantly to the Maldivian population.

Fish catch trend of Maldives is shown in Fig 3.1.1. Over the years, national fish catch increased steadily and peaked in 2005-2006 at around 180,000 tons but then decreased to 120,000 tons in 2012 largely due to the decreased catch trend of skipjack tuna (SKJ). According to the latest statistics, it was 129,843 tons in 2013.

The Maldives fish catch is characterized by dominant proportion of tuna and tuna-like species, which correspond to approximately 95% of the total fish catch (Fig 3.1.2). The major tuna species caught are skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*), kawakawa (*Euthynnus affinis*) and frigate tuna (*Auxis thazard*).

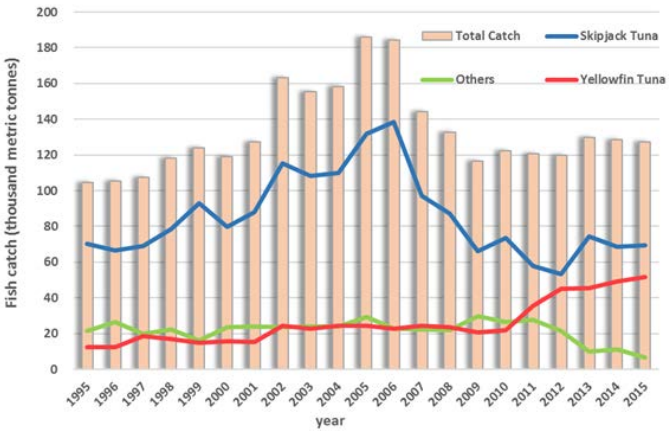


Figure 3.1.1 Trend of fish catch in Maldives

Source: Fisheries statistics, Maldives

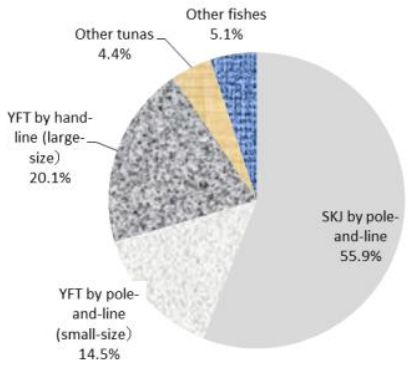


Figure 3.1.2 Composition of fish catch in 2013

Source: Fisheries statistics, Maldives

Reef fishery or coastal fishery is carried out throughout Maldives for marketing to resorts and export as well as self-consumption. Major target species include several species of snappers, jacks, breams and groupers. Lobster and sea cucumber are also important species exploited in the country, although their catches tend to significantly decline recently. The marine aquarium fishery which began in the late 1980s constitutes about 0.5% of the total export earnings from marine products.

Aquaculture is at its infancy stage in Maldives and there are few aquaculture activities carried out at commercial level except for one sea cucumber culture farm, which produces sandfish (*Holothuria scabra*) at the Nalandhoo Island in Shaviani Atoll.

3.2 Fish processing and export

A large proportion of skipjack and yellowfin tuna that are harvested are either processed or frozen in Maldives and exported (Table 3.2.1). Yellowfin tuna represented 53.3% of the export value in 2014, exceeding the 37.7% for skipjack tuna. Large-size yellowfin tuna is exported mainly to Europe and USA in forms of chilled or frozen. The amount of exported yellowfin tuna reached 19,398 tons in 2014, which indicates that almost all yellowfin tuna caught by hand line (26,085 tons in 2013) were exported considering the ratio of flesh to whole body weight.

Table 3.2.1 Export of fishery products from Maldives in 2014

		Amount (tons)	Value (million MVR)	Percentage
Skipjack Tuna (SKJ)	Frozen	21,779	489	22.5%
	Chilled	1	0	0.0%
	Dried, Smoked, Salted	3,903	331	15.2%
	Sub-total	25,683	820	37.7%
Yellowfin Tuna(YFT)	Frozen	10,211	256	11.8%
	Chilled	9,187	903	41.5%
	Sub-total	19,398	1,159	53.3%
Others		4,985	198	9.1%
Total		50,067	2,177	100.0%

Source: Fisheries statistics, (MoFA, 2015)

Large quantities of frozen skipjack and small yellowfin tuna are exported to Thailand where they are processed into cans but some are also canned in Maldives. Dried/smoked skipjack tuna (*Hikimas* and *Valhoamas* in Dhivehi) are mostly exported to Sri Lanka while some are consumed locally.

At the cottage industry level, traditional fish processing, namely dried fish (*Hikimas*), smoked fish (*Valhoamas*) and fish paste (*Rihaakuru*), had been carried out widely in several islands. However, in recent years, there have been declines in these activities due to shortages of the raw materials (fish).

3.3 International relations

Maldives is actively engaged in managing the pelagic fish species in the Indian Ocean. In July 2011 Maldives became a full member of Indian Ocean Tuna Commission (IOTC) and since then has played a very active role in promoting sustainable exploitation of fishery resources in the Indian Ocean. As a crucial aspect in managing fisheries resources, Maldives has kept records of tuna landing in the country since early 1970s. The national data collection was based on an enumeration system, which is now replaced by a modern logbook data collection system. A web-enabled database will be at online to allow compilation and processing of catch and effort data. The web-enabled database will also be used to record tuna purchases by the exporters. The database when fully functional will help to maintain records

of active fishing vessel and fishing licenses.

3.4 Government administration

Overall administration of fishery sector is carried out by MoFA under close coordination with relevant authorities, such as Maldives Customs Service, Maldives Police Service, Ministry of Environment and Energy, Ministry of Tourism, etc.

The organization chart of MoFA is shown in Fig 3.4.1. The Fisheries Division is the largest division of MoFA and there are 37 staff working (in 2015). In addition to the Fisheries Division, Marine Research Centre (MRC) plays an important role in fisheries research, management and development. MRC is officially under Office of the President and managed by MoFA. In 2015, 16 staff worked at MRC and conducted several research studies on oceanic fisheries, reef fisheries, aquaculture, coral reef and protection of endangered species.

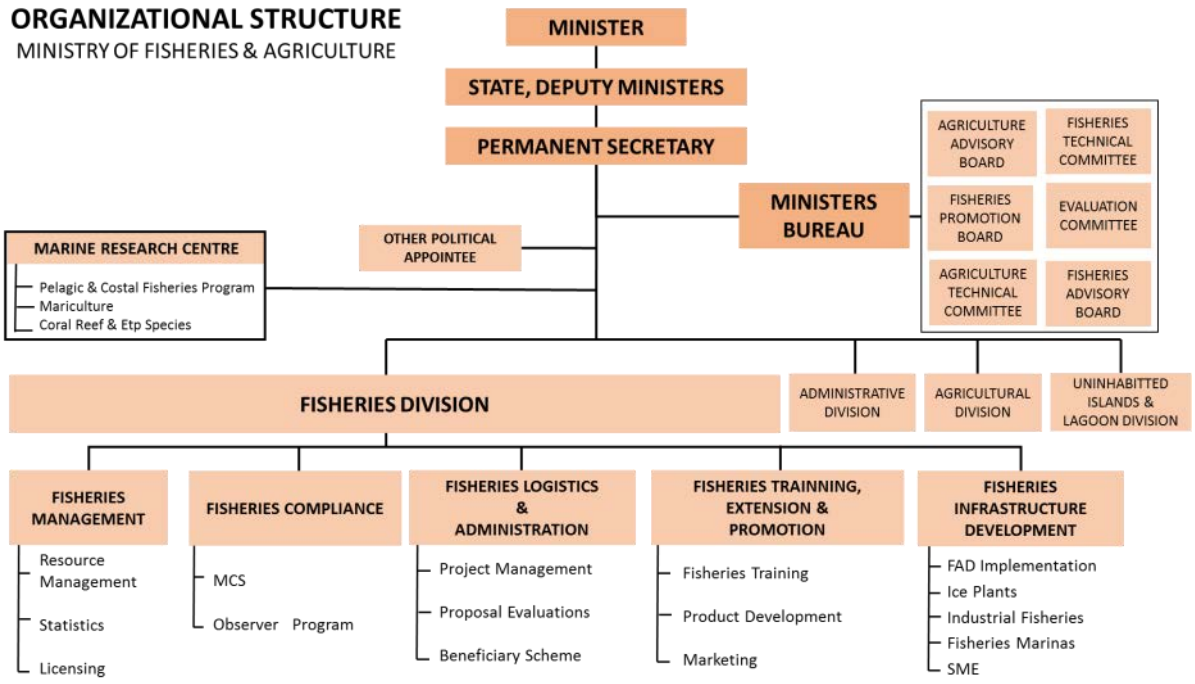


Figure 3.4.1 Organizational structure of MoFA

MoFA has played a major role in the development and management of fisheries sector in Maldives. MoFA has implemented several development projects in the fisheries sector. In addition to the Government's role in the skipjack purchasing, processing and export, major programs have been implemented in the past towards management of fishery resources and fisheries development, development of fishing vessels, encouraging new fishing methods, installing FADs, marine research, improving fish processing, extension and socio-economic improvement of the fishing. At present research is being conducted to expand mariculture and to reduce postharvest mortality in the live bait fishery. Efforts are also being made to introduce longline fishing in Maldives. The Environment

Protection Agency (EPA) of MEE is carrying out relevant research on the management and regulation of the marine environment.

The work budget of MoFA Fisheries Division from 2015 to 2017, except salaries and administration costs is as follows. The financial support from donors is not included in the table.

Table 3.4.1 Work budget of MoFA Fisheries Division (2015-2017) (unit: MVR)

	Policy area※1	2015	2016	2017※2
P1	Ensured and Facilitated income security for fisher families	50,031,000	1,981,308	0
P2	Established and developed fisheries infrastructure and sustained quality of fishing products which are exported	14,317,659	5,033,669	12,558,503
P3	Increased youth involvement in fisheries industry	186,607	132,527	64,717
P4	Established and developed mariculture industry	8,572,540	10,313,641	101,888,111
P5	Sustained Maldives fisheries at an international standard level and maintain responsible model fisheries	984,608	484,095	723,000
P6	Study for resources management/conservation etc.	499,140	398,145	485,209
P7	Acquired best price for fisheries products in international market	9,040,261	2,883,869	2,748,475
	Total	83,631,815	21,227,253	118,468,015

(Source: MoFA budget paper "Annual local budget")

※1：Name of policy area is a tentative translation from Dhivehi.

※2：The value of 2017 is unconfirmed.

According to the above table, the amount of annual budget fluctuated significantly: approximately 580 million yen in 2015, 140 million yen in 2016, 820 million yen in 2017 (approximately 7 yen/rufiyaa). For the policy area, 50 million rufiyaa (approximately 350 million yen) for Insurance of fishery income in 2015 and 100 million rufiyaa (approximately 700 million yen) for the development of aquaculture are by far the highest items. Insurance of fishery income is an important policy of the present government to compensate the part of income of fishers when their catch is poor. The fundamental study on aquaculture development and the juvenile production facility of milkfish mainly dominated the development of aquaculture in 2017. The juvenile milkfish is used as bait for skipjack tuna pole-and-line fishing. The activities related to the World Bank Project (Sustainable Fisheries Resources Development Project) began in the same year with a total budget of 18 million US dollars (grant aid).

A large amount of the budget has been secured for fisheries infrastructure, e.g. construction of "marinas" and ice plants, maintenance of FADs. The operation budget of MoFA could not be said to be well-funded, but they seem to have dealt enough with the required projects. And MoFA positively accepted the supports for large national scale initial input for aquaculture developments from the donor such as World Bank and IFAD. Appropriate budget, including the support from each donor, is indicated in the proposed

"priority projects" of the Master Plan.

3.5 Development of fishery-related infrastructure

It is a priority of the Government to develop or facilitate development of critical infrastructure to support fisheries activities across the country. With this intent GOM has encouraged investment of private sector and often established collaboration with them. Some of the recent infrastructure development are as follows:

A) Fishing vessels: second generation masdhoni was designed and introduced by MoFA to fishers as investors.

B) Fish processing plants: Felivaru tuna canning plant was established in Felivaru to buy and process skipjack tuna.

C) Fishing ports/harbours: Fishing ports are categorized into two, one is commercial fishing ports as an associated facility of large-scale fish processing factories, and the other is multipurpose small-scale ports constructed in major inhabited islands. There are 8 commercial fishing ports and nearly 200 multipurpose ports. Construction of the latter ones is the mandate of the Ministry of Housing and Infrastructure and they are managed by Island Councils after the construction.

D) Freezing plants: The facilities are set up in regions of high tuna landings to help fishers to sell their catches without interruption.

E) Ice-making plants: The facilities provide ice for fishers so that they can keep their catches in good condition till they arrive at the landing ports.

F) Fish Aggregation Devices (FADs): FADs have been deployed as a public infrastructure service of MoFA. The FAD centre of MoFA is responsible for their construction, deployment and management.

G) Fisher's marinas: The marinas are facilities to be used for relaxation of fishers who spend several days away from home. MoFA plans to establish 4 fisher's marinas during the current SAP period (2014-2018).

3.6 New Fisheries Act

The current Fisheries Law (1987) is perceived as outdated, insufficient and unable to cater for the existing challenges of the fisheries sector. A project to revise it has been carried out since 2014 with

technical assistance from FAO[1]. As of 2017, a draft for the revision of the Act has been finalized ("Fisheries Bill").

The objectives of this Act, as per the current draft, are as follows:

A) To provide for the long-term conservation and sustainable use of the fishery resources of Maldives for the present and future generations of Maldives.

B) To provide a framework for a transparent management of the fishery resources of Maldives in accordance with principles of equity and good governance.

C) To promote value addition to the fish and fishery products of Maldives with a view to ensuring the maximum economic and social benefits to Maldives.

D) To promote efficient and effective regulation of the aquaculture industry in order to contribute to the protection of the marine environment of Maldives, support economic development and food security for the people of Maldives.

E) To provide an effective framework to prevent, deter and eliminate Illegal, Unreported and Unregulated fishing.

F) To ensure a timely and effective implementation of international obligations regarding conservation and management of fisheries of Maldives.

The SFDPIS will be implemented in conformity with this new Fisheries Act.

3.7 Outlook of Sub-sectors

3.7.1 Oceanic fisheries Sub-sector

Tunas and tuna-like species are the major target species of Oceanic fisheries and caught by pole-and-line, hand line, longline and trolling. Use of large-scale net fishing such as purse seine and floating gill net is prohibited in Maldives. Although traditionally Maldivian fishers exploited almost exclusively skipjack tuna (SKJ) and small yellowfin (YFT) using pole-and-line, hand line for large YFT and longline for YFT and bigeye tuna have expanded in recent years.

(1) Pole-and-line fishery

The pole-and-line fishery using live bait has existed for nearly 1000 years and is the most important pelagic fishery in Maldives. This fishery consists of two separate fisheries: live bait fishery and tuna

[1] Assistance in support of the Fisheries and Aquaculture sector (FAO project TCP/MDV/3502), Review of fisheries and aquaculture legal framework

fishery using the live bait caught. Bait fish, i.e., sprats (*Spratelloides spp.)* and scads (*Engraulis spp.*), is caught mainly by lift net operated from the tuna fishing vessel inside the atolls. Once enough bait is harvested the same fishing vessel goes out to the open sea, outside the atolls and search for tuna school or directly go to FADs. The main target species is skipjack tuna but small amount (less than 20% in number) of juvenile yellowfin and juvenile bigeye tuna are also caught in this fishery. The pole-and-line skipjack tuna fishery of Maldives has been certified by the Marine Stewardship Council (MSC) as a sustainably managed fishery. The yellowfin tuna fishery is due to be MSC-certified soon. With the introduction of 'second-generation' masdhoni, (fishing fleet) has changed rapidly from the traditional wooden vessels of approximately 15 meters, to larger fiber glass built vessels of 30 meters or more, often fitted with means of preserving fish on ice or with refrigerated sea water, more powerful engines, and modern fish locating equipment. With the introduction of large vessels there was considerable increase of daily bait requirement for individual vessels. However due to inadequate handling practices and high intensity of bait extraction, significant amount of live bait is wasted.

MoFA/MRC has prepared the "Maldives live bait fishery management plan (2013)" and a series of activities and suggestions were included in this plan to encourage fishers to reduce over exploitation of live bait species. However, at present there are no controls on exploitation of bait resources and the management plan is yet to be implemented.

(2) Hand line fishery

Although catches of skipjack tuna have been declining since the year 2006, those of yellowfin tuna have been increasing slightly due to the rapid growth of the hand line yellowfin tuna fishery. Since no specialized gear is required for hand line tuna fishery, many pole-and-line vessels have switched to this fishing method recently. Live baits used for hand line are slightly larger than that for pole-and-line. Currently many tuna fishing vessels practice multi-day and multi-gear fishing.

(3) Longline fishery

Before 2010 there were licensed longline fleet, that were foreign-owned or under joint venture arrangements. The issuance of the license to foreign vessels was suspended from March 2010, and thereafter in 2011 Maldives has re-started a longline fishery allowing exclusively Maldivian-owned vessels. In 2014, 25 Maldivian vessels were licensed to fish within the EEZ but beyond 100 miles from the coast. All longline vessels operating in Maldives are equipped vessel monitoring system (VMS) and are continuously tracked by MoFA and Coast Guard.

(4) Trolling fishery

A small-scale trolling fishery also exists, which targets neritic species, *Kawa-kawa* and frigate tuna. This fishery considered as part of reef fisheries.

(5) FAD and fishing grounds

The tuna fishers operate within the Maldives EEZ and large quantities of tuna are caught around anchored Fish Aggregating Devices (FAD) deployed in open waters across the country. Experiments with anchored FADs began in 1981 and became a great success. Today the GOM maintains a network of 54 anchored FADs deployed across the country (Fig 3.7.1).

Tuna is caught throughout the Maldives, however currently the majority of the catch comes from the southern part of Maldives. In the late 1980s, the central atolls dominated the tuna catches, but their share dropped significantly from the early 2000s, mainly due to the huge investments made in the southern atolls by fishers and tuna processing companies.

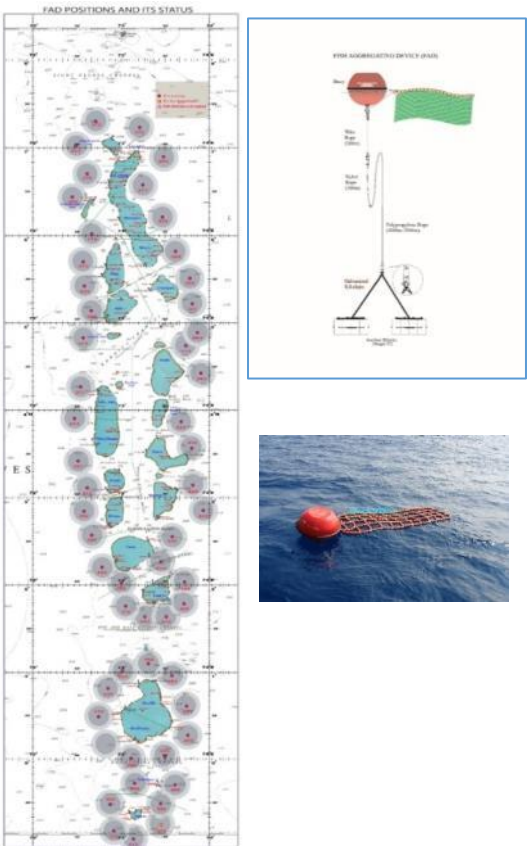


Figure 3.7.1 Locations of FADs and structure of an anchored FAD developed in Maldives

3.7.2 Reef fisheries Sub-sector

Although reef fishing has been carried out in the country for centuries, prior to the middle of 1970s it remained at a subsistence level. There was no demand for reef fish as local communities tended to prefer tuna to reef fish species. However, with the introduction of tourism demand was born for reef fish. Since then reef fisheries have developed rapidly in Maldives. New opportunities in international market, growth in recreational fishing by locals and tourists and increasing demand for reef fish for local consumption have contributed to the expansion of this fishery.

Following are the main segments of the market which reef fishers cater to;

- Fishers selling to resorts and to local markets
- Fishers selling to overseas market (valued species such as live groupers for export)

- Recreational fishers from Malé and other islands (fishing for leisure, the fish being often used for home consumption)
- Resort-based recreational reef fishing

Table 3.7.1 List of recent studies and investigations on reef fisheries in Maldives

Category/title of document		Publisher	Date
General reef fishery			
	Status of the coral reef fishery in an atoll country under tourism development; the case from Central Maldives.	MRC	2007
	Current status of the Reef fisheries of Maldives and recommendations for management	Darwin Reef Fish Project, MRC / Marine Conservation Society UK	Feb. 2014
Grouper fishery			
	Review of Grouper fishery of Maldives with additional notes on the Faafu Atoll Fishery	MRC	04/2005
	Review of the Maldivian Grouper Fishery and Export Industry	MRC, Darwin Reef Fish Project	09/2011
	Management Plan for Maldives Grouper fishery	MRC & Marine Conservation Society, UK	09/2011
Shark fishery			
	Analysis of whale shark Rhincodon types; aggregations near South Ari Atoll, Maldives Archipelago	Aquatic Biology; Vol. 8: 145–150, 2010 -10.3354/ab00215	2010
	National Plan of Action for the Conservation and Management of Sharks in Maldives	MoFA	July 2014
Aquarium fishery			
	Review of the Aquarium Fish Trade in Maldives with proposal for regulation of the trade	Marine Research Section, MoFA	1995
	Maldives Marine Aquarium Fishery Review	Darwin Reef Fish Project, MRC / Marine Conservation Society UK	2014

Although a number of reports and studies have been carried out on various reef fishing activities, there is little information available on the actual scale of the general reef fishery in Maldives (refer to "Current status of the reef fisheries of Maldives and recommendations for the management, 2014"). This urgently needs to be addressed. As a matter of fact, there is growing concern that pressure is increasing on these valuable resources and the catch may have already met maximum sustainable yields. A substantial amount of reef fish caught by local fishers is sold to resorts. In addition, there is increasing pressure on the use of fish for export, for domestic consumption and from the recreational activity. There is again limited information on the fish distribution and consumption patterns in the resorts and among the local communities.

Likewise, most of the references indicate the critical situation of reef fish resources and the necessity of proper resource management. Shark fishery has been totally banned since 2009. Also fishing for giant clams is banned at present.

3.7.3 Aquaculture Sub-sector

Unlike the other sub-sectors, there are few practical activities being carried out in this sub-sector at present, although there have been various experimental trials. The brief history of aquaculture was reviewed by the recent report, De Silva (2014)[2] as follows:

Unlike some small island states (e.g. Pacific Island States), Maldives has not ventured on mariculture development on a commercial scale in the past, except for the culture of the exotic sea cucumber, *Holothuria scabra*. This does not preclude the fact that isolated attempts to develop some aspects of mariculture were made in the past, primarily as research and development projects. Some of these programs are:

- Seaweed culture based on *Eucheuma cottonii* (*Kappaphycus alvarezii*), and *E. denticulatum* (*E. spinosum*)[3], based on material imported from the Philippines;
- Sea cucumber culture, based on indigenous species, the white teatfish, *Holothuria fuscogilva* and the prickly redfish *Thelenota ananas*[4];
- Pearl culture, based on Penguin shell, *Pteria penguin*[5]*;*
- Clownfish culture, based on *Amphiprion nigripes*[6].

At the Maniyafushi Field Station of MRC, experimental seed production of grouper *Epinephelus fuscoguttutus* has been carried out. In addition to the mentioned sea cucumber farm, in Shaviani Atoll, one other company has recently started pen culture of the same species using the artificial seeds from the existing farm in Laamu Atoll. There is an aquarium fish culture farm in Baa Atoll.

[2]De Silva (2014): Mariculture Development Plan. 42pp of main text. The report was prepared under the auspices of MEDeP.

[3]Reichenbach, N. & Holloway, S., 1997. Laamu Atoll mariculture project: Seaweed mariculture. Internal Report of the Marine Research Centre, 49 pp.

[4]Reichenbach, N. 1997. Laamu Atoll mariculture project: Sea cucumber mariculture. Internal Report of the Marine Research Centre, 58 pp.

[5]Moloque and Horsburgh Public Accountants, Sept. 2010. Plan and feasibility study for pearl culture in Baa Atoll, Thulhaadhoo. Report prepared for the UNDP, 59 pp.

[6]Mariculture Development Activities of the Marine Research Centre 1999-2009 (in Dhivehi), Marine Research Centre Malé, Maldives, May 2009. P 26.

Since aquaculture is new to Maldives, the legal structure of the fisheries sector is currently not geared towards aquaculture development and management. However, Aquaculture Regulation of Maldives has been approved in 2016.

MoFA is currently implementing a series of aquaculture promotion activities aimed at introducing sustainable aquaculture in Maldives. Some of the notable activities are as follows:

A) Renovation of Maniyafushi Field Station of MRC

The station is located at Maniyafushi, a small islet of about 4 ha in South Malé Atoll about 10 miles from Malé; it functions mainly for technical verification and demonstration of seed production of aquaculture species. Renovation of the facilities is now on-going, funded primarily through MoFA's own budget.

B) Milkfish culture for bait fish

C) MoFA started implementing a project in 2017 to culture milkfish, with technical development of seed production and grow-out farming in order to produce live bait for tuna fisheries.

D) Activities in line with on-going MEDeP

The 5-year Mariculture Enterprise Development Project (MEDeP)[7] started in 2012 with funds from the International Fund for Agricultural Development (IFAD) (US$ 2.49 million) and a counterpart contribution from the Maldivian Government, in particular MoFA. Major activities under MEDeP are as follows:

a) Aquatic animal health management

In recent years, there is a strong demand from the private sector to import brood stock or juveniles for aquaculture such as groupers. The current quarantine facility has been equipped by the project.

MoFA plans to extend the existing "Plant and Animal Quarantine Unit" in Hulhumalé to enable the quarantine control of aquatic animals and is going to materialize it in the framework of MEDeP.

b) Establishment of multi-species hatchery

A multi-species hatchery was planned under MEDeP, in order to encourage the establishment of small-scale and community-level grow-out operators through the provision of seeds. Although this hatchery was initially planned as a fully private operated facility, MEDeP

[7]IFAD, 2012. Mariculture Enterprise Development Project (MEDeP), Design Completion Report, Asia and the Pacific Division, Program Management Department, REPORT No.2859-MV, July2012.

recognized the need for the Government to support the establishment and operation of this facility, and revised the project design to establish a Joint Venture Company (JVC) between a selected private company and the Government. It was not possible to identify a private partner and the process had to be stopped.

c) Small loans for interested small-scale operators

In addition to the multi-species hatchery, which will facilitate the small-scale operators to enter aquaculture business through better access to seed, MEDeP is providing small loans to contribute for the small-scale operators establishing their grow-out system for sea cucumber culture in Laamu Atoll.

d) Extension and awareness programs

MEDeP plans to implement a training program for persons interested in starting aquaculture business. Capacity building of MoFA is also planned.

e) MoFA/MRC is seeking opportunities for training MRC staff in overseas, on aqua feed production and management as well as aquatic animal husbandry and good aquaculture techniques.

E) World Bank project

The Sustainable Fisheries Resources Development Project (Fourth South West Indian Ocean Fisheries Governance and Shared Growth Project) started in June 2017 founded by the World Bank. Its main content relating to aquaculture is the multi-species hatchery. It plans to take over activities related to sea cucumber culture in Laamu Atoll, which were developed under MEDeP.

3.7.4 Post-harvest / Value addition Sub-sector

(1) Operation of large-scale fish processing factories and ice making facilities

There are total of 11 fish processing factories (Fig 3.7.2), of which eight are large-scale fishery companies or company groups (including MIFCO [8], a semi-government company). The names, locations and types of products of those factories are shown in Table 3.7.2.

There are three major products, namely 1) frozen skipjack or small yellowfin tuna, 2) their cans, and 3) chilled or frozen large yellowfin tuna.

MIFCO produces all three types of products, while the other companies are specialized in certain products (Horizon Fisheries is a producer of frozen skipjack/small yellowfin tuna and their cans, and the other 6 companies are concentrated on marketing large-size yellowfin tuna, which is chilled or frozen for export).

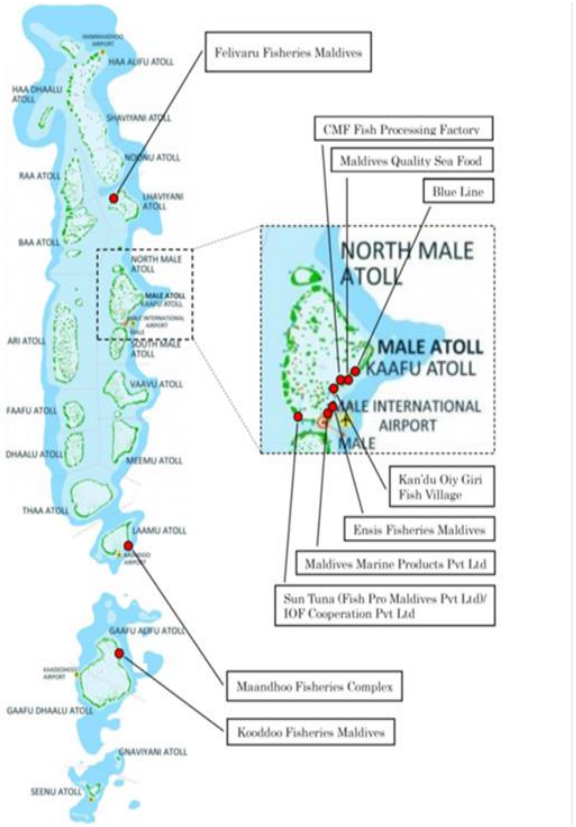


Figure 3.7.2 Location of large-scale fish processing facilities

Table 3.7.2 Large-scale fish processing factories and their products

	Company	Processing factory	Atoll/ Island	Port	SKJ/ YFT (small size)		YFT (big size)
					Frozen	Canning	
1	MIFCO	Felivaru Fisheries Complex	Lh. Felivaru	○	○	○	
2	MIFCO	Kan'du Oiy Giri Fish Village	K. Kan'du Oiy Gir	○	○		○
3	MIFCO	Kooddoo Fisheries Complex	Ga. Kooddoo	○	○		
4	Cyprea Marine Food	CMF Fish Processing Factory	K. Himmafushi	○[1)]			○
5	Euro global	Blue line	K. Hura	○			○
6	Ensis Fisheries	Ensis Fisheries Factory	K. Hulhumale	○[2)]			○
7	Maldive Marine Products	Maldive Marine Products Private Limited	K. Hulhumale	○[2)]			○
8	Horizon Fisheries	Maandhoo Fisheries Complex	L. Maandhoo	○	○	○	
9	Horizon Fisheries	Keekimini Fisheries Complex	Sh, Keekimini	○	○		

[8] MIFCO was absorbed by STO (State Trade Organization) on October 2016.

10	Sun Tuna (Fish Pro Maldives)	Ocean Fresh Fish Processing Factory	K. Hulhumale (Barge)				○
11	Maldives Quality Seafood	Maldives Quality Seafood Private Limited	K. Himmafushi	○1)			○
					5	2	7

Note:

1) K. Himmafushi fishing port: Joint venture between CMF Fish Processing and Maldives Quality Seafood.

2) K. Hulhumale fishing port: Joint venture between ENSIS Fisheries Factory and Maldives Marine Products

Large quantities of skipjack and small yellowfin tuna caught mainly by the pole-and-line are exported to Thailand as raw material for canning and part of the catch are processed into cans as well as traditionally processed in Maldives. There is a wide range of opportunities to improve the fish quality on-board, through proper handling and storage.

Demand for reef fish has increased over the past 10 years. Today reef fish is consumed by local communities and tourists visiting Maldives. In addition, several tons of reef fish are exported annually by the private sector. Not all fishers keep their catches in ice and as a result the quality of the fish is sometimes compromised. At present ice is not readily available in all atolls. There are a total of 25 ice plants but they are concentrated around atolls where tuna fishing is good. Nearly 1/3 of the ice plants are located near Malé (Fig 3.7.3).

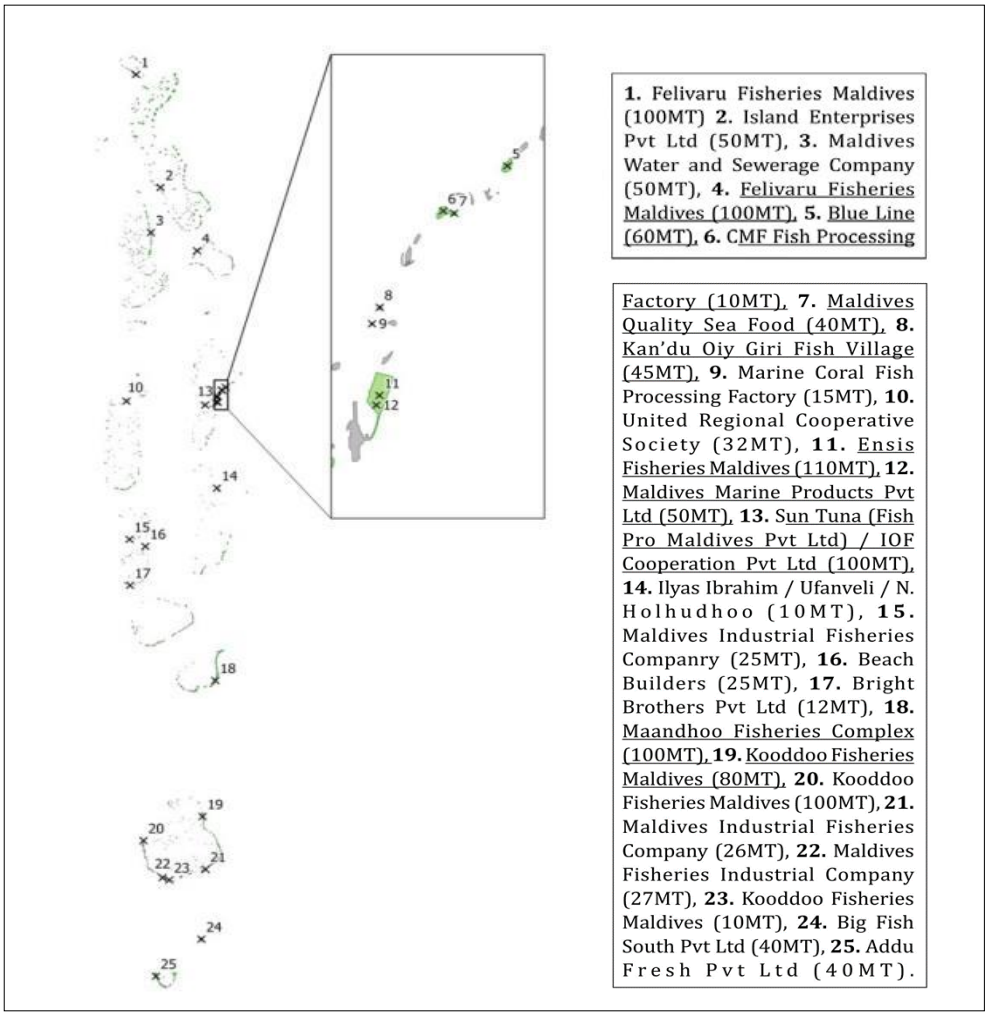


Figure 3.7.3 Location of existing ice plants

Large yellowfin tuna is preserved and exported in form of chilled or frozen fish. They are classed into three grades, A to C, depending on the quality and there is a strong need to improve this quality grade in order to increase the export value. Due to the popularity of Japanese cuisine, yellowfin tuna for Sashimi grade (A+) yields highest prices, even in EU countries. However, the percentage of A grade yellowfin tuna is currently less than 25% (Fig 3.7.4).

The processed fish is basically exported directly from the own port of each factory, except for the newly established Keekimini Fisheries Complex of Horizon Fisheries at Shaviani Atoll, which is now only freezing fish which is then transported to the Maandhoo Fisheries Complex at Laamu Atoll for export.

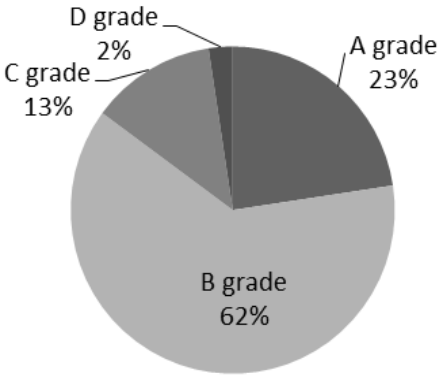


Figure 3.7.4 Grades of YFT purchased by ENSIS Fisheries in 2013-2014

(2) Traditional fish processing and local markets

Almost all skipjack tuna which is sold to small and medium fish processing factories is processed as smoked fish (*Valhoamas*) or dried fish (*Hikimas*). Almost all the smoked fish is sold locally. Dried fish is also sold on the local market but some is exported to Sri Lanka. The price of dried fish that is exported is determined by the exporters and buyers in Sri Lanka according to the quality of the products and supply and demand. There is no official standard for maintaining the quality of the dried fish hence the quality is often compromised. Smoked fish contains moisture and it is softer than dried fish.

Salted and dried products for export to Sri Lanka are produced using rainbow runner, dolphin fish, snappers, billfish and other common reef fish as raw material. The raw material is grated to two pieces and beheaded and soaked in salt for around a week in a barrel, and then sun dried. Salted and dried products are produced using sufficient amount of salt hence there are no major concerns about the quality of these products. Maldives Food and Drug Authority (MFDA) inspects the quality of the products when they are exported.

Malé market is the only fish market in the country where a substantial quantity of a variety of fish are landed and sold daily. The quality of the products sold at the market is not regularly monitored and the customers sometimes question the quality of products. Ice is not readily available at the market and the handling practices would need to be improved.

3.8 Situation Analysis

The formulation of the Master Plan involves the analysis of the fisheries-related situation of Maldives to examine current situation and needs of coastal communities, which is based on Atoll/Island situation analysis surveys carried out in 8 targeted islands in 7 atolls (2 northern atolls, 2 central atolls and 3 southern atolls, see Table 3.8.1 and Fig 3.8.1 hereafter). The survey was carried out by means of community consultations and consisted of socio-economic survey and group discussions. The targeted 8 islands were selected by MASPLAN and MoFA, based on the type of core fisheries activities being carried out by the island communities, i.e. pole-and-line tuna fishery, yellowfin tuna fishery, reef fisheries and grouper fishery.

3.8.1 Target site

The target islands for the Situation Analysis were selected as shown Table 3.8.1 and Figure 3.8.1.

Table 3.8.1 Target islands for the survey

Areas	Atolls	Islands	Major Fishery Activities
Northern	Haa Alifu (HA) Lhaviyani (Lh)	Ihavandhoo Naifaru	Tuna hand line Pole-and-line
Central	Faafu (F) Alifu Dhaalu (ADh)	Bilehdhoo Mahibadhoo	Grouper for export Reef fishery
Southern	Laamu (L) Gaaf Alifu (GA) Seenu (S)	Gan and Maamendhoo Villingili Maradhoo	Processing Pole-and-line Pole-and-line

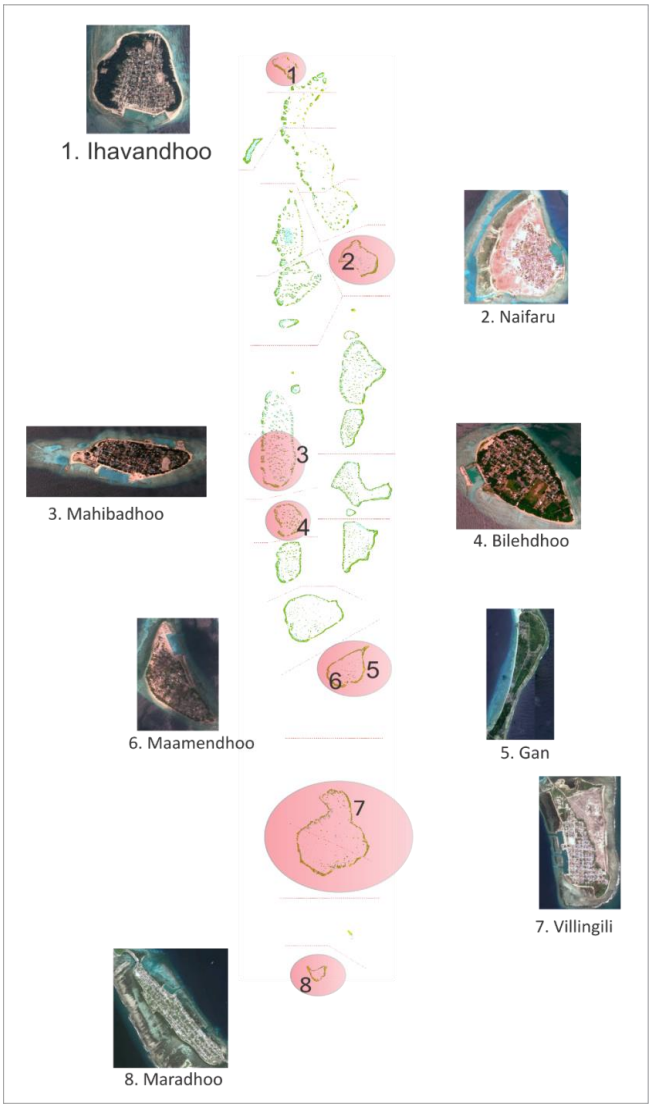


Figure 3.8.1 Locations of the 8 targeted islands

3.8.2 Methodology

The Atoll/Island-based situation analysis was conducted jointly by the MASPLAN team and the national consultants, whereby the national consultants were tasked with carrying out situation analysis of the targeted islands through community consultations and household surveys. In addition to this, the MASPLAN team carried out consultations with boat builders, boat owners, fishers, fish buyers, processors and fish processing plants within the atoll (as available).

The work was carried out in the following two phases:

(1) Community consultations with key focal groups inclusive of fishers, small- scale fish processors, fish buyers, boat owners, women, environmental NGOs. Discussions with the key focal groups focused on:

- Island development and their opinion thereof.
- Employment opportunities and social issues in the island or within atoll.
- Changes of the fisheries sector; strengths, weaknesses, threats and opportunities of the fisheries and measures that can be taken to address current weaknesses of the fisheries.

In addition to the above discussions, the national consultant survey team met with the members of the Island Council of each island to discuss about the above areas as well as population development, infrastructure development and economic avenues of the island. As the Island Council was the focal point, these meetings were held at the start of the survey, so that they were aware of the work to be carried out. Further to meeting with the Council members, information was also collected from each island through the use of so called “Island data collection sheet”, in order to get details of basic island statistics.

(2) Household survey

Household survey was undertaken to attain a target of 50 households as described in the TOR**.** The survey was conducted at households of fishers (both master fishers and crews), boat owners, fish processors/buyers and households who were not involved in the fisheries sector. While the target was to achieve 50 households in each island, this was not met for most islands (the average was 41). The household survey was carried out by the national consultant team and through the use of enumerators hired for the purpose.

The household survey collected information on the following:

- Basic structure of the household (age and gender).
- Place of employment of household members; detailed information on fisheries (if employed).
- Fish consumption of household members.
- View of fisheries sector: change to and how it has impacted their income/diet.
- Opinion on future of fisheries.

3.8.3 Summary of findings

The summary of the interview survey was shown as following. All the information in this summary is as of April to May 2015. It should be noted that these contents are only personal opinions of fishers and other local stakeholders.

<Summary of the interview result>

On the whole, the tuna fishery, especially the skipjack tuna fishery has gone through a severe decline from 2006 onwards, with impacts of these being felt by the islands whose economy and livelihoods depend on fisheries. The declining trend in skipjack tuna fishery continued until 2011, however, a gradual increase in the fish landings from 2011 onwards has been reported, though catch quantities for the different atolls are between 30 to 60% of what it was during the peak period of 2004 – 2006 recorded for this fishery. Total fish catch quantity for whole of Maldives reported for 2013, is 70% of what it was in 2006, when total catch was shown to be at its peak.

While tuna fisheries are carried out by almost all tuna fishing islands, the prevalence of the fishery is low in the southern atolls, in comparison to the northern atolls. The trend in the south is to do both fisheries, depending on the season. While skipjack tuna is the main target species down south, fishers report more fishing of yellowfin tuna due to the large decline in the skipjack tuna fisheries. However reported statistics still shows that bulk of catch by the southern atolls is comprised of skipjack tuna, although contribution to catch by yellowfin tuna is on the increase and predicted to increase further with decline in skipjack tuna availability. On the other hand, bulk of catch by central and northern atolls shows yellowfin tuna over the past 3 years.

Reef fisheries and grouper fishery (as a target reef fishery) was better than the skipjack tuna fishery, although the grouper fishery was seen to have declined and was not doing as well as in the peak years (mid 90s) for the fishery. However, increase income due to higher prices now offered to fishers by local buyers has ensured that fishers get a sustained income. Reef fisheries were faring quite well and general perception of the fisher folk was that there was much room for development of the fishery.

Fishery dependence of the economy is still high, although other areas of employment are also slowly gaining importance, such as the tourism sector and civil service related jobs. However, less job availability within other sectors (less supply than demand) leaves fisheries as preferred option of employment by a good proportion of the younger generation. Hence, in terms of future generations, there is a potential future for fisheries sector, though this may change in relation to change to fishery; e.g. declining stocks/availability.

General feeling of dissatisfaction amongst majority of the fishers is clearly evident from the SWOT analyses by the high number of weakness identified for the various fisheries, while strengths were reported to be few.

- The surveys were conducted at a time when the tuna fishery was going through a very low period).
- Feeling of low priority given by MoFA and the government at large to the fisheries sector, whereas tourism is of higher priority. Many discussions with MoFA, but without any positive outcome; mistrust linked to the actual implementation of "Beyas nubeyas 10,000".

Fishers noted that capacity development of the buyers had been very small over the past few years, with buyers still not being able to cope with the supply during good fishing periods. Furthermore, with the development of the yellowfin tuna fisheries, it is important to have good market within easy proximity for fishers to sell their catch.

Fishers consider implementation of fisheries regulations to manage fisheries a threat, because it would bring about some restrictions. Some felt that there were not enough consultations with fishers prior to such regulations being implemented. It should be noted that such regulations will never be given a 100% agreement and cooperation by fishers; hence the importance of awareness raising amongst fishers, as to why management and regulations are needed and what impact these regulations would have on their livelihoods.

In a nation where the two key economic industries share the natural resources there is bound to be conflicts. To date there has been a failure to resolve these issues through either better zoning of tourism or better implementation of regulations and/ or creation of new regulations. Such conflicts were not only reported between two sectors, but also within the fisheries sector itself, whereby fishing by yellowfin tuna vessels at the FADs was constantly reported by skipjack tuna fisheries. Same goes for reports for illegal fishing activities within Maldivian waters.

The longline tuna fishing of Maldives is now carried out by Maldivian owned fishing vessels licensed through the Ministry. However, these vessels mainly employ foreigners given the absence of skilled Maldivians in the field. The long-term plans of MoFA are to train Maldivian fishers in longlining and employ them on the vessels so that the vessels are "100% Maldivian". MoFA initially ran training programs though there were issues in getting interested fishers. Programs were run at atolls as well as in Malé if they were able to get 10 people at one time. The vessels have now been sourced to MIFCO under the condition that required training is being carried out by them. These programs are currently on-going and are planned to be continued.

In addition to these training programs, it is worth noting that fishers' training is being carried out at the Fisheries Training Centre at Villingili in North Malé Atoll, as well as at the

Fishermen's Community & Training Centre at L. Gan. Hence, there are opportunities for development of the sector and for interested youth to enter the sector.

Interest of youth in the sector is a key for future development as they are the next generation of fishers to come. Consultations revealed a good amount of youth being involved in the sector, although for most part this was more out of need than want. Having said this, there were a good a number of reports regarding interest of youth, especially in the yellowfin tuna fishery and grouper fishery. However, a few islands reported difficulties with sustaining the youth in the sector due to the high percentage of substance abuse amongst youth (which was the key social issue addressed by the majority of the target islands), which for some islands disrupts fishing activity. On the other hand, others reported interest of youth in being a crew of the vessel but not in taking leadership on the vessels. Other islands reported a lack of youth interest as prior noted. Reasons such as these have eventuated in foreigners being employed on the vessels.

The following issues need to be addressed through the Master Plan:

In terms of Policy and Governance

- Increase level of priority given by the Government and MoFA to the industry and the fishers (build trust)
- Address issues between tourism and fisheries through more productive discussions between line ministries/departments/agencies
- Licensing of all fishing vessels used for the different fisheries
- Implement regulations for better management of bait fisheries
- Better enforcement of currently existing regulations
- Introduction of boat building and boat set up guidelines / regulations
- Address issues between various fisheries through better regulations and enforcement

In terms of Infrastructures and Services

- Develop and improve buying/processing facilities and increase their capacity; especially with increasing yellowfin tuna fisheries
- Provision of better financial instruments such as tax incentives and soft loans for fishers

In terms of Fishing Technology

- Introduction of new technology which enables improved catch though with sustainable measures
- Increasing a number of FAD and provide better/regular maintenance

In terms of Market

- Set a minimum purchase price for all fisheries, which has to be followed by all buyers so that there is a price control

In terms of Awareness and Training

- Increased awareness raising programs for fishers regarding sustainable fisheries, management and importance of these
- Increased training programs for fishers and fish traders; better fish handling and quality maintenance

The results of the SWOT analysis based on the survey result are shown Table 3.8.2 to 3.8.7 as following.

Table 3.8.2 Results of SWOT analysis on SKJ fishery (1/2)

STRENGTHS	WEAKNESSES
Fishing and fishing technology ▪ Bigger, improved vessels with use of more technology ▪ Experienced fishers who are capable of switching between fisheries (depending on season) **Socio-economics** ▪ Good source of income ▪ Island economies highly dependent on fisheries; island economy thrives during good fishing periods ▪ Trip durations allow fishers to spend time on the island and with families ▪ Good source of job opportunities ▪ Cash-at-hand: get paid as soon as the tuna is weighed ▪ Youth interested in fisheries ▪ Provision of raw material for fish cottage processors	**Fishing and fishing technology** ▪ Declining tuna and bait fisheries; travel distance extended ▪ Poor quality of catch prior to being sold to buyers ▪ Insufficient a number of Fish Aggregating Device (FAD) around Maldives; lack of maintenance of FADs **Socio-economics** ▪ Whole island depends on fishery; island economy suffers during low periods ▪ Fluctuating price of fuel ▪ High operational cost of larger vessels ▪ Lack of incentives for fishers; no duty exemption of boat building materials ▪ Difficulty in getting finances/soft loans ▪ Absence of a pension scheme for fishers ▪ Participation in insurance scheme at great cost to fishers **Logistics** ▪ Difficulty in getting ice and freshwater (especially when fishing is good) ▪ Difficulty in getting spare parts for the vessels which are also very expensive **Market** ▪ Fishers do not have any control over price which is dependent on international market resulting in price fluctuation ▪ With few buyers in operation there is monopoly in setting the price; prices are not competitive ▪ Insufficient capacity at fish purchase/ processing plants in order to meet supply during good fishing season; absence of development of facilities over the past few years **Governance** ▪ Importance given by the Government to the fisheries industry is very low (especially as perceived by fishers), while that for tourism is very high ▪ Weak monitoring of Maldivian Exclusive Economic Zone ▪ Unregulated bait fishery ▪ Weak enforcement of regulations **Capacity Enhancement** ▪ Lack of awareness amongst fishers regarding consequences of unsustainable/ unsafe practices ▪ Difficulty in filling log books

Table 3.8.3 Results of SWOT analysis on skipjack tuna fishery (2/2)

OPPORTUNITIES	THREATS
Fishing and fishing technology ▪ Increasing a number of FAD around Maldives, with better maintenance ▪ Increase a number of vessel so as to allow more people to join the fishery ▪ Bigger, improved vessels which can travel long distances **Socio-economics** ▪ Better financial instruments to facilitate the investments on development of fishery **Logistics** ▪ Easy availability of fishing gear and new technology (preferably within atoll) **Market** ▪ Increase buyer capacity ▪ Set limits on price fluctuation ▪ Introduction of more buyers so as to get a more competitive price ▪ High demand for skipjack tuna in the world, potential to expand the market **Capacity Enhancement** ▪ Increase awareness of fishers regarding ways to improve fisheries (less wastage, especially of bait, better fish preservation on board) **Governance** ▪ Enforce existing regulations ▪ Regulation and management of bait fisheries ▪ Protection of good fishing spots ▪ Revise existing regulations to make them more efficient; enforcement improved ▪ Better responsibility of the coast guard staff in facilitating the implementation of the regulations on illegal practices at sea	**Fishing and fishing technology** ▪ Purse seining outside the EEZ area; harvest of migratory stocks ▪ Longlining within Maldivian EEZ by foreign vessels, which are operated by Maldivian companies ▪ Continuous damage and unsustainable fishing practices at the FADs ▪ Unsustainable and unsafe bait harvesting methods and quantities ▪ Unsustainable harvesting of fish during good fishing seasons – especially when buyers are not able to purchase **Socio-economics** ▪ Large number of foreigners on vessels, involved in all areas of operation; their practices might not be consistent with Maldivian practices; great outflow of income from fisheries ▪ Current perception of youth regarding fisheries leads to decline in number of youth from entering the fisheries ▪ Increasing drug usage amongst youth; threat to fisheries and future of Maldives ▪ Increasing price of fuel and equipment ▪ Lack of finance for further investments **Capacity Enhancement** ▪ Lack of training, especially for those who want to join the fishery **Governance** ▪ Unregulated expansion of tourism industry; need better zoning as this is having an impact on fishers due to loss of number of bait harvesting reefs ▪ Implementation of government regulations **Environment** ▪ Climate change impacts on fisheries

Table 3.8.4 Results of SWOT analysis on yellowfin tuna fishery

STRENGTHS	**WEAKNESSES**
Fishing and fishing technology ▪ Good catch quantities ▪ Bigger, improved vessels ▪ Easier in all aspects, if they come across a good fishing area **Socio-economics** ▪ Youth interested in the fishery ▪ Ready cash-at-hand ▪ High demand on international markets and good prices	**Fishing and fishing technology** ▪ Seasonal changes to the fishery ▪ Decreased availability within closer areas: have to travel longer distances ▪ With the increase in fishing area, their fishing area now falls within same area where the licensed longline vessels currently use for fishing; increased conflicts **Logistics** ▪ Difficulty in getting ice **Market** ▪ Few buyers around Maldives; decreased potential for islands which want to enter the fishery due to lack of buyers within close proximity to island ▪ Price fluctuation **Capacity Enhancement** ▪ Difficulty in filling log books
OPPORTUNITIES	**THREATS**
Potential opportunities **Fishing and fishing technology** ▪ Increase a number of vessel so as to allow more people to join the fishery ▪ Develop bigger, improved vessels which can travel long distances **Logistics** ▪ Set up of more ice plants at key fishing zones for easier accessibility and availability **Market** ▪ Increase a number of exporter: competitive price **Capacity Enhancement** ▪ Increase training facilities - enable youth interested in fisheries to be more technically trained in better handling of fish to maintain fish quality	**Fishing and fishing technology** ▪ Longlining for the same species detrimental to yellowfin tuna stocks ▪ Decreased bait availability

Table 3.8.5 Results of SWOT analysis on Reef fisheries

STRENGTHS	**WEAKNESSES**
Fishing and fishing technology ▪ Good catch and no decline in fishery over the years **Socio-economics** ▪ Good price and income **Market** ▪ Increasing demand (national market and resorts, whose number is increasing)	**Fishing and fishing technology** ▪ Decreased bait fishery **Socio-economics** ▪ Smaller vessels, hence youth not so interested **Logistics** ▪ Difficulty in getting ice ▪ Difficulty in getting fuel ▪ Difficulty in getting fishing gear **Market** ▪ Delay in payment from some resorts ▪ Lower price for reef fish in some areas
OPPORTUNITIES	**THREATS**
Fishing and fishing technology ▪ Good catch and good stock to expand the market locally and internationally ▪ Installation of FADs closer to the islands **Market** ▪ Potential to increase price from resorts and buyers ▪ Set up of ice plants; good market in Malé, and potential for export if fish can be chilled easily ▪ Increased tourism development especially within atolls where tourism currently low ▪ Establish operations by a central private buyer on reef fishing islands who can cater to the supply especially during good fishing season ▪ Increased markets which would also encourage more people to join the fishery **Governance** ▪ Create “fishing only” areas; ban other use	**Fishing and fishing technology** ▪ Increased shark populations **Socio-economics** ▪ Potential for more people to leave the fishery and change to yellowfin tuna fishery, if resorts do not increase their price accordingly **Environment** ▪ Sea cucumber fishery and processing; detrimental to reef ecosystem health

Table 3.8.6 Results of SWOT analysis on grouper fisheries

STRENGTHS	WEAKNESSES
Fishing and fishing technology ▪ Improved fishing vessels ▪ Change in fishing method from handline to visually aided snorkelling - more targeted fishery ▪ Fishery and stocks still in good condition and no decline in the fisheries, even though fishery has been ongoing for a number of year – consequent increase in fish catch and income **Socio-economics** ▪ No foreigners employed on vessels, as there is no need for this ▪ Lots of new comers / youth in the fishery ▪ Good income (in the range of MRF 15,000 to MRF 30,000 per month per person) ▪ Preferred area of income by a number of island resident.	**Logistics** ▪ Difficulty in getting spare parts, even from Malé **Market** ▪ Delay in getting payment from some exporters – unpaid bills to date ▪ Absence of price limits, corresponding to size limits **Capacity Enhancement** ▪ Lack of training given to fishers with regards to issue of safety certificate and filling and submission of the newly introduced logbook ▪ Awareness of the government officials (who are the managers of the fishery), regarding registration of cages and additional aspects of the fishery were observed by the fishers to be very low **Governance** ▪ Implementation of the regulation which only allows catch of certain sizes ▪ Weak monitoring - Catch and purchase of undersized groupers since implementation of the regulation ▪ Absence of an easy communication system / unclear communication with MoFA
OPPORTUNITIES	**THREATS**
Fishing and fishing technology ▪ Better vessels meaning more time can be spent in fishing **Socio-economics** ▪ Grouper fishery is a preferred area of work by youth – so high chance for development in the future ▪ Good income: opportunity to expand the fishery **Governance** ▪ More targeted fishery: better management ▪ Good stock; consequent increase in fish catch and income provided it is done in a sustainable manner	**Fishing and fishing technology** ▪ Increased shark populations, which is making fishing difficult **Market** ▪ Delayed payments from export companies **Governance** ▪ Catch of undersized groupers since implementation of the regulation - weak monitoring ▪ Unsustainable bait harvesting and high wastage by tuna fishers – detrimental to all fisheries

Table 3.8.7 Results of SWOT analysis on fish cottage processing

STRENGTHS	**WEAKNESSES**
Socio-economics ▪ Good income earning avenue ▪ Contributes to create local job opportunity (in particular women) ▪ Can be started with small investment; family business	**Socio-economics** ▪ Low fish availability ▪ Lack of space to carry out the operation ▪ Lack of capital/finance to compete with price and purchase in bulk form ▪ Some locals not willing to work **Logistics** ▪ Difficulty in getting firewood for fish processing **Quality and Market** ▪ Change in price of fish; unable to compete with price of industrial plants ▪ Absence of good packing facilities (and training associated with) and a good market ▪ Lack of quality control standards ▪ General reduction due to decreasing availability of raw material (skipjack tuna) and prices of traditional products on the regional markets (namely Sri Lanka) **Capacity Enhancement** ▪ Lack of awareness and knowledge on marketing the products
OPPORTUNITIES	**THREATS**
Socio-economics and Market ▪ Youth and women interested in this work so opportunity to expand given the market ▪ Availability of loans to improve the facilities **Capacity Enhancement** ▪ Capacity building regarding processing and packaging methods; increased awareness ▪ Formation of Cooperatives **Quality and Market** ▪ Packaging facilities	**Socio-economics and Market** ▪ Unavailability of fish ▪ Non-competitive price on regional market

3.9 The issues of each sub-sector

The main issues of the fisheries sector in Maldives as per the beginning of this project (2014) are as follows.

3.9.1 The issues of Oceanic Fisheries Sub-sector

As stated hitherto, the Oceanic fisheries sub-sector represents the core of Maldivian fisheries: skipjack tuna pole-and-line fishing and yellowfin tuna hand line fishing; the maintenance and sustainable development of this sub-sector is the largest issue for the whole Maldivian fisheries.

(1) Management of bait fish resources for pole-and-line fishing

The bait fish resources used for skipjack tuna pole-and-line fishing is thought to be declining. An appropriate bait fish resources management is necessary for the sustainable development of this fishery. In addition, skipjack tuna fished by this fishery is certified by MSC and the implementation of bait fish resources management is a prerequisite. MRC therefore elaborated a “bait fish management plan” which is presently not in operation.

(2) Quality control of fish in the yellowfin tuna hand line fishing

Yellowfin tuna is the largest fish catch next to skipjack tuna, and represents the first export value. Domestic consumption of yellowfin tuna is low as Maldivians traditionally don’t prefer it. Its quality is not good and the ratio suitable for Sashimi is very low. As IOTC has been enhancing proper management of yellowfin tuna resources, the increase in fish catch cannot be expected, improving quality should lead to an increase of earnings.

(3) Diversification of oceanic fisheries

As mentioned above, oceanic fisheries are mostly limited to two fisheries, which represents a risk factor for whole Maldivian fishery business. The large oceanic area of Maldives including deep-sea area has not been fully exploited yet. The diversification of fisheries through the development of ocean/deep-sea is a major challenge.

(4) Improvement of fishing management capacity

MoFA has tried to improve the fishing management capacity in the past: development of collection system for fish catch data, extension and operation of VMS etc. However, a number of fishing vessel is still not equipped with VMS and there is no evidence of a significant decline of IUU fishing by foreign vessels. It is therefore crucial to further improve the capacity of fishing management, mainly by MoFA.

(5) Efficiency of fishing vessels

In Maldives, fishing vessels have been mechanized and grew in size since the 1970’s, and the fourth generation fishing vessel has become mainstream at present. As their structure derives from the

traditional hull form since sailboat times, improving their efficiency is the needs in terms of structure of live bait tank, refrigerating function of fish tank and fuel efficiency.

(6) Construction of infrastructure

Further constructions of fishery infrastructure are needed: ice plants to maintain fish freshness and to improve value-addition, “Marinas” to provide fishers with rest/resupply/network facilities, as per the present Government’s policy.

3.9.2 The issues of Reef Fisheries Sub-sector

(1) Collection of fisheries statistics

The fish catch from reef fisheries is considered to increase, linked to the development of local tourism and of export of grouper to China. However, the method for collecting reef fish catch data, necessary to ensure sustainable resources use, has not established yet, contrarily to the case of skipjack / yellowfin / blue-fin tuna fisheries where reporting fish catch as a condition to get the license. To that effect, it is necessary to build a partner relationship with resorts who consume the largest amount of reef fish in Maldives.

(2) Formulation and implementation of fishery management plan /related laws

Contrarily to skipjack/yellowfin/blue-fin tuna resources, reef fish resources are in general sensitive to the increasing in fishing pressure. As referred above, since the reef fish catch has been increasing, it is crucial to formulate and implement the management plans. That of grouper was formulated but not yet implemented.

(3) Technical improvement for value-addition

Most of the reef fish supplied to resorts are caught by small fishing boats without adequate refrigeration. The improvement of techniques for storing fish on board and hygiene control is needed.

3.9.3 The issues of Aquaculture Sub-sector

(1) Feasibility of aquaculture development

At the beginning of the Project, MoFA was mainly dealing with the technical development of Brown-marbled grouper and sandfish as species for aquaculture. They are both aiming export to China markets. A number of country, mainly in South-east Asia, are producing these species and it is necessary to check on their feasibility in Maldives, given in particular the relatively high labour cost in the country.

(2) Technical development of new aquaculture species

The development of aquaculture techniques is needed for the two species mentioned above and for other potential species (including for seed production).

(3) The extension of aquaculture

Extension of aquaculture by private companies and isolated communities is to be promoted, after the appropriate aquaculture techniques are established.

(4) The capacity building

It is necessary to train the human resources and to improve the research facility for the study, technical development and extension mentioned above. Especially, MRC should be strengthened intensively as it plays a major role for aquaculture technique development and training.

3.9.4 The issues of Post-harvest/ Value addition Sub-sector

(1) Quality improvement of traditional processed fish

Traditional processed skipjack tuna such as *Hikimas* and *Valhoamas* is staple food item for Maldivians, and the *Hikimas* is an important export item to Sri-Lanka. However food safety and quality control of these products have become a problem recently, as many processors produce large quantities under poor conditions. The setting up of national standards including the formulation of related laws and the extension of quality control test for the improvement of foods on markets is therefore necessary.

(2) Price slump of traditional processed fish

The price of Maldivian *Hikimas* is relatively low compared with Sri-Lankan one in the Sri-Lankan market. Combined with the improvement of quality mentioned above, measures to increase the prices on the market through the improvement of sales methods are needed.

(3) Technical improvement of fish handling methods on board

Yellowfin tuna has become major export item but the rate of highest quality for Sashimi grade is still low, linked to inappropriate handling on board and of refrigeration / freezing method. Improvement and extension of handling techniques after the catch are necessary.

(4) Construction of ice plants

There is an urgent need to increase the supply of ice in the whole country in order to maintain freshness of reef fish.

Chapter 4. PREPARATION OF DRAFT MASTER PLAN (1st Fiscal Period)

MASPLAN formulated working groups by each fishery sub-sector as stipulated in the Chapter 1 (1.2.2) and aimed to complete a Master Plan in principle based on the result of the analysis done by the respective working groups. In the actual process, JICA consultants played a key role as moderators in the PCM workshops and conducted problem analysis as well as objective analysis in the each SSWG. In this workshop, a number of problems were presented from a variety of perspectives such as development of legal systems, strengthening of capacity of MoFA and specific technical issues. Besides, the cross cutting issues such as on-board handling of caught fish, improvement of fish quality and bait fisheries resource management were discussed among the sub-sectors. The results of the workshop and the discussion were compiled into the Problem tree and Objective tree by each sub-sector (as referred to in the Progress Report 1st 'Dec. 2015').

Japanese side (JICA consultants) prepared a draft of the Master Plan based on the result of the analysis on fishery sector of Maldives as stipulated in the Chapter 2 as well as discussions in the SSWGs, and submitted the draft to MoFA and JICA (3rd Draft Nov.15, 2015). The proposed table of the contents is as below:

4.1 Title and table of contents (1st Fiscal Period)

Title

The tentative title in the 1st fiscal period was:

The Fishery Development Master Plan of the Republic of Maldives for the years 2016-2025 - Towards Efficient Management and Sustainable Use of Fisheries Resources - Ministry of Fisheries and Agriculture (MoFA)

Table and contents

4.2 Strategic visions

Vision

The vision of the Master Plan is articulated as follows:

Efficiently manage and sustainably develop the use of fishery resources in the Maldivian waters for a better social and economic future for the Maldivians by way of earning foreign currency through expanded export commodities, generating job opportunities and a stable domestic supply of safe animal protein.

Goals

A) Oceanic fisheries

- Take responsible measures as a leading tuna fishing country in the Indian Ocean
- Explore unutilized or under-utilized off-shore fishery resources

B) Reef fisheries

- Develop “Atoll-based fishery management system”
- Obtain third party certification for major reef fisheries

C) Aquaculture

- Develop economically feasible mariculture as a new local industry

D) Post-harvest/ Value Addition

- Improve fish quality by using modern technologies and practices for post-harvest and value addition
- Revitalize traditional fish processing industry

4.3 Priority projects

A) Oceanic fisheries

Project 1: Improvement of MCS system of oceanic fisheries
Project 2: Establishment of oceanic fisheries resources management training program
Project 3: Establishment of fisheries co-management of oceanic fisheries
Project 4: Improvement of the catch data collection for by-catch
Project 5: Technical development and examination of live bait catch and holding for improving their survival rate
Project 6: Extension of improved live bait handling and in-board stocking system for pole-and-line fishing
Project 7: Feasibility study for the independent live bait fishery
Project 8: Technical development of tuna hand line on-board handling for quality improvement (Collaboration Project with Post-harvest/Value addition Sub-sector Working Group)
Project 9: Extension of improved on-board handling techniques for tuna hand line fishery (Collaboration Project with Post-harvest/Value addition Sub-sector Working Group)
Project 10: Technical development on the mitigation measures of shark by-catches in longline fishing
Project 11: Potential study program for the development of new fishery resources
Project 12: Development of the design of "5th Generation Masdhooni"
Project 13: Promotion of private investment for new oceanic fishing activities (longline and deep-sea fishing)

B) Reef fisheries

Project 1: Development/ improvement of biological, socio-economic and statistical catch data collection and analysis systems
Project 2: Improvement of fisheries-related legislation about reef fisheries
Project 3: Enhancement of fisheries compliance/ enforcement
Project 4: Design and implementation of fishery management plans

Project 5: Improvement of availability and use of good quality ice
Project 6: Improvement of boat design and equipment
Project 7: Awareness and training on best fishing and fish handling techniques and practices
Project 8: Capacity enhancement of stakeholders on marine resource and environmental management
Project 9: Establishment of atoll-based reef fisheries management system (ABRFMS)

C) Aquaculture

Project 1: Formulation of master plan of Aquaculture Sub-sector
Project 2: Strengthening MoFA's capacity for aquaculture training, demonstration and extension
Project 3: Institutional support required for the development of an aquaculture sector in Maldives
Project 4: Establishment of multi-species hatchery
Project 5: Feasibility study on mariculture of selected species in Maldives
Project 6: Extension of potential mariculture techniques
Project 7: Review and improve aquaculture-related policy, laws and regulations
Project 8: Establishment of aquaculture certification system
Project 9: Project for strengthening financing system for aquaculture
Project 10: Promoting aquaculture through formal education system

D) Post-harvest/ Value addition

Project 1: Development of minimum national standards/ regulations for fishery products
Project 2: Establishment of training system for fish quality assurance
Project 3: Improvement of fish quality for existing yellow-fin tuna hand line fishery
Project 4: Technical improvement of on-board handling of hand line-caught tuna
Project 5: Proper designing of fish hold insulation of fishing vessel
Project 6: Quality improvement of traditional processed fish
Project 7: Dissemination on quality improvement of traditional processed fish
Project 8: Improvement of market information service
Project 9: Feasibility study for strengthening capacity of ice plants
Project 10: Improvement of fish quality through strengthening the capacity of ice making plants
Project 11: Study on market acceptability of end products
Project 12: Feasibility study on fish feed development

Chapter 5. FORMULATION AND IMPLEMENTATION OF PILOT PROJECTS

Numbers and scopes of the pilot projects in MASPLAN were examined through comprehensive discussion with the Maldives side as well as JICA headquarters. As a result, it was agreed at the 2nd JCC on October 27, 2015 to implement the following six pilot projects in collaboration with relevant organizations (Table 5.1).

Table 5.1 Six implemented pilot projects

Title of the pilot project (PP)	Responsible Sub-Sector	Collaborative partners
PP1. Technical development and verification of live bait catch and holding for improving their survival rate	Oceanic Fisheries	Private fishing boat RASKURI/MNU
PP2. Technical development of tuna hand line on-board handling for fish quality improvement	Post-harvest and Value Addition/ Oceanic Fisheries	ENSIS Fisheries/MNU
PP3. Preliminary resource survey on availability of deep-sea resources	Oceanic Fisheries	MIFCO
PP4. Monitoring of fish supply to resorts and setting up of an ecolabel certification	Reef Fisheries	Resorts in North Malé and Baa Atolls
PP5. Feasibility study on mariculture of selected species in Maldives	Aquaculture	SEAFDEC/AQD
PP6. Quality improvement of traditional processed fish	Post-harvest/ Value Addition	MIFCO

5.1 PP.1: Technical development and verification of live bait catch and holding for improving their survival rate

5.1.1 Outline

(1) Background

To operate pole-and-line fishery, bait fishes such as sprats (*Spratelloides* spp.) and Cardinalfishes (*Apogonidae*) are indispensable resources as live bait. Before moving to the fishing ground of skipjack tuna, the fishing boat has to catch live bait inside the reef (lagoon), using light to aggregate fish and a fine net to stock the bait into the in-board tank. However, the survival rate of the bait is currently not optimum, and the remaining bait may be insufficient in particular if the vessel fishes for a couple of days without encountering any skipjack tuna school. In other words, it is said to be “wasting resources use”.

Since the size of fishing boats has increased in recent years, it is thought that the catch of bait fishes is also steadily increasing. At the same time, fishers have pointed out the decrease in bait fish resources, and its countermeasures have been sought to achieve sustainable resources use.

(2) Outline of the project

The PDM as an outline of the pilot project (PP1) is shown in Table 5.1.1. The project title is “Technical development and verification of live bait catch and holding for improving their survival rate”. The target group of the project is a pole-and-line fishing vessel “Raskuri” in Maradhoo, Addu Atoll (Fig 5.1.1). The main activities consist of modifying the live bait tank based on the Japanese method, improving the catch method of live bait and introducing fishing gears and equipment related to those activities. The implementing time schedule is shown in Table 5.1.2.

Figure 5.1.1 Fishing boat RASKURI for PP.1 monitoring survey

This pilot project started in May 2015 with the collaboration of Horizon Fisheries Co. Ltd., at Laamu Atoll. However, the targeted fishing vessel was canceled incidentally and changed to Raskuri of Addu Atoll. The modification of the live bait tank, the trial operation and the training of the crew were completed in October 2015, and monitoring survey of the pilot-project was carried out from November 2015 to January 2017. The concept of the modification of the live bait tank, as shown in Fig 5.1.2, is based on the fact that current normal tank has an inefficient water circulation and a fisher has to dive into the tank to discharge dead baits so it further stresses and damages bait fishes in the tank. The modified tank structure presents the advantage of enabling a sufficient water circulation and discharging automatically the dead bait.

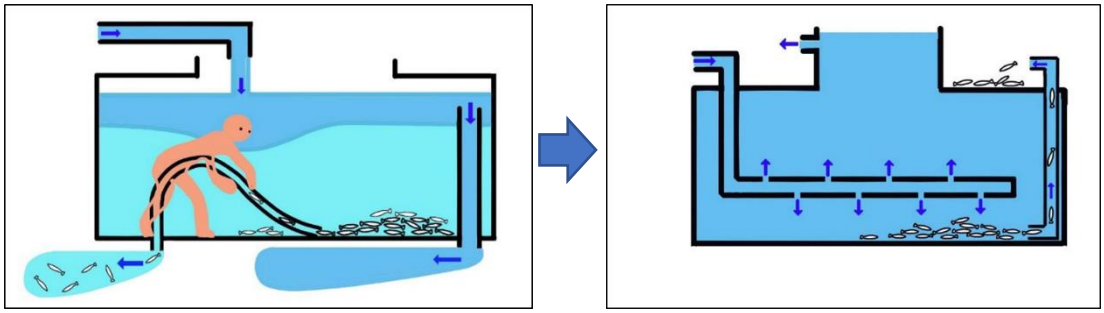


Figure 5.1.2 Concept of the current normal live bait tank and the modified tank

Concept of the current and the modified live bait tanks; Normal tank (left): Water intake and drain are done from the surface. Dead baits are removed by a diver. Modified tank (right): Water flows in through an immerged tube and is drained out from both the bottom and the surface. Dead bait is removed automatically.

Table 5.1.1 The Pilot Project PDM (PP.1)

Project title: Technical development and verification of live bait catch and holding for improving their survival rate

Project Area: Maradhoo, Addu Atoll

Project period: May 2015 – March 2017

Target group: Pole-and-line fishing boats based on Addu Atoll

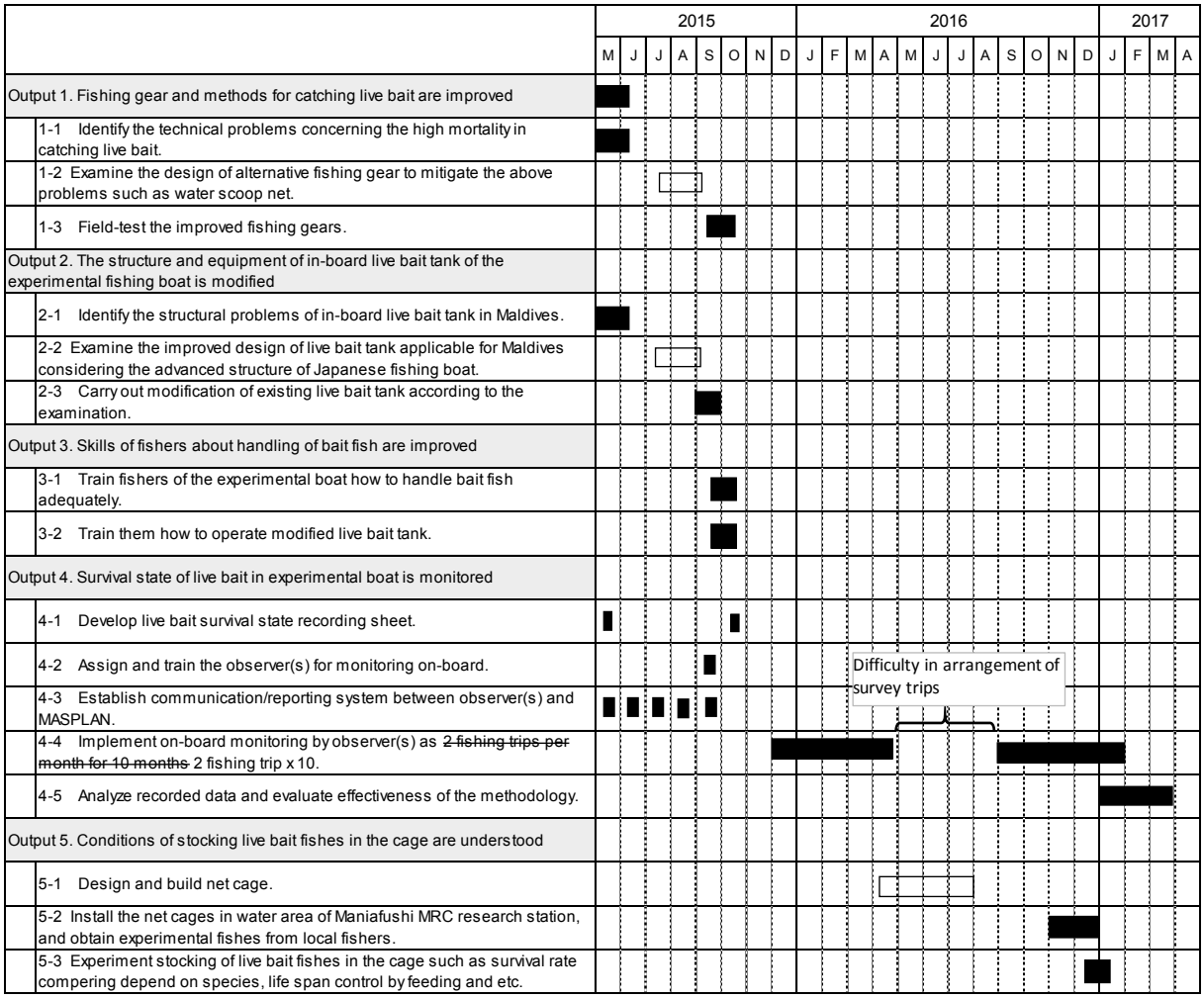
Date : October 5, 2016

Version: 4.1

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal The methods developed are extended among fishers particularly for those of pole-and-line fishery.	A new project for extension of the improved methods is started.	MoFA annual report	
Project Purpose Methods to improve live bait survival rate in the in-board tank are developed.	Survival duration of live bait in the in-board tank is prolonged by two times comparing to the current status.	Report of the pilot project of MASPLAN	Boat's equipment are maintained suitably by crews and Horizon Fisheries.
Outputs 1. Fishing gear and methods for catching live bait are improved 2. The structure and equipment of in-board live bait tank of the experimental fishing boat are modified 3. Skills of fishers about handling of bait fish are improved 4. Survival status of live bait in experimental boat is monitored 5. Conditions of stocking live bait fishes in the cage are recognized.	1. By October 2015, improved fishing gear such as water scoop net is assembled 2. By October 2015, modified live bait tank is installed in the experimental boat(s). 3. By October 2015, on-board training to fishers is completed. 4. By ~~September 2016~~ March 2017, study report for the monitoring is published. 5. By March 2017, study report is published.	Progress report of the project	Experimental boat(s) for joining to the pilot-project will be available free of charge as to be collaboration with them.

Activities	Inputs	
1-1 Identify the technical problems concerning the high mortality in catching live bait. 1-2 Examine the design of alternative fishing gear such as water scoop net to mitigate the above problems. 1-3 Field-test the improved fishing gears. 2-1 Identify the structural problems of in-board live bait tank in Maldives. 2-2 Examine the improved design of live bait tank applicable to Maldives considering the advanced structure of Japanese fishing boat into consideration. 2-3 Carry out modification of existing live bait tank according to the examination. 3-1 Train fishers of the experimental boat how to handle bait fish adequately. 3-2 Train them how to operate modified live bait tank. 4-1 Develop live bait survival status recording sheet. 4-2 Assign and train the observer(s) for monitoring on-board. 4-3 Establish communication/reporting system between observer(s) and MASPLAN. 4-4 Implement on-board monitoring by observer(s) in ~~2 fishing trips per month for 10 months~~2 fishing trip ~~x 10.~~ 4-5 Analyse recorded data and evaluate effectiveness of the methodology. 5-1 Design and build net cage. 5-2 Install the net cages in water area of Maniafushi MRC research station, and obtain experimental fishes from local fishers. 5-3 Experiment stocking of live bait fishes in the cage such as survival rate comparison depending on species, life span control by feeding and etc.	***Japan*** Personnel a. Fishing technology expert ~~(4 M/M)~~ (5 M/M) b. Fisheries resources management expert (2 M/M) c. External monitoring observers and researchers (MNU) Equipment and others a. Cost for modifying fishing gear and live bait tank of the experimental boat(s) b. Monitoring cost for the above c. Cost for net cage and feeds ***Maldives*** Personal a. MRC researchers b. Observation staff for experimental stocking of live bait fishes in cage at Maniafushi MRC research station. Others a. Necessary budget regarding activities of MRC researchers ***Project Cost*** a. Equipment/ fishing gears USD 2,000- b. Live bait tank modification USD 4,000- c. Monitoring survey USD 12,000- d. Live bait cage USD 10,000- <Total: USD 28,000- >	Monitoring crew and observer are arranged sustainably. Researcher form MRC is constantly assigned.

Table 5.1.2 Implementing time schedule of PP.1: Technical development and verification of live bait catch and holding for improving their survival rate



5.1.2 Results

(1) Achievement of the project purpose

The purpose of PP1 was set as “Methods to improve the live bait survival rate in the tank on-board the vessel are developed”, and the objectively verifiable indicator was “The survival duration of live bait in the tank on-board is doubled as compared to the current situation”. Nevertheless, satisfactory results relating to this indicator have not been clearly obtained, which is possibly due to issues in the research method, and not linked to the new technology itself. In PP1, the research on the live bait survival rate was conducted during the actual operation of the fishing vessel, taking various elements into consideration. However, it was difficult for the fishers of the vessel to fully understand the research method during the actual fishing operation, and insufficient data to assess the survival rate qualitatively was collected. In particular, in the case of the conventional live bait tank (control tank), it was very difficult to collect the dead bait accurately during the fishing operation, resulting in a significant underestimation of the figures.

However, although the results were not fully accurate, it is considered that the survival rate in the modified live bait tank was generally higher than that in the control tank. In general terms, the modified tank was more effective; the environment such as turbidity and turbulence of the water was obviously better than in the control tank, and the bait fish, unstressed, remained grouped in a school. Furthermore, according to fishers' opinion, the bait fish was more being alive as compared to the control tank, even if it was stocked longer. Although it was not possible to evaluate quantitatively the effects as expected, the evaluation from the fishers who actually used the modified live bait tank was excellent.

The following describes summarized results of the activities of the pilot project. A detailed description is presented in the document "Field technical report of the Pilot Project 1" of the Separate Volume, dealing with details on the newly introduced technologies, and the document "Monitoring survey report for Pilot Project 1", dealing with results and conclusions of the monitoring survey.

(2) Outputs

1) Output 1: Fishing gear and methods for catching live bait are improved

The "water scoop net" was designed based on the results of the preliminary survey conducted in May 2015, and 3 trial water scoop nets (40cm in diameter x 2, 60cm x 2) were manufactured in September 2015. The water scoop net was subsequently modified based on the opinions and demands of on-board fishers (Fig 5.1.3). According to the fishers of the boat, serious damage is normally experienced by bait fish during the transfer to the bait tank; it was reduced drastically thanks to this water scoop net as it improves fish handling and was therefore thought highly functional. Since it is difficult to obtain actual data on fishing operation, the results rely on fishers' opinions, which indicate that the mortality of baitfish that occurred during its transfer from the fishing net to the bait tank drastically decreased.

Figure 5.1.3 Water scoop net operating on board of PP experimental boat

2) Output 2: The structure and equipment of in-board live bait tank of the experimental fishing boat is modified

The modification plan of the bait tank was designed following the results of the preliminary survey implemented to assess the original design of the local bait tank in May 2015. The bait tank modification of Raskuri, PP experimental boat was implemented at Malladu, Addu Atoll in September 2015 (Fig 5.1.4). Subsequently, a technical problem in the automatic dead bait discharging system was encountered and extra modification work to solve this issue was done in October 2016.

Figure 5.1.4 Modified bait tank (center), Original tank (right)

3) Output 3: Skills of fishers about handling of bait fish are improved

The on-board training program including the methodology to be used in the modified bait tank and the water scoop net, targeting the crew of PP experimental boat, was carried out in September and October 2015. In particular, the skills of the captain and some senior crew members improved significantly, with a good understanding of the purposes and mechanism of those modifications. However, training for common fishers will be needed when disseminating the equipment and techniques in the future. Since Maldives' fishers have high capability to adopt the new technologies, it may be possible to carry out the required training in port, and not at sea, and reach the expected effectiveness.

4) Output 4: Survival status of live bait in experimental boat is monitored

The monitoring survey of the experimental boat has been carried out with the support of the MNU research team. The outline of implementation of the monitoring survey is shown in the next table.

Table 5.1.3 Outline of the monitoring survey of PP.1

No. of fishing trip	Day of monitoring	Species of caught bait fish	Remark
1	2015 Dec 4	Silver sprat（100%）	Data flawed
	Dec 6	Silver sprat（100%）	Data flawed
2	2016 Jan 2	Cardinal fishes (*Apogonidae*)（100%）	
	Jan 3	Cardinal fishes（90%）、S. sprat（10%）	
3	Feb 1	Cardinal fishes（100%）	
4	Feb 27	Cardinal fishes（100%）	
5	Apr 17	Cardinal fishes（100%）	
	Apr 19	Cardinal fishes（100%）	

6	Sep 22	Cardinal fishes（80%）、S. sprat（20%）	Automatic dead bait discharging system re-modified
	Sep 29	S sprat（100%）	
7	Nov 21	Cardinal fishes（95%）、S. sprat（5%）	Data flawed
	Nov 22	Cardinal fishes（98%）、S. sprat（2%）	Data flawed
	Nov 23	Cardinal fishes（80%）、S. sprat（15%） Blue sprat (5%)	Data flawed
8	2017 Jan 14	Cardinal fishes（100%）	
9	Jan 16	Cardinal fishes（100%）	
10	Jan 25	Not clear	Data flawed
	Total: 16 operations		

By January 2017, 16 monitoring surveys have been undertaken, out of the target of 20 as described in the PDM; the data of 2 monitoring surveys in December 2015, that of 3 monitoring in November 2016 and 1 monitoring in January 2017 were not useable for analysis due to errors during on-board sampling by observer and/or unsuitable conditions.

Since additional modification work to improve the dead bait fish discharging system was completed, the crew members did not have to use a scoop net anymore to clean away dead bait fish from the bait tank, which can reduce stress of the bait fish in the tank.

The figure (Fig 5.1.5, 5.1.6) shows the results of the monitoring survey from January 2016 to January 2017. The vertical axis and the horizontal axis indicate the survival rate of bait fish in the tank and the duration, respectively. The blue lines shows result of the modified tank and the red lines the control tank, respectively; both lines indicate the survival rate variation.

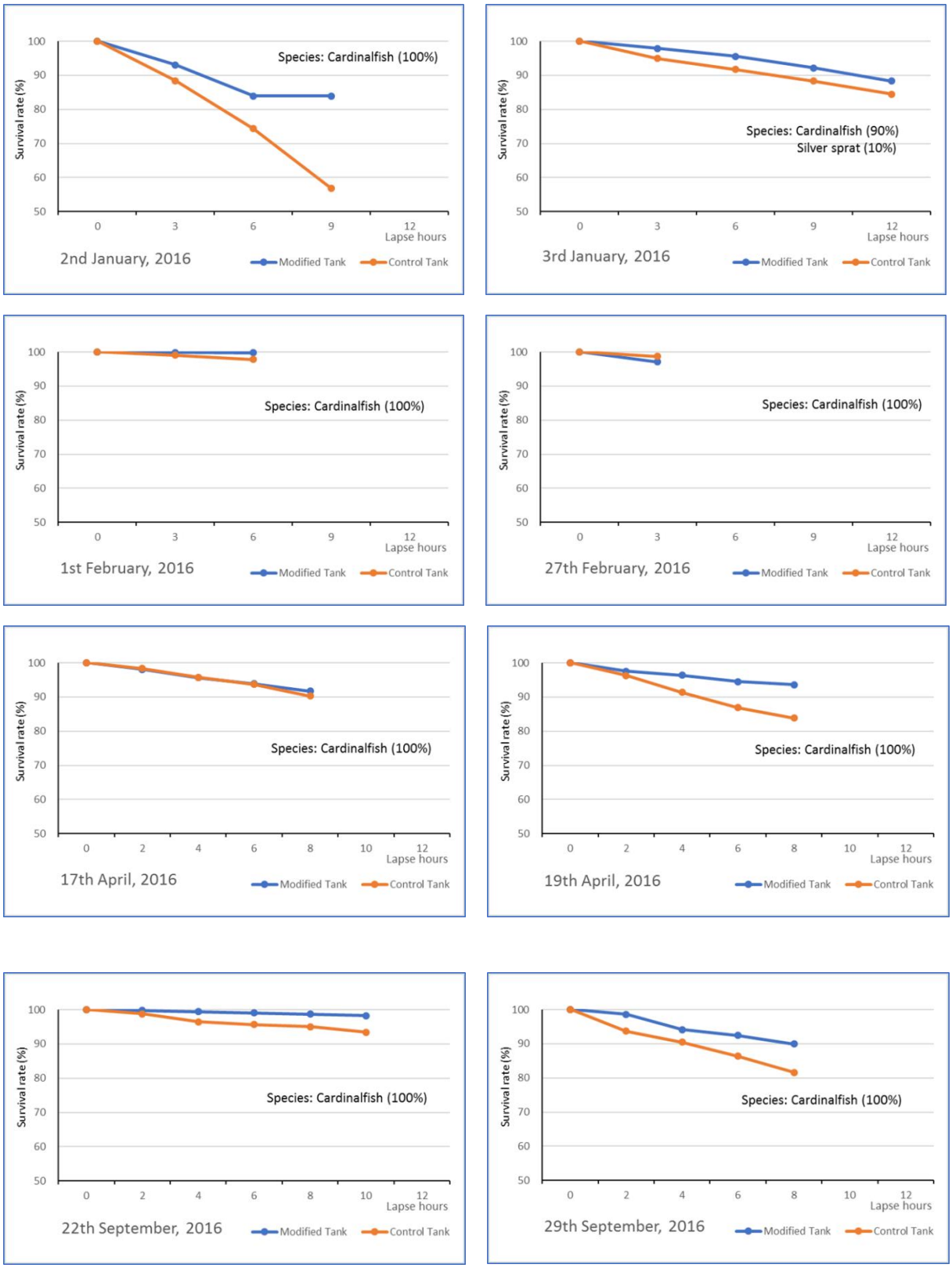


Figure 5.1.5 Comparison of the results of the live bait survival rate in a modified and a control tank (January – September 2016)

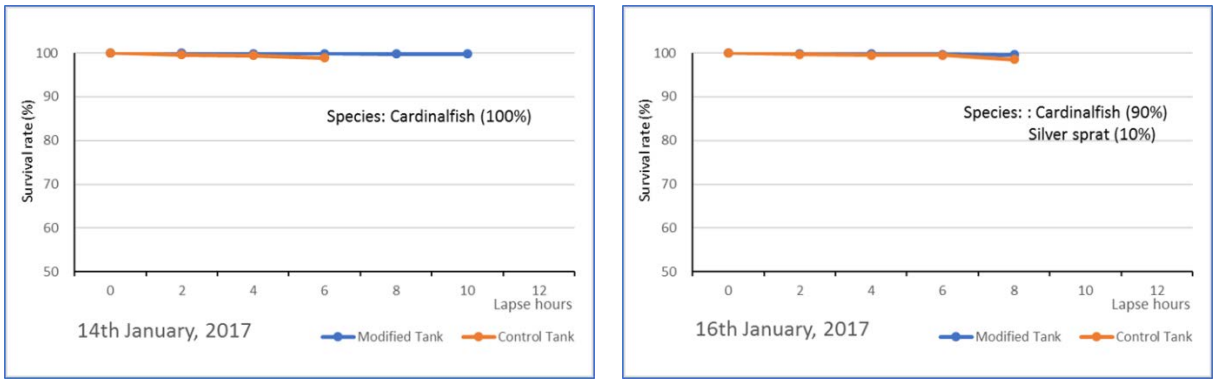


Figure 5.1.6 Results of the live baits survival rate compered between modified and control tank (January 2017)

The modified tank may show a better survival rate than the control tank, though this is not very clearly indicated in the results.

However, there were some results that showed very little difference between the survival rate of modified tank and control tank. The reasons for this phenomenon may be related to the following:

A) The amount of bait fish stocked (density of fish) into the two tanks was not the same. Especially, fishers preferred the use of improved bait fish tank, so it often received higher density of bait fish.

B) The weighing of dead bait fish in the control tank was not done accurately. The control tank needs to scoop up the dead baits accumulated at the bottom with scoop net, but due to the movement of the vessel arisen by waves they floated inside the tank or were discharged from the drain outlet to the outside of the tank. Hence it was not possible to collect all the dead baits. For this reason, the amount of dead bait reported in the control tank is considered to be significantly underestimated. This problem shows the difficulty in conducting a survey in actual fishing operation. In other words, it was difficult for fishers to follow the experiment procedure duly. This survey was aimed at assessing the change in survival rate taking into consideration various conditions in actual fishing operation; however, it failed to take into consideration other factors that biased the results.

The technical reports on the pilot project were submitted in March 2017 as per the respective indicator of PDM.

5) Output 5: Conditions of stocking live bait fishes in the cage are recognized

In September 2016, an experimental bait cage was set up near the shore of Maniafushi island, South Malé Atoll (Fig 5.1.7). MRC members, in consultation with the JICA fishing technology expert, initiated the experimental activities with baitfish procured from local fishers.


Figure 5.1.7　Setting up the experimental bait fish cage

The first bait fish stocking to the cage took place on December 10, 2016. The fish species stocked was cardinal fish and about 100 kg was stocked into one cage. Juvenile of yellowtail (*Seriola quinqueradiata*) was fed immediately after the bait fishes were stocked. However, the bait fishes did not seem to eat the feed and gradually died. Finally, its mortality was 100% after 10 days. The dead bait fishes were to be collected by a diver with a hand scoop net to measure their weight; however, it was very difficult to collect all the dead bait fishes inside the cage because of the cage design, and quantitative data could not be obtained.

Since then, experiment on stocking bait fishes has been planned repeatedly until March 2017, but because the fishers refused to sell their fish or asked an exorbitant price for it as there was little bait fish to be caught in the fishing ground, bait fishes have not been procured. In other words, since the experiment was not substantially implemented, the indicator shown in the PDM "By March 2017, study report is published" was not achieved. However, MoFA/ MRC still plans to continue the experiment.

To do so it is necessary to overcome the following two issues 1) remodel the cage so that the dead bait fish can be collected from the outside of the cage, making an inclination and an opening for discharging dead bait fish to the bottom of the cage and 2) experiments need to be conducted in a season when procurement of bait fishes easy.

5.1.3　Conclusions and relations to the priority projects

(1) Conclusions

Although the initial expected outcome was generally confirmed in PP1, there was a limitation in data monitoring on improvement of bait fish survival rate on the fishing vessels in operation encountered. The following points can be pointed out as main problems linked to the research methodology.

A) It was difficult to estimate accurately the amount of dead bait fish in the control tank (conventional

type).

B) Sometimes it was difficult to stock bait fish in both the improved and the control tank under the same conditions.

In order to solve these issues and obtain quantitative data on the survival rate, it is necessary to carry out research on a fishing boat chartered for this very purpose of monitoring survey, in order not to hinder the actual fishing operation.

This activity was implemented by a joint research framework between the Maldives National University (MNU) and MASPLAN and the costs for technical guidance, modification of bait fish tank and monitoring survey were supported by JICA; dispatch of observers, implementation of the monitoring and compilation of the reports were carried out by MNU. The MNU survey team cooperated with good will, but insufficient human resources were made available for the monitoring survey and the implementation of the monitoring survey was sometimes delayed, due for example to shortcomings in the dispatch of observers. In addition, feedback was insufficient from the observers on board, and it was also difficult for the MNU team to accurately address this problem. For this reason, various problems were exposed in the process of analyzing the obtained data, and Alternative measures to mitigate these issues were not proposed within an appropriate timing.

On the other hand, it is quite useful to carry out this kind of experiment during actual fishing operations. By using new technology in actual fishing operation, qualitative effect of the technology and points that needs to be improved was clarified. The introduced technology is for fishers to use in the future, therefore their opinion is to be taken into account in the evaluation criteria. From interviews to fishers of the boat at the end of the monitoring survey, it came out that improved live bait tank, water scoop net and fishing net shape retention ring had a significant effect on improving the survival rate and period of bait fish, and It is widely thought that those technologies could be widely adapted to pole-and-line fishing vessels in Maldives. On the other hand, some observations came up from the actual fishing operation, e.g. the small size of the tank hatch and the need to add an aeration system in the future, it is recommended to continue the field trials to evaluate quantitatively the improvement of the survival rate.

(2) Relations to the priority project

As a result of the pilot project, the following project was proposed as priority project in the SFDPIS.

Project Title in SFDPIS: **OF 4. Extension of improved live bait stocking system in pole-and-line fishery**

This project proposed in the SFDPIS aims to disseminate new technologies widely in Maldives to improve the survival rate and period of caught bait fish, which was verified by PP1. Especially effective resources use and economic effect are expected from the dissemination of the improved live bait tank, water scoop net and fishing net shape retention ring. Improvement of the survival rate of the live bait

fishes after catching and stocking into the tank will reduce the number of dead bait fish which could not be used before fishing, leading to more efficient resource utilization. Conversely, it will alleviate wasteful use of resources and contribute to the sustainable use of fishery resources. The extension of the survival period will also lead to reduction in the number of round trips between fishing grounds of bait fishes and the pole-and-line fishing grounds, therefore allowing for more fishing time, and reduction of the fuel expenses will be helpful for better profit. It is desirable to promptly start the extension activity of this introduced technology starting from Addu Atoll where PP1 was implemented.

The purpose of the priority project is "Modified live bait tank associated with improved bait handling methods are extended among pole-and-line fishing vessels" with the following two outputs: "1. Results of the PP1 regarding proper management of live bait fish are disseminated for boat owners/investors" and "2. Fishers acquire practical techniques on live bait fish handling and operation of improved in-board bait fish tank". Educational and awareness program on introduced technologies and technical training for fishers will be designed and implemented. This project is aimed at disseminating the new technologies widely within Maldives to improve the survival rate and period of live baits, as verified in PP1. It is desirable for the new project be undertaken at Addu Atoll. While the area around Addu Atoll is a good fishing ground for skipjack tuna, very limited fishing grounds for bait fishes are available since the reef area is very narrow there, therefore pole-and-line fishing vessels have to catch the bait fish at Gaafu Dhaalu Atoll or other areas.

In addition, a carpenter in Addu Atoll was trained by JICA consultants to modify the bait fish tank. In the future, the modification work for bait fish tank can be done for fishers who want in Addu Atoll only, with the involvement of this carpenter. MoFA's extension officers (staff trained by JICA consultants) will train fishers on how to use the modified bait tank.

Addu Atoll has been a pioneering region for pole-and-line fishery. The introduction of a new technology in Maldives was always done by fishers of Addu Atoll, subsequently spreading successfully to other areas. Therefore, the project intends to develop dissemination activities intensively in Addu Atoll.

5.2 PP-2. Technical development of tuna hand line on-board handling for fish quality improvement

5.2.1 Outline

(1) Background

YFT hand line fishery has become an important fishery in Maldives' fisheries sector and the Indian Ocean Tuna Commission (IOTC) has taken strict fisheries management measure as the resources level of yellowfin tuna in the Indian Ocean is overfished, with no possibility to increase catches. On the other hand, the prices of yellowfin tuna are still low compared with the expected prices based on the international market. The proportion of high grade fish to sale as Sashimi is low. There is a high demand

for value addition for sustainable development of yellowfin tuna fishery without depending on the catch increase.

Since the handling method on board is insufficient, the fish quality is low and the selling price to the international markets also remains low. For this reason, the Oceanic fisheries working group decided to implement a pilot project on the development of on-board fish quality management technology (PP2).

(2) Outline of the project

The PDM, outline of the pilot project is shown in Table 5.2.1. The project title is "Technical development of tuna hand line on-board handling for fish quality improvement". Target group of the project are ENSIS Fisheries of North Malé Atoll and the yellowfin tuna hand line fishing vessel "Nabeela" belonging to ENSIS Fisheries (Fig 5.2.1). The main activities are the installation of fishing gears/equipment for quality control, the improvement of on-board handling and the modification of cooling method.

Figure 5.2.1 Fishing boat Nabeela for PP.2 monitoring survey

PP2 started in May 2015 with an on-board survey to identify technical problems. Installation of a tuna electric shocker and a modified cooler box to the survey vessel was done in October 2015. The PP adopted the Japanese "Irabu method" for Yake prevention as a quality improvement technique to avoid Yake (refer to "Box"). The implementation time schedule is shown in Table 5.2.2.

PP2 was carried out jointly with the Post-Harvest and Value Addition Sub-sector.

Table 5.2.1 The Pilot Project PDM (PP.2)

Project Name: Technical development of tuna hand line on-board handling for fish quality improvement

Project period: May 2015 – March 2017

Date : November 2, 2016

Project Area: North Malé Atoll/ Whole country

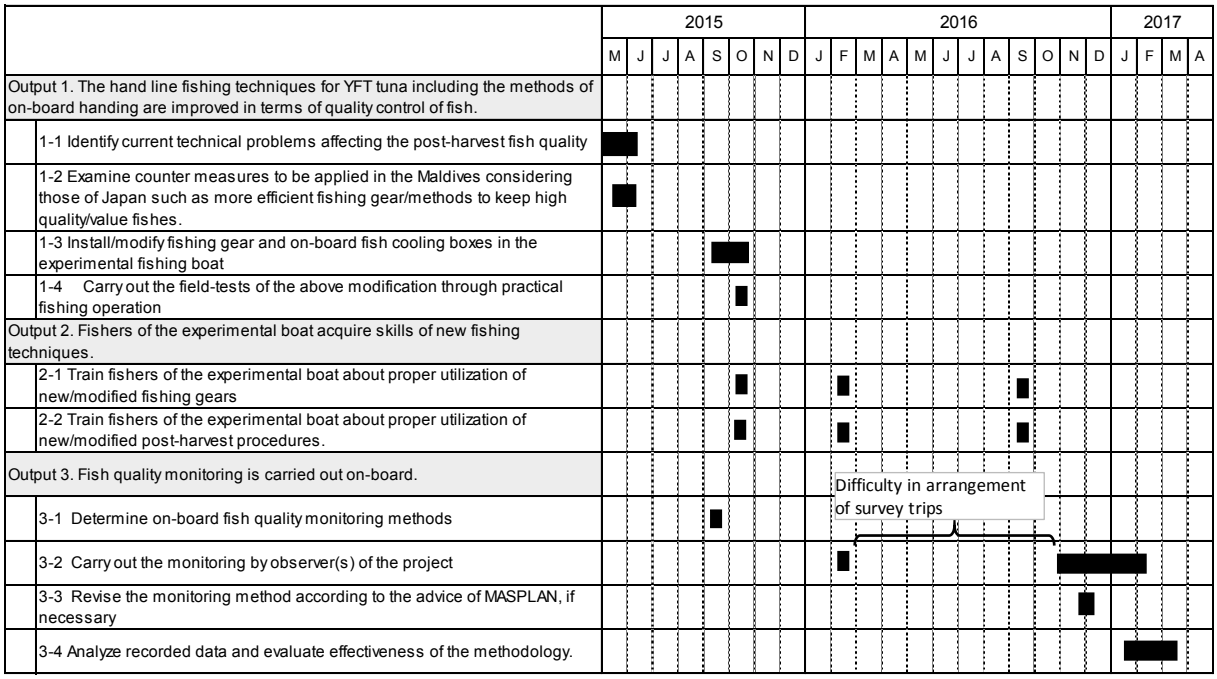
Target group: ENSIS fisheries/ Tuna hand line fishing vessels belong to ENSIS

Version: 4.0

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal The developed techniques and methods are extended among hand line fishing vessels.	The new project for extension of the developed techniques and methods starts (Project OF-9).	MoFA annual report	
Project Purpose Quality of YFT is improved through development of fishing techniques and methods for on-board handling.	The rate of A-grade YFT is increased in the survey fishing vessel(s).	ENSIS fisheries' purchase records.	Vessels and relevant equipment are maintained properly.
Outputs 1. The hand line fishing techniques for YFT including on-board handing methods are improved in terms of the quality control of fish. 2. Fishers of the survey vessel acquire skills of the new fishing techniques. 3. Fish quality monitoring is carried out on-board.	1.1 By October 2015, new/modified fishing gear is installed to the survey vessel. 1.2 Field-tests are carried out by October 2015. 2. Fishers can operate new fishing techniques and also carry out post-harvest handling properly. 3. By ~~September 2016~~ March 2017, study report on the result of the monitoring is published.	The pilot-project report	Survey vessel(s) for joining to the pilot-project is available free of charge in collaboration with ENSIS.
Activities 1-1 Identify current technical problems affecting post-harvest fish quality 1-2 Examine countermeasures to be applied in Maldives considering those of Japan such as more efficient fishing gears/methods to keep high quality/value fishes. 1-3 Install/modify fishing gears and on-board fish cooling boxes in the survey fishing vessel 1-4 Carry out field-tests on the above installation/modification through the practical fishing operation	**Inputs** ***Japan*** Personnel a. Fishing technical expert (~~4 M/M~~5M/M) b. Fisheries resources management expert (2 M/M) c. External monitoring observers and researchers (MNU)		Monitoring observers are assigned continuously.

2-1 Train fishers of the survey vessel about proper utilization of the new/modified fishing gears 2-2 Train fishers of the survey vessel about proper utilization of the new/modified post-harvest handling. 3-1 Determine on-board fish quality monitoring methods 3-2 Carry out the monitoring by observer(s) of the project 3-3 Revise the monitoring method according to the advice of MASPLAN, if necessary 3-4 Analyze recorded data and evaluate effectiveness of the methodology.	Equipment and others a. Cost for necessary equipment (fishing gear, insulation box, etc.) and its installation to the survey vessel b. Monitoring cost ***Maldives*** Personnel a. MoFA Fisheries training, extension and promotion section b. MRC researcher(s) c. Staff of ENSIS in charge of technical supports and communication with MoFA/MRC Others a. Necessary cost regarding the activities of MRC researchers ***Project Cost*** a. Electric shocker USD 11,000- b. Cooler box USD 12,000- c. Torry meter USD 4,000- d. Other equipment USD 1,000- e. Monitoring survey USD 4,000- <Total: USD 32,000- >	

Table 5.2.2 Implementing time schedule of PP.2: Technical development of tuna hand line on-board handling for fish quality improvement



5.2.2 Results

(1) Achievement of the project purpose

The project purpose of PP.2 is to “Improve Quality of yellowfin tuna through development of fishing techniques and methods of on-board handling.”, and its objectively verifiable indicator is “The rate of A-grade yellowfin tuna increases in the survey fishing vessel(s)”. According to the results of PP.2, it was assessed that the grade of fish quality handled by the introduced “Irabu method” for Yake prevention was higher than that treated by the conventional method (control). In all observations, the conventional method included low-grade fishes of C grade and R (rejected), while Irabu method did not include any C and R grade, but included middle to upper grades A, B+ and B only. Hence, it is clear that the Irabu method is effective in improving the quality of the fish catches as expected. However, the percentage of A grade fish was only slightly increased compared with the conventional method, and the highest A+ grade was not observed at all.

In addition, as there was no difference in the grade composition of the fish catches depending on whether tuna electric shocker was used or not, the effect of the shocker on the quality improvement could not be verified.

The following describes outline results of the activities relevant to each output mentioned in the PDM. Detailed descriptions are presented in the “Field technical report of the Pilot Project 2” in the Separate Volume for details on the newly introduced technology such as “Irabu Yake” prevention method etc.,

and “Monitoring survey report for Pilot Project 2” for results and conclusions of the monitoring survey implemented by the joint research team collaborated with MNU.

(2) Outputs

1) Output 1: The hand line fishing techniques for yellowfin tuna including the methods of on-board handling are improved in terms of quality control of fish.

As per the results of the interview survey to yellowfin tuna processing and exporting company in May 2015, the main cause of the low quality of yellowfin tuna in Maldives is “Yake” meat (Fig 5.2.2). Yake meat arises from; 1) high central body temperature due to heavy stress during the catching process and 2) insufficient cooling method on board. To address this issue, the Project decided to introduce a “tuna electric shocker” and a “highly effective cooler box”. These equipment were installed on the survey vessel in September-October 2015, and it was verified that the cooler box placed on the deck kept ice for a longer period. Moreover, to increase the effectiveness of cooling, the “Irabu Yake prevention method” was introduced as well (refer to the following box). The trial fishing operation to verify Yake prevention with this method was implemented on board “Magulas”, the PP survey vessel belonging to ENSIS Fisheries, in October 2015.

Figure 5.2.2 Normal meat of YFT in good condition (left) and Yake meat (right)

Box: The "Irabu method" for Yake prevention

Yake is a phenomenon of deteriorating tuna meat (it looks like burnt meat), which appears when the inner body temperature of tuna elevates a lot after strenuous movements made during the catch. It happens frequently in high water temperature areas. The problem of Yake has been a critical issue for long in Maldives since fish with Yake commands very low prices or is even rejected by the processing companies.

The same problem occurs in Okinawa, Japan, under similar sea and environment conditions; there, the Irabu Fisheries Cooperative Association developed a Yake prevention method named the "Irabu method". This method is quite unique as compared to the traditional one: the fish is not killed after it is caught and is directly put into cold water so that the inner body temperature of the fish cools down through natural gill respiration and blood circulation. The Okinawa Fisheries Research Center verified the effectiveness of "Irabu method", as documented in publications in 2002.

2) Output 2: Fishers of the survey vessel acquire skills on new fishing techniques

The training in the use of tuna electric shocker and the Irabu Yake prevention method were implemented in October 2015 and February 2016 to the fishers of the survey vessel "Magulas" (Fig 5.2.3). Simultaneously, the expert on fishing technology delivered technical guidance to the observer of the MNU monitoring team and MoFA.

However, even though the learning process for the monitoring had been achieved, it came out that the vessel was not capable to fish constantly and catch the required number of fish. Upon consensus with ENSIS Fisheries, the project decided to change the survey vessel, and subsequently "Nabeela" was allocated by ENSIS as the substitute vessel. The necessary training for fishers of Nabeela as well as the transfer of the equipment from Magulas to Nabeela was carried out in September 2016.

Figure 5.2.3 Training on use of tuna electric shocker for crews of the vessel

MoFA would need to disseminate the developed technologies, however, it is difficult to implement on-board training on a continuous basis as it requires intense efforts in terms of labor and time management. Therefore, training on "Irabu method" without use of electric shocker should be included in any training program carried out on the land.

3) Output 3: Fish quality monitoring is carried out on board

The monitoring survey on the survey vessel was carried out with the support of the MNU research team. There was a severe delay in PP.2 time schedule due to the aforementioned issue. In addition, the monitoring using "Irabu method" was not introduced on board Nabeela as of September 2016 as the training for the fishers was given priority.

In November 2016, the actual first data collection within PP.2 was carried out under the leadership of Mr. Morimitsu, fishing technology expert. The results of this monitoring survey are shown in Table 5.2.3 and Fig 5.2.4 hereafter. The results on grading of fish quality (in percentages) were compared between (a) conventional method and iced seawater chilling (immediate killing, gutting/ bleeding and cooling of fish) and (b) Irabu method. Grading of fish was done by a fish quality grader of ENSIS Fisheries at the fish landing site of Hulhumalé Island.

Table 5.2.3 Grading results of YFT (numbers of fish caught by the survey vessel)

		Grading Category					
		A+	A	B+	B	C	R
Irabu	Nov 2016		3	3	2		
	Dec 2016			2	11		
	Jan 2017		5	3	7		
	Feb 2017		1	2	2		
	total	0	9	10	22	0	0
Control	Nov 2016		8	3	13	5	5
	Dec 2016	2	7	6	19	14	9
	Jan 2017		3	0	23	1	9
	Feb 2017		5	1	5	2	1
	total	2	23	10	60	22	24

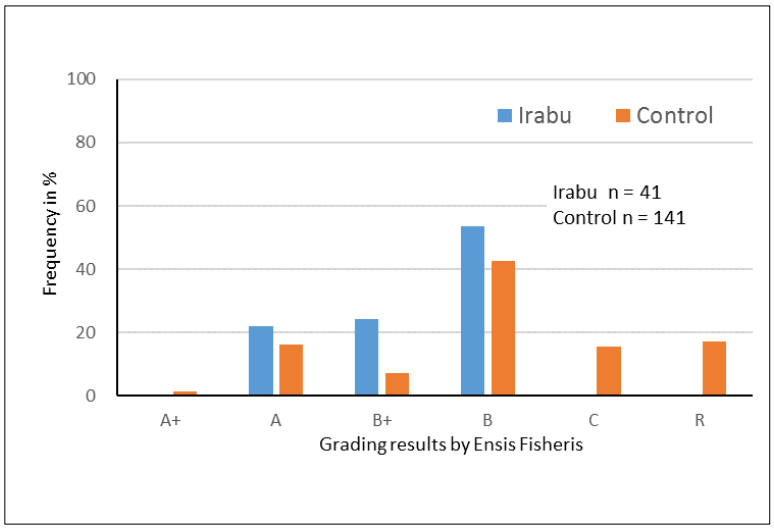


Figure 5.2.4 Grading results of YFT caught by the survey vessel

(Data combined for all four monitoring results from Nov 2016 till Feb 2017)

The monitoring survey was conducted four times from November 2016 to February 2017. The number of yellowfin tuna samples obtained through all the surveys was 141 individuals by the conventional on-board handling method and 41 individuals by Irabu method. All grading results are summarized in the above graph. The horizontal axis of the figure shows six grades from A+ to R (reject), and the

vertical axis shows the proportion of number of the fish catches in each grade by both treatment methods.

All grades from A+ to R were encountered with the conventional method, especially B which showed a high ratio. However, A+ was only a very small percentage. On the other hand, in Irabu method, there were only three grades, A, B +, B, the proportion of B was highest, and A/B+ were half of B. This clearly shows that, in the conventional method, the low grades C and R were sampled in high proportion, whereas in Irabu method, those lower grade fish were not presented and only B or higher grade fish was encountered. It can therefore be assessed that Irabu method is effective in improving the quality of the fish caught compared to the conventional method.

A as mentioned above, the indicator of PP2 is "the rate of A grade is increased". However, the proportion of A grade by Irabu method was slightly higher than in the conventional method, and the highest A+ grade was not encountered at all. Although the effect of the Irabu method was clearly confirmed, it is a fact that the objectively verifiable indicator of the project purpose has not been achieved yet. It is desirable to continue the study in the future and to develop more effective yellowfin tuna on-board handling method.

The study reports on the monitoring of PP2 were submitted in March 2017 as stipulated in the indicator of the PDM.

5.2.3 Conclusions and relations to the priority projects

(1) Conclusions

PP2 was able to generally achieve the outputs that were originally expected. It proved that Irabu method is effective in improving quality of the fish caught compared with the conventional method; the improved cooler box was found to be more effective for long-term cold storage of the fish caught than the conventional type. However, the proportion of A grade with the highest export value and used as the indicator of PP2 was not as high as expected compared with the conventional method. In addition, the highest A+ grade was not observed in the samples treated by Irabu method. ENSIS fisheries participated in PP2, has been supporting the Oceanic Fisheries SSWG and Postharvest and Value addition SSWGs mainly and is seeking to increase the proportion of A+ grade to supply the Sashimi product, which is an overall goal of tuna fishery industry in Maldives. Additional and continuous researches and studies aiming at further development of quality improvement technology are necessary.

The tuna electric shocker that was expected to be effective in the quality improvement along with the improved cooler box did not show obvious effects in the survey and it cannot be concluded that using electric shocker yields better quality fish when comparing the grade distribution of the fish caught with the conventional treatment method. In addition, problems were encountered with the tuna electric shocker such as insufficient length of the electrode cable and the energization time. As a result, it deemed

difficult to use it in the actual fishing operation and therefore was not used in the latter part of PP2.

Although the pilot project ended, it is recommended that MoFA continues to conduct researches and studies to increase the proportion of A grade fish. In parallel with this, the project proposed in the SFDPIS mentioned above should be started to promote the technology on Irabu method and improved cooler boxes. In addition, in order to motivate fishers to improve their fish quality, the Government and the fish processing/exporting companies need to continue their efforts to resolve the issue of the purchase price determination.

(2) Relations to the priority projects

Based on the pilot project, the following project was proposed as a priority project in the SFDPIS.

Project Name in SFDPIS: **PV 1 Extension of improved on-board handling techniques for tuna hand line fishery**

This project is included in the SFDPIS in order to disseminate widely the technologies and equipment proven the effectiveness for improving the quality of yellowfin tuna through PP.2.

Irabu method does not require any special equipment and the improved cooler box can be produced locally, so they can be disseminated easily. If yellowfin tuna can be exported with high quality, its economic effect is expected to be very high. In addition, if the proportion of A grade (Sashimi grade) can be further increased, it is also possible to make a brand of Maldives yellowfin tuna with value added in the future.

The target is basically tuna fishing vessels and fishers throughout the country. However, since yellowfin tuna processing and exporting companies are concentrated around Malé, the activity will be carried out mainly for fishing vessels which call in Malé to sell fish catch and get supplies.

5.3 PP-3. Preliminary resource survey on availability of deep-sea resources

5.3.1 Outline

(1) Background

The fishery sector of Maldives is currently dependent on skipjack and other tuna species. Taking into consideration the recent declining tendency of skipjack tuna catch, the diversification of fisheries activities needs to be one of the future development scenarios. However, as of to date a survey on unutilized deep-sea fisheries resources has not yet been carried out systematically.

As for deep sea fisheries resources, demersal fin-fishes as well as the Diamondback squid (DBS) *Tysanoteuthis rhombus* are expected as a new target considering the results of foregoing resource surveys

in some coastal countries such as the South Pacific and Caribbean countries. In fact, there have been some reports about floating egg mass of DBS by researchers and fishers in Maldives.

This pilot project is formulated to discover those unutilized deep-sea resources.

(2) Outline of the project

The outline of the project is shown in the PDM in Table 5.3.1. The main activities were 1) collect basic information to prepare a detailed resource survey plan, 2) prepare fishing gear and equipment for the resource survey and 3) carry out the planned resource survey in the field. The expected available resources were bottom fin-fishes (e.g. deep-sea snappers and groupers) and DBS.

The project was carried out from October 2015 to March 2017 as shown in the implementing time schedule of Table 5.3.2. Vessels managed by MIFCO were used for the resource survey during the period from November 2016 to March 2017.

Table 5.3.1 The Pilot Project PDM (PP.3)

Project Name: Preliminary resource survey on availability of deep-sea resources	Project period: October 2015 – March 2017	Date: November 5, 2016
Project Area: Whole area of Maldives	Target group: Oceanic fishers/ potential investors	Version: 2.0

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal Development potential of unutilized fishery resources in Maldives is clarified.	Potential resources of deep-sea fish species, the fishing grounds and the stocks are identified by 2022.	Project paper/ MoFA annual report	
Project Purpose Availability of unutilized deep-sea fishery resources is suggested by the preliminary survey.	The final report of the survey is submitted by May 2017.	Progress report of MASPLAN/ Project report	
Outputs 1. Basic information for planning of the resource survey on unutilized deep-sea resource is obtained 2. Necessary fishing gear and equipment for the resource survey are prepared. 3. The distribution status of unutilized deep-sea fishery resources is recognized.	1. The report on the "Expected deep-sea fishery resources distribution (DBS)" is published by November 2016 2. Necessary gear and equipment are installed to the resource survey vessel by September 2016. 3. The report on the "unutilized deep-sea fishery resources survey" is completed by March 2017.	Project report	
Activities 1-1 Implement web-questionnaire survey for distribution of Diamondback squid (including sighting information of DBS egg mass) targeted at diving instructors and marine-biologists who work at resort hotels across the country 1-2 Implement detailed interview survey regarding distribution of deep-sea fishery resources to local fishers. (the target area is decided by result of "Activity 1-1") 1-3 Make report on the "Expected deep-sea fishery resources distribution (DBS)" 2-1 Plan necessary fishing gear and equipment for the resource survey. 2-2 Procure the fishing gear and equipment needed. 2-3 Install the fishing gear and equipment to the resource survey vessel. 3-1 Draw out the plan on the "unutilized deep-sea fishery resources survey" 3-2 Implement the resource survey regarding the fauna, habitats and distributional densities. 3-3 Make final report of the resource survey with collected data analysed.	**Inputs** ***Japan*** Personnel a. Fishing technology expert (2.67 M/M) b. Fisheries resources management expert (1M/M) c. Marine biological researcher (1 M/M) Equipment and others a. Necessary cost for interview survey b. Fishing gear and equipment for the resource survey ***Maldives*** Personal a. MoFA/MRC researchers for the survey ***Others*** a. Preparation of a resource survey vessel b. Any running costs for operation of the vessel c. Allowances for MoFA/MRC researchers and crews of the vessel ***Project Cost*** a. Equipment/ fishing gears: USD 10,000- b. Running cost: USD 2,500/ trip (6 days) x 4 trips = USD 10,000- (IF 6 trips = USD 15,000) <Total: USD 20,000 – 25,000 (excluding personnel expenses)>		

Table 5.3.2 Implementing time schedule of PP.3: Preliminary resource survey on availability of deep-sea resources

	2015								2016												2017			
	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A
Output 1. Basic information for planning of the resource survey on unutilized deep-sea resource is obtained																								
1-1 Implement web-questionnaire survey for distribution of Diamondback squid (including sighting information of DBS egg mass) targeted at diving instructors and marine-biologists who work at resort hotels across the country					■	■	■	■	■	■	■	■	■	■	■									
1-2 Implement detailed interview survey regarding distribution of deep-sea fishery resources to local fishers. (the target area is decided by result of "Activity 1-1")										■														
1-3 Make report on the "Expected deep-sea fishery resources distribution (DBS)"																■	■	■						
Output 2 Necessary fishing gear and equipment for the resource survey are prepared.																								
2-1 Plan necessary fishing gear and equipment for the resource survey.												■	■											
2-2 Procure the fishing gear and equipment needed.																■	■							
2-3 Install the fishing gear and equipment to the resource survey vessel.																	■		■			■		
Output 3. The distribution states of unutilized deep-sea fishery resources is recognized.																								
3-1 Draw out the plan on the " unutilized deep-sea fishery resources survey"																			■					
3-2 Implement the resource survey regarding the fauna, habitats and distributional densities.																			■			■		
3-3 Make final report of the resource survey with collected data analysed.																							■	■

5.3.2 Results

(1) Achievement of the Project Purpose

Although a technical accident happened to the hired survey vessel and basic fishing equipment was insufficient, both fishing trials on fin-fishes and DBS have achieved excellent results. The presence of a total of 14 demersal fish species with high commercial value, was confirmed and adult DBS were caught for the first time in Maldives. Detailed explanations are given hereafter.

(2) Achievement of Outputs

1) Output 1: Basic information for planning of the unutilized deep-sea fishery resources survey is obtained

In order to collect sighting information of DBS egg mass (Fig 5.3.1), a questionnaire survey targeting resorts was carried out by e-mail in November 2015. In addition, the same questionnaire form was posted on the Facebook page for marine biologists working in Maldives. Additionally, interview survey for fishers was conducted three times during February and March in 2016.

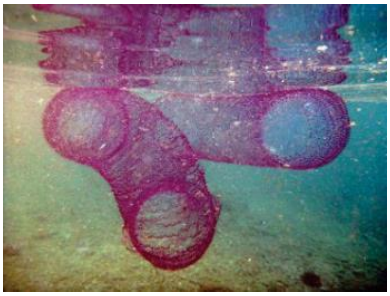


Figure 5.3.1 Egg mass of DBS

Source: Nimoho *et al*. (2004)

Results of the questionnaire survey indicated 41 cases of DBS egg mass sightings. Based on the collected information, monthly variation and locations of the sightings were analyzed considering

the seasonal wind direction and ocean current. Results of the analysis indicated a high possibility of DBS spawning in the coastal areas of Maldives from November to February; the spawning area is assumed to be around the whole country. The results of the analysis were presented in the technical report entitled “Expected deep-sea fishery resources distribution (DBS) in November 2016 “(see Additional Volume of MASPLAN).

2) Output 2: Necessary fishing gear and equipment for the resource survey are prepared

The necessary equipment for the deep-sea fishery resources survey such as bottom-set vertical longline (BVLL) for fin-fishes and reel-cartridge line-hauler and vertical drift lines for DBS was procured in Japan and transported to Maldives in September 2016. Upon arrival of the equipment, the fishing technology expert of MASPLAN (Mr. Fujii) supervised the installation of the line hauler onto the survey vessel, “Reendhoouraha” of MIFCO and completed the deployment. Thereafter he provided lectures on DBS and BVLL fisheries, and transferred technology on the rigging method of fishing gear to the captain and the crews of the vessel (Fig 5.3.2).

However, the vessel “Reendhoouraha” accidentally ran aground on 1st of November 2016 and her propeller, propeller shaft, the keel and the rudder holder were severely damaged. Several weeks were required for the repair works on the dry dock.

As a result of the accident above mentioned, an alternative vessel of the same type, the “Loabodu” (Fig 5.3.3), used by MoFA for FAD deployment, was allocated hastily for the experimental fishing in November 2016. The line hauler was transferred from the Reendhoouraha to the Loabodu, and technical training was done for the captain and crews of the Loabodu.

For the resource survey of February-March 2017, the repaired Reendhoouraha was used as a survey vessel after checking of the fishing gear, replacement of the line hauler and rigging of spare fishing gear on board. Thereafter, it was possible to conduct a series of activities according to the PDM.

Figure 5.3.2 A scene of DBS gear construction practice

Figure 5.3.3 The resource survey vessel “Loabodu”

3) Output 3: The distribution status of unutilized deep-sea fishery resources are recognized

＜Deep-sea fishery resources survey (demersal fishes)＞

The planned resource survey for demersal fishes was suspended in November 2016 because it appeared that the Loabodu was not equipped with an echo-sounder. The survey was carried out February-March 2017 by the Reendhoouraha, with an echo-sounder on board. However, since its monitoring range was limited to waters up to 100 m in depth, the survey points could not be identified by the echo-sounder, so the determination of the survey points was carried out only with the nautical charts and electronic charts, with limited accuracy.

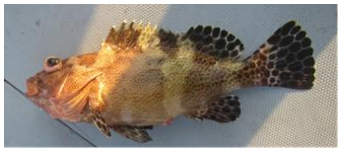
A total of 8 fishing operations were carried out at several banks in the deep-sea and reef edges, where the seabed is 150 - 400m in depth. Outline of the survey points from February 12, 2017 to March 1, 2017 and the number of fishes caught are shown in Table 5.3.3.

Table 5.3.3　Summary of deep-sea fishery resources survey

Date of operation	Time	Survey sea are		No. of catch
		Atoll	Coast	
12 Feb 2017	PM	North Malé	East	0
14 Feb 2017	AM/PM	South Malé	East	0
15 Feb 2017	PM	Alifu Alifu	North west	0
21 Feb 2017	PM	Haa Dhaalu (Maamakunudhoo)	South West	5
22 Feb 2017	PM	Raa	West	1
26 Feb 2017	PM	Meemu	East	3
28 Feb 2017	AM	Dhaalu	West	5
1 Mar 2017	PM	Alifu Dhaalu	South	5

Throughout the resource survey, a total of 19 fishes of 14 species with a high commercial value such as groupers and snappers were caught, as shown in Table 5.3.4.

Table 5.3.4 Deep-sea fish species caught by the resource survey

Species	Place of catch	Species	Place of catch
 Serranidae (not specified)	West reef edge of Maamakunudhoo (Haa Dhaalu) D: 300m	 *Lethrinus conchyliatus*	East of Veyvah, Meemu D: 200m
 *Epinephelus chlorostigma*	East of Vayah Meemu D: 200m 3NM SW of Hulhudheli, Dhaalu D: 300m	 *Lethrinus microdon*	East of Dhuvaafaru reef in Raa D: 200m
 *Epinephelus miliaris*	South of Fenfushi, Alifu Dhaalu D: 300m	 *Etelis carbunculus* or *E. coruscans*	3NM SW of Hulhudheli, Dhaalu D: 300m
 *Epinephelus areolatus*	South of Fenfushi, Alifu Dhaalu D: 300m	 *Macolor macularis* or *M. niger*	West reef edge of Maamakunudhoo (Haa Dhaalu) D: 300m
 *Pristipomoides filamentos*	West reef edge of Maamakunudhoo (Haa Dhaalu) D: 300m	 *Aphareus rutilans*	West reef edge of Maamakunudhoo (Haa Dhaalu), D: 300m 3NM SW of Hulhudheli, Dhaalu D: 300m, 150m
 *Pristipomoides auricilla*	East of Veyvah Meemu, South of Fenfushi, Alifu Dhaalu (2 fishes) D: 300m	 *Pinjalo lewisi*	South of Fenfushi, Alifu Dhaalu D: 300m
 *Pristipomoides* sp.	3NM SW of Hulhudheli, Dhaalu D: 300m	 *Wattsi mossambico*	West reef edge of Maamakunudhoo (Haa Dhaalu) D: 300m

＜DBS resource survey＞

The resource survey of DBS was carried out twice in November 2016 using the vessel Loabodu and 3 times in February to March 2017 using the Reendhoouraha. Each survey trip lasted 5-6 days including travel days.

The survey area in November 2016 was determined along with the sighting points of DBS egg mass shown in the report “Expected deep-sea fishery resources distribution (DBS)” (refer to above Output 1). The Central Eastern and the North Eastern coastal areas of Maldives were prioritized for the resource survey in November 2016. The operations were conducted in 9 areas, where the 2,000m contour line forms an embayed-shape, in order to avoid strong ocean currents in sea channels. Furthermore, in the resource survey of February-March 2017, the survey areas were expanded to the west side and south-central part of Maldives, in addition to the sites of November 2016. Table 5.3.5 shows the results of the 5 resource surveys.

Table 5.3.5 Summary of results of DBS resources survey

Surveys	Survey area		Date	Fishing numbers	DBS catch
	Atoll	Location			
1st	North Malé	East	14-Nov-16	①	3
				②	0
			15-Nov-16	③	2
	Vaavu	East	16-Nov-16	④	0
	South Malé	East		⑤	3
	North Malé	East	17-Nov-16	⑥	2
2nd	Lhaviyani	North East	20-Nov-16	⑦	6
	Shaviyani	East	21-Nov-16	⑧	0
	Noonu	North east		⑨	1
		East	22-Nov-16	⑩	2
			23-Nov-16	⑪	1
3rd	North Malé	East	12-Feb-17	⑫	4
			13-Feb-17	⑬	2
	South Malé	East	14-Feb-17	⑭	1
	Alifu Alifu	North west	15-Feb-17	⑮	0
		North west		⑯	0
4th	Lhaviyani	North east	19-Feb-17	⑰	4
	Noonu	East	20-Feb-17	⑱	2
	Raa	West	21-Feb-17	⑲	17
	Shaviyani	West	22-Feb-17	⑳	1
5th	Thaa	East	26-Feb-17	㉑	2
	Meemu	South east	27-Feb-17	㉒	3
	Dhaalu	West	28-Feb-17	㉓	0
	Alifu Dhaalu	West	1-Mar-17	㉔	3
Total				24	59

During this pilot project, DBS was caught for the first time in Maldives[9] on November 14, 2016 (Fig 5.3.4 and 5.3.5), and thereafter a total of 59 individuals of DBS, with a total weight of 500.5 kg, were caught in 24 operations (Table 5.3.5).

Fig 5.3.6 shows the sites where DBS were caught and where egg mass or big squid carcasses were observed. The sites where DBS were caught are approximately 5-15 nm off the atolls, with a water depth of 1,500 to 2,000 m (NB: the length of the vertical fishing line is 500 m only). Although more examinations are needed, it is assumed that a wide area of potential squid fishing grounds exists in nearby oceanic waters around Maldives.

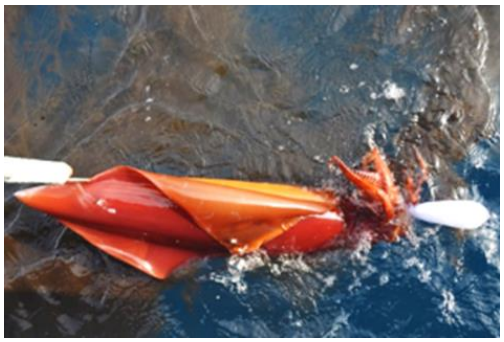


Figure 5.3.4 A harvest scene of DBS

Figure 5.3.5 First record of DBS caught in Maldives

The mantle length of the 20 DBS caught in November 2016 ranged 35-71cm (weight range: 1.60-11.65 kg), and that of the 39 DBS in February-March 2017 was 46-82cm (weight range: 4.0-16.8kg) (Fig 5.3.7).

The sex ratio in November 2016 was 90% male and 10% female, while the ratio in February-March 2017 was approximately 60% male and 40% female. The average gonad weight of the male DBS was 20.8g (4-46g) in November 2016 and increased to 42.6g (10-70g in February-March 2017. The average gonad weight of the 2 female DBS caught in November 2016 was 270.0g (60-480g) and that of the 16 female DBS caught in February-March 2017 was 330.0g (75-580g). The gonad weight of female increases rapidly after their mantle length reaches 60cm (Fig 5.3.8).

Those observations suggest that the squids grow and mature off the coast of Maldives during this season, i.e. November to March.

Detailed explanation about deep-sea resource survey of the pilot project is shown in the Separate Volume of MASPLAN entitled “Final report of Pilot Project 3: Preliminary resource survey on availability of deep-sea resources”.

[9]Cruise Report “Dr. Fridtjof Nansen” - Survey of the Abundance and Distribution of the Fish Resources in the Coastal Waters of Maldives - 17-28 August 1983

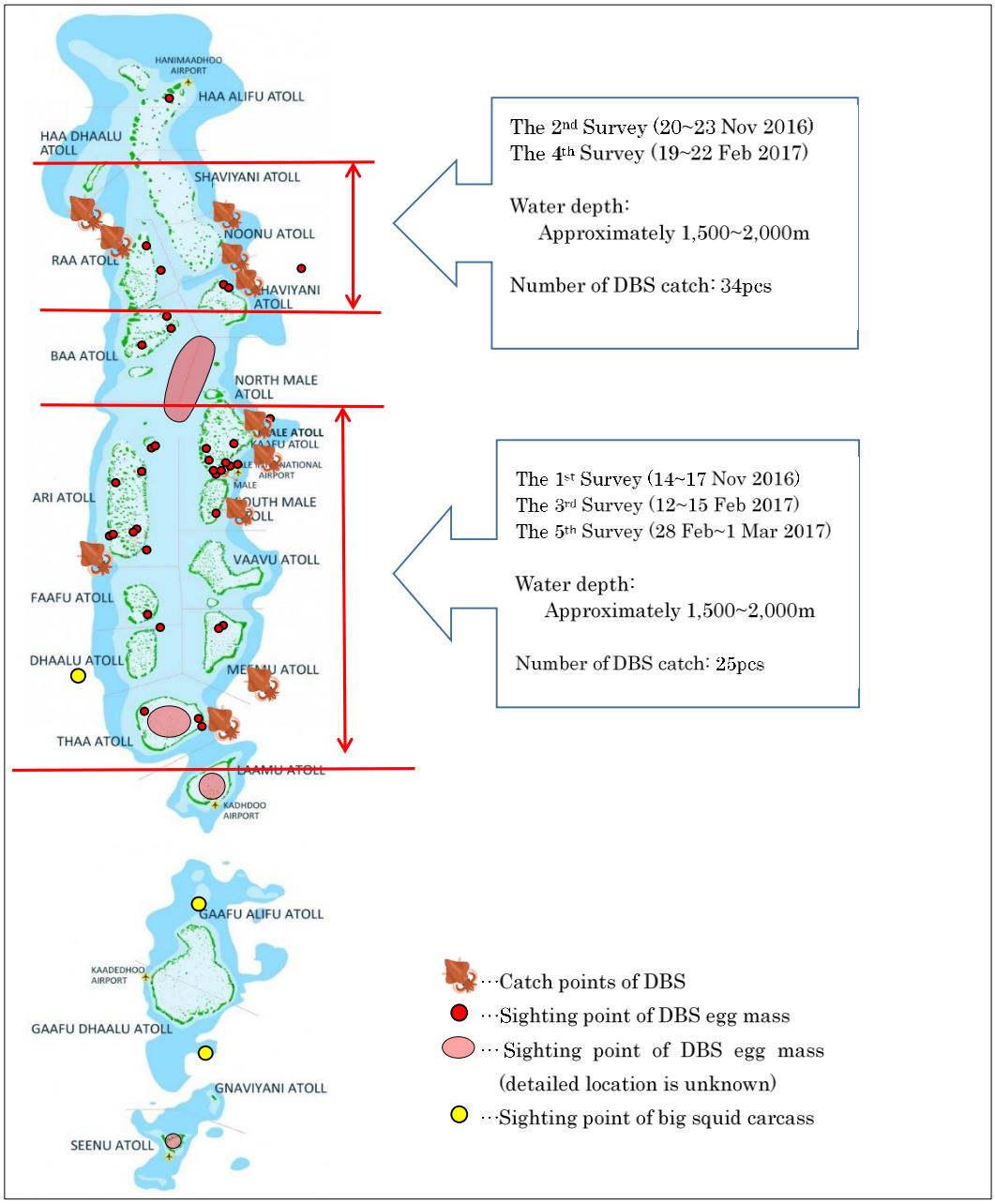


Figure 5.3.6 Sighting points of DBS egg mass and big squid carcass, and DBS catch areas

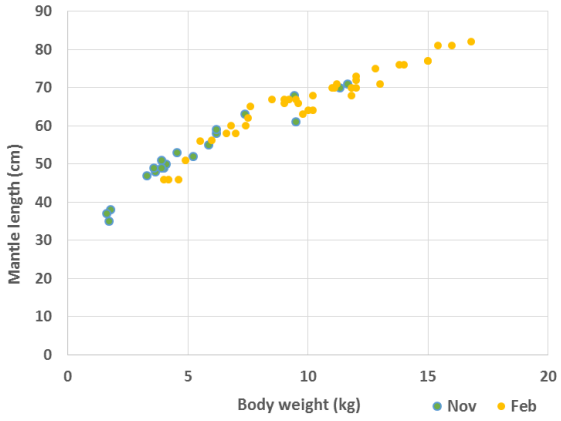


Figure 5.3.7 Relation between mantle length and body weight of DBS caught in November 2016 and February-March 2017

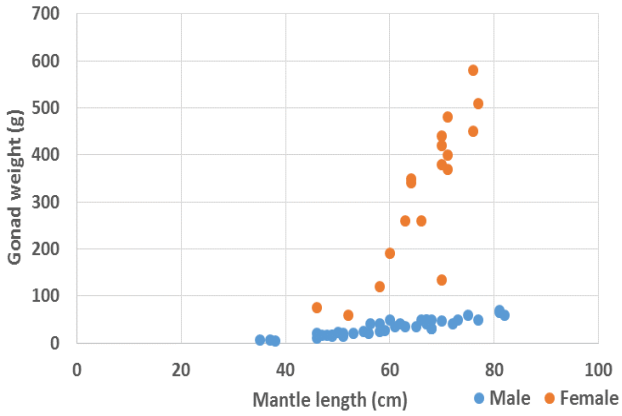


Figure 5.3.8 Relations between mantle length and gonad weight of DBS

4) Additional activities

The primary processing of the DBS caught was conducted in collaboration with MIFCO processing facility in Kandu Oiy Giri (KOG); DBS were processed into frozen vacuumed packages and frozen rolls and preserved in a freezer at KOG. A total of 383.25kg of frozen fillet of the squid was obtained from 500.5kg of whole DBS, corresponding to a 76.6% yield ratio.

MoFA conducted a media release about the first catch of DBS in November 2016 (Fig 5.3.9) , when Mr. Fujii (JICA expert of MASPLAN) and Mr. Jaufar (counterpart of MoFA) explained the biology of DBS and the processing method.

In addition, upon completion of the resource survey, MASPLAN held a DBS tasting session in collaboration with Chefs Guild of Maldives on March 12, 2017 at the Faculty of Hospitality and Tourism Studies in the Maldives National University. A Maldivian chef working at the Bandos resort as a Japanese food chef prepared a series of delicacies using DBS, i.e. hand-rolled Sushi, Sashimi, Japanese curry, Sushi rolls and Chirashi sushi (Fig 5.3.10 and 5.3.11). About 50 people including the Minister of MoFA, staff of the Embassy of Japan and JICA Maldives staff participated in.

Figure 5.3.9 A scene of media release for the first DBS catch in Maldives

Figure 5.3.10 DBS hand-rolled Sushi prepared by Maldivian chef

Figure 5.3.11 Demonstration of primary processing

5.3.3 Conclusions and relations to the Priority Projects

(1) Conclusions

Although this pilot project was not identified at the beginning of MASLAN and there were several technical issues regarding the survey vessels, remarkable results were achieved for both demersal fishes and DBS surveys, with good cooperation of the project team of MASPLAN. It is highly recommended that unutilized and valuable resources be exploited in a sustainable way based on further resource evaluation and monitoring.

In Okinawa, Japan, the DBS has been one of the important target species since the 1980s, with 1,800-2,600 tons landed per year. Based on the survey results, it is expected to move into commercial operations for this valuable resource. As for deep sea demersal fishes, it is assumed that their resilience is low and so careful monitoring is necessary when the exploitation of this unutilized resource begins.

It is noted that the outcomes of this pilot project are a promising entry point for further fisheries development.

(2) Relations to the Priority Projects

Based on the achievements of the pilot project, a priority project entitled “Development of new deep-sea fisheries (DBS and other fishes)” has been formulated and proposed in the SFDPIS (OF 7).

In the proposed priority project, the following activities are included:

- Continuation of resource surveys, possibly all year around, at selected locations.
- Examination of potential fishing quota and allowable number of fishing vessels.
- Development of fishing technology affordable for smaller fishing vessels.
- Extension of fishing techniques among fishers.
- Marketing survey on new resources, particularly on DBS, for resorts as well as overseas.

5.4 PP-4. Monitoring of fish supply to resorts and setting up of an ecolabel certification

5.4.1 Outline

(1) Background

Based on the results of the discussions in the Reef Fisheries SSWG, the insufficiency of the catch data collection was identified as a priority issue to be tackled, linked to the overall increase of the fishing effort on these resources. As a matter of fact, an increase in demand for reef fish from the tourism industry (both as a tourist attraction and a source of food for the tourists and staff of the resorts) and

overseas markets has raised the level of exploitation of particular reef fish varieties. Furthermore, reef fish is gaining more importance in the diet of locals.

Since there are presently over 100 resorts in Maldives and this number is expected to grow significantly in the next 10 years, the SSWG decided to implement the pilot project focusing on the promotion of sustainable fishery resources use through the monitoring of reef fishes use by the resorts.

(2) Outline of the Project

The PDM as outline of the pilot project is shown in Table 5.4.1. The project title is "Monitoring of Fish Supply to Resorts and Setting up of an Ecolabel Certification". The purpose of the project is as follows: "The basis for proper monitoring of reef fisheries resources is set up with the active participation of the resorts and an eco-label certification is designed as a tool for their promotion, in North Malé and Baa Atolls". Target areas of the project are North Malé Atoll and Baa Atoll, and its target groups were all stakeholders of the Reef fisheries Sub-sector including resorts and seafood suppliers. The main output of this project is to establish a proper data collecting system from the resorts and seafood suppliers, as it is difficult to collect information directly from fishers in the situation where there is presently no systematic market mechanism for Maldives' reef fisheries. This pilot project is to design and implement an "eco-labelling" certification system for building incentive for resorts to be involved in data monitoring.

The project was carried out from November 2015 to March 2017, as shown in the implementing time schedule of Table 5.4.2.

It should be noted that due to time and capacity limitation, it was decided by end 2016, after discussion with the SSWG, that the eco-label process and the activities in Baa Atoll would not be implemented.

Table 5.4.1 The Pilot Project PDM (PP.4)

Project Name: Monitoring of Fish Supply to Resorts and Setting up of an Ecolabel Certification

Project Area: North Malé atoll ~~and Baa atolls~~

Project period: 2016 to March 2017

Target group: All stakeholders of reef fisheries sub-sector

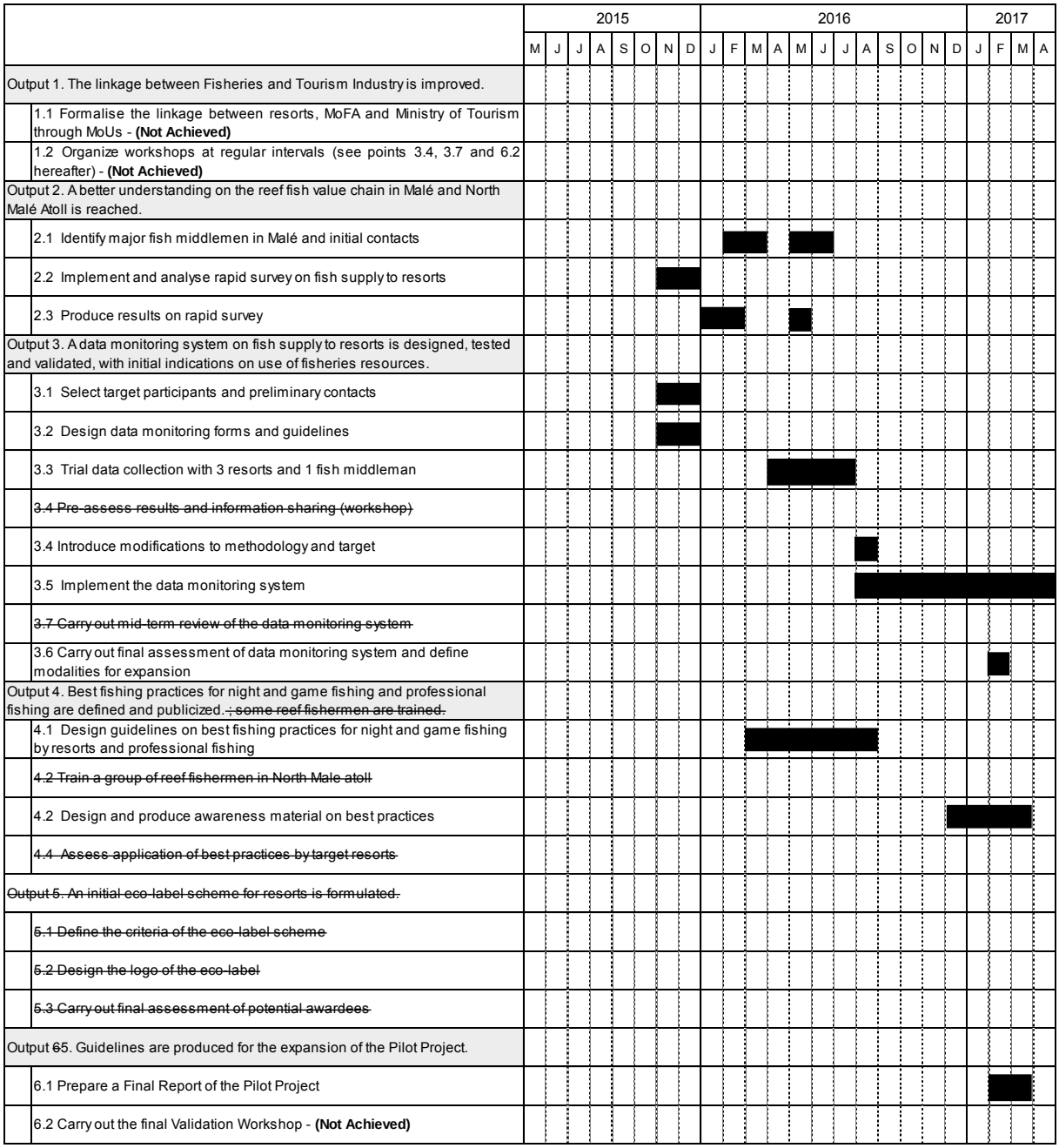
Date: November 18, 2016

Version: 3

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal All concerned stakeholders of reef fisheries are duly involved in data collection and eco-labelling as tools for proper resource management	• Statistical data collection systems are ready for replication in other atolls	• Final assessment report	• Unpredictable environmental deterioration does not occur
Project Purpose The basis for proper monitoring of reef fisheries resources is set up with the active participation of the resorts and an eco-label certification is designed as a tool for their promotion, in North Malé and Baa atolls.	• The resorts and reef fishers collaborate in data collection system and eco-label scheme	• Trip reports to resorts	• Short and medium-term availability of MoFA and MRC staff to be part of the project / ensure guidance and follow-up. • Master plan is officially approved.
Outputs 1. The linkage between fisheries and tourism industry is improved. 2. A better understanding on the reef fish value chain in Malé and North Malé Atoll is reached. 3. A data monitoring system on fish supply to resorts is designed, tested and validated, with initial indications on use of fisheries resources. 4. Best fishing practices for night and game fishing and professional fishing are defined and publicized. ~~; some reef fishermen are trained.~~ ~~5. An initial eco-label scheme for resorts is formulated.~~ 5. ~~6.~~ Guidelines are produced for the expansion of the pilot project.	• No. of MoUs between resorts, MoFA and Ministry of Tourism • No. of workshops • No. of actors involved in the pilot project • No. of data sheets collected and analysed • Quantities of fish assessed ~~• No. of eco-label pre-awarded (no. of resorts possibly eligible)~~ ~~• No. of persons trained on best practices~~	• Survey report on fish value chain in North Malé atoll • Monthly data collection sheets from professional fishers, fish traders and resorts. • Consolidated monthly data and reports. • ~~1st and~~ Final assessment report. • Guidelines on best fishing practices • Awareness material produced	• Proper collaboration from Ministry of Tourism and involved resorts.

Activities	**Inputs**	
1.1 - Formalize the linkage between resorts, MoFA and Ministry of Tourism through MoUs	Personnel	No serious change in tourism sector
1.2 - Organize workshops at regular intervals (see points 3.4, 3.7 and 6.2 hereafter)	a. MoFA, MRC staff	
2.1 - Identify major fish middlemen in Malé and initial contacts	Equipment and others	No serious meteorological situations
2.2 - Implement and analyse rapid survey on fish supply to resorts	b. ~~Small fishing equipment and~~ Stationary	
2.3 - Produce results on rapid survey	c. Implementation of workshops	
3.1 - Select target participants and preliminary contacts	~~Follow-up trips to Baa atoll~~	
3.2 - Design data monitoring forms and guidelines	d. Production of awareness materials	
3.3 - Trial data collection with 3 resorts and 1 fish middleman	~~Training of fishers in North Male atoll~~	
~~3.4- Pre-assess results and information sharing (workshop)~~		
3.4 - Introduce modifications to methodology and target		
3.5 - Implement the data monitoring system		
~~3.7- Carry out mid-term review of the data monitoring system~~		
3.6 - Carry out final assessment of data monitoring system and define modalities for expansion		
4.1 - Design guidelines on best fishing practices for night and game fishing by resorts and professional fishing		
~~4.2- Train a group of reef fishermen in North Male atoll~~		
4.2 - Design and produce awareness material on best practices		
~~4.4- Assess application of best practices by target resorts~~		
~~5.1 - Define the criteria of the eco-label scheme~~		
~~5.2 - Design the logo of the eco-label~~		
~~5.3 - Carry out final assessment of potential awardees~~		
6.1 - Prepare Final Report of the pilot project		
6.2 - Carry out the final Validation Workshop		

Table 5.4.2 Implementing time schedule of PP.4: Monitoring of fish supply to resorts and setting up of an ecolabel certification



5.4.2 Results

(1) Achievement of the Project Purpose

Since the PP has developed at a pace much slower than expected, mainly due to constraints linked to availability of staff at MoFA level, the achievement of the main output, "Implementation of a data collection system with resorts", has hardly taken shape on a limited scale and major efforts still need to be exerted to make it happen as expected on a routine basis, as a follow-up of the PP.

(2) Achievement of the Outputs

1) Output 1: The linkage between Fisheries and Tourism Industry is improved

In spite of initial contacts established by MoFA with the Ministry of Tourism (MOT), the linkage between the two institutions, relating to the PP, has not been established on a routine basis. Although MoFA approached MOT at an early stage of the pilot project and a positive response was received initially, no follow-up was given by MOT. This will possibly be achieved after the PP completion, once significant results are obtained in terms of data collection from the resorts, whenever these results can be shared among the various stakeholders.

A draft MoU has been prepared and circulated to MOT and selected resorts soon after the beginning of the project. The final version of the MOU has not been agreed yet by MOT, in spite of various attempts by MASPLAN team; however, this fact has not hindered the establishment of direct collaboration between MoFA and the selected resorts.

2) Output 2: A better understanding on the reef fish value chain in Malé and North Malé Atoll is reached

The MoFA staff involved in the PP has exerted intense efforts in order to identify and interact with the main actors of the reef fish value chain in Malé and North Malé Atoll, and to initiate a good working collaboration with some of them. In addition, a detailed study at national level came up with very relevant indications on the supply of reef fish to resorts.

Some major middlemen in Malé and North Malé Atoll have been identified and met, specifically in Malé and Huraa. Quite interestingly, they showed interest to participate in the pilot project, and their involvement is still to be put in place by the MoFA/MRC team after the completion of the PP.

A Rapid Survey on fish supply to resorts has been carried out by end 2015, with intense dedication by the MoFA senior officer assigned to the PP. Quite significantly, over 50% of the resorts at national level accepted to participate in this survey. Its main findings were shared and discussed within MoFA, and the final report was circulated by May 2016. The survey was useful to refine estimates put forward by previous studies and showed that about 4,000 tons of reef fish are consumed each year by the resorts.

3) Output 3: A data monitoring system on fish supply to resorts is designed, tested and validated, with initial indications on use of fishery resources

The data collection system (2 survey forms) to be used by the PP has been adopted from the one implemented by MRC in recent years, with minor modifications aiming at simplifying it and making it more easily applicable to resorts. Subsequently, the actual implementation of the system logically proved to be the more cumbersome part: a lot of efforts and follow-up visits of MoFA staff in the field are required to establish a working relationship with resorts, explain the objectives and content of the PP and namely, the fact that what the PP requires does not imply a considerable additional workload. This point has proven to be critical, as MoFA staff has not been able to dedicate sufficient time to this endeavor.

Initial contacts have been made with 5 resorts in North Malé Atoll and 2 in Baa Atoll in September 2015. One of them, Meeru Resort, showed quite a positive response: it started providing data in March 2016 and has efficiently been doing so since then on a routine basis. Regular contacts have been maintained with successive marine biologists in another resort (4 Seasons), with so far limited outputs but positive prospects of cooperation. Mainly due to limited staff and respective follow-up at MoFA level, contacts have not been strengthened with the other selected resorts.

The first form (quantities by species categories) is presently implemented on a routine basis by one resort in North Malé Atoll (Meeru Resort); it was initiated by another resort (Kurumba), but discontinued after some months; in addition, one resort in Baa Atoll successfully started implementing it, just after the PP was completed. The second form (scientific data) has not been implemented by any resort on a routine basis, mainly due to the absence of marine biologists in the resorts and/or the insufficient follow-up thereof by MRC staff; however, one resort (4 Seasons) has been implementing the system for some years already, on the basis of a similar system introduced by MRC; this work has been carried out successively by a large number of persons in charge, and still needs to be validated with MRC's support.

However, quite significantly, this second form has been implemented by MRC staff on several occasions, directly from fishing vessels and thanks to the excellent collaboration of one boat owner/ fish middleman in Huraa.

Some results regarding data collection reef fish supply are shown in Fig 5.4.1 to 5.4.3.

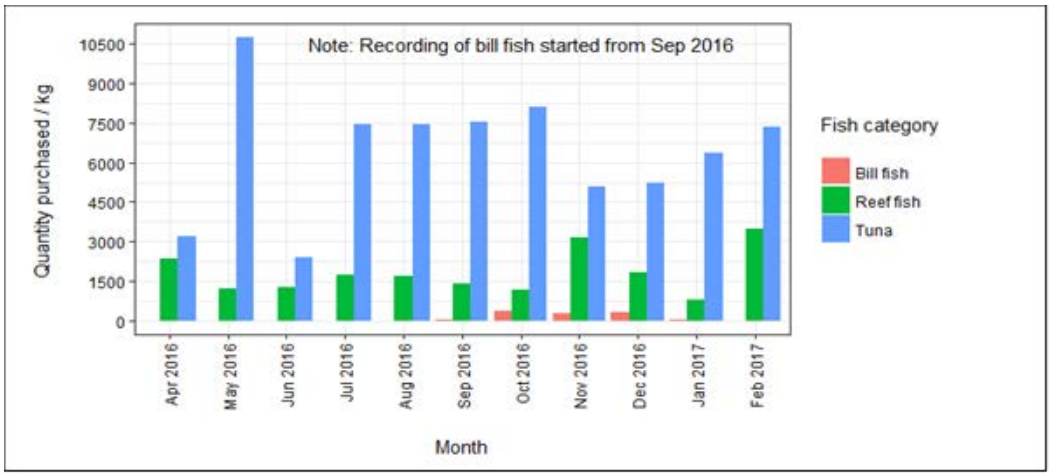


Figure 5.4.1 Quantities of fish purchased per category per month (in kg) - Apr. 2016 to Feb. 2017

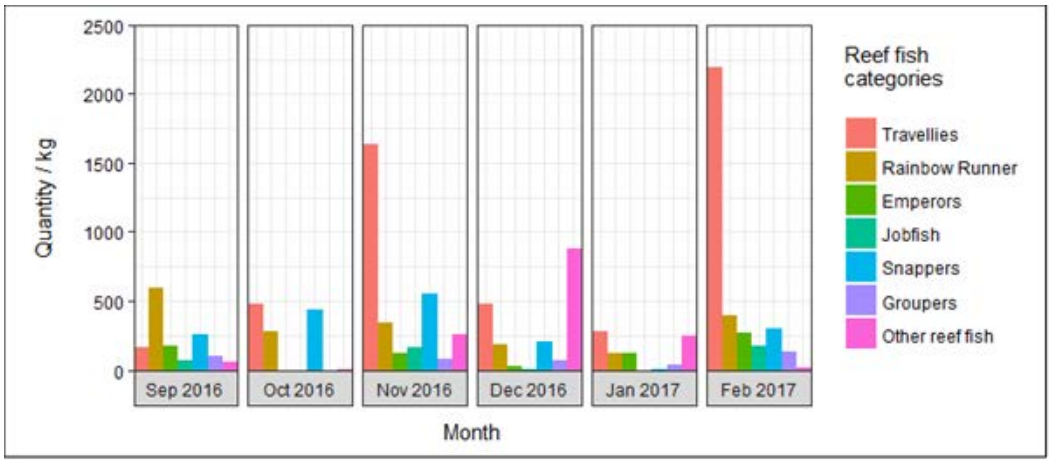


Figure 5.4.2 Quantities of reef fish purchased per category per month (in kg) - Sep. 2016 to Feb. 2017

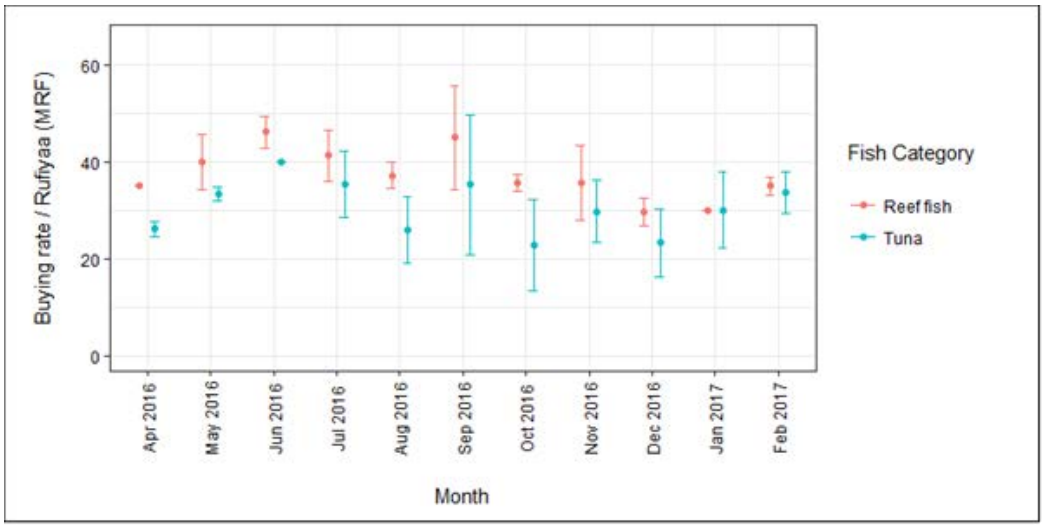


Figure 5.4.3 Buying price per fish category per month (in MVR/kg) - Apr. 2016 to Feb. 2017

4) Output 4: Best fishing practices for night and game fishing and professional fishing are defined and publicized; some reef fishers are trained

Guidelines on Best Fishing and Fish Handling Practices, in particular for reef fisheries, have been prepared within the PP. The content of the guidelines has been prepared with intense involvement of the senior officers assigned to the PP within MoFA and MRC as well as concerned MoFA staff. The design itself has been handed to a professional designer in December 2016, and the printing of the English copies should be completed by August 2017. The copies will then be disseminated to resorts and professional fishers; the guidelines will subsequently be translated into Dhivehi, printed and distributed. The sample pages of the guideline are shown in Fig 5.4.4.

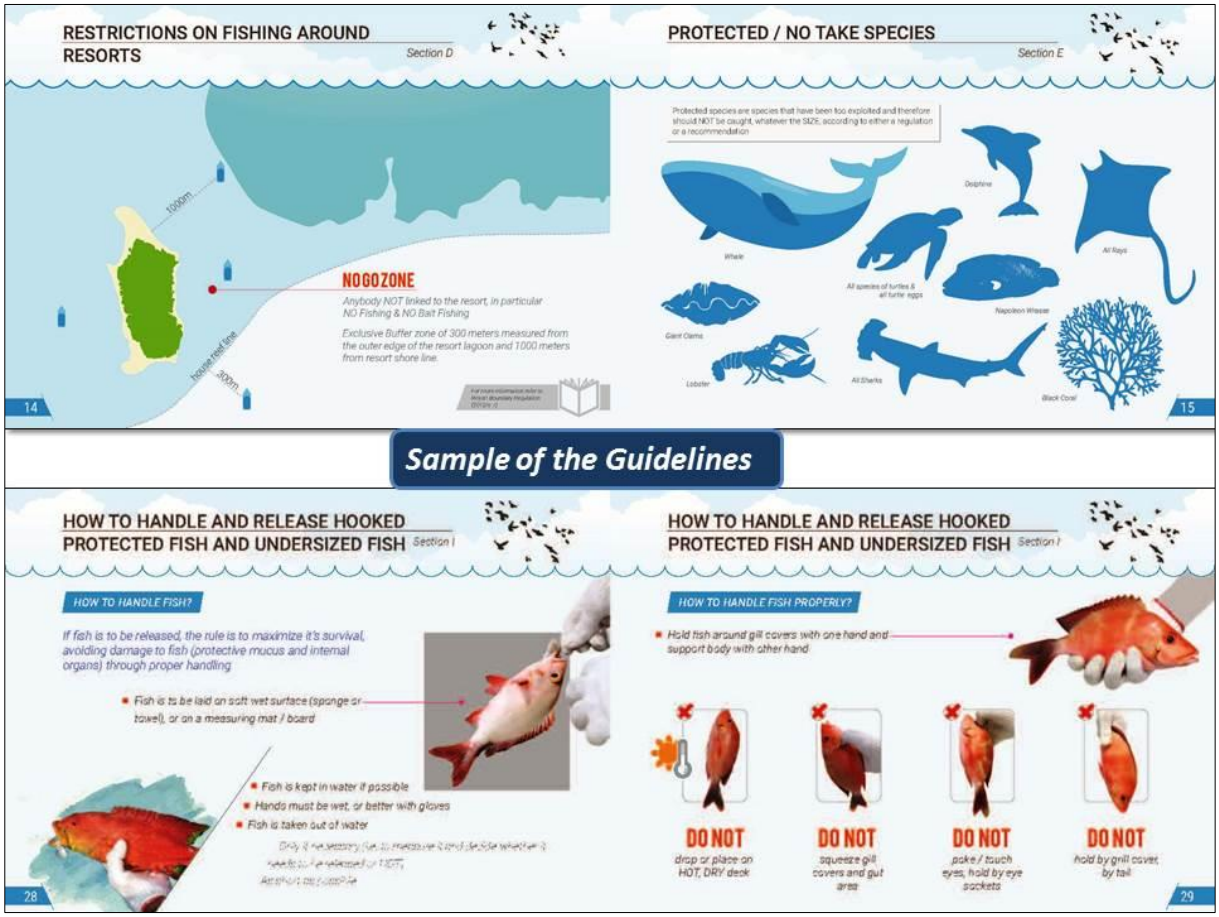


Figure 5.4.4 Sample pages of the Guideline on Best Fishing and Fish Handling Practices (2017)

5) Output 5: Guidelines are produced for the expansion of the pilot project

A final report on the PP was produced upon its completion. No workshop was carried out to share and discuss its results due to insufficient involvement of the stakeholders (in particular Tourism).

5.4.3 Conclusions and relations to the Priority Projects

(1) Conclusions

Overall, motivation of the resorts to participate in the data collection system is not implicit ("what are the benefits to be gained from this system", "is this system not cumbersome" etc., as would be the first reaction of some resorts); this motivation can only be ensured through close interaction and communication between MoFA/ MRC staff and the various persons in charge at resort level.

The PP has shown that it is possible to build up this motivation, as some resorts responded positively and have been implementing the data collection system with dedication and success. In addition, the PP made it clear that other elements of the reef fish value chain, i.e. major fish middlemen and possibly,

fishers themselves, can be instrumental for the implementation of this system. It is quite significant that, even after the PP was officially completed, the involved resorts have been going on implementing the data collection system; MRC staff on their side has been exerting efforts with new resorts to widen the scope of intervention.

It is believed that the concept of eco-label for resorts is still valid; it can be developed as more resorts adhere to the data collection system, as a reward for their active participation therein.

Data collection goes hand in hand with best fishing practices, in order to make sure that reef fisheries are properly managed. Awareness and sensitization to all concerned, in particular professional fishers, resorts and their clientele and recreational fishers are therefore of utmost importance, and need to be strengthened at the national level. It is believed that the guidelines produced within the PP4 will be quite instrumental for this.

Finally, and most importantly, it is crucial that MoFA and MRC make sure that the labor force needed for this endeavor is assigned to it on a permanent basis, in order to ensure the sustainability of this system.

(2) Relations to the Priority Projects

The implementation of a proper data collection system for reef fisheries has been identified as a crucial prerequisite for proper fishery resources management. The pilot project has been designed as a way to verify the feasibility of data collection with resorts; it has set up the basis for the implementation of the respective system, in particular as regards to the output 4) mentioned hereafter, to be extended at the national level. The related project under the Fisheries Development Plan has been designed as "RF1. Improvement of biological, socio-economic and statistical data collection and analysis system" within the "Approach for strengthening reef fisheries management".

Through this project, the following outputs are expected: 1) a Frame Survey for reef fisheries is carried out on a regular basis; 2) the data system for exported fish and sea products is improved; 3) the statistical data collection project "Regenerate" is completed in one atoll then extended to other atolls; 4) the biological and statistical data collection and analysis for general reef fish, grouper, sea cucumber, aquarium fish and lobster is improved and successfully implemented and 5) certification programs for sustainable general reef fisheries, grouper, and aquarium fish (eco-labelling) are designed and implemented. The "World Bank Project" has recently started and encompasses a large component related to fisheries management.

The Guidelines on Good Fishing and Fish Handling Practices prepared within the PP will be utilized as a tool for dissemination within the Project "Awareness on fishing and fish handling techniques in reef fishery" of the Fisheries Development Plan.

5.5 PP-5. Feasibility study on mariculture of selected species in Maldives

5.5.1 Outline

(1) Background

In the aquaculture sector of Maldives, the on-going Mariculture Enterprise Development Project (MEDeP) co-funded by IFAD is providing financial and technical assistance. The strategy of the MEDeP is to extend the aquaculture to small and medium scale enterprises through the sandfish culture in remote islands as well as to enhance the facilities of the Mariculture Training and Demonstration Facility (MTDF). The Sustainable Fisheries Resources Development Project (Fourth South West Indian Ocean Fisheries Governance and Shared Growth Project) co-funded by the World Bank has recently been launched (May 2017) and foresees the establishment of a multi-species hatchery as its major component.

However, information about financial feasibility of aquaculture of the target species still needs to be refined. In addition, capacity of the MoFA staff for planning needs to be improved thought technical training and field observations of successful aquaculture activities in leading countries.

(2) Outline of the project

The PDM as outline of the pilot project is shown in Table 5.5.1. The title of the project is “Feasibility study on mariculture of selected species in Maldives”. The selected species of the pilot project were in principle Brown-marbled grouper (*Epinephelus fuscoguttatus*) and sandfish (*Holothuria scabra*), that were confirmed as potential species by the members of the Aquaculture SSWG. Other species of groupers and sea cucumbers were also to be included in the examination whenever necessary.

The activities of the pilot project include review of the existing materials (Output 1), experimental rearing of sandfish at MTDF (Output 2) and financial feasibility analysis of aquaculture of the two species (Output 3). As part of this pilot project, technical training of counterparts and study trip about overseas aquaculture were included. The implementing time schedule is shown in Table 5.5.2.

In addition, as a general activity of MASPLAN, i.e. not specifically related to this pilot project, five counterpart staff of MTDF attended the Japanese training course “Knowledge Co-creation Program on Capacity Development for Fisheries Sector Technology (Aquaculture)” to understand and observe the latest aquaculture activities, particularly on groupers (see Annex 7).

Table 5.5.1 The Pilot project PDM (PP.5)

Project name: Feasibility study on mariculture of selected species in Maldives

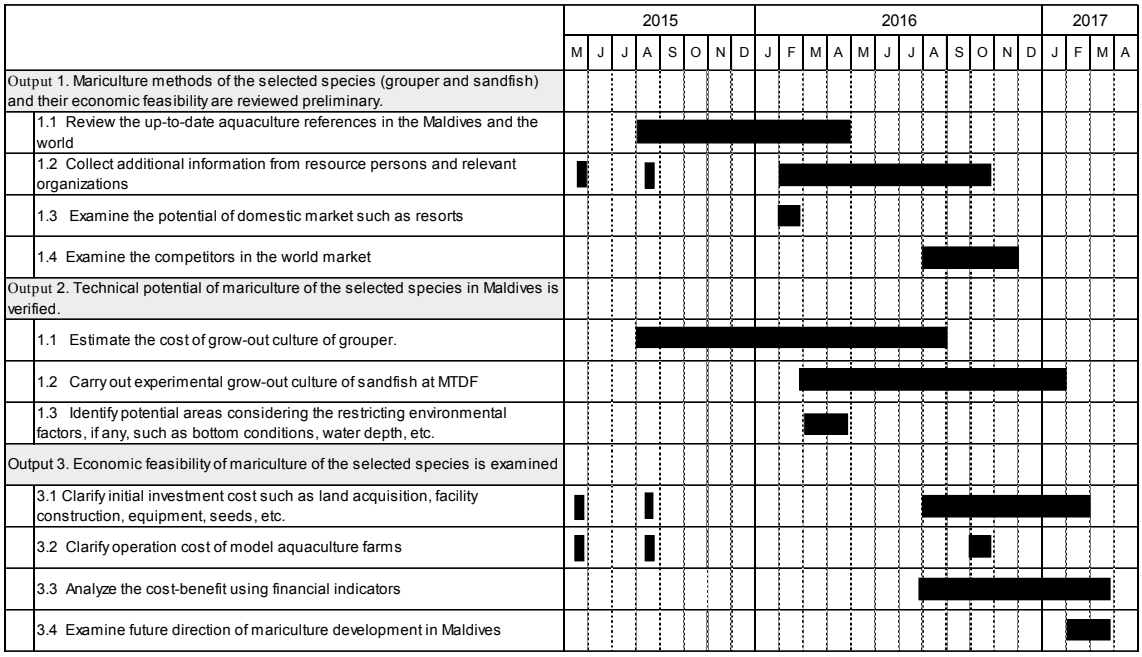
Project period: December 2015 – March 2017 Date : August 25, 2016

Target Area: Mariculture Training and Demonstration Facility and whole country

Target group: Investors and producers of mariculture Version : 2.0

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal Results of the study are used by the private sector as well as the MASPLAN	More than 3 private companies use the outcomes of pilot projects for application of their investment planning by 2020	• Business plan of private company • Annual report of MoFA	The regulation related to aquaculture does not change
Project Purpose Strategy for mariculture development in Maldives is refined	• Draft Mater Plan is revised based on the results	• Revised draft Master Plan	Economic situation does not drastically change
Outputs 1. Mariculture methods of the selected species (grouper and sandfish) and their economic feasibility are reviewed preliminary. 2. Technical potential of mariculture of the selected species in Maldives is verified. 3. Economic feasibility of mariculture of the selected species is examined	• Results of the review work is summarized • Cost of grow-out of grouper in floating cage is clarified • Grow-out result of sandfish in cage culture is verified • Report on results of cost-benefit analysis is submitted	• Project report • Progress report of the pilot project • Feasibility study report	There is no serious change in the policy of government
Activities 1.1 Review the up-to-date aquaculture references in Maldives and the world 1.2 Collect additional information from resource persons and relevant organizations 1.3 Examine the potential of domestic market such as resorts 1.4 Examine the competitors in the world market 1.1 Estimate the cost of grow-out culture of grouper. 1.2 Carry out experimental grow-out culture of sandfish at MTDF 1.3 Identify potential areas considering the restricting environmental factors, if any, such as bottom conditions, water depth, etc. 3.1 Clarify initial investment cost such as land acquisition, facility construction, equipment, seeds, etc. 3.2 Clarify operation cost of model aquaculture farms 3.3 Analyze the cost-benefit using financial indicators 3.4 Examine future direction of mariculture development in Maldives	**Inputs** ***Japan*** Personnel d. Aquaculture expert Equipment and others c. A part of rearing facilities and equipment (i.e., net and cage materials, feed, sandfish seeds) d. Organization of study trips 1. Advanced aquaculture techniques (Japan) 2. Competitor analysis (~~Sri Lanka~~) (Vietnam) ***Maldives*** Personal b. MRC researcher(s) c. Technicians who carry out rearing experiments at MTDF Equipment and others d. A part of rearing facilities and equipment e. Necessary budget required for domestic travels		Extraordinary natural disaster does not occur **Preconditions** Necessary amount and size of sea cucumber juveniles are available on time

Table 5.5.2 Implementing time schedule of PP.5: Feasibility study on mariculture of selected species in Maldives



5.5.2 Results

(1) Achievement of the Project Purpose

The project purpose is set as “Strategy for mariculture development in Maldives is refined”. The results of the pilot project indicated a significant feasibility for aquaculture of the two species, i.e. brown-marbled grouper and sandfish, as explained hereinafter. The findings and knowledge obtained through the pilot project were incorporated in the planning work of the SFDPIS. Thus, the project purpose was achieved.

(2) Achievement of Outputs

1) Output 1: Mariculture methods of the selected species (grouper and sandfish) and their economic feasibility are reviewed preliminary

The culture method of both selected species was reviewed from the existing technical papers, reports and manuals, and the latest information was collected through the following activities:

- Field surveys of the private sandfish aquaculture farms in Maldives (Table 5.5.3 and Fig 5.5.1).
- Interview to resorts near Malé (Banyan Tree and Gili Lankafushi) on the demand for aquaculture species, September 2015.
- Technical training at the Aquaculture Department of the Southeast Asian Fisheries Development Centre (SEAFDEC/AQD), April-May 2016.

- Training course in Japan, July 2016.
- Study tour to Vietnam, November 2016.

Table 5.5.3 List of aquaculture farms visited during the project period

Date	Name of the enterprise	Target species
13th May 2015	Barakathor Bhar in Shaviyani Atoll	Sandfish (seed production and grow-out)
14th May 2015	Black Gold Investment	Groupers
18th Sep 2015	Blue Bridge in Laamu Atoll	Sandfish(grow-out)
27th Sep 2016	Mr. Mohamed Adil in Maroshi island	Sandfish (seed production and grow-out)
21st, 22nd Feb 2017	IFAD project site in Laamu Atoll	Sandfish (grow-out)

a) Barakahor Bhar, Shaviyani Atoll

b) Blue Bridge, Laamu Atoll

Figure 5.5.1 Survey of the sandfish culture firms

Major results were compiled into technical reports, as follows (see the Separate Volume of MASPLAN)

- Applicable method of groupers and sandfish culture in Maldives (February 2016).
- Training report for the sandfish seed production, nursery and management in SEAFDEC (May 2016).
- Report of the study trip to observe sandfish aquaculture operations in Vietnam (November 2016).
- Financial feasibility of grouper and sandfish grow-out operations in Maldives.

Based on the interview survey to the resorts about demand for cultured grouper and sandfish, it appears that there is a significant potential demand for cultured grouper, particularly for Chinese guests, as long as it has the same quality and price as the wild grouper. Contrarily, there is almost no demand for cultured sandfish in any resorts at present.

During the technical training at SEAFDEC/AQD, the MRC staff acquired the latest techniques in sandfish seed production (Fig 5.5.2); they are now able to produce the juveniles effectively at MTDF and to give technical guidance to private firms.

Figure 5.5.2 SEAFDEC technical training of sandfish seed production

In order to observe the advanced sandfish culture practice, a study tour was conducted in November 2016 to Vietnam, which is considered as the leading sandfish producer in the world and can be considered as a potential competitor on the international market. However, it appeared that the aquaculture of sandfish in Vietnam is being carried out as a by-product of Babylon snail culture in earthen ponds (Fig 5.5.3) and currently the target market is mainly domestic. This means that cultured sandfish in Maldives would not compete with that of Vietnam.

Figure 5.5.3 Snail cum sandfish aquaculture in Vietnam.

Babylon snail is cultured inside the net fence in the pond, while sandfish are released as by-product outside the fence.

2) Output 2: Technical potential of mariculture of the selected species in Maldives is verified

Rearing experiments on the sandfish grow-out using cages was carried out in MTDF as one of the activities under Output 2 (Fig 5.5.4). The cages for the experiment were designed by the MRC staff and constructed by MASPLAN. They were set up on the bottom of the sea in front of MTDC. Then artificially bred seeds were procured from Barakahor Bhar and released to the cages after nursing in March 2016.

Figure 5.5.4 Juvenile seacumbers being stocked in bottom-set cages deployed in the lagoon

Although the first rearing trial had to be terminated due to the damage of cages caused by rough sea in July 2016, the consecutive second rearing trial was carried out successfully.

One of the results of the experimental rearing is shown in Fig 5.5.5. Based on the growth and survival of sandfish in bottom-set cages in this experiment and the performances of sandfish in other culture systems, it can be concluded that bottom-set cage is a suitable culture system for small scale grow-out of sandfish with feed inputs, particularly for early stages of grow-out. This type of cage can also be used for nursing smaller juveniles in the sea before putting them in sea pens for further growing. Additional studies are needed to determine the more suitable cage size and materials, stocking density, culture period and scale of grow-out operation.

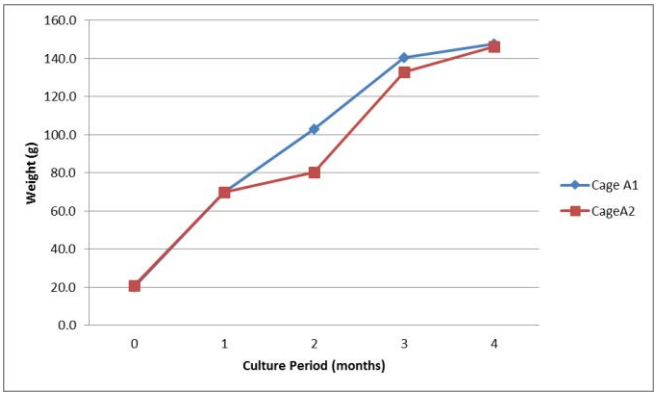


Figure 5.5.5 Mean monthly growth of sandfish in bottom-set sea cage culture in shallow lagoon

Those results were compiled into the technical report, "Pilot Study on Grow-out Culture of Sandfish (*Holothuria scabra*) in Bottom-set Sea Cages in Lagoon", which is included in the Separate Volume of this report.

Although the rearing experiment of grouper culture was not implemented, the cost estimation for the grouper culture was reviewed in the report of output 1, based on the existing reports.

3) Output 3: Economic feasibility of mariculture of the selected species is examined

Based on all the information obtained through the pilot project, financial analysis of grouper culture and sandfish culture was carried out by setting different scale model facilities. In the case of grouper, the minimum feasibility model was found for facilities of 8 cages, with a profit increasing as the facility scale increases (Fig 5.5.6).

The economic feasibility of sandfish grow-out culture in pen was clearly showed, even with one pen (24x24 m) only.

The result of the feasibility analysis was submitted as attached documents of MASPLAN, entitled "Financial feasibility of grouper grow-out operations in the Maldives" and "Financial feasibility of sandfish grow-out operations in Maldives".

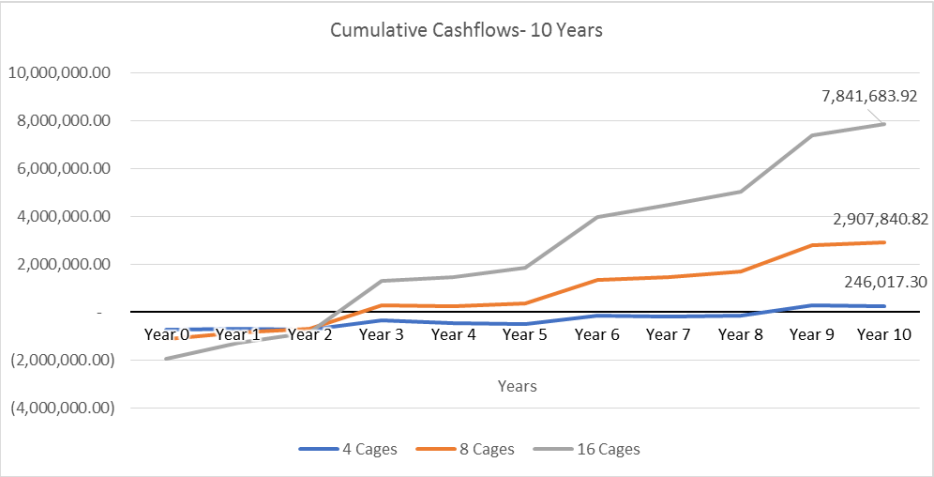


Figure 5.5.6 Cash flow analysis of grouper aquaculture for different facilities

5.5.3 Conclusions and relations to the priority projects

(1) Conclusions

The result of the pilot project indicated the way to develop mariculture in Maldives. In sandfish culture, it can be profitable in a wide range of facilities, from a small-scale family based to a large-scale with entrepreneurs. The private sector is already producing seeds of sandfish. The access to the sandfish market in China through the existing company Barakathor Bhar has been developed. According to the study trip results, it was found that Vietnam will not be a strong competitor. All these elements indicate a high potential for aquaculture development of sandfish in Maldives.

As for grouper culture, it was concluded that only medium and large scale facilities would be financially viable. More clarification is needed about practical assumptions which will be validated through further rearing experiments. Cost of seeds and feed will be reduced when further technical development is effective.

(2) Relations to the priority projects

It is recommended that the knowledge gained through the pilot project is utilized as baseline information for the priority projects, particularly for those relating to the technical development and extension. Developed capacity of MRC staff through the pilot project will contribute to efficient implementation of these projects.

Among the priority projects identified in the SFDPIS, the following ones are a follow-up of the pilot project:

AQ5 Training and demonstration capacity building of MTDF/MRC.

AQ6 Extension of potential mariculture techniques.

The establishment of a multi-species hatchery is one of the major components of the Aquaculture Sub-sector (AQ1 Establishment of multi-species hatchery). The newly initiated World Bank co-funded project will be instrumental in supporting the implementation of various aquaculture activities.

5.6 PP-6. Quality improvement of traditional processed fish

5.6.1 Outline

(1) Background

Valhoamas, or traditional processed fish of Maldives made from skipjack tuna, is a popular food among Maldivians. In recent years, vacuum-packaged *Valhoamas* has been sold widely. It is more expensive than unpacked one, but preferred by consumers. However, molds or very poor appearance can be observed in retail shops of Malé. Even though they may have different moisture content vacuum-packaged *Valhoamas* are sold with the same product shelf life in retail shops, whereas to ability of *Valhoamas* depends on the moisture content. High moisture content product will rot and mold will develop easily even if it is vacuum-packaged. Consumers sometimes eat *Valhoamas* without cooking and heating after they open the package, as they seem to believe that vacuum-packaged product must be safe and of high quality.

Since there is no standard on moisture content of *Valhoamas*, products are available in a diversified range of moisture content, even form a given fish processor. There is no standardized technology regarding heating time and temperature, and no knowhow on adjustment of heating time and temperature by size or thickness of fish meat piece used.

(2) Outline of the project

The PDM of the pilot project is shown in Table 5.6.1. The title of the project is "Quality improvement of traditional processed fish". The target areas are Malé, Kooddoo, and Gemanafushi Islands. MIFCO's fish processing plant is located in Khoodhoo, where the project set up a room for quality control for the purpose of the pilot project. The project introduced a simple heat sterilization method after vacuum-packaging of *Valhoamas* and tested the quality of the products as compared to non-heated ones. The project procured necessary analytical equipment. Some QC technicians of MIFCO were allocated to cooperate with the project and a Japanese expert provided technical guidance on quality control and management to these technicians.

The activities of the pilot project included quality analysis of vacuum-packaged *Valhoamas* by showing difference of products' quality parameters between heated and non-heated packaged *Valhoamas* (Output 1), on-site practical guidance for small and medium-scale processors to produce heated packaged *Valhoamas* (Output 2), analysis of histamine content especially for *Rihaakuru* (Output 3), and compiling

the analytical results on parameters of heated and non-heated packaged *Valhoamas* and producing manuals (Output 4).

The implementing time schedule is shown in the Table 5.6.2.

Table 5.6.1 The Pilot Project PDM (PP.6)

Project Name: Quality improvement of traditional processed fish | Project period: 1 year from January, 2016 | Date : October 24, 2015

Project Area: Malé, Kooddoo, Gemanafushi | Target: Small-medium processors/Cooperatives | Version :3

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal Small-scale fish processors retain more profit from fish processing.	Income of fish processors	Impact survey	The target group applies the technologies disseminated.
Project Purpose Quality of traditional processed fish is improved.	Technical paper on products' quality (appearance, color, odor, product life, number of bacteria, moisture content, histamine content, storage condition etc.)	Sampling test (Comparison between samples and products sold in the market)	The modified technologies are disseminated to the target group.
Outputs 1. Fish processors obtain knowledge and technologies on improvement of traditional processed fish	Quality of products and samples (appearance, color, odor, product life, number of bacteria, moisture content, histamine content etc.)	Monitoring results Evaluation of the samples made	Incentive of the beneficiaries is maintained.
2. Fish processors utilize the knowledge and technologies to produce.	At least one processor utilizes the technologies to produce.	Project report	
3. Histamine content of the products is clarified.	Numerical data of histamine content	Project Report	
4. A manual to produce safe *Valhoamas* is made.	The manual completed	Project Report	
Activities 0.1 Technical points to be modified or improved are clarified. 1.1 Necessary input assistance is provided. 1.2 Monitoring of the products sold in the market is implemented. 1.3 Evaluation of the products' sample is conducted. 2.1 On-site guidance is conducted. 2.2 Evaluation of the products (QC) is conducted. 2.3 Test sale is conducted. 2.4 Reaction of consumers is examined. 3.1 Histamine content of the products is examined. 3.2 The result of the examination is utilized for awareness. 4.1 A manual on sterilization and storage method for *Valhoamas* is prepared.	**Inputs** <u>Human resources</u>: ・ Experts on fish processing ・ Maldivian counterparts including large processors <u>Facilities and equipment</u>: ・ Storehouse ・ Cooking space and equipment ・ Packaging equipment ・ Equipment for QC test ・ Refrigerator ・ Others <u>Consumable, spare parts and allowances</u>: ・ Spare parts of equipment		・ It is easy to get raw materials for processing. Pre-condition ・ Large processors collaborate MASPLAN to develop samples of the products

Table 5.6.2 Implementing time schedule of PP.6: Quality improvement of traditional processed fish

	2015								2016												2017			
	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A
Output 1. Fish processors obtain knowledge and technologies on improvement of traditional processed fish																								
0.1 Technical points to be modified or improved are clarified.										■														
1.1 Necessary input assistance is provided.										■														
1.2 Monitoring of the products sold in the market is implemented.										■	▒	■	▒		■		■							
1.3 Evaluation of the products' sample is conducted.													■			■		■						
Output 2. Fish processors utilize the knowledge and technologies to produce.																								
2.1 On-site guidance is conducted.													■			■		■						
2.2 Evaluation of the products (QC) is conducted.													■			■		■						
2.3 Test sale is conducted.																		■						
2.4 Reaction of consumers is examined.																		■						
Output 3. Histamine content of the products is clarified.																								
3.1 Histamine content of the products is examined.													■			■		■						
3.2 The result of the examination is utilized for awareness.																		■						
Output 4. A manual to produce safe Walhoamas is made.																								
4.1 A manual on sterilization and storage method for Walhoamas is prepared.																			■					

5.6.2 Results

(1) Achievement of the Project Purpose

The project purpose is "Quality of traditional processed fish is improved". The results of the pilot project suggested that quality can be improved through heating of the package of *Valhoamas* (simple heat sterilization), contributing towards supply of safer food to the markets. The findings and knowledge obtained from the pilot project were incorporated in the planning of the SFDPIS. Therefore, the project purpose was achieved.

(2) Outputs

1) Output 1: Fish processors obtain knowledge and technologies for the quality improvement of traditional processed fish.

The pilot project established a laboratory for the project within the Quality Control room of MIFCO Khoodhoo Plant and conducted quality inspection of products sold in the markets (Fig 5.6.1). The quality was examined for vacuum-packaged products that were not heated and for heated products that the pilot project introduced. The parameters measured were moisture content, water activity (Aw), number of viable bacteria (TC), coliform count, number of pathogenic bacteria, appearance, color, odor etc. Obviously, the latter's quality proved better than the former's. In many cases, for non-heated products, mold grown or bacteria number increased immediately after the production was completed. On the contrary, heated products showed high storage stability and mold and/or bacteria were rarely

seen. The number of bacteria in the products decreased and storability in vacuum-packaged *Valhoamas* was improved when the products were heated over 40 minutes in water with 85-90 degree Celsius. It also became clear that moisture content of the sold vacuum packaged *Valhoamas* was diverse and not standardized (Table 5.6.3 and Fig 5.6.2). Mold was detected under room temperature in some heat-sterilized *Valhoamas* 2-3 months after the heat-sterilization. It was observed that storability of the heated products varies depending on water activity, moisture content, heating time and temperature.

Figure 5.6.1 Bacterial analysis in the laboratory of the project at Khoodhoo Plant of MIFCO

Table 5.6.3 Moisture content, Aw, TC of *Valhoamas* sold in the market

Sample Number	Water(%)	Aw	TC	E. Coli
1	50.8	0.95	2.6×10^{7}	+(6.0×10)
2	43	0.93	9.2×10^{4}	—
3	57.4	0.97	8.3×10^{7}	+(4.1×10^{4})
4	51.2	0.94	2.8×10^{6}	—
5	42.1	0.93	4.4×10^{4}	—
6	45.5	0.93	6.5×10^{7}	—
7	42.2	0.94	1.3×10^{5}	—
8	42.7	0.93	6.4×10^{4}	—
9	35.9	0.93	2.8×10^{7}	+(6.5×10^{2})
10	39.7	0.94	2.4×10^{5}	—
11	47.1	0.94	1.1×10^{7}	—
12	52.2	0.96	6.8×10^{6}	—
13	49.1	0.94	5.2×10^{6}	—
14	38.2	0.92	5.0×10^{6}	—
15	34.4	0.89	1.6×10^{3}	—
16	43.5	0.93	8.4×10^{6}	—
17	33.7	0.9	7.4×10^{3}	—
18	41.6	0.93	1.5×10^{7}	—
19	44.2	0.94	2.2×10^{7}	+(3.0×10)
20	40.5	0.92	3.6×10^{6}	—

Water : Moisture content
Aw : Water activity
TC : Total Count of Bacteria
E. Coli : Escherichia coli

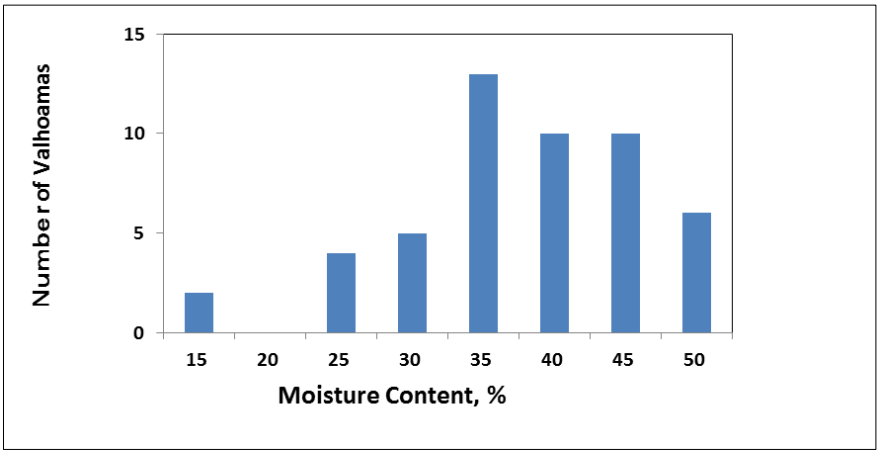


Figure 5.6.2 Moisture content of *Valhoamas* examined

The results of the analysis on TC of bacteria showed that for products with a high moisture content (Aw≧0.96), the heated products have a better storability than the non-heated ones; however, even the heated products showed an increase in bacteria after a couple of days (Table 5.6.4). For heated products with a low water content (Aw 0.91), no bacteria were identified and the taste was still good even three months after the production; on the contrary, for non-heated products, bacteria increased daily during the storage period and mold developed one month after the production (Table 5.6.5). Therefore, it was verified that the effectiveness of heat-sterilization is high, for vacuum-packaged *Valhoamas*, if the water content of the product is low.

The results were shared with SSWG members including representatives of fish processing companies.

Table 5.6.4 Storage test of heated and non-heated *Valhoamas* (Aw.0.96) (Data source: MASPLAN)

Sample	Storage period (day)				
	1	3	5	7	9
Heated Product	0%	25%	40%	50%	65%
Non-heated product	0%	100%	—	—	—

Samples were stored at room temperature

The number in the table shows percentage of the package swollen by gas of bacteria

Table 5.6.5 Storage test of heated and non-heated *Valhoamas* (Aw.0.91)

Sample	Storage Period		
	0 days	60 days	90 days
Heated Product	(－)	(－)	(－)
Non-heated product	7.3×10^{4}	2.8×10^{-5}	Mold

(－) : Bacteria wasn't identified in 10 times dilution
Mold : Mold was observed on the surface of *Valhoamas*

2) Output 2: Fish processors utilize knowledge and techniques they learnt for their production.

Since the method to heat and sterilize vacuum-packaged *Valhoamas* is simple, as it only consists in soaking the product into water at 90° Celsius for 40-45 minutes, small-scale processors acquired the technique easily in Gemanafushi Island of Gaafu Alifu Atoll and Maavha Island of Laamu Atoll (Fig 5.6.3).

Figure 5.6.3 Technical guidance on heat sterilization for small processors in Gemanafushi Island

However, it is difficult to assess whether they could fully understand why heat-sterilization is necessary in principle, since awareness activities were carried out one to three times (according to the participants) only.

During the project period, MIFCO introduced heat sterilization in the company's production process, utilized knowledge and techniques gained from the project, and produced heated vacuum-packaged *Valhoamas* to assess the reaction on the market (Fig 5.6.4). The test sale was carried out at the MIFCO Shop in Malé on October 31, 2016 from 20:00 to 22:00. All 100 heated products were sold within 1.5 hours.

Figure 5.6.4 Vacuum-packaged *Valhoamas* prepared in MIFCO Khoodhoo plant

Figure 5.6.5 Sticker developed by the project.

3) Output 3: Histamine content of sold products is clarified.

The project examined the histamine content of *Valhoamas* as well as *Rihaakuru* as histamine is a critical issue. The result of the analysis on histamine content of non-heated vacuum packaged *Valhoamas* showed that the products had 10^6 or more TC, and would become rotten at a later stage. The result infers a positive correlation between bacteria TC and histamine content (Fig 5.6.6). Histamine content of a product with 10^4 or 10^5 bacteria TC was relatively lower. Since bacteria number increases easily when moisture content and water activity (Aw) are higher, histamine content seems to increase in *Valhoamas* due to bacterial increase. As per the standards of the Government of Maldives, a product which contains 50 ppm or more histamine per gram should not be sold; 15% of the samples examined had 100 ppm histamine per gram.

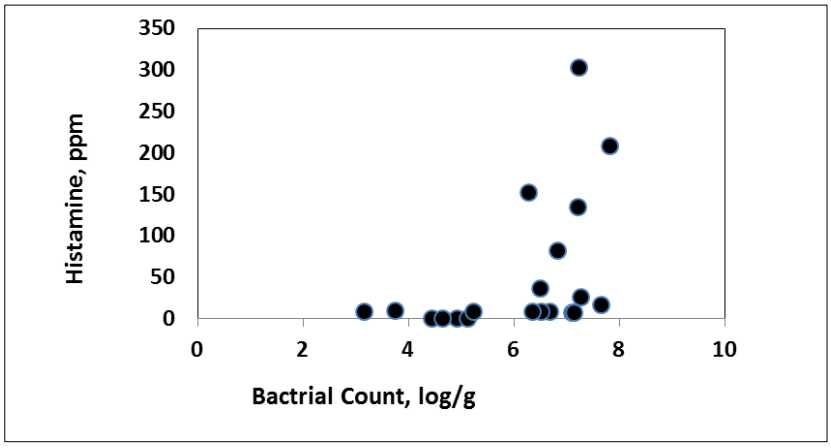


Figure 5.6.6 Correlation between TC and histamine content of non-heated *Valhoamas* (Data source: MASPLAN)

In the case of *Rihaakuru*, the histamine content happens to be either low or high, and the highest was 450ppm (Table 5.6.6). The water activity of *Rihaakuru* is relatively low and bacteria are deemed not to increase easily; therefore, high histamine content of *Rihaakuru* seems to derive from the raw material. On the other hand, some *Rihaakuru* with a higher number of bacteria showed high histamine content; in such cases, the increase in histamine seems to derive from bacterial increase during the

processing process as well.

Table 5.6.6 Quality of sold *Rihaakuru* (Data source: MASPLAN)

Sample Number	RI	Water(%)	Aw	Salt(%)	Histamin	TC	E. Coli
1	72,5	22.4	0.82	4	116	—	—
2	57.7	36.2	0.86	4	69	—	—
3	74.5	20.5	0.73	7	453	4.1×10^4	—
4	78.2	15.1	0.69	7	—	—	—
5	77	17.1	0.66	13	186	—	—
6	77	17.1	0.77	5	—	5.4×10^6	＋(300/g)
7	78	19.1	0.75	5	52	—	—
8	70	29.6	0.82	4	186	4.0×10	—
9	77.5	19.7	0.79	4	—	1.2×10^2	—
10	76.8	20	0.74	7	—	—	—

RI : Refractive Index
Salt : Salt Concentration (%)
Histamin : Histatmin concentration (ppm)

4) Output 4: A manual on heat sterilization and storage method of *Valhoamas* is made. The manual is made as a final output of the project.

As of October 2016, a manual was produced based on the results of quality inspection of both non-heated products collected from the markets and heated products. The manual will be utilized in the future for the extension work to produce heat-sterilized and vacuum-packaged *Valhoamas* regardless of the scale of production in Maldives. Two manuals and a report on "hygiene status of *Valhoamas*" were made.

- Manual for heat sterilization
- Manual for analysis on quality of *Valhoamas*
- Hygiene status of *Valhoamas*

It is most probable that the heat sterilization technique will be expanded if the effect of heat sterilization is widely known and consumers' demands rise. As the analysis of the products needs to be implemented in the facilities where the necessary equipment and technicians are available, MoFA, at this point, plans to introduce equipment in the Fishers Training Centre and carry out the analysis of products' quality in this Centre after MASPLAN ends.

5.6.3 Conclusions and relations to the priority projects

(1) Conclusions

The results of the pilot project showed that effectiveness of heat-sterilization is high, for vacuum-packaged *Valhoamas*, if the water content of the product is low. It was clarified that storability of the

heated products varies depending on water activity, moisture content, heating time and temperature. Since heat sterilization itself can be conducted by using simple resources such as cooking pot and firewood and a thermometer, even a small-scale processor can produce the heated *Valhoamas*, if he/she has a vacuum-packaging machine. However, quality control of the products needs to be implemented properly. Small-scale processors don't have equipment to analyze the quality of the product they produce; technical staff of MIFCO Khoodhoo Plant and MoFA staff knowledgeable in the techniques to measure the parameters using the equipment can play an important role to disseminate these techniques to processors. This is to overcome the current situation where producers of the vacuum-packaged *Valhoamas* do not test its storability scientifically but indicates 6 month best-before date or expiration date on the label of their products. In addition, the effect of heat sterilization is not yet widely known among processors and consumers. Therefore, the dissemination of the techniques and the heated products relies on more awareness activities.

The relevance of the analysis techniques introduced by PP6 can be accepted by technical staff related to food quality control, if laws and regulations on food safety for fishery products in Maldives are prepared and effective for local products. A system for legal enforcement also needs to be developed.

(2) Relations to the priority projects

It is recommended that findings obtained through the pilot project are utilized for planning the priority projects. Consumers will pay more for safe food in the future, as their awareness about food safety becomes higher. Currently, there are risks of frequent food poisoning especially from products sold on local markets in Maldives and simultaneously, there is a lack of awareness on risks related to food among fish processors and consumers. Production of heated vacuum packaged *Valhoamas* needs to be expanded through training and awareness activities with support of the technical manuals produced by the pilot project.

Regarding other traditional processed fish such as Maldives Fish (*Hikimas*) and *Rihaakuru*, histamine is the most critical issue in terms of quality control, besides food poisoning caused by bacteria. High concentration of histamine is linked to deteriorated raw material. However, it was inferred by the results of the pilot project that high histamine concentration was detected from *Rihaakuru* which contained a large number of bacteria. Especially this tendency was observed from repacked *Rihaakuru*. Therefore, control of bacteria number will be a key to reduce histamine and this point is critical to improve quality of Maldives Fish as well as *Rihaakuru*.

Establishment of minimum national standards and regulations together with an effective system for their enforcement is crucial for fishery products of Maldives. Several government agencies such as Ministry of Health (MOH), Maldives Food and Drug Authority (MFDA), Ministry of Economic Development (MED), Customs, Maldives National Defense Force (MNDF) take part in enforcement and inspection of food under specific laws, e.g. the "Food Safety and Quality Act", the "Public Health Protection Act", the "Consumer Protection Act" etc. Currently there is no specific act for fishery products.

Among the priority projects identified in the SFDPIS, the following are two follow-ups of the pilot project (PP6).

PV3 Extension of quality improvement methods for traditional processed fish.

PV6 Development of the minimum national standards/ regulations for fishery products

5.7 Overview of results of the Pilot Projects

5.7.1 Summary

(1) PP-1. Technical development and verification of live bait catch and holding for improving their survival rate

An improved live bait tank designed according to the model used on board Japanese fishing vessels, in addition to a Japanese water scoop net, was installed and a monitoring research was conducted to assess their effects within the PP1. It was not possible to draw out clear quantitative results through this experimental method, but the target captains of the pilot project positively assessed the improvement in quality. It is necessary to continue the monitoring research to assess the quantitative effects, as well as to introduce and extension of the live bait tank and water scoop net.

(2) PP-2. Technical development of tuna hand line on-board handling for fish quality improvement

The Japanese “Irabu method” for Yake prevention was installed as a quality improvement technique, which includes a tuna electric shocker and an improved cooler box; a monitoring research was conducted to assess their effects in PP2. Effective improvement for tuna grade was confirmed by the “Irabu method” but no clear effect was gained by the tuna electric shocker. As the cooler box improves the cold storage, the positive effect of both the cooler box and the “Irabu method” is to be expected and should therefore be pushed through. The monitoring research should proceed in order to get more reliable information, as the number of research was less than planned.

(3) PP-3. Preliminary resource survey on availability of deep-sea resources

In this pilot project, the existence of unused resources which have high commercial value in worldwide, e.g. Diamondback squid (DBS), and deep-sea fish could be confirmed. However, the full potential of the resource in terms of seasonal fluctuations, amount of resources, fishing grounds and consumption demand were not assessed. Together with surveys to evaluate these points, the implementation of technical development and training for fishery management will be needed in the future.

(4) PP-4. Monitoring of fish supply to resorts and setting up of an ecolabel certification

In this pilot project, with the cooperation of resorts and fishery products supplier/fishers in North Malé,

a data collection research method was established to assess the reef fish catch supplied to resorts and develop the introductory guidelines for the preservation of reef fish resources and quality control methods. It is in need of involving more resorts are necessary to improve the fishery statistical research and therefore proper fishery resources management. The preparation of an eco-label was not pushed through in this pilot project, but it is still desirable to develop it to motivate resorts and fishers to take part in resources management.

(5) PP-5. Feasibility study on mariculture of selected species in Maldives

In PP5, the profitability on mariculture of brown-marbled grouper and sandfish was confirmed, and the verification test of sandfish mariculture and technical training were implemented. As a result, sandfish mariculture appeared feasible; the profitability in brown-marbled grouper was verified for medium or large scale facilities. Extension of mariculture for both species and simultaneously capacity building of MRC are necessary in the future.

(6) PP-6. Quality improvement of traditional processed fish

In PP6, the sterilization effect of vacuum-packaged *Valhoamas* was confirmed and the techniques of quality inspection method were transferred to the fish processing company. In addition, a strong potential demand for heated vacuum-packaged *Valhoamas* was confirmed through its test sales. The extension of quality improvement of traditional processed fish as vacuum-packaged *Valhoamas* and the formulation of national standards for it is needed in the near future.

5.7.2 Relations to the priority projects

Based on the results of the pilot projects mentioned above, the following “priority projects” were proposed in the Master Plan. These projects have a high-priority and the concrete methodologies are mentioned in the Master Plan and are easy to deal with due to clear and objective methods.

Table 5.7.1 The proposed priority projects to the Master Plan from the results of pilot projects

Pilot project	Priority project proposed to Master Plan (SFDPIS)	Responsible Sub-Sector
PP-1. Technical development and verification of live bait catch and holding for improving their survival rate	OF4. Extension of improved live bait stocking system in pole-and – line fishery	Oceanic Fisheries
PP-2. Technical development of tune hand line on-board handling for fish quality improvement	PV1. Extension of improved on-board handling techniques for tuna hand line fishery	Post-harvest and Value Addition/ Oceanic Fisheries
PP-3. Preliminary resource survey on availability of deep-sea resources	OF7. Development of new deep-sea fisheries (Diamondback squid and other fishes)	Oceanic Fisheries

PP-4. Monitoring of fish supply to resorts and setting up of an ecolabel certification	RF1. Improvement of biological, socio-economic and statistical data collection and analysis system	Reef Fisheries
PP-5. Feasibility study on mariculture of selected species in Maldives	AQ5. Training and demonstration capacity building of MTDF/MRC	Aquaculture
	AQ6. Extension of potential mariculture techniques	Aquaculture
PP-6. Quality improvement of traditional processed fish	PV3. Extension of quality improving methods for traditional processed fish of Maldives	Post-harvest and Value Addition
	PV6.Development of the minimum national standards and rules of fish products	Post-harvest and Value Addition

Chapter 6. THE COMPLEMENTARY ACTIVITIES FOR THE FORMULATION OF THE MASTER PLAN

6.1 Environment and social consideration

The guideline for socio-environmental considerations of JICA regulates that a Strategic Environmental Assessment (SEA) for the planning of projects proposed in any Development Study such as MASPLAN has to be conducted. The SFDPIS is a plan aiming at sustainable fisheries development and therefore the sustainability is the overall goal. Because of this, comparative analysis on socio-environmental considerations could not be done and instead, socio-environmental impact assessment was done in line with the concept of SEA for the pilot projects of MASPLAN as well as individual priority projects proposed in the SFDPIS. In addition, measures for mitigation of negative impacts and respective monitoring plans, for those projects with possible negative effects, were identified and therefore, it can be assumed that the SFDPIS as a whole is fully in line with sustainability.

The results of the study on the Environment and Social Consideration are indicated in Annex 5.

6.2 Gender

A research for gender consideration was conducted while formulating the Master Plan. It appears that the number of women in decision making is relatively low in the fisheries sector of Maldives. It is therefore important to build systems for gender consideration by increasing the number of female decision makers. One of the best ways to tackle this issue is securing management positions positively in the private fishery sector. It is simultaneously necessary to raise awareness on gender among male decision makers.

In addition, the following topics about gender consideration should be duly considered during planning and implementation of the SFDPIS priority projects.

A) For the implementation of the priority projects, it is strongly recommended to make sure females occupy leading positions in the administration and in the targeted communities.

B) It is necessary to extend the techniques of family management level which will help to link for capacity building of female workers.

C) Potential female participation in aquaculture is high as the working conditions are not as severe as on-board fishing vessels and it is expected that not difficult to undertake management/administration works, therefore women should be encouraged to go into that business.

D) Providing loan to develop business is effective to enhance female participation.

E) Setting up a targeted number of females is necessary during the planning stage of the projects.

F) It is important to consider time for household work for female participation in trainings.

It is estimated that potential labor population of Maldives is 15,000 20,000 of whom are female according to the population/household survey by the National Bureau of Statistics, Ministry of Finance 2014. Opportunity to access education is equally provided between men and women in Maldives, therefore, there is no difference in knowledge and capability of human resources between men and women. Developing the fishery industry with increased female involvement will contribute to absorb part of the potential labor population and also to empower some women who will contribute to further development of fishery. Hence, it is critically important to consider the gender issue at the planning and implementation stages of the projects.

The results of the survey on the gender are indicated in Annex 6.

6.3 Training in Japan

The trainings were implemented in Japan for the counterparts of MASPLAN in 2015 and 2016. The outline of trainings are shown in the following Table 6.3.1.

Table 6.3.1 Outline of trainings in Japan

year	Course name	Number of participants	Place	Contents
2015	Co-creation Program on Capacity Development for Formulation of Fisheries Sector Development Plan	5	Tokyo (Tokyo Univ.), Nagasaki (Nagasaki Univ.)	Acquisition of necessary knowledge for the formulation of Master Plan targeted at decision makers
2016	Knowledge Co-creation Program on Capacity Development for Fisheries Sector Technology	10	Kagoshima (Kagoshima Univ.)	Fishing technique of skipjack tuna,Katsuobushi processing factory etc.
	Knowledge Co-creation Program on Capacity Development for Fisheries Management	5	Tokyo (JICA Tokyo)	Institution of fishing management, surveillance system, fishing information supply system etc.
	Knowledge Co-creation Program on Capacity Development for Aquaculture	5	Tokyo (JICA Tokyo), Okinawa, Kagawa	General aquaculture, aquaculture technique for grouper etc.

The training in 2015 was implemented for mid-level officers of MoFA and MRC, with the aim to acquire the necessary knowledge to formulate the Master Plan. By getting the full support of the International Fishery Development Laboratory of Tokyo University, the training was implemented in Fisheries Agency/ National Fisheries Research Center/ Tokyo University/ Tokyo University of Marine Science and Technology/ Nagasaki Prefecture, for topics such as fishery management system/ quality control of fishery products/ fish distribution system/ fishery administration in district; fishing ports/ fishery product processing factory/ live bait fishing/ skipjack tuna pole-and-line fishing vessel/ aquaculture farm of blue-

fin tuna were observed. The participants participated in a symposium "Possibility of regional assessment by utilizing Ocean Health Index" organized by the University of Tokyo. The participants delivered a presentation about fisheries in Maldives during this symposium. A positive support was given by the Fisheries Department of Nagasaki Prefecture during the visit to Nagasaki. In this training, information was shared on fisheries administration, quality control of fishery products, fisheries management and promotion of processed fish and on technical fields such as the structure of live bait tank for pole-and-line-fishery of skipjack tuna, which are very useful for the formulation of the Master Plan. Knowledge acquired through observation of skipjack tuna pole-and-line fishing vessel and live bait fishing influenced intensely the planning and implementation of the pilot projects.

The training in 2016 was implemented for young officers, technicians and also young fishers, for the aim of execution of capacity building and more practical challenges. This training was divided into three courses, consistent with the practical agendas of each sub-sectors: 1) Fishing/Value addition course, 2) Fisheries management course, 3) Aquaculture course. As for the training course for Fishing/Value addition, the implementation of the training was entrusted to the Faculty of Fisheries, Kagoshima University, and consisted mainly of lectures and observations on skipjack and blue-fin tuna fishing and Katsuobushi processing. The participants could understand the practical agendas of Maldives fisheries and the importance of quality control in the process of Katsuobushi production. For the training course on Fisheries management, the participants were given lectures on the institution of fishery management/ surveillance system/ fishery information suppling system mainly in Tokyo, and observed fishery management/ patrol vessel etc. in Sakaiminato City, Tottori Prefecture, which was arranged by Fisheries Agency/ Tottori Prefecture. Especially in this training, the participants could understand the agendas of surveillance by administration and the importance of providing fishery information to fishers. And in the course of Aquaculture, the participants were given lectures on aquaculture technique etc. at Tokyo University of Marine Science and Technology, and observed actual fish farming sites in Okinawa and Kagawa prefecture. They could learn the whole concept of technique and facility of seed production and also the importance of quality control at the time of shipping to markets.

The details of the training in Japan are indicated in Annex 7.

6.4 Exhibition at the FISHAGRI EXPO 2015

MoFA holds "Fisherman's and Farmer's Day" in December every year. This is an event for the promotion and extension of fisheries and agriculture with each island around. Particularly as the year 2015 was the 50th anniversary for the independence of the Republic of Maldives, the event's title was upgraded to "FISHAGRI EXPO 2015" and carried out from 19th to 21st of November in Malé. MASPLAN set up a booth based upon MoFA's request and provided information on the project and Japanese fishing techniques applicable to Maldives fishery. Upon a request of the Minister of Fisheries and Agriculture, a model live bait tank was built by Earth Co., Ltd, major fishery tank production company of Japan, which was entrusted by the project.

The model of live bait tank was demonstrated to explain easily about water circulation in the tank and the automatic discharge system of dead bait, visible through an acrylic plate. The effectiveness of the Japanese live bait tank was explained to visitors by using lure bait. Large number of fishers was interested in installing the tank in their fishing vessels.

The exhibition on MASPLAN was reported by all media, which proved high interest of Maldivians for skipjack tuna fishery. It was fortunate for MASPLAN to take part in the EXPO, not only for advertisement of the project's effects, but also impacts to MoFA. Until then, even among staff of MoFA/MRC, who knowledgeable on skipjack tuna fishery, only a few staff knew the structure and issues of conventional live bait tank. Many staffs could then understand these points through the demonstration. Especially, it was helpful for the staff who involved in Oceanic fisheries sub-sector to understand the technical issues in practice for formulating Master Plan.

Figure 6.4.1 Japanese model of live bait tank for SKJ pole-and -line fishery

After FISHAGRI EXPO, the model tank was moved to MRC and shown to the public for dissemination purpose of the Japanese live bait tank, as verified within the pilot project. The details of the exhibition of FISHAGRI EXPO 2015 and a model of live bait tank are indicated in Annex 8.

Chapter 7. PREPARATION OF THE SFDPIS

7.1 Background on the formulation of the Master Plan

MASPLAN team prepared a revised draft Master Plan based on the initial draft prepared in the first Fiscal Period, taking into account comments from various concerned stakeholders and outputs of the pilot projects. Both Maldives and Japan sides discussed about the title of the Master Plan in the 3rd JCC implemented on March 8, 2017, which was ”Sustainable Development of the Important Fisheries Sub-sectors in Maldives, 2016-2025, -Goals, Objectives and Projects” as per the minutes of the meeting. Subsequently the title was revised as “Sustainable Fisheries Development Plan of the Important Sub-sectors in the Maldives 2016-2025, - Goals, Objectives and Projects” (SFDPIS) after discussions in the following SPDC meeting.

The outline of the SFDPIS was shared in the 2nd Stakeholder Consultation Meeting held on May 8, 2017, with a question-and-answer session about its contents (see Annex 4).

A new draft was compiled and discussed in the subsequent SPDC Meeting taking the above points into consideration; on May 25, 2017, Ms. Zaha Waheed, Project Director of MASPLAN, submitted this draft to MoFA Fisheries Technical Committee for discussion. Based on the comments from this Committee, MASPLAN team prepared a final draft and submitted it to the Minister through the project director by 8th August 2017. The final draft is still in a process of the formalization for approval of the Minister.

7.2 Outline of the Master Plan (SFDPIS)

The Master Plan (SFDPIS), output of MASPLAN, describes 1) the overall situation of the four sub-sectors, 2) the fisheries development policy and approaches to be followed for the sub-sectors, and 3) the priority projects related to each approach and respective roadmap. The outline of the results of the pilot projects and priority projects are drawn in Annex 1 and 2 of the SFDPIS document, respectively.

The SFDPIS is based on the following guiding principles:

A) It supports the implementation of the SAP

B) It encourages stakeholder involvement

C) It promotes community development

D) It enhances human resource development

E) It enhances partnership with other sectors

F) It gives due consideration to environment protection

G) It promotes gender equality

During the preparation process of SFDPIS, SWOT analysis was carried out for each sub-sector and was refined through a problem/objective analysis. As a result, the overall picture of the fisheries sector clearly shows that in spite of a number of weaknesses and threats, the sector enjoys considerable strengths and could benefit from existing opportunities. The purpose of SFDPIS is to build on these strengths and opportunities and simultaneously, address the weaknesses and mitigate the threats. The SFDPIS encompasses a comprehensive series of the components, i.e. fishery resources management, technological development, training and awareness, public services, legal and institutional framework and financial system.

The **overall goal** of SFDPIS is to provide MoFA in charge of the sector with the framework to fulfil its overall mandate, i.e. "to manage and develop all marine living resources in the maritime zones of Maldives in a sustainable manner".

The **goals and sub-goals** of SFDPIS correspond to the objectives to be reached through the resolution of the core issue and its main causes identified for each sub-sector. An **approach** is the way through which a given sub-goal of a sub-sector is achieved; it encompasses a set of projects to be implemented to that effect.

The following figure shows the approaches for each of the sub-sectors.

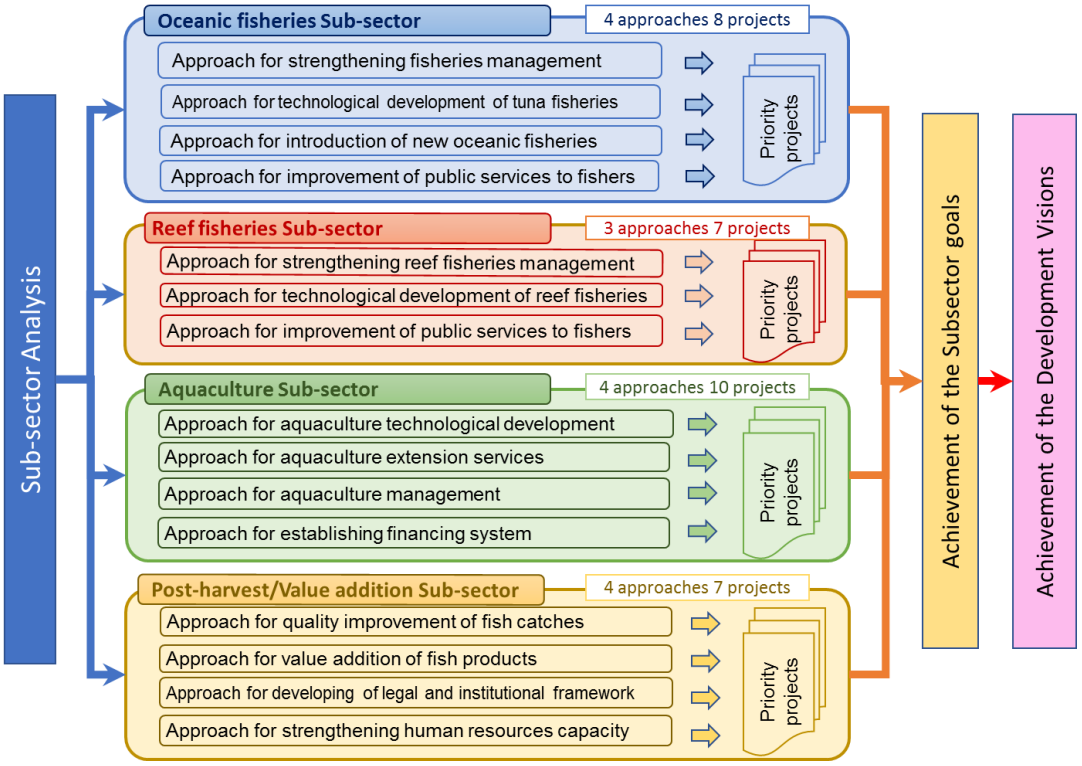


Figure 7.2.1 Flow chart towards the achievement of the development visions, with outline of approaches and respective projects

Goals, sub-goals / approaches and priority projects for each sub-sector are as follows:

For Oceanic fisheries, the goal is: "The opportunities to benefit from the Oceanic fishery resources are fully taken advantage of". The sub-goals / approaches and respective priority projects are as follows:

- Strengthening of fisheries management, with the projects i) Improvement of MCS system, ii) Training on resources management, and iii) Review and implementation of bait fish management plan.
- Technological development of tuna fisheries, with the projects i) Extension of improved live bait stocking system in pole-and-line fishery and ii) Development of new masdhoni (fishing fleet) design.
- Development of new Oceanic fisheries, with the project i) Development of new deep-sea fisheries (Diamondback squid and other fishes and ii) Promotion of private investment.
- Improvement of public service to fishers, with the project "Establishment of fisher's marinas".

For Reef fisheries, the goal is: "The reef resources are exploited in an ecologically and economically sound manner". The sub-goals / approaches and respective priority projects are as follows:

- Strengthening of reef fisheries management, with the projects i) Improvement of biological, socio-economic and statistical data collection and analysis system, ii) Improvement of relevant legislation about reef fisheries, iii) Enhancement of fisheries compliance/ enforcement, iv) Design and implementation of reef fisheries management plans and v) Capacity enhancement on fishery resources management.
- Technological development of reef fisheries, with the projects i) Improvement of boat design and equipment for reef fishery and ii) Awareness on fishing and fish handling techniques in reef fishery.
- Improvement of public service to fishers, with the projects i) Establishment of fisher's marinas and ii) Strengthening capacity of ice making plants.

For Aquaculture, the goal is: "The aquaculture industry is fully developed in Maldives". The sub-goals/ approaches and respective priority projects are as follows:

- Aquaculture technological development, with the projects i) Establishment of multi-species hatchery, ii) Establishment of milkfish seed production facilities to provide bait, iii) Development of domestic fish feed using by-product of fish processing, iv) Refinement of existing aquaculture techniques and v) Training and demonstration capacity building of MTDF/MRC.
- Aquaculture technical extension, with the projects i) Extension of potential mariculture techniques and ii) Promotion of aquaculture through formal education system.

- Management of Aquaculture sub-sector, with the projects i) Improvement of aquatic animal health management and ii) Strengthening institutional mechanism on aquaculture activities.
- Establishing financing system, with the project "Development of financing system for aquaculture".

For Post-harvest and Value addition, the goal is: "The quality of fish catch and fish products is optimized". The sub-goals / approaches and respective priority projects are as follows:

- Quality improvement of fish catches, with the projects i) Extension of improved on-board handling techniques for tuna hand line fishery and ii) Strengthening capacity of ice making plants.
- Value addition of fishery products, with the project i) Extension of quality improvement methods for traditional processed fish, ii) Improvement of fish marketing system and iii) Development of Katsuobushi processing technology and facility.
- Development of legal and institutional framework, with the project "Development of the minimum national standards/ regulations for fishery products".
- Strengthening of human resources capacity, with the project "Establishment of a training system for fish quality assurance".

A total of 32 priority projects are included in the SFDPIS, with 8 projects for Oceanic fishery sub-sector, 7 for the Reef fisheries sub-sector, 10 for the Aquaculture sub-sector and 7 for the Post-harvest and value addition sub-sector, respectively. Some of them have already started.

7.3 Road maps

The road maps of priority projects on each Sub-sector were formulated, which show the implementation schedule of each project during the SFDPIS period (2016-2025), as a final output of the Master Plan. To clarify the whole image of the Master Plan, an abstract of the road maps is described below. It is noted that the order of the priority projects in the table below is adjusted to the timing of their implementation.

Table 7.3.1 Road map of Oceanic fisheries sub-sector (Summarized version)

Projects	Current SAP period			Under new National Development Plan							Remarks
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
OF1: Improvement of MCS system	TCP/FAO						→ Continuation				Implemented based of results of the FAO project of TCP/MDV/3501
OF4: Extension of improved live bait stocking system in pole-and-line fishery	MASPLAN			Extension							Preliminary stage is implemented as pilot-project of MASPLAN
OF3. Review and implementation of bait fish management plan											The bait fish management plan has already been drafted in 2013, but not yet launched officially.
OF7: Development of new deep sea fisheries (Diamondback squid and other fishes)	MASPLAN			Extension							Preliminary stage is implemented as pilot-project of MASPLAN
OF5: Development of new masdhoni design				Design							
						Extension					
OF2: Training on resource management						Manual					
								Training			
OF6: Promotion of private investment											Particularly for longline and deep sea fishing
OF8: Establishment of fisher's marinas	On-going										Both for oceanic and reef fishery

Table 7.3.2 Road map of Reef fisheries sub-sector (Summarized version)

Projects	Current SAP period			Under new National Development Plan							Remarks
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
RF2: Improvement of relevant legislation about reef fisheries	TCP/FAO										
RF4: Design and implementation of reef fisheries management plans	Grouper										Grouper and aquarium fish management plans have already been drafted in 2011 and 2014, respectively, but not yet launched officially as of 2016.
	Aquarium fish										
				Other species							
RF1: Improvement of biological, socio-economic and statistical data collection and analysis system	MASPLAN						→ Continuation				Preliminary stage is implemented as pilot-project of MASPLAN
RF3: Enhancement of fisheries compliance / enforcement		Licensing system									
				GMS system							
RF6: Improvement of boat design and equipment for reef fishery			Design								Ice storage in the boat is an integral part of the project.
				Extension							
RF5: Capacity enhancement on fisheries resource management				Material							
							Training				
RF7: Awareness on fishing and fish handling techniques in reef fisheries				Material							
							Training				

Table 7.3.3 Road map of Aquaculture sub-sector (Summarized version)

Projects	Current SAP period			Under new National Development Plan							Remarks
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
AQ6: Extension of potential mariculture techniques	MASPLAN							→ Continuation			Including a technology which developed by pilot-project of MASPLAN
AQ5: Training and demonstration capacity building of MTDF/MRC	MASPLAN					→ Continuation					As a part of pilot project of MASPLAN, technical training on sea cucumber seed production was carried out.
AQ2: Establishment of milkfish seed production facilities to provide baits											
AQ1: Establishment of multi-species hatchery											
AQ8: Improvement of aquatic animal health management											
AQ3: Development of domestic fish feed using by-product of fish processing											
AQ4: Refinement of existing aquaculture techniques									→ Continuation		
AQ10: Development of financing system for aquaculture											
AQ9: Strengthening institutional mechanism on aquaculture activities											
AQ7: Promotion of aquaculture through formal education system											

Table 7.3.4 Road map of Post-harvest/value addition sub-sector (Summarized version)

Projects	Current SAP period			Under new National Development Plan							Remarks
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
PV3: Extension of quality improvement methods for traditional processed fish	MASPLAN										Preliminary stage is implemented as pilot-project of MASPLAN
PV1: Extension of improved on-board handling techniques for tuna hand line fishery	MASPLAN						→ Continuation				Preliminary stage is implemented as pilot-project of MASPLAN
PV2: Strengthening capacity of ice making plants				F/S	Implementation						
PV6: Development of the minimum national standards/ regulations for fishery products											
PV7: Establishment of training system for fish quality assurance							→ Continuation				
PV5: Development of katsuobushi processing technology and facility											
PV4: Improvement of fish marketing system											

Most of the proposed priority projects are planned in accordance with work budget of MoFA. In addition, a large amount of inputs and projects needed for technical development from foreign countries are to get support from appropriate funding agencies. The details of each priority project are indicated in Separate Volume: “1. Sustainable Fisheries Development Plan of the Important Sub-sector in the Maldives”.

ANNEX

Annex 1.

Assignment of JICA Consultants

	number of trips	1st fiscal period																			Total days	Total M/M
		2014			2015																	
		10	11	12	1	2	3	4	5	6	7	8	9	10	11	12						
Doi Masanori (Chief adviser/ Fisheries development)	6			12/17-26 10days		1/23 31days	2/22		4/27 39days	6/4		8/10 25days	9/3	10/1 31days	10/31	11/17-23 7days					143	4.77
Maekawa Akira (Vice chief adviser/ Fish processing & distribution)	6		11/17	(12/3-7) 37days	12/28	1/18 30days	2/16	3/23	4/10 19days			8/9 19days	8/27 7days	9/13-19	10/17 20days	11/5						132	4.40
Echigo Manabu (Fisheries resources management)	6		11/15	44days	12/28	1/17 60days		3/17	4/18 50days	6/6		8/8 27days	9/3	9/28 32days	10/29	11/13-24 12days						225	7.50
Bernard O'Callaghan (Socio-economic analysis/ Fisheries information)	2		11/15	12/23 39days		1/9 30days	2/7															69	2.30
Bernard Adrien (Socio-economic analysis/ Fisheries information)	3					2/1 49days		3/21	5/1	(5/27-6/4) 39days	6/15			8/24 45days		10/7						133	4.43
Morimitsu Ritsuo (Fishing technology)	2							4/18 50days		6/6			9/5 60days			11/3						110	3.67
Takiguchi Akihide (Fish processing & distribution)	1											8/9 40days	9/17									40	1.33
Sano Kosuke (Aquaculture development)	1											8/10 40days	9/18									40	1.33
Ohara Misato (Environment and social consideration/ Gender)	1											8/31 40days		10/9								40	1.33
Hino Yoshiki (Project coordinator/ Livelihood improvement/ Environment and social consideration)	4		11/15	44days	12/28	1/11 61days		3/12	4/21 45days	6/4		8/8 109days				11/24						259	8.63
															Total							1191	39.69

	number of trips	2nd fiscal period																							Total days	Total M/M
		2016												2017												
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11		
Doi Masanori (Chief adviser/ Fisheries development)	4		1/26 26days	2/20						9/4 30days	10/3				2/9 30days	3/10		4/27 29days	5/25						115	3.83
Echigo Manabu (Vice chief adviser/ Fisheries resources management)	7		1/26 40days	3/5		5/7 29days	6/4		8/27 50days		10/15				2/6 40days	3/17		5/6 17days	5/22		7/17 41days	8/26	9/24 21days	10/14		238	7.93
Maekawa Akira (Fish processing & distribution)	4		2/17 15days	3/2		5/15-24 10days					10/15-24, 30-11/8 10days	10days														45	1.50
Bernard Adrien (Socio-economic analysis/ Fisheries information)	7		1/30 30days	2/28		5/10 25days	6/3		8/16 25days	9/9		11/27 27days	12/23		2/14 25days	3/10		4/24 23days	5/16			8/2-21 20days				175	5.83
Morimitsu Ritsuo (Fishing technology)	4		1/26 40days	3/5					8/27 40days		10/5	11/8 30days	12/7		1/21 30days	2/19										140	4.67
Fujii Motoki (Fishing technology)	3									9/17 16days	10/2	11/8 25days	12/2		2/5 39days	3/15										80	2.67
Takiguchi Akihide (Fish processing & distribution)	4		2/17 30days	3/17		5/8 25days	6/1		8/13 20days	9/1	10/14 28days	11/10														103	3.43
Sano Kosuke (Aquaculture development)	5		2/1 30days	3/1		5/8-14 7days			8/6 35days	9/9		11/4-13 10days			1/30 30days	2/28										112	3.73
Ohara Misato (Environment and social consideration/ Gender)	1																4/18 25days	5/12								25	0.83
Hino Yoshiki (Project coordinator/ Livelihood improvement/ Environment and social consideration)	8		1/26 50days	3/15		5/7 29days	6/4		8/13 55days		10/6	10/24 53days	12/15		1/22 55days	3/17		4/17 40days	5/26			8/21-9/9 20days	9/17-10/7 21days				323	10.77
																								Total		1356	45.19

Annex 2.

Strategic Action Plan of MoFA, 2014 – 2018

(unofficial translation)

PLEDGE1: Income for fishermen with or without any fish catch
AIM: Given the seasonal nature of fisheries, there is a considerable risk of fishermen changing their profession if they do not earn enough money to support their families during periods of low fish catch. This may reduce the number of fishermen and in turn reduce productivity of the fisheries sector. The aim of this pledge is to retain fishermen in their profession, incentivize them to go fishing even during low catch periods and thereby increase annual production.
Policy 1: Enable ways to financially support fishermen's families during low catch periods.
Strategy1. Establish an Insurance scheme
Activity1. Establish "BEYAS NUBEYAS" (FISH CATCH OR NO CATCH) - Fishermen's income insurance and publicly open it for applications.
Activity 2. Establish an insurance scheme to provide financial cover for threats to life and bodily harm in the fishing profession.
Activity 3. Create awareness in the general public for the insurance schemes started by the Ministry

PLEDGE2: Establish marinas for fishermen
AIM: It has been observed that climate change and other global factors can cause shifting of fishing grounds and bait fishery grounds. In addition to this, the increase in fishing vessel sizes have led to changes in fishing practices where unlike previously, day fishing is no used. The current fishing practices require fishermen to stay away from their home islands for long periods. In order to support this new trend and lead to a sustainable fishery where fishermen do not loose enthusiasm for their profession, it is vital that their basic needs and other activities of interest are available from a single location. Therefore the aim of this pledge is to provide basic services and some recreational avenues for fishermen.
POLICY 2: Development of fisheries industry infrastructure, improve quality of fish catch and increase exports.
Strategy1. Establish infrastructure necessary for fisheries industry development.
Activity 1. Establish marinas in 4 regions of the country.
Activity 2. Monitor projects throughout the country Which have been approved with the aim of developing the fishing industry
Strategy 2. Improve quality of fish and fish products produced in Maldives
Activity 1. Establish ways for fishermen to obtain ice in locations close by to them.
Activity 2. Implement the national standard for dried fish production.
Activity 3. Conduct training programs throughout the country to improve the quality of fish catch
Strategy 3. Decrease fuel expenditure on fishing vessels
Activity 1. Monitoring/management of the fish aggregating device network

Activity 2. Conduct research on the economic efficiency of current fishing vessels

PLEDGE3: Increasing the amount of young fishermen and young boat owners
AIM: As youth constitute the largest demographic of the population, it is necessary to increase their participation to ensure that the fishing sector remains sustainable. In addition to this, youth can play a large role in developing fisheries by choosing to utilize more modern technology in fishing practices. The aim of this pledge is create growth in the fishing industry, develop and maintain sustainable fishing practices that incorporate modern technology.
POLICY 3: Increase the proportion of youth involved in the fishing industry
Strategy 1. Facilitate long line fishery targeting yellowfin tuna within the area of the Maldivian EEZ beyond 100km from the shoreline
Activity 1. Training youth for long line fishery.
Strategy 2. Increase interest among youth for the fisheries industry
Activity 1. Conduct fish camps targeting school students
Activity 2. Conduct career guidance programs to youth
Activity 3. Design fisheries training courses and provide technical assistance.
Activity 4. Conduct long term and short term training programs relating to the fisheries industry
Activity 5. Provide loans to start production of various fish products
Activity 6. Ensure that fishery training programs are accredited by the Maldives Qualifications Authority.
Activity 7. Mark fishermen's day
Strategy 3. Increase young boat owners.
Activity 1. Provide loans to youth to obtain fishing vessels

PLEDGE4: Obtaining the benefits of available marine resources
AIM: It is important to benefit from marine resources to the fullest extent possible. It is risky to be dependent on a single type of fishery or a single type of fish. Therefore the aim of this pledge is to increase diversification in the fisheries sector.
POLICY 4- 1:Establish and develop the mariculture industry
Strategy 1. Implement the infrastructure necessary to establish a mariculture industry
Activity 1. Establish a mariculture training and demonstration facility in Maniyafushi
Activity 2. Establish a quarantine facility in Hulule for mariculture purposes
Activity 3. Establish a multi species hatchery in the country
Activity 4. Formulate and implement a framework for mariculture development
Strategy 2. Starting aquaculture of economically high value species

Activity 1. Develop skills/techniques of grouper aquaculture
Activity 2. Develop skills/techniques for sea cucumber aquaculture to facilitate work in that area
Activity 3. Identify viable and economically valuable species that can be cultured in Maldives
Strategy 3. Developing human resources required for a mariculture industry
Activity 1. Conduct mariculture trainings for private and public sector
Activity 2. Establish cooperatives for aquaculture business of marine species using sea cages
Strategy 4. Formulating a vision for the future of the fisheries sector
Activity 1. Formulate and implement the fisheries master plan
POLICY 4-2: Maintaining Maldivian fishery as a world recognized model for responsible and sustainable fishery
Strategy 1. Formulate and implement management plans for different types of fishery in the country
Activity 1. Formulate and implement management plans for all commercial fisheries
Activity 2. Ascertain the state of sport and recreational fishing in Maldives and establish management mechanisms
Activity 3. Raising public awareness of (fisheries) management plans
Strategy 2. Review and revise fisheries legislation and formulate regulations
Activity 1. Revise the Maldives fisheries act
Activity 2. Raise public awareness of the fisheries act
Activity 3. Formulate and implement fisheries regulations
Activity 4. Raise public awareness of fisheries regulations
Strategy 3. Implement a monitoring, control and surveillance system in accordance with the fisheries laws/regulations and resolutions of international organizations of which Maldives is a member.
Activity 1. Formulate and implement an observer program to monitor fishing vessels, production facilities and aquaculture establishments.
Activity 2. Training of observers
Activity 3. Strengthening the vessel monitoring system
Activity 4. Raising public awareness on vessel monitoring systems
Activity 5. Installing vessel locating devices on commercial fishing vessels
Strategy 4. Increasing the accuracy of fisheries statistics and strengthening this area.
Activity 1. Establish and operate a "fisheries information system"
Activity 2. Produce and distribute log books used in fisheries statistical data collection
Activity 3. Raising public awareness of fisheries statistics/data collection system
Activity 4. Introducing new methods to strengthen fisheries statistics.

Strategy 1. Conduct research on offshore fisheries
Activity 1. Estimate the amount/proportion of big eye and yellowfin tuna caught during pole and line fishing
Activity 2. Estimate the amount caught at Fish Aggregating Devices (at log schools) in order to strengthen fisheries statistics
Activity 3. Revise the conversion factors used in fisheries statistics
Activity 4. Strengthen and expand the length-frequency program for tuna, and increase representation of Mackerel tuna and Frigate tuna samples in this data
Activity 5. Conduct awareness programs to reduce waste in bait usage and to promote responsible bait fishery
Strategy 2. Collecting data required for strengthening the planning and management of reef fisheries.
Activity 1. Conducting compliance audits under the National Coral Reef Monitoring framework
Activity 2. Raising awareness of National Coral Reef Framework protocols among stakeholders
Activity 3. Conducting fish watch programs in collaboration with tourist resorts
Activity 4. Identify and test new technological approaches to obtain detailed data of reef fish purchases by resorts
Strategy 3. Ascertain the state of protected fish and marine life, reducing the threat of bycatch to these species.
Activity 1. Continuing work on the Shark Watch program
Activity 2. Conduct research on shark bycatch amounts in long line fishery, raise awareness of fishermen to reduce shark bycatch
Activity 3. Establish standards for turtle monitoring programs being conducted by resorts and NGOs
Strategy 4. Conduct socioeconomic studies on fisheries
Activity 1. Conduct a fuel use intensity study using data collected from fishermen for the "fuel subsidy program".
Activity 2. Conduct a study to identify the social benefits of fishing communities

PLEDGE5: Fishermen shall be involved in determining the price of their catch
AIM: Fishermen need to be assured that the price of their catch correspond to market prices and that they will receive the best prices possible at time of landing. Additionally, a mechanism for the involvement of fishermen as stakeholders in determining the price of their catch and investments in the fisheries sector needs to be established. Therefore the aim of this pledge is the empowerment of fishermen.

POLICY 5: Obtaining the best prices for fish products in the international market
Strategy 1.Enable fishermen to be involved in determining the price of their catch
Activity 1. Establish a means for fishermen to receive up to date international market prices for fish
Strategy 2. Establish and start a fisheries promotion board to enable fish product businesses to develop
Activity 1. Establish and operate a fisheries promotion board.
Activity 2. Participate in fisheries industry fairs/tradeshows
Strategy 3. Establish fishing cooperatives and to increase the role of fishermen in the fisheries industry
Activity 1. Establish and empower fishing cooperatives
Activity 2. Conduct training programs to support fishing cooperatives
Strategy 4. Obtain and maintain the international third party certification of sustainable fishery to help various fisheries businesses to expand.
Activity 1. Facilitate the MSC certification of hand line fishery for yellowfin tuna
Activity 2. Maintain the MSC certification of pole and line fishery for skipjack tuna
Strategy 5. Determining the role/stake of fishermen in Government owned fisheries companies
Activity 1. Restructuring government owned fisheries companies

Annex 3.

Memorandums and Minutes of Meeting at JCCs

1st JCC (December 24, 2014)

2nd JCC (October 27, 2015)

3rd JCC (March 8, 2017)

Dec. 24, 2014

Minutes of Meeting on the 1st JCC

- JCC Pre-meeting with State Minister of the Ministry of Fisheries and Agriculture.

1. About Inception Report

State Minister:

She expects to start pilot projects on bait fishery of oceanic fishery subsector and cottage system fish processing of value addition sub-sector earlier than the others.

Mr. Sugiyama of JICA mission leader:

He stated that more discussion is necessary for the value addition sub-sector since there are many stakeholders such as small-scale processors, commercial processors etc. Problems and opportunities are diversified among them.

State Minister:

Around more than one year has passed since the preliminary study team of JICA had come. But no activities have started yet. So that she stated that the above two pilot projects should start as soon as possible.

Mr. Sugiyama:

JICA's consultant team and Maldivian side must stand on the same understanding on value addition (fish processing).

Dr. Echigo of MASPLAN:

As fish handling on board is also related to improvement of value addition, it had better to start two pilot projects, namely on baitfish and tuna handling on board in the oceanic fishery sub-sector. And the pilot project on fish processing may be better to start later than those two pilot projects.

State Minister:

IFAD project established a cooperative in Gemanafushi island and the cooperative needs funds within a year.

Mr. Sugiyama:

He recommended to draw a project related to cooperative in the road map.

State Minister:

In Maldives, there have been no successful examples of cooperatives not only in fishery but also other sectors.

State Minister:

As for making a draft of the master plan, SPDC will provide inputs only and JICA's consultant team will be able to write the draft. Is the understanding right? When WB made a study, the fund went to environment sector. That is why the master plan in fishery sector doesn't exist.

Mr. Sugiyama:

He mentioned that making guidance principle had to be done first. It is the work of SPDC, isn't it?

State Minister:

She suggested that sub-sector WG develop it by bottom-up approach.

2. Collaboration with WB

State Minister:

WB plans to dispatch an expert to Maldives from Washington DC for two weeks from January 7 in 2015. This is to examine what kind of loan and/or grant project WB will be able to provide. She told that there would be no overlaps between MASPLAN and WB's future activities, but able to collaborate each other.

Ms. Oshima of JICA:

She stated that WB seems to find what programs or projects can be done in the same components that MASPLAN has focusing on sustainable fisheries. So that it is important to collaborate with WB.

3. Other issues

Ms. Oshima:

She requested MoFA's kind consideration on improvement of daily working hours for JICA consultant team since the MASPLAN office enabled to use until three o'clock.

State Minister:

She answered MoFA would try the best but it would not be a simple problem.

State Minister:

Regarding the timing of the training in Japan for 2015, there will be individual difference among the participants how they will be stringent about religious custom. She wanted to know hours of sunshine during the Ramadan period. In addition she asked to prepare order-made training program for the participants who work for bait fisheries.

- JCC meeting held at Custom's Hall (13:00-16:00) on December 24 in 2014

1. Presentation of the Inception Report

Dr. Doi of MASPLAN explained about the Inception Report.

2. Discussions

(1) Chairman of Seafood Processing and Export Association:

There have been several researches on aquaculture of grouper and sea cucumber, and also fishery on deep sea bivalves, crabs, lobsters, and snappers until present. These activities deem to need more, therefore should be included in the value addition sub-sector. These fishery resources are important for tourists and restaurants.

(2) State Minister:

It is recommended to discuss about the point in the sub-sector WG.

Some key issues for example, bait fishery should be tackled and the relevant activities should be implemented without delay.

(3) Director of MRC:

Over-catching of baitfish has become serious problem. Most of fishers are not aware of how to handle baitfish properly. It is necessary to create awareness program for them and examine how fishers can keep baitfish longer by modifying design of tanks. This is to improve transportation methods for baitfish, for example.

(4) Permanent Secretary:

He agreed on the contents of the Inception Report. He also mentioned it is necessary to examine issue on reef fish more deeply from the point of view on economy.

(5) Representative of EPA:

How does MASPLAN consider about environmental impacts on endemic species of Maldives in food chain and ecosystem to attain sustainable fisheries?

(6) Director of MRC:

Regarding reef fish, a pilot project supported by USAID has been newly started to make a database of the catches. This is done by asking fishers to take record of their catches which are divided into two groups, namely 1) general reef fish and 2) special reef fish. Therefore, it should be examined well what pilot project should run in reef fishery sub-sector. He also asked who would write the master plan in the Sector Plan Drafting Committee and who takes minutes of meetings in SPDC. It is meaningless if MASPLAN collect existing information only. For example, it is meaningful for reef fishery if the MASPLAN can collect fisher's income which has not been collected in the previous studies to strengthen data collection and management system.

(7) Mr. Sugiyama of JICA mission leader:

He mentioned his idea. The members of SPDC should provide ideas and JICA consultant team and the members of SPDC should write the draft of master plan jointly. But the initial draft for the discussion in SPDC should be prepared by JICA consultant team, shouldn't it?

- Meeting among core members of JCC

1. When MASPLAN will start pilot projects

State Minister:

She stated that pilot projects on bait fishery and value addition should start May 2015.

Director of MRC:

What we want to know about bait fishery should be clarified more concretely. Also he mentioned it is necessary to clarify what kind information MASPLAN needs to collect in the socio-economic survey. He asked if the socio-economic data collected by the national census can be utilized or not. Information collection should more focus on small-sized fishing boat which has not been examined in the previous studies for statistical purposes. Information on craft size, gears used, duration of fishing operation and trip, equipment for fishing etc. need to be collected.

State Minister:

Since the national census has been done recently, MASPLAN should not undertake socio-economic survey.

Mr. Sugiyama of JICA mission leader:

The baseline collection survey aims to fill the gap of information collected. Reef fishery deems to be related in deep to socio-economy aspect of fishers who live in coastal areas.

Permanent Secretary:

He agreed on this point.

Mr. Sinan of MoFA:

Since it is better for reef fishery to reflect the results of the situational analysis, the pilot project on the same sub-sector needs to wait the results. But bait fishery and tuna handling on board in the oceanic sub-sector are not related to socio-economic aspects of coastal fishers directly, it is not necessary to wait longer to start the relevant pilot projects. However, since the results of the situational analysis will be come out by the end of April 2015, the same results can be utilized to make a plan in reef fishery sub-sector in time.

In order to run the pilot projects faster, the field survey for the situational analysis should start from the targeted islands for bait fishery and tuna handling and then continue the other islands.

Director of MRC:

It is better to prepare teaching materials using cartoon and in Dhivehi.

Dr. Doi of MASPLAN:

Although it is better to start the pilot project of value addition sub-sector at the same time, input (assignment of Japanese consultant) is difficult. JICA's consultant team member(s) will work with the selected national consultant team for the situational analysis to prepare the two pilot projects smoothly.

State Minister:

MoFA side is ready to start the pilot project.

Mr. Sugiyama:

It is very necessary to run the pilot projects by not only Japanese side but also MoFA side.

Permanent Secretary:

He agreed to start two pilot projects on bait fishery and tuna handling on board from May 2015.

Representatives of the Ministry of Tourism and EPA:

They stated that they didn't know the contents of MASPLAN since they didn't received the Inception Report before JCC.

Director of MRC:

The Grouper Management Plan has already started. He stated that he would try to collect more detailed data in the Plan. He also added that methods for the management of all fish species which are important economically should be reflected in the next SAP.

Representative of EPA:

EPA is now preparing Biodiversity Master Plan and hopes to link with the Fishery Sector Master Plan.

Director of MRC:

He agreed on the idea of EPA.

Mr. Sinan:

MASPLAN should cover development of fishery products for export.

State Minister:

It seems to be good for MoFA that the training in Japan in 2015 will be set during Ramadan since there will be no practical work of MASPLAN during the period.

(End)

MASPLAN Project

2nd Joint Coordination Committee Meeting

10:00-14:00, 27th October 2015

ATTENDEES

Name	Organisation
Sugiyama Shunji	JICA
Saito Hiroshi	JICA
Aishath Nahuma	JICA
Doi Masanori	JICA MASPLAN
Echigo Manabu	JICA MASPLAN
Morimitsu Ritsuo	JICA MASPLAN
Hino Yoshiki	JICA MASPLAN
Zaha Waheed	MoFA
Hassan Shakeel	MRC
Dr. Shazla Mohamed	Maldives National University
Ilham Atho	Ministry of Environment
Adam Manik	MoFA
Shafiya Naeem	MRC
Hussain Sinan	MoFA
Adam Ziyad	MoFA
Ahmed Shifaz	MoFA
Raufiyya Abdulla	MoFA
Aminath Lubna	MRC
Mohamed Ahusan	MRC
Mohamed Shimal	MRC
Fahmeeda Islam	MRC
Mohamed Adam	Customs
Musthafa Rafeeu	MIFCO
Ali Ahmed	ENSIS
Anwar Saadath	MIFCO
Abdullah Shakir Mohamed	Maldives Fishermen's Association
Imad	LGA

OPENING REMARKS BY MADAM ZAHA

Madam Zaha opened the second Joint Coordination Committee meeting of MASPLAN. Even though it was the second JCC meeting, the sector plan drafting committee and the 4 sub-sector working groups were invited to garner support and increase stakeholder participation. In her opening remarks she highlighted the importance of marine resources to the country's economy. Livelihood of Maldivians has always depended on exploitation of the country's marine resources. The two main pillars of the country's economy, fisheries and tourism, rely heavily on the country's marine resources.

Fisheries sector is a key player in the national economy and the most important economic activity in almost all the inhabited islands. Fisheries also play a critical role in the country's food supply and economic development. Although the relative importance of the fisheries sector has declined since the late 70s mainly due to the rapid growth of tourism, its role in the Maldivian economy is still significant. In 2014 it accounted for 1.7% of GDP and 11% of the labour force and generated an equivalent of approximately 163 million dollars in revenue in 2013.

Sustainable development of fisheries is a priority area in the national development policies of the Government of the Maldives. In order to aid and develop sustainable fisheries management in the Maldives, with assistance from the Government of Japan, the Masterplan for Sustainable Fisheries Development of the Maldives for the next 10 years is being formulated under the MASPLAN project. MASPLAN will serve as a roadmap that will be used in planning and formulation of activities and projects to achieve Maldives's national development goals and strategic action plans.

Madam Zaha informed that the Minister had delegated her responsibilities as the Project Director of MASPLAN. The post of Deputy Director will be filled in by the new Permanent Secretary. Madam Zaha also acknowledged the contributions of the former Permanent Secretary, Dr. Abdulla Naseer, to the project.

Madam Zaha acknowledged and thanked all stakeholders for their contributions to the subsector working group meetings. Working groups are assigned to carry out extensive discussions to identify issues and challenges as well as possible solutions for development of the respective working group areas. The information obtained from working group discussions will be used for the formulation of a comprehensive masterplan for the development of the fisheries sector of the Maldives. MASPLAN will also address current issues in fisheries management and development.

Situational analysis of 8 islands were carried out; islands were selected based on the key type of fisheries (in particular pole and line tuna fishery, handline yellowfin tuna fishery, reef fishery and grouper fishery) carried out by island communities. Information was gathered through island councils, community discussions and household surveys. Overall results were presented as fishery specific SWOT analyses. The key issues identified pertained to policy and governance, infrastructure and fisheries technology, marketing and awareness and training. The first stakeholder consultation workshop on MASPLAN was held on 10th May 2015. The workshop intended to gather relevant stakeholders to discuss on key findings of the work carried out by the 4 subsector working groups. Inputs from the workshop have been incorporated into the current draft of the masterplan.

The draft report of the fisheries development masterplan for 2016 to 2025 has been prepared and circulated for comments from stakeholders and will be finalized in October 2017, taking into consideration the information obtained from the pilot project.

Madam Zaha noted that JICA had approved the 4 project areas proposed by the subsector working groups and expressed her wish that JICA will be able to facilitate a 5th project which will look into new potential areas to develop fisheries.

Furthermore, Madam Zaha expressed her gratitude to the Government of Japan and the JICA team for assisting in the implementation of MASPLAN project with which Maldives would be able to come up with a plan for sustainable management of its marine resources.

REMARKS BY DR. SHUNJI SUGIYAMA (JICA)

Dr. Shunji Sugiyama, in his introductory remark, welcomed the attendees. He noted that MASPLAN project was implemented under JICA's Technical Cooperation Project scheme, through close collaboration between the Governments of Maldives and Japan. Joint Coordination Committee (JCC) being the highest decision making body of the project has very important functions for the implementation of the project including examination and approval of the final work plan, monitoring of overall progress and achievements of project activities, discussion and exchange of opinions on major issues of the project in addition to making difficult decisions which require mutual agreement from both the Maldivian side and the Japanese side.

Dr. Sugiyama highlighted the importance of a policy document such as a fisheries sector development plan which defines strategies, approaches and actions required to achieve fisheries related policy objectives in a comprehensive manner. Although it is common practice to formulate such a document simply as a list of exercises by a limited number of experts, MASPLAN takes a different approach. MASPLAN established subsector working groups in order to facilitate technically sound discussions and identify potentially suitable development options. The validity of those development options are then critically examined with the implementation of pilot projects. This approach will assist in producing a practical, guiding document that will lead the fisheries sector of the Maldives to the right direction.

Dr. Sugiyama requested that all participants carefully and critically review the planned work which was going to be presented by representatives of the 4 subsector working groups and provide comments and suggestions.

PRESENTATION ON THE FRAMEWORK OF MASPLAN

The general framework and progress of MASPLAN was presented by the chief advisor Dr. Masanori Doi.

Dr. Doi briefed the attendees on the title, vision and goals of the draft masterplan which were as follows:

Title: The Fisheries Development Masterplan of the Republic of the Maldives from the Year 2016 to 2025

Vision: Efficiently manage and sustainably develop the use of fishery resources in the Maldivian waters for a better social and economic future for the Maldivians by way of earning foreign currency through expanded export commodities, generating job opportunities and a stable domestic supply of safe animal protein.

The specific goals for each subsector which were defined by the Sector Plan Drafting Committee (SPDC) were as follows:

Oceanic Fisheries

- Take responsible measures as a leading tuna fishing country in the Indian Ocean
- Explore unutilized or underutilized offshore fishery resources

Reef Fisheries

- Develop atoll-based fishery management system
- Obtain third party certification for major reef fisheries

Aquaculture

- Develop economically feasible mariculture as a new local industry

Post harvest and value addition

- Improve fish quality by using modern technologies and practices for post harvest and value addition
- Revitalize traditional fish processing industry

At present there are 13 projects for the oceanic fisheries, 9 projects for the reef fisheries, 10 projects for aquaculture and 11 for post harvest and value addition. Those projects will be refined and finalized based on the results of the pilot project with additional new information.

The list of the proposed pilot projects are:

1. Improvement of livebait survival rate
2. Technical development of on-board tuna handling
3. Potential study of new fisheries resources
4. Development of data collection system in North Male atoll
5. Feasibility study of aquaculture in Maldives
6. Quality improvement of processed fish

The masterplan will be a framework for fisheries development in the Maldives for the next 10 years. The Plan is being prepared in harmonization with the strategic action plan for the fisheries sector.

Dr. Doi then showed the work flowchart for the second fiscal year of the project. The second fiscal year is approximately 2 years, starting from January 2016. In the year 2016 the pilot projects will be implemented. Based on the results, necessary amendments will be made on the draft master plan and finalised as an official document of the Government of the Maldives.

Dr. Doi's presentation was followed by the presentations on the progress of the 4 subsector working groups.

PRESENTATION ON THE PROGRESS OF OCEANIC FISHERIES SSWG

The Senior Research Officer of Marine Research Centre, Mr. Mohamed Ahusan presented the main activities of the working group which had been carried out from Nov 2014 to Oct 2015. Based on the key issues identified through working group discussions, the following two pilot projects were identified:

i. Improvement of live bait fish survival in the pole and line tuna fishery,
ii. Improve quality of handline caught yellowfin tuna through improved onboard handling

The above pilot projects started in May 2015 and discussions are ongoing for a third pilot project which focuses on survey of potential deep sea fishery resources.

Ahusan also presented the selected approaches that were discussed in the WG based on the problem analysis.

i. Improving livebait survival rate

The main purpose of this pilot project is to develop mechanisms to enhance post-harvest survival of live bait on pole and line fishing vessels.

The expected outputs for this pilot project are:

- Introduction of new methods for handling live baitfish.
- Modified bait tank that facilitates a higher survival rate
- Fishermen trained on best practices and use of the modified bait tanks
- Establishment of a recording system to study the post-harvest mortality of bait
- A clearer understanding of the conditions for holding live bait.

What the SSWG has achieved so far:

Field trips were conducted by MRC staff and data expert to study conditions of baitfish handling techniques and methods. Based on this new methodology, equipment and gear were proposed. The following year, data on the trials will be collected with assistance from Maldives National University.

ii. Improve quality of handline caught yellowfin tuna through improved onboard handling

The purpose of this pilot project is to develop mechanisms to improve the quality of catch landed by the handline yellowfin tuna fishery.

The expected outputs are:

- Improved handling and storage techniques of yellowfin tuna
- Establishment of a system to monitor the quality of fish landed.
- Study the effectiveness of the introduced gear and techniques.

Activities carried out so far include:

- Field trips conducted to study the current conditions and situations in the fishery
- Identification of issues and storage techniques
- In October 2015, 'tuna shocker' was introduced and modified ice boxes were installed

What the SSWG has achieved so far:

During the third week of October the first trial study tour was conducted. The following year, data on the trials will be gathered with assistance from the Maldives National University

The 3rd pilot project which is under discussion will explore the development of new potential fisheries resources with target species being deep sea bottom finfish and the deep sea diamond-back squid. The main activities for this pilot project are resource survey trips which will take place between September 2016 and March 2017.

Pictures of the existing bait holding tank were shown and the main issues with the current design were explained and how the modified design addresses the issues were also explained. Tuna shocker and installed iceboxes were also shown.

The floor was then opened for questions and comments from attendees.

Question: Have the new bait tank has been tested and if so, how does the mortality in the new design compare with the old design?

Response from SSWG: The bait tank has been modified in only one vessel and field trips are yet to be conducted to compare the survival rates between the two designs.

Question: Whether dead bait collection from the bottom was successful or not with the modified design?

Response from SSWG: At the end of the modification process there will be a mechanism to automatically remove the dead from the bottom. Unfortunately it has not been observed yet as the mechanism requires a slope at the bottom to retrieve the dead bait and the test boat has not been modified that way yet.

Question: Have the differences in oxygen levels been measured in the old tank and the modified tank?
Response from SSWG: Data collection trips have not been conducted yet but the trips proposed for the future will do that.

Question: What was the feedback from fishermen regarding the modified livebait tank?
Response from SSWG: Currently only one vessel has been modified this way. But the vessel owner who owns also owns a larger vessel expressed his plan to modify the larger vessel as well. So he must obviously be happy with the modified bait tank.

PRESENTATION ON THE PROGRESS OF THE REEF FISHERIES SSWG

Director of MoFA, Mr. Hussain Sinan, presented the progress of the reef fisheries subsector working group. Members of the working group include personnel from the MoFA, MRC, Ministry of Tourism, Ministry of Environment and Energy, Environment Protection Agency (EPA), Fishermen's Association, Maldives Seafood Processor's and Exporter's Association (MSPEA) and MASPLAN consultants.

Work carried out so far include:

- Analysis of the current situation and identification of issues and priorities.
- Review of existing information and identification of information gaps

Discussions of the SSWG focused on general reef fishery, grouper fishery, tourist recreational fishery, local recreational fishery, shark fishery, lobster fishery and aquarium fishery.

Sinan also briefly explained the current status of the fishery. The increase in fishing pressure on reef fish stocks attributed mainly to the following:

- Increase in demand for reef fish, mainly due to increased tourist arrivals
- Increase in demand of reef fish as target species for leisure fishing
- Weak observance of good fishing practices both by professional fishers and leisure fishers
- Absence of motivation for fishers and buyers to apply good fisheries management practices

The governance issues highlighted in the presentation were:

- Absence of management plans for fisheries, except for the grouper fishery
- Ineffective legislation
- Insufficient cooperation between policy making agencies and enforcement agencies (Marine Police/EPA/MoFA)
- Grouper management plan not being fully implemented
- Biological and statistical data collection systems not being well established as reef fisheries are given relatively low priority compared to offshore fisheries

Other issues highlighted were:

- Lack of awareness of fishers, resorts, purchasers and general public on good fishing and fish handling practices
- Insufficient capacity in management and enforcement for reef fisheries in MoFA
- Insufficient capacity to do biological examinations in Marine Research Centre
- Lack of infrastructure, mainly the insufficient availability of ice.

Improvements needed in boats for live fish and live bait include:

- High fish mortality during transportation
- Poor fishing and on-board handling techniques by fishers
- Boat not being designed properly

From an environmental and marine habitat perspective, the following issues were highlighted:

- Development of coastal infrastructure and land reclamation
- Poor sewage and solid waste management onshore and at sea
- Limited number of MPAs for fishing purposes

Working group discussions focused on prioritizing the needs in the subsector and identifying a project that would make the biggest positive impact on reef fisheries. It was agreed that the main focus should be on the improvement of data collection.

Unlike in tuna fisheries where fish are mainly exported, in reef fisheries the fish are sold locally to tourist resorts. Therefore as a pilot project, an eco-labeling scheme was decided to be developed so that the resorts will also benefit by providing MoFA with data.

The goals of the pilot project which is to be called “Pilot project on Monitoring of Fish Supply to Resorts and Setting up an Ecolabel Certification” are to:

- Set up the system for proper monitoring of reef fisheries resources on a continuous basis, with the ultimate goal of sustainably managing the Maldivian reef fisheries and conserving the integrity of the reef ecosystems.
- Stimulate active participation of the resorts in fisheries resource monitoring by providing them with an eco-label certification as a tool for marketing and promotion
- Improve awareness of resort clientele and local fishers in proper use of fisheries resources

The two components of this pilot project are data monitoring and eco labeling scheme.

Sinan also informed that discussions with resorts from North Male’ on the pilot project had yielded positive responses and a MoU is being drafted which will be signed by MoFA, Ministry of Tourism and resort management. This eco-labeling scheme will give resorts a chance to promote themselves as supporters of sustainable fisheries and get a financial benefit.

Obligations of the resort under this eco-labeling scheme will be to:

- Comply with the data monitoring program.

- Discontinue purchase of undersized fish from local fishers.
- Apply good practices during night / recreational fishing by the resort's clientele.

The pilot project will be assessed after 6 months from its inception and at the end of the 1 year period, a final assessment will be made based upon which the eco label will be awarded.

Perceived advantages of the pilot project

- Recognition of the resort as a promotor of reef fisheries sustainability; marketing.
- Better awareness of fishers and resort clientele on good fishing practices.
- Potential for replication / dissemination of the scheme to more resorts.
- Stronger basis for design and implementation of a reef fisheries management plan.
- Better collaboration between tourism and fisheries sectors.

At the end of the presentation, the floor was opened for questions and comments.

Question: What is the advantage of creating an additional eco-labelling scheme while other such schemes exist?
Response from SSWG: Already existing schemes which are internationally recognized have higher eco-labeling criteria which may not be met with the current conditions of the Maldivian reef fishery, especially with the lack of data on reef fisheries.
Comment from member: There are internationally recognized certifications such as MSC certification which may require a huge amount of money to obtain and maintain which may not be suitable for small scale fisheries. Since the tourism industry is based on marine resources, a national certification scheme would very likely appeal to tourists as well. Even in some other countries national certification schemes are being used.

Question: It was mentioned in the presentation that one of the conditions for eligibility to the ecolabel certification be that resorts do not buy undersized fish. Right now the size limitations are only for groupers; does it mean that in the future there will be regulations for other species as well?
Response from SSWG: It would be a voluntary scheme; without stock assessments and scientific advice, regulations on size-limits cannot be made. However, best practice guidelines and sizes for buying fish will be made and since the pilot project is in its early stages, discussions are still ongoing on how to proceed with the scheme.

PRESENTATION ON THE PROGRESS OF THE AQUACULTURE SSWG

Aquatic pathologist of Marine Research Centre, Ms. Shafiya Naeem presented progress of the Aquaculture Sub-Sector Working Group.

Activities carried out by the working group include an analysis of problems associated with the development of an aquaculture sector in the Maldives. The subsector working group comprise of members from MoFA as well as other relevant government institutions and potential partners.

Shafiya also noted that focus was being given to capture fisheries rather than aquaculture and identified the following as the major problems:

- Gaps in technical capacity and awareness
- Gaps in demonstration of economics
- Gaps in investment capacity

Different approaches were discussed to deal with the issues and a set of projects were identified to address those issues.

The SSWG came up with a pilot project to conduct a feasibility study on sea cucumber grow out. The following activities are planned to be carried out under the pilot project which is scheduled for the beginning of 2016.

- Review of sea cucumber global grow-out practices
- Determination of potential grow-out areas
- Grow-out trials with customised cage setup and different feed material to test for their suitability in the Maldivian environment
- Assessment of economics using results of the pilot project.

In collaboration with the JICA team and the mariculture team of MRC, a cage design and an experimental setup has been made that would be used for the study.

A brief background on work carried out through two major projects to establish an aquaculture sector in the Maldives was also given. The projects were:

1. The development of a mariculture training and demonstration facility which would work towards running pilot projects and demonstrating the feasibility of certain selected species.
2. The IFAD funded mariculture development project (MEDEP) which would work towards developing institutional capacity in addition to training and demonstration and community engagement through value chain development.

Dr. Doi explained that although the pilot project involves rearing sea cucumbers, the title of the pilot project is feasibility of aquaculture in general- including groupers and other species of interest as well. One of the objectives of the pilot project is to review the existing differences and survey the competitors in the market, especially in South East Asia so that the Maldivian aquaculture sector can compete in the South East Asian markets. Sea cucumber culture was proposed so that gaps in information can be filled.

At the end of the presentation, the floor was opened for questions and comments.

Question: Is the aquaculture project the first of its kind in the Maldives and were there any such projects carried out in the past?
Response from SSWG: Aquaculture projects have been carried out on a very fine scale for over 10 years. Culture of pearl, clownfish and grouper have been successfully carried out; experimentation with sea cucumber culture was recent. The next stage is to start demonstrating to the public on how to culture them.

Question: Have feasibility studies been carried out on culture of other species besides the ones mentioned?
Response from SSWG: Earlier aquaculture had been done on research basis rather than assessing the actual economics of operations. One of the reasons why many people had not gotten involved in aquaculture in Maldives is that the economic feasibility had not been demonstrated to the public. This will be the first time that proper economics on commercial scale aquaculture is done.

Question: As certain areas of the sea would be needed for long periods, exclusively for aquaculture activities, does a legal framework exist that gave businesses exclusive rights to carry out aquaculture activities?
Response from SSWG: A legal framework was in development; however all companies that had been issued aquaculture licenses were leased areas for aquaculture development, including areas of the reef.

PRESENTATION ON THE PROGRESS OF THE POST-HARVEST AND VALUE ADDITION SSWG

Mr. Adam Manik from the Ministry of Fisheries and Agriculture presented the progress of the Post-harvest and Value Addition Sub-sector Working Group.

The core problem identified by the working group was the low quality of raw materials. The first pilot project regarding the core issue is addressed by the Oceanic SSWG, i.e. improving the quality of hand line caught yellowfin tuna. SSWG discussions identified that focus should be given on improving traditionally processed fish, specifically smoked fish or ”valhomas”.

Therefore a pilot project was developed to improve the quality of valhomas by taking into consideration its food safety and marketability. valhomas is risky in terms of food safety because it has a high moisture content; vacuum packed product can give a false sense of safety of the product.

The Current Situation

Retail stores sell packed products which do not have any label or production date. valhomas has a variety of moisture contents. Traditionally, two types are produced, valhomas and hikimas. hikimas is drier with very little moisture in it. On the contrary, valhomas has high moisture content and will

develop mould easily and decompose faster albeit being vacuum packed. It is a misconception that all vacuum packed valhomas are hygienic, of good quality and have longer shelf life.

In the pilot project, a simplified sterilization technique was introduced and trialed with assistance by Gemanafushi Cooperative Society. Improvement of spoilage times have been noticed by visual observation, however microbiological tests have not been conducted yet.

At the end of the pilot project practical guidance on sterilization temperature and time will be given to valhomas processors. In addition manuals will be prepared and provided to them based on the scientific knowledge gained through the process. Sample collection method for monitoring thereafter, will be decided through discussions within the SSWG. Parameters that will be monitored include moisture content, salt content, bacteria (through microbiological tests) and histamine content. Monitoring tests will be conducted in the laboratory of MIFCO. Equipment needed for basic tests will also be procured under the pilot project.

Expected outputs include:

- Establishment of proper application of simple sterilization method for valhomas to improve shelf life and hygienic status.
- Proper storage methods will be developed for both highly dried valhomas and non-dried valhomas.
- Consumer acceptability & marketability of the new hygienic products is clarified.

The floor was then opened for questions and comments.

Question: Since histamine is one of the safety concerns of valhomas and depends on handling of fresh fish, was any consideration given to improve the histamine content of valhomas?
Response from SSWG: The quality of raw material is very important when dealing with Scombrid species. The issue had been discussed in the working group and the aspect of post harvest handling will be considered since histamine production is mainly attributed to post-harvest handling.

Question: What was the range of the moisture content?
Response from SSWG: MASPLAN experts had taken some samples to Japan and results of the tests had not been received yet. Some samples were with Adam Manik himself, for visual observation for mould growth.

Question: Is the project only about the shelf life of valhomas or is there any other component and whether hikimas is considered at all in the project.
Response from SSWG: The pilot project only focuses on valhomas- improving its packaging quality and safety aspects. Hikimas would be much safer due to its low moisture content.

Question/Suggestion: Although hikimas and valhomas might not have been considered as souvenir items in the past, with the increased number of Asian tourists, with improved packaging and hygienic

conditions they could be developed as souvenir items. Had the SSWG considered value addition of these products?

Response from SSWG: It was a good suggestion since a lot of tourists bought vacuum packed fish from the local vegetable market even without a label or a production date. As safety aspects were a significant concern as well as the overall packaging and presentation, improvement of the product will be considered.

Question: Since hikimas and valhomas have been used for centuries, have the health risks from these products been identified?

Response from SSWG: Histamine and mould had been identified as the major problems. However, toxic moulds hadn't been identified yet and it could be risky. But it would pose a greater risk to Europeans than Maldivians as they must have a higher tolerance for histamine due to prolonged usage of the two products.

Question: In the introductory presentation, some programs had been presented as being related to both oceanic fisheries and post-harvest fisheries. How would post-harvest activities contribute to onboard handling of fish?

Response from SSWG: The oceanic fisheries working group concentrated on the handling of handline caught yellowfin tuna only. So an activity or pilot project related to onboard handling of other species could be considered and discussed further in the SSWG as there was still some time.

Question: What was the feedback from Gemanafushi Cooperative Society with regard to the trials that had been carried out to improve valhomas?

Response from SSWG: Although they did not know what was happening when the first trials were done, soon they realized that the product's shelf life and safeness had increased and were quite happy and very cooperative with the project.

Question: In the pilot project, improving the quality of valhomas is looked at mostly from a health perspective. Are there any plans to diversify the range of products?

Response from SSWG: There isn't a pilot project that dealt with diversification of products; however projects to improve the quality of other fishery products have been identified. If Maldive Fish or 'hiki kandumas' can me made a safe product, it can be used as an ingredient to make products with a higher value.

Response from the industry (Ensis): Extending the shelf life of a product is also a form of value addition to an existing industry and will have a significant impact on already existing facilities. If the product's shelf life can be increased from two weeks to even two months it will have a huge positive impact and will be safer to sell to tourists as well. The working group discussed at length on what would have the greatest impact and that was the reason why improving the quality of valhomas was chosen rather than introducing a new product or a new value addition formula. Working group also had ideas and considerations to produce unique flavoured products such as 'naashi' (coconut shell) smoked or maybe 'bombi' (coconut husk) smoked valhomas which could also be a potential area to

consider. Packaging is also an issue and a lot of homework needs to be done to find the right type of packaging for a particular flavor.

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The afternoon session of the meeting began with a brief explanation of the general outline of the draft masterplan by Sinan. Dr. Doi explained further that corrections were being made and that the draft would be finalized after incorporating the results of the pilot project into the document. The floor was then opened for comments, questions and discussions on various aspects of the project.

General questions and discussions regarding the draft masterplan

Dr. Shunji Sugiyama enquired who the wider target audience of the document is besides policy level staff at MoFA. Madam Zaha and Hussain Sinan explained that the masterplan will be used as a bankable document to attract potential partners and donors. It will also be used by people who may want to invest in the fisheries sector and want to know the strengths, weaknesses and opportunities in the sector. They will then have a clear idea of the sector's goals and develop their work in line with MoFA's targets.

Ms. Ilham Atho said that the Ministry of Environment had developed a national biodiversity strategic action plan and was in the last stages of finalizing it. All targets related to fisheries and agriculture had been proposed by MoFA and would therefore be in line with the goals set for the development of the sector. On Dr. Doi's request, Ms. Atho promised to share the draft NBSAP and its implementation plan with the MASPLAN team.

Madam Zaha requested that any comments on the draft be submitted in writing so that they can be taken into consideration. Ms. Atho requested that 2 more days be given to comment on the document.

As the masterplan is going to be adopted by the government and it should be of high standard, Dr. Sugiyama assured that JICA will contribute towards making it a quality document.

Discussion related to the proposed 5th pilot project

Dr. Echigo Manabu gave a very brief introduction of the 5th pilot project which intends to explore potential deep sea fishery resources. In the first stage deep sea finfish resources will be targeted; during the second stage which will begin in early 2016, the diamond-backed squid will be explored as a new potential fishery resource. A preliminary report and study report will be made on the preliminary resource survey. More discussions are needed on technical and budgetary aspects of the project.

Discussion related to Reef Fisheries Subsector

Mr. Ali Ahmed enquired whether there was a plan to test for ciguatera toxin under a pilot project as it is a requirement for reef fish export to European Union countries. Madam Zaha and Sinan responded that due to limitations of funding, pilot projects had been focused on high priority areas

and as ciguatera poisoning had not been identified as an issue in the Maldives, ciguatera studies will not be carried out as a pilot project. However, as with the MSC certification of the tuna fishery which was initiated by the private sector, the private sector could come up with a project for ciguatera studies.

Discussion related to the Aquaculture Subsector

Since there already is an established company who cultures sea cucumber at a commercial scale, Mohamed Shimal enquired why the pilot project focuses on sea cucumber, instead of another species. Shafiya and Dr. Doi responded that the company who is culturing sea cucumber is doing it on an island which has unique features that are optimal for grow-out operations. The pilot project looks at developing a system for small scale operations which will work for most other islands of Maldives. As the species that is being cultured is not a native species, under the pilot project a new cage system will be set up in which aquaculture of sea cucumbers can be carried out in lagoons while taking measures to prevent them from spreading elsewhere. Another reason why sea cucumber was selected was because of the increasing interest for sea cucumber culture from the private sector. The pilot project for the aquaculture subsector also looks at different types of feeds to find a suitable feed. This will also be an opportunity to empower island communities who are interested in aquaculture.

The aquaculture group was also asked whether they had any plans to culture other species besides sea cucumber – groupers, for instance. The response was that grouper was a target species for feasibility studies. However as work related to groupers are being carried out under the MEDEP project, practical rearing experiments are not included in the masterplan. MRC already has some data on seed production which can be used for feasibility evaluations. But in the case of sea cucumbers such data is not available which is the reason that more focus is put on sea cucumber culture.

Discussion related to the Post-harvest and Value Addition Subsector

Atho enquired why the goals listed in the handout does not mention diversification of products since ideas were shared on developing fishery products aimed at the tourist market. Dr. Sugiyama answered that although it had been discussed, due to budget limitations for pilot projects, product diversification was not included as a pilot project. However, diversification of products will be included in the MASPLAN.

CONCLUDING REMARKS

Madam Zaha encouraged the attendees to provide their comments in writing so that they can be incorporated into the draft report that is being prepared. She expressed her pleasure that JICA had taken a keen interest to improve the quality of the report and expressed her wish that all stakeholders would contribute to make the masterplan a successful one. As the masterplan will only be finalised after incorporating results of the pilot project, there are still many lessons to be learned.

The budgetary process for 2016 has ended and projects cannot be incorporated further; however, if proposed early, projects may be accommodated in the budget for 2017. Madam Zaha requested all attendees to provide their comments for the draft masterplan by the end of the week and thanked all attendees for contributing to making it a productive session for MASPLAN.

Dr. Doi remarked that the direction to proceed was made clear since the vision, goals and proposed pilot projects that were presented were approved by the attendees. Dr. Doi thanked the attendees for their contribution and urged them to provide their comments to the draft masterplan at their earliest convenience.

End.

MINUTES OF MEETING
OF THE SECOND JOINT COORDINATING COMMITTEE
OF THE TECHNICAL COOPERATION PROJECT FOR
"FORMULATION OF MASTER PLAN FOR SUSTAINABLE FISHERIES"
IN REPUBLIC OF MALDIVES

The second meeting of the Joint Coordinating Committee (hereinafter referred to as "JCC") of the technical cooperation project "Formulation of Master Plan for Sustainable Fisheries" (hereinafter referred to as "the Project") was held in 27th October, 2015 in Male with participation of representatives of Maldives' government authorities concerned, representatives of Japan International Cooperation Agency (hereinafter referred to as "JICA") and the Project Team members. As a result of discussion, members of the committee agreed on the matters referred to in the documents attached hereto.

Male, 27th October, 2015

Mr. Shunji SUGIYAMA
Senior Advisor
Japan International Cooperation Agency

Ms Zaha WAHEED
Executive Coordinator
Ministry of Fisheries and Agriculture

Dr. Masahiro DOI
Chief Advisor of the Project
JICA

ATTACHED DOCUMENT

1. Progress of the Project

Based on the progress reports made by the sub-sector working groups of the Project, the meeting reviewed current status of project activities. It was confirmed that project activities have been conducted as planned without any serious obstacles

2. Appointment of the Project management posts

It was reported by the Maldivian side that a modification to the project implementation structure (i.e post assigned for project director) as described in the Record of Discussions(R/D) signed on 24th July 2014 is necessary due to re-arrangement of responsibilities among senior management staff of the Ministry of Fisheries and Agriculture. The notification of the modification will be officially informed to JICA in due course.

Furthermore, the appointment of the Deputy Project Director, which is currently unfilled, shall be made in accordance with the R/D

3. Drafting of the master plan

In view of the expected goal of the Project, namely "the Master Plan formulated by the Project will be officially adopted by the Government of Maldives as the Fisheries Sector Development Plan for achievement of National Development Strategy, both sides agreed to exert further efforts in drafting master plan so as to ensure the required quality of the document, which reflects government development goals. The members of the sector plan drafting committee are required to play a pro-active role in this respect.

4. Operation costs of pilot projects

It was observed that the scope and number of pilot projects have been increased as a result of incorporating the requests from Maldivian sides. Both parties agreed to carry out the pilot projects that were identified and agreed upon in the initial phase of the Project with no financial implications. In this context, both parties shall explore the possibility of mobilizing resources required for the successful implementation of newly proposed pilot projects such as experimental fishing for under-utilized deep-water species.

End

MASPLAN PROJECT
3rd JOINT COORDINATION COMMITTEE MEETING
"PROJECT FOR THE FORMULATION OF MASTER PLAN FOR SUSTAINABLE FISHERIES (MASPLAN)"
8th March 2017; 10:23AM
VENUE: STATE ELECTRI COMPANY LIMITED; 5TH FLOOR TRAINING ROOM

ATTENDEES:

Ministry of Fisheries & Agriculture, (MoFA)

- Ms. Zaha Waheed, Project Director
- Mr. Adam Manik, Deputy Director General
- Mr. Hussain Sinan, Director
- Mr. Abdulla Jaufar, Assistant Director
- Ms. Mariyam Simla, Senior Research Officer

Marine Research Centre, (MRC)

- Dr. Mohamed Shiham, Director General
- Mr. Hassan Shakeel, Aquatic Pathologist

Japan International Cooperation Agency, (JICA) / Project for the Formulation of Master Plan for Sustainable Fisheries (MASPLAN) Team

- Dr. Doi Masanori, Chief Advisor/ Fisheries Development
- Dr. Echigo Manabu, Vice Chief Adviser/ Fisheries Resources Management
- Mr. Hino Yoshiki, Project Coordinator/Livelihood Improvement/Environment and Social Consideration
- Mr. Adrien Bernard, Socio-enconomic analysis/ Fisheries information
- Mr. Fujii Motoki, Fishing technology
- Mr. Mohamed Faiz, Local consultant

Japan International Cooperation Agency, (JICA)

- Mr. Sugiyama Shunji, JICA HQ
- Mr. Katano Kentaro, JICA HQ
- Mr. Hidaka Hiroshi, JICA Sri Lanka Office
- Mr. Saito Hiroshi, JICA Maldives office
- Ms. Aishath Nahuma, JICA Maldives office

Ministry of Tourism, (MoT)

- Mr. Ibrahim Fikree, Assistant Director

Ministry of Foreign Affairs

- Mr. Ahmed Fazeel, Director
- Mr. Mohamed Shujau, Project Director

The meeting started at 10:15am.

- Initially the meeting was chaired by Dr Mohamed Shiham Adam, Director General of Marine Research Centre since Ms. Zaha Waheed, MASPLAN's Project Director has to attend the official ceremony of Women's Day 2017. Dr. Shiham welcomed and thanked the participants.
- It was agreed to proceed with Agenda item no.3 and to accommodate the agenda item no.1 and no.2 in the presence of Project Director.
- The third item in the agenda is General Outline of the achievements of the pilot projects

1. First Presentation *(10:23AM)* - GENERAL OUTLINE *by Vice Chief Advisor, Dr. Echigo Manabu*

- Content of the presentation was to give an outline of the 6 pilot projects which was successfully executed under MASPLAN projects proposed by the four subsector working groups, between April 2015 and March 2017. They are:
  1. Technical development and examination of live bait catch and holding for implementing their survival rate
  2. Technical Development of tuna hand line on boat handling for quality improvement
  3. Preliminary resource survey for the availability of deep sea resources
  4. Monitoring of fish supply to resorts and setting up of the ECO-label and certification
  5. Feasibility study of Mariculture of selected species in Maldives
  6. Quality improvement of traditional processed fish

- Pilot projects were implemented by the Sub sector working groups
  - Each Pilot project will produce a final report with recommendations to be incorporated into the sector plan.
  - The plan will be submitted to a stakeholder workshop attended by fishermen, Fisheries industry and other relevant stakeholders for their feedback.

- Main points in each pilot project were briefly explained to the attendees.

Main activities carried forward in each pilot project is summarised as follows:

PILOT PROJECT 1 - Technical development and examination of live bait catch and holding for implementing their survival rate

- Implemented by Oceanic Fisheries SSWG
- Implemented duration: April 2015 until March 2017
- Activities include:
  Modification of bait fish tank
  Modified water scoop net and other equipment

On n-board monitoring survey of survival rate
Live bait cage stocking examination

PILOT PROJECT 2 – Technical Development of tuna hand line on boat handling for quality improvement

- Implemented jointly by Oceanic Fisheries SSWG and by Post-harvest and Value addition SSWG.
- Implemented duration: April 2015 until March 2017
- Presented the:
  IRABU "Yake" Prevention method
  Use of Tuna electric shocker for improvement of fish quality
  High insulating cooler boxes introduced

PILOT PROJECT 3 – Preliminary resource survey for the availability of deep sea resources

- Implemented by: Oceanic Fisheries sub sector working group
- Implemented duration: May 2016 until March 2017
- Activities include:
  Egg mass sighting; conducted as a questionnaire based survey/interview
  Deep sea Fisheries resource survey conducted on vertical long lines targeting Diamondback squid and deep sea fishes

PILOT PROJECT 4 – Monitoring of fish supply to resorts and setting up of an ECO-label and certification

- Implemented by: Reef Fisheries sub sector working group
- Implemented duration: January 2016 until March 2017
- Activities include:
  Data collecting system for purchase and composition of reef fish from resorts
  Guideline of good practices for fishing and handling

PILOT PROJECT 5 – Feasibility study of Mariculture of selected species in Maldives

- Implemented by: Aquaculture sub sector working group
- Implemented duration: January 2016 until March 2017
- Activities include:
  Sea-cucumber cage culture verification
  Study trip to Vietnam
  Feasibility study of sea cucumber and grouper culture in Maldives

PILOT PROJECT 6 – Quality improvement of traditional processed fish

- Implemented by: Post harvest & value addition sub sector working group
- Implemented duration: January 2016 until November 2016
- activities include:
  Simple sterilization method for "Valhomas"
  Customer acceptability and marketability for "Sterilized Valhomas"

OUTLINE OF THE PILOT PROJECTS

- Recommendation from the pilot projects, and how to apply to the sector development in the near future
- However some activities did not clearly identify the feasibility of the activities
- Acknowledged the work done by all pilot project team works

2. Second Presentation (10:30AM)- OCEANIC FISHERIES SUB-SECTOR by Dr. Mohamed Shiham Adam

Acknowledged Mr. Ahusan for compiling the presentation, Dr. Echigo and Mr. Hino for checking out the details of the presentation

- Dr. Shiham presented the following 3 pilot projects and is summarised below

1- Technical development and examination of the live bait catch - improving the survival rate

Key objective:

Fishers often harvest bait fish in excess of what is required for a fishing trip and remaining bait fish is often discarded at the end of fishing trip. Effective utilization of baitfish resources realizes sustainable utilization of fisheries resources and development of pole-and-line fishery. The main purpose of this project is to improve the survival of the post-harvest live bait catch

What the project team experts has attempted;

- Modified the bait fish tank and tested it on different experimental trials
- The modified live bait tank was displayed as an exhibit in the last fishermen's day which got quite a lot of attention
- The project was well received by all and the fishing communities were aware of the modified bait tank
- As a further activity the team tried holding live bait fishes in cages at the ministry's research island K. Maniyafushi.
- The current situation –Improper bait handling was observed. In addition to this

when the bait is dead and sinks down to the bottom of the tank; fishermen's tend to jump in and collect it. This clouds the water and makes the water murky accelerating the problem.

- However in the new approach the use of water pressure to create a suction which automatically pushes up the dead bait is quite an effective & very clean method to get rid of the dead bait and aerating the bait hull.
- Preliminary survey was done on April 2015 to identify the technical problems and modification work for bait tank of Raskuri vessel in Addu Atoll.
- This study was done in collaboration with MNU. The data was collected as evidence that this modification of bait hull achieved it objective and is worth doing. MNU research team was hired to the collect data, both on the older version and the new version of the tanks, and how and how much bait survived on both these tanks. The result of this research was graphically presented to the participants of the meeting.
- It was highlighted in the previous working group discussions the difficulty on measuring the survival rate of bait over time.
- Overall there is a consensus among the fishermen that the new bait tank improves the survival of bait and is well worth investing.

Some key findings:

- Does not show clear differences of survival between both tanks due to limitations of methodology and applied on data collections. However qualitative assessment shows clear update on the modified tank as the conditions are favourable with the tank. The fishes are relaxed and happy in the natural behaviour in the tanks with clear water and natural circulation.
- In the older version of the bait tank there was no suction to remove the dead bait from the tank and as mentioned earlier the fishermen had to jump in or use a net which contaminates the water.
- A Further activity was carried out in Maniyafsuhi to observe how the live bait survived when put in a cage. It was observed that dead bait was not cleared on time and new ideas evolved on the feed and the mesh of the net
- Choose high bait fishing season

2- Technical development of tuna hand line on-board handling for quality improvement

Key objectives:

Improve through development of fishing techniques and method of on board handling of yellow fin tuna.

Activities carried forward:

1- Use of electric shocker: to improve the quality of fish to grade A or B. Once the fish is caught to give an electric shock to it so that the fish dies slowly reducing the damages caused to the flesh of the fish.

2- Modification of the cooler box to improve ventilation in one additional vault so that the ice will stay for a longer period and also to increase the thickness of the wall

Some trials were undergone to get evidence of insulations.

- The problem was identified during the survey trip in May 2015 and the new cooler box was designed in October 2015. The Tuna shocker was installed on the vessel "Magulas" belonging to Ensis Fisheries
- Adopted for the prevention of YAKE. "Yake" is defined as low quality of fish meat caused by losing fresh colour, elasticity and moistures
- A research was conducted for a period of one year. The data was collected with collaboration with Maldives National University (MNU). The team identified difficulties in getting data from the fishermen.
- The Third technique tested was the IRABU method which is to give a shock and put it in ice water before it dies. This method was extremely efficient to maintain the quality of fish

Key findings of IRABU method:

- The data suggests that IRABU method can produce high quality fish however needs a very detailed experimental data collection
- The data is quite difficult to obtain.
- The effectiveness of the tuna shocker is unfortunately not very unclear. This is partly due to a technical issue.
- Ideally the project team want to increase the duration of the shock. If the shocking duration was improved hopefully the method will work.
- High insulation effect from the designed insulation box was identified.
- New designed cool box was introduced to general hand line yellow fin fisheries
- More experiments are needed for verification on electric shocker.

3- Preliminary survey on Diamondback squid

- Initially the idea came from industrial discussion with an idea to explore for new species.
- A survey was conducted by sending a questionnaire via Facebook to marine biologist, fishermen and experts asking them about the possibility of egg masses and whether they have seen it.

- 5 survey trips were done and the results of the catches from the trips were shared with the participants.
- Information on the Positions of the squid were caught was shared.
- Egg masses sightings also were specified on a map
- Information on Some species which were caught from the vertical long line was shared.

Recommendations:

- Resource survey to be carried for an year
- Implementation of the feasibility survey
- A market research can be carried out to sell these species to high end markets
- Experts suggested that since this is a new fishery, precautionary approaches should be taken at early stages. Like catch caught and fishing capacity to be identified.
- Awareness sessions on training of this new fishery to fishermen.

A short video was shown on the pilot project/trips narrated by Dr. Mohamed Shiham Adam

QUESTIONS / COMMENTS AND SUGGESTION ON THE PRESENTATION

- Shakeel directed a question at Mr. Jaufar, asking the difference between male and female squid
- Mr. Jaufar replied saying that a female squid is bigger than male squid in size.
- Mr. Fujii Motoki agreed and added that female has a sperm receptacle around the mouth which is in pink colour and easy to identify. Also when a squid is cut from the gut, it can be seen that female has a pink colour gonad and male has a white colour gonad.

- Mr. Shakeel also made a suggestion regarding bait fish feeding. He said that since it is difficult for the fish to accept the artificial feed at first, try not to give artificial feed immediately. He suggested fixing both natural feed and artificial feed and later feeding just artificial feed alone. This could help fishes to accept artificial feed.

Ms. Zaha Waheed joined the meeting and she welcomed all participants to the *3rd Joint Coordination Committee Meeting (JCC Meeting*). Thanked Dr Shiham for chairing the meeting on behalf of her. She apologized that she was not able to attend the JCC meeting at the beginning as she has to attend the official ceremony on Women's Day Celebration 2017.

- Sinan's Comment on the presentation

Sinan raised a comment on the outcome of the oceanic fisheries other than Diamondback squid or modification of tanks, expected on more data on bait dead. Sinan added that he pointed out this point because Dr. Shiham's presentation he highlighted that the fishermen have acquired vessel which stores the bait tank. Also during the presentation Dr. Shiham mentioned that bait

survival has increased with the new adaptation, hence to sell or promote the model to other fishermen it would be very much important to have more data on these findings. He also added that there are lot of complications to obtain the data.

He added that there was another vessel in Gdh. Thinadhoo which has adopted the new method and that this was a good improvement. He noted that more data is needed as evidence to market this as a successful concept.

- Dr. Shiham's comment

Dr. Shiham's stated there was a documentary on live bait survival compiled by WWF fund. He agreed with Sinan's comment and added saying that there is 6 more months left in the project duration and his idea would definitely be considered.

- Sinan added up with Dr. Shiham's Comment

Not only fishermen to adopt this method but also policy makers to make decisions and gain further funds to replicate this activities we would need more data.

3. REEF FISHERIES SUB SECTOR: MR. HUSSAIN SINAN (11:00AM) (Third presentation)

1. Due to low catch not much importance was given to Reef fishery in the Maldives. 90% of the catch from the Maldives is from the oceans while only 10% is from Reef Fishery.

Objective of the Project

- Objective of the project was to set up the basis of the monitoring of reef fisheries, as there is no proper mechanism established at the moment.
- How to incentivize the whole process through eco label mechanism as resort clients are one of the key buyers of the reef fish.
- How to engage these buyers in this process is important

Expected Outcomes of the Project

- To establish linkages between Ministry of Fisheries and Agriculture, Ministry of Tourism and Industry.
- As the project has limited funds primary focus of the project was not to expand the project to whole of Maldives. Pilot project originally focused on a single atoll and to later expand if the outcome is productive enough.
- Also to establish a data monitoring system on fish supply and to have best fishing practise guidelines for resort and for local fisher folk as well.
- Huge ambitious outcome was eco label which was discussed before.

Activities under the Project

OUTPUT 1: Establish Linkages between the respective main stake holders

- To improve the linkages between MOFA and resort; an MOU was developed. This was finalized and shared with Ministry of Tourism.
- Planned to have a workshop on regular interval under the MOU, however it is not realised so far. There was already a good connection between MOFA and resorts, however to make it more formal this process was undergone.

OUTPUT 2: Reef Fish Value Chain – Identify the Key Stakeholders

- Identify the key players, especially Male' and middle men involved in the processes.
- Key stake holders in the value chain has being identified.
- This process was not done before and was quite problematic as the team was not able to identify who to approach.
- Hence, this activity was a good outcome of the pilot project.

OUTPUT 3: Data Monitoring System on Fish Supply

- Selected 6 resorts; however data was collected from only one resort
- Have to be more optimistic on this process because to get this information project team is depending on secondary resources.
- Has to be done on regular follow up basis and has being problematic
- No dedicated staff assigned to this project
- Previously assigned staff had to leave for study / trainings for three months
- Now have a good engagement with one resort and hope to expedite further

OUTPUT 4: Best Fishing Practise Guideline

- Best fishing practises guidelines has been designed and developed. The design of these guidelines is almost completed and shared for comments from MOFA, Ministry of Tourism and Environment Protection Agency (EPA). Once the stakeholders send their comments the document would be shared.
- Once the document is finalized MOFA will translate it to local language and will distribute it to fishermen.
- A Pocket guideline for now is developed for the tourist resorts.
- Hopes to expand it further

OUTPUT 5: Resort Survey to Identify the Level Reef Fish Consumption by the Resorts

- While doing the value chain analysis, Reef fish consumption by the resorts were identified
- Before the survey it was 50,000 metric tonne of reef fish consumption was identified
- After the survey it was identified that 9,000 metric tonne of fish was consumed through the survey of 50 active resort

Few slides on the guideline were shared with the participants of the meeting. Sinan added that after more modification the team will be able to finalize it within the next few weeks. Also has restriction on fishing around resorts. These are the comments from the Ministry of Tourism. There are protected areas and species identified from the Environment Protection Agency (EPA). Can give a good guideline for any new comer.

OUTPUT 6: Eco label Establishment

- To establish this in Ministry of Tourism green awards which is given to the resorts
- Establish a good relationship with the resorts

CONCLUSION

- Overall strengths
- Limited on special excessive geographical area as the data collection was new and relied on previous data collected by Marine Research Centre (MRC)
- Excellent collaboration with the resorts
- Valuable output of the surveys on reef fish supply to the resorts
- Large potential of stake holders was identified under the project

- **Overall weakness**

- Limited staff
- Limited budget

QUESTIONS / COMMENTS AND SUGGESTION ON THE PRESENTATION

- Mr. Sugiyama's Comment

Mr. Sugiyama's remarked that it is a very interesting presentation. He commented that during his frequent visits within the last 4 years, he was very much surprised to find that Maldivians do not consume reef fishes that much. He took note that things are changing and now reef fishery consumption has increased over the past few years. He stated that more local people should consume reef fish then only people will know the importance of monitoring of this fishery. At the same time reef fishing practise is more complicated and diversified and is a "nightmare" when it comes to monitoring. Much information was gained from this pilot project and provides useful information on way forward.

- Sinan's comment

He agreed with Mr. Sugiyama's comment and added that it's a night mare when it comes to monitoring of reef fishing as it's done by few people. And reef fish are usually sold to resorts, locals and guest houses. In the case of tuna data collection is easy it is easy as it is sold to exporters. Reef fishery is however not exported.

- Fikree's comment (on behalf on Ministry of Tourism)

Need more supporting document to get the blessing of minister and resorts, as this is very business oriented.

- Sinan's comment

Have already sent the document one years back but will send it again.

4. AQUACULTURE SUB SECTOR WORKING GROUP; MR. HASSAN SHAKEEL (11:25am)

(Fourth Presentation)

Mr. Shakeel appreciated all the hard work from the team members of the project. Ms. Shafiya Naeem who is also the leader of the sub sector working group had prepared the slides.

Vision of the sub sector:

Develop an economically, technically and environmentally sustainable; and competitive aquaculture sector that contributes to the Fisheries sector diversification, Income and employment generation and Sustainable livelihood of the fisherman

At the moment the sector is very under developed.

1- Currently there is only one commercial facility which is Hatchery producing sandfish
2- MRC is putting a lot of effort into Research and Development of the Mariculture sector. While Grouper and Sandfish culture is being done in K. Maniyafushi, Sandfish grow-out pilot (with 100 beneficiaries) is done through the MEDEP project

Outline of the pilot project:

- Set two species; one is grouper and the other one is sea cucumber
- First going to commercialize these two species
- JICA concentrated on these two species
- The two species was different when commercializing

- Grouper is more attracted to SME (Small and medium enterprises)
- Sea cucumber more towards community and companies

Overall goal, purpose and output was shared through presentation.

- Overall Goal - Financially feasible aquaculture models are available for interested groups to use
- Project Purpose - Aquaculture techniques are refined to suite local conditions

- Main Outputs of the pilot project
  - Evaluation of current aquaculture technology in Maldives
  - Technical potential for Mariculture of selected species
  - Economic feasibility assessment of selected species

- **Sandfish Training** - Staff from the project visited Philippines training on sea cucumber seed production techniques. MRC field staffs were able to successfully spawn sandfish in Maniyafushi

- **Training** - Capacity development for aquaculture sub-sector training was held in Japan.

- **Study Tour** - project staff visited Vietnam on a study tour to understand the Vietnamese techniques, understand their extension systems and how it can be adopted to the Maldivian context. Finding from the field trip was shared with the participants

- **Sandfish Grow-out** –This activity was launched in February 2016. The main objective was to introduce new sea cucumber grow-out/ocean nursery techniques: bottom-set/off-bottom cage. Good growth was noticed during initial month even though the experiment was interrupted due to bad weather. Later it was redesigned and commenced in August 2016. Modified experiment was carried out during August 2016 to February 2017.

5. Fifth Presentation (11:40am) by Mr. Adam Manik POST HARVEST AND VALUE ADDITION SUB SECTOR WORKING GROUP.

(Fifth Presentation)

Mr. Adam Manik appreciated the work done under Mr. Maekawae's assistance.

Objective:

The project focuses on how to improve the quality of the fishes and to maintain the shelf life of valhomas.

Activities carried forward:

Established a special laboratory in Kooddoo MIFCO processing Plant to carryout tests on vacuum packed Valhomas. The product was selected based on the discussions which was held among the sub sector working group members. Current method of making vacuum packed Valhomas is not safe and has a very short shelf-life. The team has also carried out some works beyond the scope of the pilot project.

Some activities that were carried out:

- Simple sterilization method after vacuum packed which could be practised among house hold
- Tested the product in different conditions to determine the best method to prolong shelf life of the product.
- Marketing process of the product was done
- Experiments was carried out with fishing communities like Ga. Gemanafushi Island.
- The final product was displayed on the shelf of MIFCO. 100 samples were displayed and were sold within one hour. The product received good customer feedback.
- Customers say that their first concern is on the quality of the product; safety and hygiene and the second concern was the shelf life of the product.
- Extension activities were demonstrated in Ga. Gemanafushi Island with the processors.
- The project met some processors from Local Island and this information was shared.
- Information sharing session was carried out in a national forum on the Fishermen's day
- This information was shared with the all media and leaflet on the pilot project were also prepared.

Findings:

- Sterilization duration was best at 85 – 95 degrees Celsius at 45 minutes was the best temperature based on the micro biological tests that was carried out.
- Vacuum packed sterilized had good quality and shelf life was longer
- Product with high water content activity should be kept in low temperature and need some chilling
- Product with high bacteria contains more histamine.
- Under 0.92 shelf life increased for 110 days at room temperature
- Some storage activities done with product with high water activities, it deturted after 2 or 3 days (non-heated and heated products)
- Heated product with water activity has a longer shelf life at room temperature
- New method obtain from the project where smaller processors can increase the product shelf life

Conclusions:

- vacuum packed Valhomas under heat sterilization is more safer and has a longer shelf life
- Productive training with Kagoshima on how bait tank is made and pole and line fishing was done. Training was very helpful for staff and fishermen

QUESTIONS / COMMENTS AND SUGGESTION ON THE PRESENTATION

Observation from Sugiyama:

When talking about post – harvest sector we normally talk about introducing new products. New way of doing it. This pilot project is very interesting because it does not talk about introducing new products or additional products. Traditional products are given importance. This is something unique and special for MASPLAN.

INTRODUCTORY REMARKS BY MR. SUGIYAMA

<See Attachment 1>

Lunch Break at 12:00

Retrieved back at 13:00

6. PROGRESS OF THE PROJECTS PRESENTED BY MS ZAHA WAHEED

- Working on project since November 2014 and since then the project team has not changed much from the Ministry side and project team.

- The project started with a situational analysis which was conducted by third party with an aim to understand the current situation of the fishery sector. Later a stakeholder consultation was held to officially announce the project. Stakeholders from different sectors of the fisheries industry participated in the project.

- Appreciated the industry members who represented and supported in the working groups. The industry members were very forth coming. Maldives National University (MNU) was a very involved and good stakeholders. In future hope to affiliate and collaborate more with MNU in a better way. Now they have limitations when it comes to students to engage in researches. Now they have limitations when it comes to students to engage in researches.

It is a good effort to involve the students in researches.

- Have being working on the draft of the Master Plan from the beginning. By the request of the government of the Maldives the Japanese government has accommodated the needs Ministry's needed and came up with 6 pilot projects.

- During the first year there was a trip for the policy makers to explore the fishing in Japan. Second year was more on implementing the six pilot projects.

- Fishermen were also involved in the trainings. There was an opportunity to understand the "Japanese Fisheries Industry" for the youth Fishermen of the Maldives. It was a good experience.

- At the end of each year a progress report was prepared. Second year project report has also been prepared by now. Works are undergoing by drafting committee.

- During May 2017 hopes to come to an agreement with a concrete document (a reader friendly document) of the Master Plan.

- Hopes to endorse the document by July 2017 after which the document will be submitted to Fisheries Technical Committee for review. The next step would be to submit the document to higher authorities for endorsement.

- Considerable works done last SPDC. All colleagues of team went through the document. Ministry has proposed to bring chapter 5 forward and chapter 4 afterwards. Merge chapter 4 and 6 to make it comprehensive and concise document. These are major changes which has taken over.

- The final document will look more attractive and practical. Ms. Zaha Shared a sample plan done by Mr. Bernard. The vison statement could be improved.

- Goals of the subsectors were shared.

- Some of the priority projects approved by sub sector working groups will be covered under the World Bank Project. Areas covered by all sub sector groups were shared with the participants of the meeting.

- Some of the areas can be carried through the national budget such as the "Valhomas" project. Final JCC will be on September. Ministry colleagues will give their best even though time is very limited.

<u>Dr, Doi Comments:</u>

- Appreciated the work of ministry and Japan.

7. DISCUSSION ON THE PRESENTATIONS

Mr. Sugiyama comments:

Mr. Sugiyama was happy with the progress of all pilot projects. He asked the project team whether they though the concept of "Sub Sector Working Groups" is effective.

Dr. Mohamed Shiham Adam comments:

Dr. Shiham mentioned that lot of new exciting areas were tapped under the project. Aquaculture is a very dynamic sector.

Ms. Zaha comments:

Ms. Zaha commented that this was a very good learning experience. Aquaculture is already established and believes that it is a success story.

Dr. Shiham comments:

Dr. Shiham commented that he would like to see progress on the Reef fisheries sector as the tourism sector is expanding.

Mr. Sugiyama comments:

Japanese fisheries agency does not take data from fishes. But collect the data from fisheries cooperatives. Government just take the copy of the transaction record. Most of the hotels also have the records for their needs. So the government just obtain the daily record of the transaction which are done regularly. The hotel will do it for their own purpose.

8. DISCUSSION ON THE DRAFT MINUTES OF THE MEETING:

Mr. Sugiyama Comments:

"MASTERPLAN" is a high policy document in the Maldives. The title of the document should be discussed and finalized in the JCC. Since don't have cross cutting issue, major important sub sectors are included the title of the document can be said as "Sustainable Development of the Important Fisheries Sub Sectors in the Maldives 2016-2025 – Goals, objectives and projects"

Zaha comment:
First paragraph last sentence, can we change to adopted instead of agreed.

Bernard comments:
Why is important included in the title? Isn't all the sub sectors important?

Sinan comments:

Sinan suggested not to change the name any more and to move forward. Important terminology can be changed later also.

For example, the long line fishery is not reflected in the Draft Master Plan. Hence most of the important sub sectors included. Hence the word is fine.

“Results” of project to change to “outcome” – first line of second page. The reason is because some of the pilot projects are ongoing and not yet finish to say as results.

One more suggestion. Last line of second paragraph in second page to be omitted. It is a two mechanism hence, the last line should be deleted.

Before the sector drafting committee finalize the plan. The plan should be submitted to Fisheries technical committee to discuss the plan.

<Attachment 1>

Opening remarks by JICA

Ms. Zaha Waheed, Executive coordinator, Ministry of Fisheries and Agriculture

Mr. Hussain Sinan, Permanent Secretary of MFA

Mr. Hidaka Hiroshi, Deputy Chief Representative of JICA Sri Lanka Office

Mr. Saito Hiroshi, Representative of JICA Maldives office

Distinguished representatives of other government agencies;

Ladies and Gentlemen;

It is indeed a pleasure for me to have the opportunity to deliver opening remarks at this occasion of the 3th Joint Coordinating Committee's meeting of the Project "Formulation of master plan for sustainable fisheries. On behalf of the Japan International Cooperation Agency (JICA), I would like to extend warm greetings to all the participants gathered here.

I heard that project members from both Maldives and Japanese side have been working very hard to implement the project including the conduct of pilot- projects in each sub-sectors, which are resulted in a number of remarkable achievements. Let me name some of these remarkable outputs of the PPs. In the oceanic fisheries sub-sector, possibilities of utilizing under- or non-utilized resources are explored and, first ever catch of diamond-back squid was recorded in Maldives. In the post-harvest sub-sector, the methods of improving onboard handling of fish are also field tested for tuna fishery, which may lead to even higher reputation of quality fish from Maldives. Today we are going to learn more about the achievements of pilot project.

As a result of such hard work, it seems that our project is now getting famous. When your senior officials from the Ministry of Foreign affairs visited Japan and met with Vice president of JICA recently, they actually talked about this project.

I, as a person who has been involved in this project from the early stage of project formulation, very much look forward to listening to the relevant presentations.

Ladies and gentlemen

This project is conducted as part of technical cooperation scheme of JICA. As you may have been aware by now, our approach for technical cooperation is different from those of other donors. We basically support what is needed to be done in the recipient countries and in the process we join hands and work together with the key players of line agencies and local stakeholders of the recipient countries, and we always respect their ownership and self-help efforts.

<Attachment 1>

In this regard, our technical cooperation project is NOT the provision of technical consultancy services, and hence we all have the shared responsibility for the quality of end products.

Of course there would be pros and cons in this approach, There might have been some hiccups and difficulties associated with this in the course of the project implementation. Nevertheless this is our strong belief that we can make a difference in this way.

Ladies and gentlemen

Our project is now entering in a concluding phase. What we have done in conducting pilot projects, what we have observed and learnt during our field studies in Japan and third countries, what we have discussed in the sub-sector working groups as well as sector plan drafting committed will be compiled and synthesized in the master plan.

Now on behalf of JICA, I would like to make a sincere request to all of you gathered here today to exert your upmost efforts in finalization of the plan.

We believe that the document produced in such a collaborative manner will be definitely a useful one and we do hope that new ideas and approaches summarized in this document will soon become an integral part of normative work of your ministry. I would also like to mention that this project is subject to independent post evaluation in due course as this is a requirement for any JICA projects. If this happens, I am sure that with concerted efforts of both side, we can have a high score in the evaluation.

Lastly, I would like to mention one thing again.

People of Maldives and Japan have something in common. We live in islands and prefer eating fish. A very similar skipjack fish product called “hikimas” in Maldives and “katsuobusi” in Japan forms an integral part of our traditional diet and we both catch this fish ecologically friendly way with pole and line fishing.

When people of these two countries join forces and work together for fisheries project like this one, the result has to be a good one

With that comment, I would like to finish my opening remarks

Thank you [End]

MINUTES OF MEETING
OF THE THIRD JOINT COORDINATING COMMITTEE
OF THE TECHNICAL COOPERATION PROJECT FOR
"FORMULATION OF MASTER PLAN FOR SUSTAINABLE FISHERIES"
IN REPUBLIC OF MALDIVES

The third meeting of the Joint Coordinating Committee (hereinafter referred to as "JCC") of the technical cooperation project "Formulation of Master Plan for Sustainable Fisheries" (hereinafter referred to as "the Project") was held in 8th March, 2017 in Male` with participation of representatives of Maldives' government authorities concerned, representatives of Japan International Cooperation Agency (hereinafter referred to as "JICA") and the Project Team members. As a result of discussion, members of the committee agreed on the matters referred to in the documents attached hereto.

Male`, 8th March, 2017

Mr. Shunji SUGIYAMA
Senior Advisor
Japan International Cooperation Agency

Ms Zaha WAHEED
Executive Coordinator
Ministry of Fisheries and Agriculture (MoFA)

Dr. Masanori DOI
Chief Advisor of the Project
JICA

ATTACHED DOCUMENT

1. Title and the position of the master plan

It was confirmed with reference to the R/D signed on 24th July, 2014 that the master plan formulated by the project is a principal technical guiding document for the important fisheries sub-sectors in Maldives, which is expected to support the achievement of sector's overarching policy objective as described in the Strategic Action Plan of MoFA. In view of such nature of the document, the sector plan drafting committee suggested the official title of the plan to be defined as "Sustainable Development of the Important Fisheries Sub-sectors in the Maldives, 2016-2025 - Goals, Objectives and Projects" (hereafter referred to as SDIFS plan). The meeting has agreed this title.

2. Progress of the Project

The meeting reviewed the outcome of pilot projects conducted by each sub-sector working group as well as the contents of the draft SDIFS plan. In principal, a variety of valuable technical information, together with important lessons learnt, has been drawn from the conduct of pilot-projects, which shall be reflected in the plan. In terms of the contents of the draft SDIFS plan, both sides agreed to exert further efforts to ensure the required quality of the document.

3. Further schedule of the project

Both sides confirmed further implementation schedule of the project as follow;

1) The final draft of the SDIFS plan shall be prepared and agreed upon by the sector plan drafting committee by 1st of May 2017
2) The final draft of the SDIFS plan will be presented to Fisheries technical committee prior to stakeholder consultation.
3) The stakeholder consultation meeting will be held in the middle of May (tentative), whereby final draft of the SDIFS plan will be technically scrutinized by key stakeholders of the fisheries sector.
4) Revised final draft of the SDIFS plan resulting from the stakeholder consultation will be put forward for official approval process

End

Annex 4.

Memorandums of Stakeholder Consultation

1st SC (May 10, 2015)

2nd SC (May 8, 2017)

Report of the First Stakeholder Consultation Workshop on "MASPLAN, Project for the formulation of a Master Plan for the Sustainable Fisheries of the Maldives"

By

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&

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1.0 Background

1.1 Overview of the Fisheries Sector

Livelihood of Maldivians has always depended on exploiting the country's marine resources. Both fisheries and tourism, the two main pillars of the country's economy, rely very heavily on utilizing the marine resources.

Maldivians have traditionally been engaged in tuna fishery for generations; however reef fishery has recently become popular due to the demand created by the tourism industry. Today, the key components of the fisheries sector are pole-and-line skipjack tuna fisheries, hand-line yellowfin tuna fisheries, grouper and other reef fish fisheries, and sea cucumber and lobster fisheries. The sector has accounted for around 4-6 percent of GDP in recent years, and contributes to Maldives' earning of foreign exchange on account of the export of fresh, chilled, frozen and canned skipjack tuna and yellowfin tuna. The fishing fleet consists of about 1,200 vessels. Close to 15,000 fishermen are engaged in fishing, which represent about 10-15 percent of the local workforce.

With the expansion of the tourism industry in the Maldives, the exploitation of some fisheries resources, such as reef fish and lobsters, which remained at a subsistence level for a long time, has intensified and developed to a commercial scale. Grouper fishery is the most popular export oriented reef fish fishery today. Sea cucumbers are also fished for export. These small-scale fisheries have considerable socio-economic benefits. These supplementary opportunities provide employment to fishermen when tuna fishing is poor. They also provide fishermen a choice of engaging in tuna or reef related fisheries depending on the market situation of the target species.

1.2 Fisheries Sector Master Plan (MASPLAN)

The sustainable development of the fisheries sector is a priority area in the national development policies of the Government of Maldives. In order to aid the sustainable development of the Maldivian fishery, Ministry of Fisheries and Agriculture (MoFA) is formulating a fisheries sector master plan, in collaboration with the Japan International Cooperation Agency (JICA), MASPLAN, project for the formulation of a master plan for the sustainable fisheries of the Maldives. The MASPLAN is intended to support the fisheries developmental efforts of the Maldives. The master plan will serve as a roadmap that will be used as a guiding tool during planning and formulation of activities and projects to achieve Maldives's National Development Goals.

MASPLAN Implementation Structure

MASPLAN establishes two committees – Joint Coordination Committee (JCC) and Sector Plan Drafting Committee (SPDC);- and four sub-sector working groups (SSWG). The four SSWGs assigned for the purposes of developing the MASPLAN are: (i) Oceanic fisheries WG, (ii) Reef fisheries WG, (iii) Post harvest/value addition WG, and (iv) aquaculture WG. These working groups comprise of stakeholders from relevant government organisations and fisheries industry. The mandate of the working groups is to carry out extensive discussions to identify the issues and challenges, as well as possible solutions for development in their respective working group areas. The information obtained from these discussions will then be used in the formulation of a comprehensive master plan for the development of the fisheries sector in the Maldives.

MASPLAN also addresses current issues in the fishery management and development.

2.0 Workshop Aims and Objectives

First Stakeholder Consultation Workshop on "MASPLAN, Project for the formulation of a Master Plan for the Sustainable Fisheries of the Maldives" was intended to gather relevant stakeholders to discuss on the key findings from work carried out by the four sub-sector working groups. Key objectives of the workshop were to:

- Present key issues identified by the respective sub-sector working groups; proposed approaches to address these issues and collect feedback from stakeholders.
- Develop the MASPLAN in collaboration with stakeholders by involving relevant stakeholders at an early stage of the master plan formulation
- Provide stakeholders, both governmental and non-governmental, a forum/platform to facilitate an open discussion

3.0 Outline of the Meeting

Agenda

The consultation workshop was held on 10th May 2015 at Islamic Centre Conference Hall from 9:00 hrs to 16:15 hrs. The workshop was designed to create a forum for presentations and discussions on the fisheries related issues of the Maldives. The workshop was organized into three sessions, opening session, presentations session and a panel discussion session. Agenda of the workshop attached as Appendix 1

Opening session

Following the introductory speech by Mr. Masanori Doi and the opening remark by Madam Zaha Waheed, Dr. Abdullah Naseer, Permanent Secretary of Ministry of Fisheries and Agriculture presented an overview of the Maldivian fisheries sector and the MASPLAN. Summaries of remarks and speeches from the opening session is attached as Appendix 2

Presentation sessions

Each sub-sector working group presented their situation analysis, problem/objective analysis and approaches to address the problems identified. The presentation followed by a 10-15 minutes question and answer session. A summary of the presentations and outcomes of this session is presented under section 4.0.

Panel Discussion

During the panel discussion, each sub-sector was given a slot of 20 minutes in the panel discussion. Along with the leaders from the sub-sector working groups, Project Director Dr. Abdullah Naseer and Madam Zaha Waheed were present on the panel to answer and clarify the points raised by the participants.

Participants

The workshop focused on involving relevant stakeholders from both government and non-government bodies. A total of 44 participants attended the one day workshop. Participants included representatives from government agencies; Government Ministries (MoFA, Ministry of Environment), enforcement agencies (Maldives Customs Services and Maldives Police Services). Additional participants included personnel from Fishery Industry, JICA, JICA/MASPLAN, World Bank, Bank of Maldives, NGOs and fishermen. A complete list of participants is attached as Appendix 3.

4.0 Workshop outcomes: Presentation Session

4.1 Sub-sector Working Group Presentations and Discussions

Leaders of the four sub-sector working groups presented their situation analysis, core problems and approaches to address the problems identified in the respective sub-sectors. Each presentation followed a 15 minute Q&A session. Below are brief descriptions of each presentation and discussion.

4.1.1 Oceanic fisheries sub-sector

Findings of the Oceanic Fisheries Sub-sector were presented by Dr. Mohamed Shiham Adam, Director General of Marine Research Centre. Important highlights of the presentation include:

- Brief explanation of the process used by the working group to identify core problems and approaches
- Four key issues of the sub-sector identified:
  - Less benefit by low quality fish
  - Wasteful resource use
  - Lack of utilization of unexploited resources

- Shortage in management policy and system
- Approaches to address the identified issues were discussed. Two main activities were mainly focused out of the various approaches and activities discussed in the working group meetings. These approaches were :
- Technical development and examination of live bait catch and holding for reducing post-harvest mortality for the effective use of live bait resources.
- Improving quality of hand line caught yellowfin tuna.
- Progress on MSC Client Action Plan (MSC CAP).

Presentation attached as Appendix 4: Oceanic Fisheries Sub-sector Working group.

Discussion and open comments from participants

Over-utilization and wasteful use of bait resources were identified as major issue currently facing the tuna fisheries. Participants noted that fishermen's notion of resources being an infinite source has led to excessive harvests and wasteful use of bait resources. Poor handling practices during bait fishing, overstocking the bait holds and the consequent post-harvest mortality were also discussed. The discussion highlighted the importance of creating awareness on responsible fishing and utilization of bait resources important resource and to aware fishers on how to prevent large post-harvest mortalities. Commenting further on the bait issue, Dr. Shiham stated that Marine Research Centre in collaboration with NGOs is conducting a nationwide program to create awareness on best practice methods in live bait fishery.

Recommendations:

- It was suggested that MoFA control and regulate the amount of bait that can be harvested by a given vessel, which will regulate the amount of bait put in the holds, whereby reducing the post-harvest mortality due to overstocking.
- Introduce the practice of using sea pens to hold leftover bait to allow reutilization of left over bait and reduce wastage..

4.1.2 Reef fishery Sub-sector

Findings of the Reef Fisheries Sub-sector were presented by Mr. Hussain Sinan, Director, Ministry of Fisheries and Agriculture. The fisheries focused in this presentation were general reef fishery, grouper fishery, tourism recreational fishery, shark fishery, lobster fishery and aquarium fishery. The presentation did not focus on the issues pertaining to specific fisheries but a general overview. Highlights of the presentation include:

- Introduced the Reef Fishery Working Group and outlined the scope of group.
- Summarised the work undertaken by the working group (analysis of current situation, identification of issues and identification of priorities)
- Briefed on the current status of the Maldivian reef fishery. It was noted that there is an increase in fishing pressure on the reef resources. Main factors leading to this were:
  - Increase in demand for reef fish for local consumption (resort and general public)
  - Increase in leisure fishing targeting reef associated species
  - Weak observance of good fishing practices by both commercial and recreational fishers
  - No motivation for fishers and buyers to comply with good fishery practices
- Key issues identified by the working group were; governance, lack of awareness, insufficient institutional capacity, lack of infrastructure, and environmental issues related to coastal development and improper sewage and waste disposal.

Presentation attached as Appendix 4: Findings of Reef SWG, Stakeholder consultation for MASPLAN

Discussion and open comments from participants

- Extensive discussion took place on the issue of lack of statistical data and scientific information on reef fish fisheries. The working group identified this as the major issue faced by the reef fishery sub-sector. Participants reiterated on the importance of collecting catch and effort data through a properly established data collecting mechanism.
- Dr. Shiham highlighted that, a rapid phone survey carried out as a sub-sector activity revealed significantly high numbers of island fishing communities and fishing vessels engaged in different reef fisheries throughout the Maldives. The rapid phone survey was carried out to understand the current status of different forms of reef fishery across the country as the current situation and the nationwide distribution of many of these activities are not very well known. For the survey, a brief set of questions were formulated covering all the reef fishery activities. In

addition to this, questions relating to tuna fishery ("Pole & Line" and "Hand line fishery") were opportunistically included in the survey. This information was gathered by calling each island council during March-April 2015. Adding further to this, Dr. Shiham also stressed on the importance of data collection to better understand and manage the fishery.

- It was highlighted that introduction of the "Decentralization Act" resulted in the devolution of the former island office catch and effort data collection system and that fishermen are not educated enough on the logbook system resulting in under-reporting of catch. Hence, the need to educate fishermen on this reporting system was identified and acknowledged by the participants.
- Mr. Shakir representing Fisherman's Association of Maldives stated that Maldivian reef fishery is unregulated, and reiterated that data collection is vital to regulate the fishery. He also stated that the working group found it difficult to come up with decisions due to the lack of data. Stressing on the importance of catch and effort data, he urged on the establishment of a good mechanism to collect catch and effort data from the various fisheries targeting reef associated species.
- Hassan Mohamed Manik from B. kudarikilu proposed the improvement of the fishery logbooks. He further raised the issue or organic waste disposal from the tourist resorts negatively affecting the bait and reef fishery in the vicinity. He also noted the depredation of reef fish catch by sharks due to an increased abundance resulting in loss of catch. Use of long lines in reef fishery. According to him this practice of using longlines can cause detrimental impacts on the reef resources as reef fish occupy a narrow habitat.
- Mr. Sinan Agreed on the shortcomings from MoFA's side on the data collection system and elaborated on the mechanism of data collection. He explained that the decreased reporting of catch and effort data from the reef associated fisheries is the result of the developments in the fisheries where the single day trips carried out previously have been replaced by multi day trips. Hence, the island office based catch and effort data collection system does not work as fishermen do not return to their home islands regularly. He further reported that unlike in the reef fishery, catch and effort data collection from the tuna fishery is well established as nearly 70% of the catch is exported and data can be obtained from fishermen as well as the exporters.

<u>Recommendations</u>

- With regard to the results from the rapid phone survey Dr. Shiham stated that the survey has shown the presence of a large number of vessels targeting reef associated species and that there is a lot of unknowns in the fisheries and proposed that such issues are focused in the MASPLAN.
- Participants suggested engaging resorts in collecting important fishery data as resorts are the major consumer of reef fish. It was noted that failure of resorts to report data arise because there is no incentive for the resorts for the provision of data. Participants agreed that proper data reporting from resorts will happen if the resorts were incentivized. Hence, it was suggested that this be focused and presented as a recommendation in the MASPLAN
- On data collection and reporting by resorts, Mr. Sinan stated that MoFA is currently planning to formulate a plan to incentivize resorts through MASPLAN
- Dr. Naseer, on data collection, stated that there is an increase in the number of small boats that are designed and constructed specifically for reef fishery. He stresses on the importance of collecting fishery data by vessel type and gear used.

4.1.3 Aquaculture Sub-sector

Findings of the Aquaculture Sub-sector were presented by Ms. Shafiya Naeem, Aquatic Pathologist, Marine Research Centre. As an aquaculture industry has is not yet established in the country, the presentation mainly focused on the challenges in establishing an aquaculture industry. Highlights of the presentation are:

- An overview of aquaculture in the Maldives and work conducted by MoFA to facilitate establishment of this industry.
- The ongoing Mariculture Enterprises Development Project (MEDeP) was briefly explained.
- The core reasons for the absence of an aquaculture industry in the Maldives were identified as the reluctance of investor's to invest and the low priority given to aquaculture in the government's development objectives.

- 6 approaches were discussed by the working group. These approaches are:
  - Policy development approach
  - Training and technical development to deal with the technical knowhow, focusing on training people on field work
  - Economic demonstration approach - A major issue is the inability to demonstrate the economic potential of the industry
  - Education approach
  - Financial approach- discussions on why there is lack of capacity for investments in public sector and the need to incentivize people to start aquaculture projects
- Aquaculture support services development approach

Presentation attached as Appendix 4: Aquaculture Sub-sector

Discussion and open comments from participants

- Lack of a feasibility study in the context of economic benefits of aquaculture in the Maldives was identified as a key factor inhibiting the establishment of this industry. In response to a question by a participant on a absence of studies on the economic feasibility, , Ms. Shafiya stated that over the years, MoFA was in the process of developing the technical aspect of aquaculture rather than demonstrating the economic feasibility. Ms. Shafiya reiterated that the vision is to focus on understanding the economics of the target species that have been experimented. Furthermore, it was stated that a significant amount of islands have been leased for aquaculture projects but none has materialized except for a sea cucumber farm established by a private party.
- It was informed that the government is in the process of establishment of a national quarantine facility to facilitate the import of seeds and broodstock.
- Participants raised the issue of lack of legal instruments pertaining to investment safety from policy changes.
- Mr. Sinan stated that MoFA and MRC are currently in the process of delivering a regulation on aquaculture.

4.1.4 Post-Harvest/ Value addition Sub-sector

Findings of the Post-Harvest/ Value addition were presented by Mr. Adam Manik, Deputy Director General, Ministry of Fisheries and Agriculture. Highlights of the presentation include:

- Brief explanation of the methodology used to identify core issues and select approaches
- The 7 areas the Sub-sector working group focused on:
  - Post-harvest handling
  - On-board & On-shore handling of fish
  - Challenges in improving the quality of fresh fish
  - Challenges in distribution of fish & fishery products
  - Challenges in Marketing
  - Challenges in complying with local & international standards
  - Value-addition of fish and fishery products for both domestic and international markets
- Core problems that lead to poor quality of fish identified by the working group
- Project design matrix that was developed for the identified problems

Discussion and open comments from participants

- Mohamed Shiham Adam inquired on the estimation of economic losses due to low quality products to which Adam Manik responded that there has been no such studies yet and the industrial companies will be aware of such loses. He further emphasized that Maldivian companies adhere to stringent food safety management systems and that products from Maldives has not faced any issue of low quality so far.
- Ilham suggested that environmental issues for example waste disposal, be addressed in the plan.
- Participants discussed on the Carbon Monoxide treatment of hand line caught yellowfin tuna, which would allow companies to purchase tuna that are now rejected due to low quality.
- Mr. Shakir, on national standards noted that even though products are targeted at the domestic market, foreigners and tourists visiting the country are a significant consumer of the products and therefore needs national standards to assure the quality.

- The discussion then focused on the issues at the Male' fish market. Adam Manik stated that improving the facilities and practices at Male' fish market will be easier now as the market is now under the jurisdiction of Health Protection Agency. On the contrary, Mr. Sinan pointed that the issues at Male' Fish Market were not solely due to infrastructure, but rather due to lack of awareness of fishermen. A possible cause for low quality fish at the market is the involvement of middlemen in the supply chain. MoFA has conducted extensive awareness campaigns to fishermen on post-harvest handling of fish.

Presentation attached as Appendix 4: Sub-sector Working Group on Post-Harvest and Value Addition

4.2 Situation Analysis

Key findings of the situation analysis were presented by JICA Expert Mr. Bernard Adrien. The presentations had two parts; the overall situation of the Maldivian Fishing fleet prepared by MRC and Situation Analysis conducted by MASPLAN project's local consultant *Lamer* and Ryan. Highlights of the presentation include:

- Firstly, Mr. Bernard noted that he was presenting the findings of the situation analysis on behalf of Lamer. It is clear that the situational analysis reflects the opinions of the fisheries communities gathered from the consultations held in the selected islands, and may not necessarily correspond to MoFA's views
- Overall situation of the national fishing fleet from the rapid phone survey mentioned above was presented. The aim of this activity was to get an atlas of fleet per type of fishery. Mr. Bernard stressed the fact that these outputs represent a very valuable tool for the management of reef fisheries (and other fisheries), and that this kind of work should be updated on a regular basis.
- Situation analysis: Mr. Bernard briefly explained the methodology of the situation analysis. 8 islands were selected by MoFA on key type of fisheries carried by the island communities; pole and line tuna, hand line yellowfin tuna, reef fishery and grouper fishery. Information was gathered through island councils, community discussions and household surveys. Overall results were presented as a SWOT analysis for each fishery. Mr. Bernard expressed the opinion that the work carried out by the consultant has been done in a serious and professional way and supplies insights on the fisheries communities which are quite relevant for the elaboration of the MASPLAN.
- Key issues identified were :
    - Policy and governance
    - Infrastructure and services
    - Fisheries technology
    - Market
    - Awareness and training

The presentation and discussion thereof had to be considerably shortened due to lack of time as the presentation had to be conducted in English with Dhivehi translation and interpretation.

Presentation attached as Appendix 4: Situation Analysis

5.0 Workshop outcomes: Panel Discussion

5.1 Oceanic fisheries sub-sector working group

Riyaz highlighted 14 areas which were explored with regard to work that needs to be carried out for skipjack and yellowfin tuna fisheries. The 14 areas had been scored and the area which ranked highest in the priority score was identified by the working group as live bait fishery, specifically implementation of the live bait fishery management plan.

Reportedly, discussions of the sub-sector working group mainly focused on:

- Measures that can be taken to manage the live bait fishery.
- Introducing methods to measure the amount of live bait caught and how best to obtain live bait catch data from fishermen.
- Identifying issues with the existing methods of catching and handling live bait and modifications that can be made to the design of the bait hold and train fishermen on how best to transfer bait from the net to the hold. Work on this is ongoing with assistance from the technical expert from JICA.

Discussion

Mr. Ali Didi, fisherman from GA. Gemanafushi, noted that they were already practising the three methods recommended for sustainable bait fishery:

- It has been about 3 years since they had been using bait scoops similar to the one shown during the presentation. As MoFA had been concerned about the small sized bait that they had been catching earlier, they now use nets with larger mesh sizes (roughly the circumference of the little finger) which also has a part with smaller sized mesh in which the bait collects, when it is hauled.
- Earlier they used to attract bait fish to the surface at night using lights. Now, a different method is used – the vessel is anchored at a location having a depth of about 40m; and when it is close to sunrise, at around 5:15am, when the first light is .... the weighted net is sunk, occasionally accompanied by a diver. With this method, even though a lot of smaller sized bait are caught at first, they are given a chance to escape through the mesh when it is dragged through water and brought to the surface, retaining mainly larger fish when the net is finally brought onboard.
- Their bait holds are already designed as recommended in the presentation.

Mr. Hassan Mohamed, councilor from B. Kudarikilu, expressed that the new methods, if introduced, would be a good change. He also raised the concern that although the fish may escape from the nets, they may not survive due to the increased water temperature brought on by the strong lights.

Hassan Mohamed also raised issues related to filling in daily catch recording logbooks. Those issues had arisen partly due to the lack of training given on filling the logbooks.

Dr. Shiham stated the two goals MoFA and MRC need to achieve with respect to bait fisheries as being:

1. To regularly measure the amount of bait harvested.
2. To monitor the amount of bait extracted and locations from where it is extracted so as to monitor the long term changes that occur in the availability of bait for future management of the live bait fishery.

Riyaz briefly shared some of the experiences he had had on his field trips with fishermen from different regions of the country who conduct bait fishing at night with weighted nets. Reportedly, he had not observed any cases where nets with altered mesh sizes were used (as Mr. Ali Didi had reported). Riyaz said that if fishermen use nets with larger mesh sizes, it would be good to introduce it and share their knowledge and experience with fishermen from other regions. During harvest of live bait with the aid of lights, a typical vessel uses 5 lights, each of 2000W, summing up to a total of 10,000W. As such powerful lights are used, tests were done to monitor for any changes in water temperature. However, due to currents and good circulation, no change in temperature was noticed. The high concentration of zoo plankton that gets attracted to lights, especially during the inter-monsoonal transition period, would have an impact on the reef ecosystems.

The plankton funnel created by lights used in live bait fishery has been observed to reach a depth of 20m and include fish larvae among other varieties of zoo planktons.

Participants were then shown video clips featuring:

- The amount of bait that die in the hold
- The use of bait scoops that do not retain water and ones that do
- Poorly designed water circulation systems with water inlet and outlet at deck-level

It was noted that bait fishery was discussed in-depth only because the pilot project was based on bait fishery. Participants were invited for discussions and propose further work required in all areas of the oceanic fishery sector.

Mr. Didi shared his experience that bait fish are observed seasonally in varying quantities and regardless of them being caught or not they would increase and decrease depending on the season. In his opinion there was no reason not to catch as much as they want during a season of abundance, as they would not be there the following season.

Dr. Shiham's argument was that, baitfish being a biological natural resource would need to reproduce, like all other living things, thus the need to maintain a balance in harvest of resources and the need for management. Riyaz explained that the objective of the live bait fishery management plan was not to limit the amount of baitfish harvested, but rather to employing methods which may prolong their survival in the hold, thereby reducing wastage.

The participants were also asked for their opinion on developing live bait fishery as a separate fishery. Mr Didi responded by saying that it would only work if the bait is caught from outside the atolls, rather than from reefs inside the atolls. No further explanation was sought for his response.

Mr. Didi enquired whether circulated bait holds, such as that shown in the video clip, operated by pumped water or through aeration. In response, Riyaz said that both methods were used and pumps are placed close to the walls of the holds, so as to minimize disturbance to fish.

Hussain Sinan (MoFA) enquired regarding the duration of survival of baitfish in cages. Dr. Shiham responded by saying that survival periods would differ for different species of bait- silver sprats may not survive long in captivity, however species of fusiliers would hold for a few days. He further went on to explain the advantages of developing a separate commercial live bait fishery, which in short are:

- It would aid in management of live bait fishery
- Putting a value on bait may help minimize wastage
- Fishermen may keep leftover bait for use the following day, instead of discarding it.
- It would save fishermen a lot of time, effort and fuel costs as they would not have to search for bait.

Mr. Adnan Ali, Managing Director of Horizon Fisheries, raised his concern regarding the restriction for fishermen from accessing good bait fishing grounds which are in close proximity to resorts. MoFA needs to identify such fishing grounds and take measures to stop such areas being given for resort development.

Mr. Hassan Mohamed (Kudarikilu councilor) shared his opinion that the tourism industry causes damage to reefs by anchoring and destroying the reef structure, especially by liveaboards. As areas are continually being declared as MPAs and islands are being leased for resort development, a lot of valuable resources are becoming inaccessible and would eventually be lost. Another point he raised was the lack of awareness on occupational health hazard and safety in fishing operations. He also suggested that the government design and build boats with optimal conditions for fisheries and sell to fishermen.

Shakir, from Fishermen's Association, recommended that development of live bait fishery as a separate fishery be included in MASPLAN. The government needs to take initiative to demonstrate that it would be feasible. This demonstration could also be one of the pilot projects carried out under MASPLAN. If bait fishery is developed as a separate fishery, it would make management of the fishery easier and people would start valuing the resource.

5.2 Reef Fishery Subsector working group

Sinan briefed the participants on the discussions carried out within the reef fishery subsector working group. Key points of concern were as follows:

- Lack of data on reef fisheries and lack of biological information on reef fish species. Absence of data on recreational reef fishery was highlighted as a major issue.
- Lack of enforcement of regulations
- Lack of a legal framework to regulate reef fisheries.
- Importance of training fishermen on fish handling and quality control
- Inadequate institutional capacity for reef fishery management.
- Importance of providing reef fishermen access to ice.
- Closure of reef fish spawning aggregation areas.

Discussions

Dr. Shiham stressed upon the importance of considering the amount and quality of data collected. Results of the Rapid Phone Survey, which was initiated following discussions of the Reef fishery subsector working group, provide an approximate picture of how heavily reef fishery is being conducted across the country. He reiterated the importance of increasing effort to collect reef fishery data.

¥The participants were briefed on the biology of reef fish including their relative longevity, low fecundity and sedentary nature. Results of underwater Fishwatch surveys showed that sizes and diversity of fish in areas where fishing was restricted were higher than in areas which were open to fisheries. Consecutively, participants were asked to share their views regarding breeding/spawning area closures for reef fishery management.

According to Mr. Hassan Mohamed, he had personally observed grouper spawning aggregations, but claimed that fish would not take bait before releasing their eggs. This would allow for release of eggs before being caught by fishermen. He also noted that reef fish species such as certain species of jacks had been observed to move between atolls, as evidenced by the reef fish tagging program conducted by MRC, in which fish tagged and released in Baa atoll had been caught from Lhaviyani and Alif atolls. If good fishing grounds were closed, fishermen would have to travel farther which would make fishing operations less efficient in terms of fuel, effort and time that would need to be spent. The young

generation is moving away from fisheries as is the case of B. Eydhafushi which used to have 25-30 fishing vessels, out of which only 2 operate now. He urged that more effort be put to include fisheries related content into the school curriculum. Even young people who study fisheries science at school are not keen to get themselves employed in fisheries. Hassan Mohamed thinks that this is mostly because income from fisheries is unreliable, especially during the months May- August when fishing is poor. People prefer to work in the tourism industry as an alternative since the income from tourism would be steady and more reliable. These factors would need to be taken into account when MASPLAN is formulated.

Yoosuf Nishar (Coast Guard) stressed on the need to take management measures to sustain Maldivian marine resources. As was being practiced in other parts of the world, he suggested implementing measures to restrict fishing effort such as time restrictions and bag limits, to manage recreational reef fishery.

Addressing Nishar's suggestions, Sinan noted that good practices need to be adopted by recreational fisher folk such as releasing smaller sized fish as soon as they are caught instead of landing and discarding it. Bag limits or quotas should be set if the status of the fishery was observed to decline. However, due to lack of data, fishery status cannot be ascertained. Until recently, only aggregate data had been collected for reef fisheries. MoFA would need species-wise data to know the status of reef fish populations to take appropriate management measures.

Dr. Shiham suggested the following activities to be included in MASPLAN:

- Improving research and data collection required for reef fisheries management.
- Banning reef fish exports because of sustainability concerns due to the increasing demand from the growing tourism industry.

Anwar Saadat, from MIFCO, informed the group that in addition to tuna MIFCO also buys reef fish. The price of fish fluctuates depending on the availability of fish- when they get more fish they reduce the buying price and when they get less fish they increase the buying price of the fish. If the rate is increased to 25-30rf/kg the company would get 1-2T per night. When there is an excess of fish the company decreases the price. The company is in the process of formulating regulations for handling and postharvest of fish. In the southern atolls, especially in Huvadhoo atoll, MIFCO is planning to install ice plants with the purpose of giving fishermen easy access to ice.

5.3 Post-harvest/ Value addition subsector working group

Adam Manik (MoFA) briefed the group on what had been discussed in the subsector working group discussions and noted that the working groups proposed pilot projects in the following areas:

- Quality of fish and fishery products made by SMEs and cooperatives
- Redesigning of vessels to better handle and maintain quality of fish
- Quality assurance of fresh and processed fish
- Installation of 2 ice plants (as JICA does not provide funding for infrastructure, this may not work out)
- Formulation of a Standard Act
- Improving the quality of yellowfin tuna caught by hand line

Discussions

According to Ali Didi, the reason for low quality yellowfin tuna was due to sudden drop in prices- the crew gets careless with handling of fish when they are informed en route to the factory that the prices had dropped. Additionally, boats of Gemanafushi have to travel far to get to the nearest island with an ice plant.

Ali Didi also raised the issue of a report he had made to MoFA, about a fishing vessel (which also had a VMS) tied to a FAD, and the report being dismissed without any action taken. But if MoFA cannot look into such issues, even when formal complaints are made, the expensive VMS systems that they had installed in their vessels are of no use. He hopes that such issues will be resolved with the 10 year master plan.

Adam Ziyad, from Compliance Unit of MoFA, said that it must have been a miscommunication as he had received no such reports. One of the objectives of having a VMS was to stop illegal activities and he would look into the matter.

Adnan Ali, from Horizon Fisheries, raised his concern about Maldivian fishing vessels not been optimally designed to preserve the quality of fish. In Japan, pole and line vessels are designed in such a way that fish lands on canvas and falls through a conveyor belt and directly into ice. However, from his

observations on Maldivian pole and line vessels, the first batch of fish caught is left on deck. If fishing is good, and when they catch some, the whole lot is put into ice. But by then, the first batch would have started to lose its quality by being left exposed to the sun for too long. Local pole and line vessels need to modify their design so that fish are soft-landed on a material like canvas and falls directly into the hold.

As Adnan recounted, in 1982, the Government operated a boatyard at R. Alifushi where 2nd generation boats were designed and built. Those boats, along with shore facilities to sell fish at Kooddoo and Maandhoo boosted fisheries production rapidly. However, for some reason the boatyard does not operate any longer and Adnan thinks that the government should build such a boatyard, under a fisheries development project. The boatyard could be made into a self-sustaining unit and could offer a lease/purchase system for fishermen. Mr. Adnan also thinks that it would make vessels safer for fishermen, as vessels built in such a boatyard would be built and designed under supervision of experts and would conform to safety codes as well.

Ali Didi agreed with Adnan and added that it would also enable fishermen to venture out further than 70-80 miles, the zone where fishermen tend to operate out of safety concerns. As fishermen do not fully exploit the 200nm zone, a lot of resources are being lost. If the government builds boats adapted to weather rough seas, it would enable fishermen to venture out farther safely and put in more effort to exploit the resources.

Shakir (Fishermen's Association), said that although the government may not have the capacity to lease/sell such boats, at least the government should demonstrate how it is done so that people would know that it is practical. Shakir also agreed with Adnan that current post-harvest strategies focus more on fish processing rather than onboard handling and quality control. Although the Food Act, requires food processing facilities to have inspectors, at the island level, there aren't enough people trained to do so. Even most processors haven't had proper training. When such trainings are conducted, they would need to be formalized and professional, rather than ad hoc. There already exists a Fish Processor's Certificate Level 1 course which is approved by Maldives Qualification Authority (MQA), but is not sufficient to attract young people into the field. This course could be advanced up to Inspector or Food Technologist level or even higher, to appeal to the younger generation. In Shakir's view it would create hype, create more qualified processors, increase awareness and also pique the interest of youth.

Shakir informed the group about the Master Fisherman Certificate Level 4 course that Fishermen's Association had been trying to conduct but had not been able to attract participants. More effort should be made to create interest among the youth to engage in fisheries.

Shakir also stressed on the importance of considering the quality of catch rather than the quantity. Companies who export fish get a higher price for fish of good quality from the international market-this should be fairly reflected in the price companies pay to fishermen for providing good quality fish.

As more cooperatives are being formed, island level processors will increase, increasing the need for adequate processing facilities and infrastructure conforming to national standards. Trained inspectors would also then be required to regularly monitor operations at the island level.

In response to Adnan's suggestion, Adam Manik (MoFA) said that, to address safety at sea, a boat building code had been designed and developed with funding from IFAD's Post Tsunami Project. The Code would require vessel designs to be approved before they could be built. As responsibility of implementing the boat building code would fall under the mandate of Transport Authority, it had been sent to the Authority for approval and adoption. Human resource capacity at Transport Authority would be a great challenge in implementing the Code as the islands are widely dispersed and every stage of building would require inspection.

According to Adam Manik, MoFA has been trying to professionalize their training courses. In 2006 a Training Needs Analysis was conducted, based on which courses had been designed in collaboration with the Canadian Marine Institute. The Seafood Processing Worker level 1 course is an MQA approved course. In addition, under Employment and Skills Project, a 6 month seafood processing course with industrial placement had been conducted for 2 batches.

Interest and demand for training courses can be created only with the support and backing of the Industry. Young people who enter into fisheries may not have any fisheries science background and he may not know anything about navigational skills and seamanship. So a basic fishermen's course needs to be a prerequisite for him to enter into fisheries, as is done in UK.

5.4 Aquaculture subsector working group

Work current carried out in the field of aquaculture currently focuses on:

- Development of a hatchery
- Establishment of a quarantine facility.

On-going work at MRC/MoFA would be incorporated into MASPLAN.

Discussions

Adnan Ali (Horizon Fisheries) said that as Maldives does not have a continental shelf, although the diversity of species may be high, the quantity would be relatively less, especially of reef fish species. Therefore, there is a huge potential for aquaculture in the future. In his opinion, people are hesitant to enter and invest in the aquaculture industry since there are no existing regulations. They are cautious of making big investments in the industry for fear of facing losses when regulations finally do come about. MoFA/MRC can create public interest by demonstrating that aquaculture can be successfully carried out. It has been about 6 years since MoFA/MRC has been trying to culture grouper. Since grouper culture is being successfully carried out in the region—Malaysia, Indonesia and Thailand-why not apply their technology, rather than do what is already there.

Shafiya Naeem, answered that, until recently those countries had been harvesting juveniles from the wild and growing them out instead of hatching from eggs. The hardest part of grouper culture, rearing larval stages, is bypassed when that approach is used. In Maldives, as information on nursery grounds of groupers do not exist, aquaculture needed to start from scratch, beginning with eggs. In most other countries, the survival rate is very low, at about 10 percent. Although MRC is now working with a survival rate of 14 percent, but the scale is too small to provide hatchlings for the public. Hopefully with the establishment of a commercial hatchery people will be more interested in aquaculture.

Ilham Atho (MEE), asked whether geography of the islands be a hindrance to aquaculture development in the Maldives.

Shafiya responded that in countries where aquaculture production was high, they had large fresh water bodies, unlike Maldives, and the major proportion of their production came from freshwater species. Fresh water species are relatively easier to culture than saltwater species; larval stages of saltwater species are hard to look after. Although Maldives has clear, unpolluted waters which is perfect for the grow-out stage, the lack of land resources prove to be a challenge to produce juvenile fish until the grow-out stage.

Shafiya explained that one of the reasons why aquaculture hasn't been developed is because it is still easier to catch from the wild, than to invest in aquaculture. Now, as the grouper fishery is showing signs of decline and sustainability issues arise, people are becoming more conscious of the possible need for aquaculture in the future.

As the economic feasibility of aquaculture has not been demonstrated, people would naturally be cautious in investing their money in the industry.

Sinan explained that the hatchery, when established, would facilitate the private sector to carryout aquaculture successfully, as the most risky part, rearing of larval stages, would be covered by the government.

Adnan asked if aquaculture can be used for stock enhancement and Shafiya said that it has been done in other parts of the world, especially aquaculture has been used for stock enhancement of Marine Protected Areas.

Ilham expressed concern on the possibility of alien species being introduced into the country. Sinan said that Aquaculture Regulations specifically restrict import of alien species for aquaculture purposes.

Shakir enquired whether bait species can be cultured and said it would be good to consider in the masterplan since there are issues with sustainability of baitfish. Shafiya said that there are baitfsish species which have potential to be cultured, but none has yet been experimented with in Maldives.

6.0 Closing

Ms. Zaha, Minister of State for Fisheries and Agriculture closed the workshop. In her closing remarks Madam Zaha Waheed thanked the participants from the fisheries industry and officials from government agencies and relevant institutions, for making the time from their busy schedules to attend the workshop. She stated that the main activities that would be carried out towards achieving the objectives of the Fisheries Master Plan had been shared with stakeholders during the workshop. It was not the final stage of the process; the next step would be to formulate the Master Plan and share it with all stakeholders. Madam Zaha thanked the leaders of the subsector working groups and all stakeholders involved, for putting in the effort that lead to the present stage of the process. In her remarks she emphasized the

role of stakeholders to bring the work to fruition and welcomed all stakeholders to share their opinions, ideas and thoughts regarding MASPLAN as it would shape the future of the industry.

A very special thanks was extended to the Government of Japan, JICA and the MASPLAN team for the contribution they had made and are continuing to make, in work leading up to the formulation of the Plan which would guide the future of the industry. Madam Zaha said that the World Bank mission present at the workshop had expressed hope that the projects which would come out of MASPLAN be bankable documents which would then become World Bank funded projects implemented for the development of the Industry. Madam Zaha thanked World Bank for the support and assistance received for the development of the Industry. Due thanks were extended to Maldives Customs Services, Coast Guard and Bank of Maldives for the essential roles they play in providing services related to their respective fields, to the fisheries industry. Madam Zaha expressed hope that the master plan would become one that would guide the future of the industry. Despite the challenges in the fisheries industry such as issues related to sustainability of resources, Madam Zaha pointed to the opportunities that can be explored through development of the mariculture industry.

Zaha concluded by encouraging resource users to be mindful of how they use resources and to be responsible and abide by the laws and regulations.

SECOND STAKEHOLDER CONSULTATION WORKSHOP
"PROJECT FOR THE FORMULATION OF MASTER PLAN FOR SUSTAINABLE FISHERIES (MASPLAN)"
8th May 2017
VENUE: SHE building - Asaree Maalam (3rd Floor)

ATTENDEES:

Ministry of Fisheries & Agriculture, (MoFA)

- Ms. Zaha Waheed, Project Director
- Mr. Adam Manik, Deputy Director General
- Mr. Hussain Sinan, Director
- Mr. Abdulla Jaufar, Assistant Director
- Ms. Mariyam Simla, Senior Research Officer

Marine Research Centre, (MRC)

- Dr. Mohamed Shiham, Director General
- Ms. Shafiya Naeem, Aquatic Pathologist

Japan Embassy in Maldives

- H.E. Mr. Kazumi Endo, Ambassador of Japan to the Republic of Maldives
- Mr. ABE Masamichi, from Japan Embassy in Maldives

Japan International Cooperation Agency, (JICA) / Project for the Formulation of Master Plan for Sustainable Fisheries (MASPLAN) Team

- Dr. DOI Masanori, Chief Advisor/ Fisheries Development
- Dr. ECHIGO Manabu, Vice Chief Adviser/ Fisheries Resources Management
- Mr. Adrian Bernard, Socio-enconomic analysis/ Fisheries information
- Mr. HINO Yoshiki, Project Coordinator/Livelihood Improvement/Environment and Social Consideration
- Ms. OHARA Misato, Gender /Environment and Social Consideration
- Mr. Mohamed Faiz, Local consultant

Japan International Cooperation Agency, (JICA)

- Mr. SAITO Hiroshi, JICA Maldives office
- Ms. Aishath Nahuma, JICA Maldives office

Stakeholders

The list of stakeholders is attached in Annex

< Session I: Opening >

1. The workshop started with Recitation of the Holy Qur'an

2. Welcome Remarks was given by Mr. Hussain Sinan, Permanent Secretary of MoFA

3. **Introductory Remarks was given by H.E. Mr. Kazumi Endo, Ambassador of Japan to the Republic of Maldives**

In his speech, Ambassador H.E. Mr. Kazumi Endo noted about the vast marine resource in Maldives and that fisheries sector remains a large source of employment, especially for the residents of outer atolls, the largest source of physical exports, one of the few local industries supplying the tourist resorts and a major food supply for the local market. Those are the reasons major donor countries like Japan and international financial institutions like World Bank continues to extend support to the fisheries industry in the Maldives. He also highlighted that this project was formulated in order to make up a mid and long-term development plan for the fisheries sector based on the guiding principles of efficient use of fishery resources in a sustainable manner, contributing to long-term environment management and support to tourism industry through sustainable marine resources management.

< Session II: Presentation of MASPLAN and Discussion>

1. First Presentation - Introduction to the Fishery Sector Plan, *by Project Director of MASPLAN, Ms. Zaha Waheed*

- Ms. Zaha Waheed gave an introduction to the participants about the Fishery Sector Plan (SPDPIS) - Sustainable Fisheries Development Plan of Important Sub-sectors in the Maldives - 2016-2025, Goals, Objectives and Projects. She explained about the Structure of the latest draft of SFDPIS, briefly explaining about the four subsectors; Oceanic fisheries, Reef fisheries, Aquaculture, Post-harvest and Value Addition.

- Ms. Zaha then explained how the Fishery Sector Plan will be harmonized with the current SAP (2014 to 2018) and Fisheries Sector Policies of MOFA.

2. Second Presentation - Presentation and discussion on the achievements of pilot projects and development plan Oceanic Fisheries Working Group, *by Dr. M. Shiham Adam, MRC/MoFA*

- **Dr. Shiham** presented on the Overview of the Oceanic Fisheries Sub-Sector Working Group with achievements and key findings of the three pilot projects. He presented recommendations for the three pilot projects.

PP.1 Technical development and examination of live bait catch and holding for

improving their survival rate

PP.2 Technical development of tuna hand line on-board handling for quality improvement

PP.3 Preliminary resource survey for availability of deep-sea resources

Discussions

1. **Question from participant (fisherman):** What is the name of the company that did the survey on bait and fishery resources?

Dr. Shiham explained that the research was done in collaboration with Japan International Cooperation Agency (JICA) consultants.

2. **Question from participant (fisherman):** How much research was done by the vessel that did the bait survival testing techniques? Was the temperature checked regularly?

Mr. Ibrahim Fikree who had formerly in the project from MOFA, confirmed that the temperature was monitored in every stage. It was tested in the ocean, Reef, even during fishing.

Dr. Shiham added that the pilot project aimed to test for how long the bait would survive in the new method. He stated that there were difficulties in measuring the dead bait but noted that the new design is a major improvement compared to the old design.

Dr. Shiham also explained that when the temperature is low the activity of the bait is low. He inquired about how to decrease the temperature and said the option will be to use ice.

3. **Question from participant (fisherman):** By using saltwater it is possible to prolong the life of bait.

4. **Comment by participant (fisherman):** The problem with bait tank is with the temperature and not being able to increase the level of oxygen

Mr. Sinan responded that this project is a research based trial experiment. He explained that these issues will be addressed to overcome the difficulties. He noted that the main issue to address will be decreasing dead bait

Mr. Sinan reminded that even though the data may not show the desired results for now, MRC will continue research in to this and gain a better understanding of the problem.

5. **Question from participant (Abdulla Shakir, MFA) regarding Cage Stocking examination):** Was any research done to see the outcome, when the bait is transferred from cages to the fishing vessels?

Dr. Shiham explained that they weren't able to conduct research into that. The bait had lived in the cages for about 10 days and had died so no chance to transfer live ones to fishing

vessels. In addition to this the bait did not consume the fish feed brought from Japan. Hence the team was unable to expand any research into this.

Mr. Sinan added to this. During the study trip in Japan the participants noticed that the bait was taken from the reef and kept in cages for a certain period. This was to accustom them to a closed environment and after this period the bait was taken and used in fishing. While doing the research in Maldives, the bait had died in the cages before they were able to move to the next stage of the research.

6. **Question from participant (Abdulla Shakir, MFA) regarding DBS:** Is there enough DBS stock in Maldives to economically exploit in a commercial fishery? And how soon would the stock run out if it is opened for commercial fishery?

Dr. Shiham informed that the possibility of a large stock is high based on the research done by the consultant. Since DBS is not locally consumed, if caught in great volumes it can exported. He also noted that before it can be opened for commercial fishery a management plan is needed.

7. **Question from participant regarding live bait catch**: Do you plan to have a certain area for bait fishery?

Mr. Sinan stated that demand for bait has increased with larger vessels. He explained that this year a new project is being implemented from MOFA PSIP budget to culture bait in in GA atoll.

Mr. Sinan also noted that the aim of the MASPLAN project was to research on the sustainability of fishery resources. A huge percentage of the YFT catch was rejected in the past due to low quality. Now all the fish are above C grade. In addition to this, previously we never used any resources below 200 or 300 meter below sea level. Hence the second objective of the project was to research on new resources.

8. **Comment from participant (Fisherman)**: Private companies are not developing. Fishermen don't get the required assistance from the government. Fishermen have difficulties in getting ice. Ice plants are not repaired when they are damaged.

Mr. Sinan noted that MIFCO is not under MOFA. He explained that whenever MOFA receives complains regarding iceplants, MIFCO is contacted and asked to resolve the issue.

Dr. Shiham added to this by commenting that frequency of good fishing seasons has decreased. Hence it is difficult for companies to make huge investments on big storage especially due to high operational costs.

3. Third Presentation - Presentation and Discussion of Reef Fisheries Working Group by Mr. Hussain Sinan, MoFA,

- **Explained the of implementation of priority projects in Reef fisheries subsector**

- Approach for strengthening reef fisheries management
- Approach for quality improvement of reef fish catches
- Approach for improvement of public service to fishers

- **Main outputs of pilot project**

Output 1 - The linkage between Fisheries and Tourism Industry is improved

Output 2 - A better understanding on the reef fish value chain in Malé and North Malé Atoll is reached

Output 3 - A data monitoring system on fish supply to resorts is designed, tested and validated

Output 4 - Best fishing practices are defined and publicized; some reef fishermen are trained

Output 5 - An eco-label scheme for resorts is designed

- **The Way Forward –** He also explained the way forward for this project

Discussions

1. **Question from participant (Fisherman):** Youth want to engage in Spearfishing. Can it be legalized to encourage youth in fisheries sector?

Mr. Sinan reminded this kind of fishing is illegal and as it is a dangerous method of fishing, MOFA has no intention to legalize it for now. But have to think about it.

Dr. Shiham also agreed that it is illegal under the current law to use spearfishing even though it is common in other countries.

2. **Comment from participant (Fisherman):** There are conflicts in the atolls between fisherman who use PL and nets. Need to think how to resolve these conflicts.

3. **Question from participant (supplier) regarding reef fisheries:** biggest concern of the industry is not getting enough supply to cater to the high demand from resorts. The quality of the reef fish is also very low and resorts refrain from buying low quality fish. But ice is not easily available. Do you have plans to install ice plants in areas where is not currently available?

Mr. Sinan stated that the government's policy is to install at least one ice plant in each atoll. Government budget is limited and only a certain amount of ice plants can be installed each

year. He also noted that private parties are welcome to install ice plants on their own and it is a profitable business.

Dr. Shiham added to this noting that there are some private parties already addressing this problem. These private parties to sell ice to the reef fishermen and buy back the reef fish from them.

4. Fourth Presentation - Presentation and Discussion of Aquaculture Working Group by Ms. Shafiya Naeem, MRC/MoFA,

Discussions

1. **Question from participant (Fisherman):** What was the result of the pearl culture project? Is there any opportunity to study marine biology in Maldives?

Ms. Shafiya explained that technically pearl culture project was a very feasible project even though the commercial model used was wrong. But currently the focus is on export products which can give a higher return. Pearl project is now on hold. She also explained that Grouper and Sea cucumber can be exported at higher prices and noted that MOFA have received technical support to pursue this.
Commenting on the second question she noted that the long term plan is to create opportunities to study marine Biology in Maldives.

Dr. Shiham noted that MNU is already doing some works in Marine environment. One issue is not having enough students due to lack of job opportunities in Maldives. He noted that there are people working in the private sector after studying marine biology from abroad.

5. Fifth Presentation - Presentation and Discussion of Post-harvest/Value-addition Working Group by Mr. Adam Manik, MoFA

Discussions

Mr. Adam noted that there are vacuumed packed fish in the male market without any labels or identification. Which means there is no way to identify where it was produced and by whom. If the product is not safe people will get food poisoned. He explained that a sterilized and safe product has now been made under this project.

1. **Comment from Mr. Satish (MFDA):** Mr. Satish noted that heat treated is a more appropriate term than heat sterilized, as heat sterilized means complete elimination of bacteria.

Mr. Adam explained that the professor had recommended it based on their terminologies.

2. **Comment from participant (processor)**: current situation does not allow us to distinguish between products that were produced under safe conditions and others.

6. Sixth Presentation - Presentation on Results of Strategic Environmental Assessment and Gender Study by Ms. Noora Jaleel, MoFA

Discussions

1. **Question from Mr. Riffath (EPA)**: Why was gender study carried out only in Gemanafushi?

Ms. Noora explained that due to time constraints the gender study was done only in Gemanafushi and Maandhoo factory. Need to do more surveys to confirm the results.

2. **Comment from Mr. Riffath (EPA)** noted that the terminology used by JICA was not correct.

Ms. Noora: Terminology SEA was used for future analysis which will/can be done in the future.

Dr. Shiham stated that in the strategic section the scope can be changed from Nation level to Fisheries Sector.

Annex 5.

Report of Environment and social consideration

The Republic of Maldives
Project for the Formulation of Master Plan for Sustainable Fisheries (MASPLAN)

Report of Environment and social consideration

May 2017

Ohara Misato (Environment and social consideration1/ Gender)
Hino Yoshiki (Environment and social consideration 2/ Livelihood improvement/ Project coordinator)

Contents

Attachment 1: Summary of related laws, regulations and important documents

Attachment 2: Flow chart of EIA in Maldives

Attachment 3: Gap analysis between JICA guideline and Maldives regulations

Attachment 4: Results of scoping (SFDPIS Proposed projects)

Attachment 5: Results of Scoping (Pilot projects)

Attachment 6: Result of Impact Assessment (Pilot projects)

Attachment 7: Results of Impact Assessment (SFDPIS Proposed projects)

1. Background and Purpose

Environment and Social Consideration covers environmental impacts on air, water, soil, ecosystem, flora and fauna, as well as social impacts including involuntary resettlement, and respects for human rights of indigenous people etc. Japan International Cooperation Agency (JICA) formulated a guidelines and decided that the work related to Environment and Social Consideration should be implemented at early stage of the elaboration of any Master Plan, Action Plan or other policy plan[1].

MASPLAN aims to develop the "Sustainable Fisheries Development Plan of the Important Sub-sectors in the Maldives, 2016-2025 – Goals, Objectives and Projects- (SFDPIS)" which focuses on sustainable development. The present document deals with the implementation of the impact assessment of the projects proposed in the SFDPIS and the pilot projects (PP) in terms of environment and social aspects. The purpose of this Environment and Social Consideration work is to confirm that SFDPIS has a high environmental and social sustainability.

1.1 Method and work flow

This work was implemented through the following 3 steps.

STEP 1: The target was 26 projects out of the proposed 32 projects in SFDPIS, excluding 6 projects which are already being implemented[2]. The first stage was the "Scoping" of these 26 proposed projects. The second stage was the "Survey" for the evaluated items which had been assessed as having a 'negative impact' or being 'unclear at this point' at the scoping stage.

Note that the evaluation items were selected based on JICA guidelines[3]. The selected 18 evaluation items and respective definitions are shown in Table 1.

STEP 2: The target was the 6 pilot projects (PPs). The process was the same as STEP1 as above. The next stage is the "Impact Assessment". Then "Formulation of mitigation measures" for the items which had been assessed as a 'negative impact' in the impact assessment. Subsequently the "formulation of a monitoring plan" was implemented for those items assessed as a 'negative impact' and as 'unclear at this point' in the impact assessment.

During the implementation of the pilot projects, the monitoring was implemented.

STEP 3: Based on the monitoring results of the PPs in STEP2 and the results of the evaluation in STEP1, the "Impact Assessment" was implemented for the 26 proposed projects. Then the mitigation measures were formulated for the items which were evaluated

[1] JICA guidelines require a SEA (Strategic Environmental Assessment) for any Master Plan or Action Plan. However, this term is not applicable in the present document as SEA is called EIA in the Maldives. Thus, the term "Environment and Social Consideration" is used in this English report.

[2] The excluded 6 projects are already implemented by Maldivian Government and funding agencies. These projects already followed the Maldivian EIA or other regulation, thus they are excluded from the present work.

[3] https://www.jica.go.jp/english/our_work/social_environmental/guideline/pdf/guideline100326.pdf

as 'negative impact' in the Impact Assessment. In addition, the monitoring plans were formulated for the items which were evaluated as 'negative impact' and 'unclear at this point' in the Impact Assessment.

Table 1. Evaluation items, definition and evaluation criteria[4]

Evaluation items		Definition	Evaluation criteria
Pollution measures	1. Water quality	Evaluation of effects that project influences to the water quality in project site.	Prospective serious negative impact: A Prospective certain level of negative impact: B Unclear at this point: C No prospective impact: D
	2. Waste	Evaluation of presence or absence of effects related to waste and extent of these possible effects.	
	3. Noise and vibration	Evaluation of presence or absence of effects related to noise and vibration and extent of these possible effects.	
	4. Odor	Evaluation of presence or absence of effects related to odor and extent of these possible effects.	
Natural environment	5. Protected areas	Evaluation of effects that project influences to protected area near the project site.	
	6. Ecosystem	Evaluation of effects that project influences to ecosystem on project site.	
	7. Hydrology	Evaluation of effects that project influences to hydrology on project site.	
	8. Topography and geology	Evaluation of effects that project influences to topography, geology, ground and natural beach.	
	9. Natural disaster	Evaluation of effects on a natural disaster to the facility built by the project.	
Social environment	10. Resettlement	Evaluation of presence or absence of effects related to resettlement.	
	11. Living and livelihood	Evaluation of effects that project influences to living conditions and livelihood (income, employment and public health).	
	12. Heritage	Evaluation of effects that project influences to heritage.	
	13. Landscape	Evaluation of presence or absence of effects related in landscape and extent of these possible effects.	
	14. Ethnic minorities and indigenous peoples	Evaluation of presence or absence of effects related to ethnic minorities and indigenous peoples and extent of these possible effects.	
	15. Working conditions	Evaluation of effects that project influences to working conditions of the project site.	
	16. Conflicts of interest	Evaluation of effects that project influences to conflicts of among parties concerned.	
	17. Independent management	Evaluation of possibility that the activities are implemented on a continuous basis after the end of project.	
	18. Public welfare	Evaluation of effects that project influences to public welfare on project site.	

[4] among the 18 items, 1. Water quality, 2. Waste, 3. Noise and vibration, 4. Odor, 5. Protected areas, 6. Ecosystem, 7. Hydrology, 8. Topography and geology, 10. Resettlement, 11. Living and livelihood, 12. Heritage, 13. Landscape, 14. Ethnic minorities and indigenous peoples and 15. Working condition were quoted from 'Appendix 5. Categories and items in the checklist of the JICA guideline.
The following 5 items: 9. Natural disaster, 16. Conflicts of interest, 17. Independent management and 18. Public welfare were selected taking into account the project component with reference to section '2.3 Impacts to be assessed' in the JICA guidelines.

The following Figure 1 presents the flow and outline of Environment and Social Consideration[5].

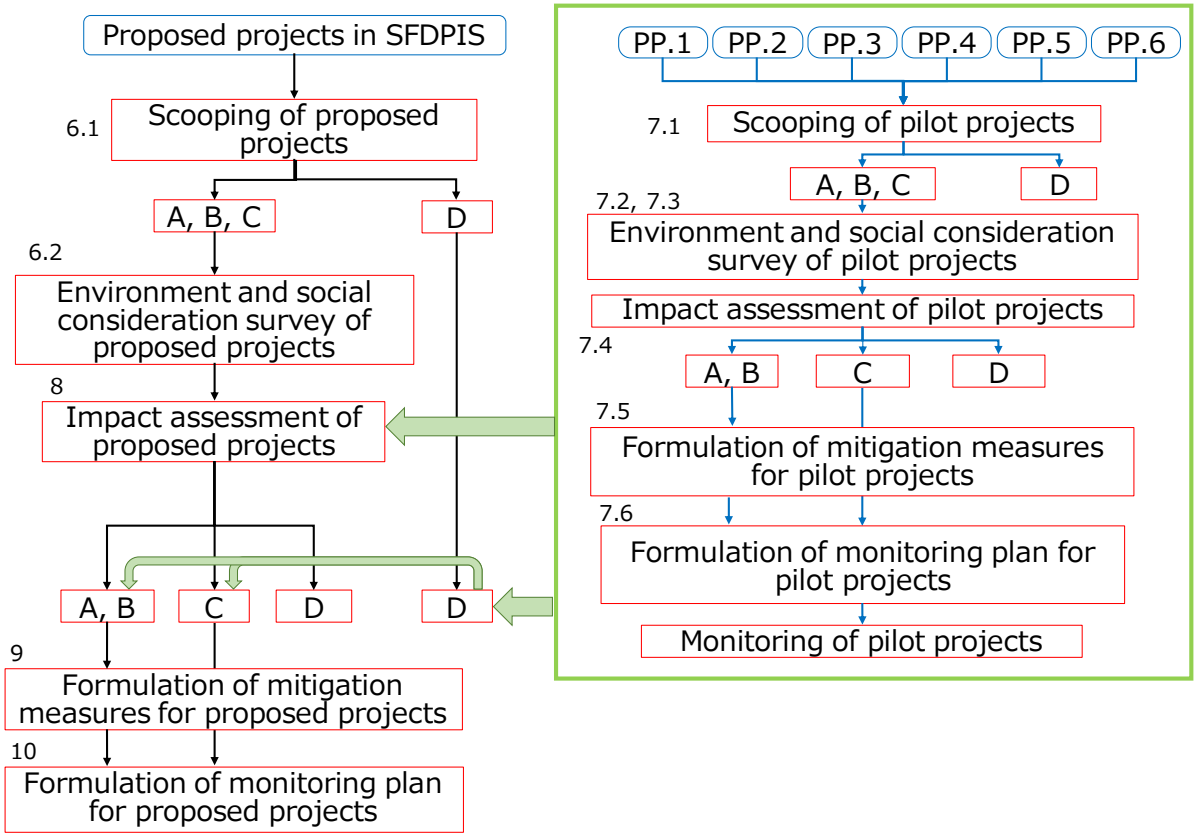


Figure 1. Flow and outline of Environment and Social Consideration

2. Analysis of zero option

In order to evaluate the necessity and adequacy of the proposed project, the "Zero option" assesses the situation in case a proposed project is not implemented in the future.

2.1 Goal of each sub-sector

In the SFDPIS, the sub-sector goals are set as follows:

A: Oceanic fisheries sub-sector: "The opportunities to benefit from the oceanic fisheries resources are fully taken advantage of".

B: Reef fisheries sub-sector: "The reef resources are exploited in an ecologically and economically sound manner".

C: Aquaculture sub-sector: "The aquaculture industry is fully developed in the Maldives".

D: Post-harvest/ Value addition sub-sector: "The quality of fish catch and fish products is

[5] The numbers written near the box correspond to the respective chapter numbers in the present document.

optimized".

2.2 Approaches to achieve the sub-sector goals

In order to achieve the sub-sector goals, the following approaches and respective projects were set up:

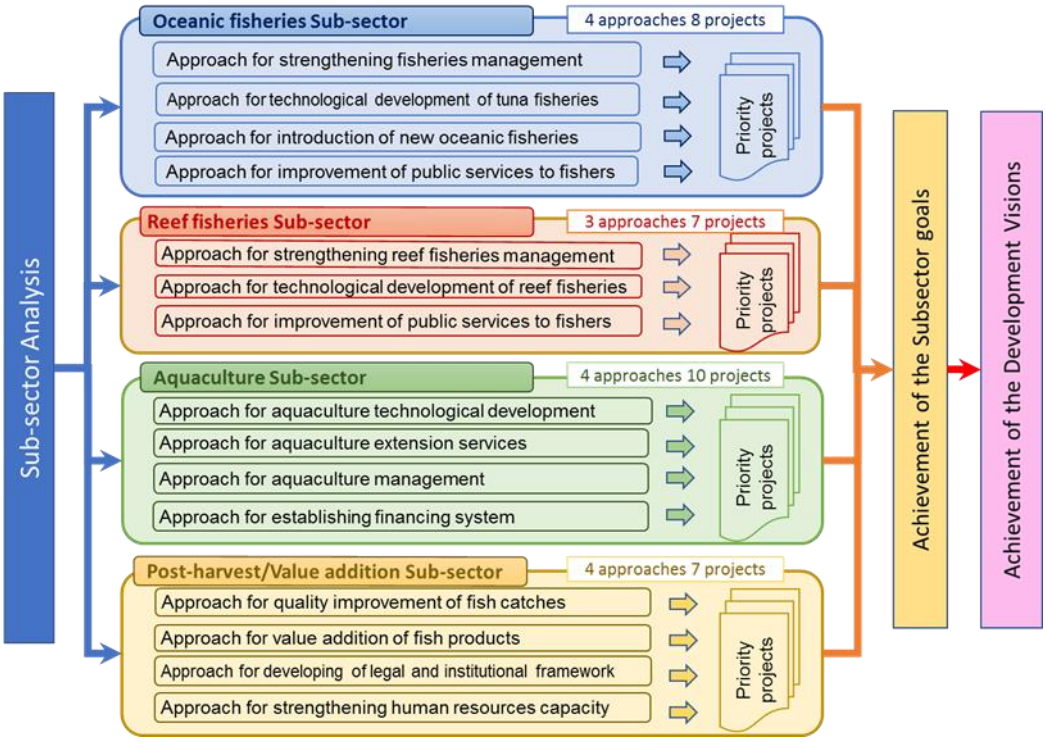


Figure 2. Approaches to achieve the sub-sector goals

The zero option is analyzed hereafter for each sub-sector.

2.3 Oceanic Fisheries Sub-sector

(1) The details of the approaches

The "Approach for strengthening fisheries management" is set for promoting the strength of MCS (Monitoring, Control and Surveillance), awareness of resources management and implementation of bait resources management. Oceanic fisheries is the main in the Maldivian fisheries, and the fishery resources management is one of the most important issues to ensure their sustainability. The "Approach for technological development of tuna fisheries" includes the effective utilization of live bait and the development of new design of vessels to improve the efficiency of fishing operation, fuel efficiency, safety and fish handling. The "Approach for introduction of new oceanic fisheries" is set to diversify the food source and to obtain foreign currency by developing unutilized fishery resources. The "Approach for improvement of public services to fishers" includes the infrastructure improvement such as construction of ice plants and fishers' marinas, the improvement of socio-economic environment for fishers and development of fishing technology.

(2) Consideration of zero option

If the projects corresponding to these approaches are not implemented, the bait fish resources will be in a very critical situation. This will also affect to the sustainable development of tuna fisheries. If the catch form these fisheries decrease, the livelihood of fishers as well as the economy of Maldives will be affected directly. Moreover, if the effective fishery management framework is not put in place, it will lead to over-fishing in the worst case. In addition, if the development of new fisheries does not materialize, the current high fishing pressure will continue on tuna resources and bait fish resources. Moreover, considering the decreasing trend in number of fishers, it is also important is the improvement of social services for those concerned with the fishing industry is necessary.

From the above, if the proposed projects of SFDPIS are not implemented, the sub-sector goal "The opportunities to benefit from the oceanic fisheries resources are fully taken advantage of" will not be achieved.

2.4 Reef Fisheries Sub-sector

(1) The details of the approaches

The "Approach for strengthening reef fisheries management" aims to strengthen the development of legal systems and fishery management plan of reef fisheries because reef resources are easily affected by fishing operations and natural disasters. This approach includes the survey of resource utilization to formulate the fishery management plans. The "Approach for technological development of reef fisheries" includes the designing of fishing vessels and awareness activities on quality control for both fishers and processors. The "Approach for improvement of public services to fishers" includes the improvement of access to ice and construction of fishers' marinas to improve the working conditions for fishers.

(2) Consideration of zero option

If the projects corresponding to these approaches are not implemented, the formulation of regulation and management framework which should be carried out by the Government will not be realized. Reef fisheries are under an open access system and are easily subject to over-fishing. Moreover, if techniques about fish quality control are not improved at fishers' level and the infrastructure are not developed, the value of reef fish on the resort market and the export market will not be optimum. The low price of fish products may possibly lead to the increase of fish catch effort by fishers and subsequent over-fishing. Therefore, it is essential to ensure reef fisheries are exploited in a sustainable way under an appropriate fishery resource management system.

From the above, if the proposed projects of SFDPIS are not implemented, the sub-sector goal "The reef resources are exploited in an ecologically and economically sound manner" will not be achieved.

2.5 Aquaculture sub-sector

(1) The details of the approaches

Aquaculture is a developing sub-sector in Maldives, with only a few entrepreneurs currently. Therefore, approaches were not designed to address current issues, but to develop the aquaculture industry for the future.

The "Approach for aquaculture technological development" is to develop and disseminate applicable aquaculture techniques for Maldives after testing some aquaculture technologies which have been already developed in other countries. It also includes development of environmental friendly aquaculture techniques considering feed etc. to mitigate competition with other countries. The "Approach for aquaculture extension services" aims to develop capacity of technical staff and incorporate collaboration with aquaculture technology research center etc. in other countries and educational systems. The "Approach for aquaculture management" develops diagnosis service and constructs facility for quarantine and examination of fish disease in order to increase safety of cultured fishes. In the "Approach for establishing financing system", appropriate financing system and distribution model of cultured fishes to promote private investment are established.

(2) Consideration of zero option

In case the proposed projects are not implemented, it would difficult for the aquaculture sub-sector to develop for a significant scale. In addition, if private operators start aquaculture business in a situation where institutional framework is insufficient, this may lead to the production of cultured species with low consideration for the environment and safety. It can also lead to a low value of the cultured species.

From the above, if the proposed projects of the SFDPIS are not implemented, the sub-sector goal "The aquaculture industry is fully developed in the Maldives" is impossible to achieve.

2.6 Post-harvest/ Value addition sub-sector

(1) The details of the approaches

The "Approach for quality improvement of fish catches" is to improve fish handling methods on board, especially improve use of ice and quality control. In addition, a new system of which quality of fish influences the market price is introduced in order to improve the current system which the purchase price is not linked to the quality of fish. In the "Approach for value addition of fish products", processing techniques aiming at improving the quality of traditional fish products are promoted and quality standards are developed, and processing technology for high value fish products for export is developed. Through the "Approach for developing of legal and institutional framework", a national standard, regulation and monitoring system for quality control, which cover pre/post-harvest, processing, quality check and marketing, are set up. The "Approach for strengthening human resources capacity" aims to raise the knowledge

level on fish quality assurance to fishers and traders.

(2) Consideration of zero option

If the above proposed projects are not implemented, the quality of fish products would remain unstable, as it is in the current situation, and there would be a risk for consumer's safety. Moreover, even if the quality is improved through efforts made by some processors, processors who keep on producing products of low quality remain in the market mechanism where price does not reflect quality. For these reasons, it is highly desirable to implement the projects proposed in the SFDPIS to achieve the sub-sector goal "The quality of fish catch and fish products is optimized ".

3. Basic information on current situation of Maldivian environment and society

- Geography

Maldives consists of 1,190 islands grouped in a double chain of 26 atolls, located 671 km southwest from Sri Lanka in the Indian Ocean. The country is a flat topography with a maximum elevation of 2.4 m above sea level. The total land area is estimated at about 300 km^2. Maldives has an Exclusive Economic Zone (EEZ) of 923,322 km^2 and a continental shelf of 34,538 km^2. The EEZ area of the country is the 32nd in the world.

- Environment

  · Climate

  The climate is tropical with high temperature and humidity, and the average air temperature is about 28℃ with little temperature variation. The season is divided into the Northeastern Monsoon season from November to April and the Southwest Monsoon season from May to October. The sea surface temperature is quite stable, at about 28-29℃.

  · Freshwater resources

  Freshwater resources in Maldives are not sufficient. There is no river in the country. The methods to get freshwater are pumping up groundwater, using rainwater, or desalinating sea water. Water shortage is getting worse especially in southern islands, closer to the equator, due to recent decline in rainfall.

  On the islands where the public water supply is developed, seawater is used after desalination, but on the islands where the system has not been introduced, rain water or groundwater is used for daily consumption.

  · Natural disasters

  Natural disasters are relatively few, but there were some serious disasters in the past. In 1987, a large cyclone occurred and damaged one-third of the country including the capital

city, Malé. In addition, the Indian Ocean Tsunami triggered by the large-scale earthquake off the coast of Sumatra in the end of 2004 caused enormous damage for a wide range of lands in Maldives. Although the damage caused by the tsunami was estimated at 4.7billion USD, this did not include indirect influences such as soil erosion and salinity of land. More than 80% of Maldives' land is below 1 m above sea level, therefore the disappearance of the land caused by rising sea levels is an increasing concern.

- Protected flora and fauna

Protected flora and fauna are defined in Protected Bird List (EPA, 2014), Protected trees in Maldives and Protected Marine Species (EPA) respectively. 10 species including sea turtles, whale sharks, dolphins and all female lobsters which are less than 25 cm are prohibited to fish or catch. In addition, there is a guideline for fishing and fish handling "the Guidelines on Good Fishing and Fish Handling Practices" which is issued by MoFA.

- Protected areas

There are a total of 42 protected areas in Maldives, 33 of which are Marine Protected Areas. The protected area of land is 272 hectares, and the marine protected area is 43,478 hectares, accounting for about 0.38% of the national area of Maldives including the territorial sea. . Inside these protected areas, all activities excluding bait fishing using traditional methods and diving for sightseeing purpose are prohibited. In addition, 274 areas are designated as Environmental Sensitive Areas.

- Land use

There are about 1,190 islands in Maldives, of which 33 islands are small islands less than 1 km^2. The usage is different in each island, 118 islands are utilized for residence of people, 109 islands are utilized as resort, 128 islands are for industry (agriculture, fishery, factory, airport, etc.) and others are uninhabited. 23.3% of the land area is agricultural land, forest is 3.0%, and other usages (residential, tourist and industrial areas) are 73.7%.

- Economy

Maldives used to be one of the least developed countries, but the status changed and was upgraded in 2011 by the economic growth. According to the World Bank statistics in 2016, Maldives' GDP in 2015 is USD34.35 billion, and the per capita GDP is the highest in South Asia. The main industries are tourism and fisheries. Tourism contributes for 27.7% of the GDP and fisheries contributes for 3.8% of the same (2014). Yellowfin and skipjack tuna accounts for around 95% of the total catch in fisheries.

- Resettlement

There is no law or regulation for resettlement in Maldives, but there were cases where island

residents were relocated to another island in order to build industrial factory in their original island. In addition, the island residents who were affected by the Indian Ocean Tsunami have moved to other islands with support from the Government and donor agencies. Resettlement is managed by the Ministry of Housing and Infrastructure, and the Ministry compensates for the damage caused by resettlement.

- Ethnic minorities, indigenous peoples

There are no ethnic minorities or indigenous peoples in Maldives.

The standard laws, regulations and other important documents for SEA are summarized in Attachment 1.

4. Regulation and organization for environmental consideration

4.1 Implementing agency and the organization

Implementing agencies in Maldives are the Ministry of Environment and Energy and Environmental Protection Agency (EPA), but the EPA is actually responsible for process of EIA and other environmental administration. The EPA is under the Minister of Environment and Energy.

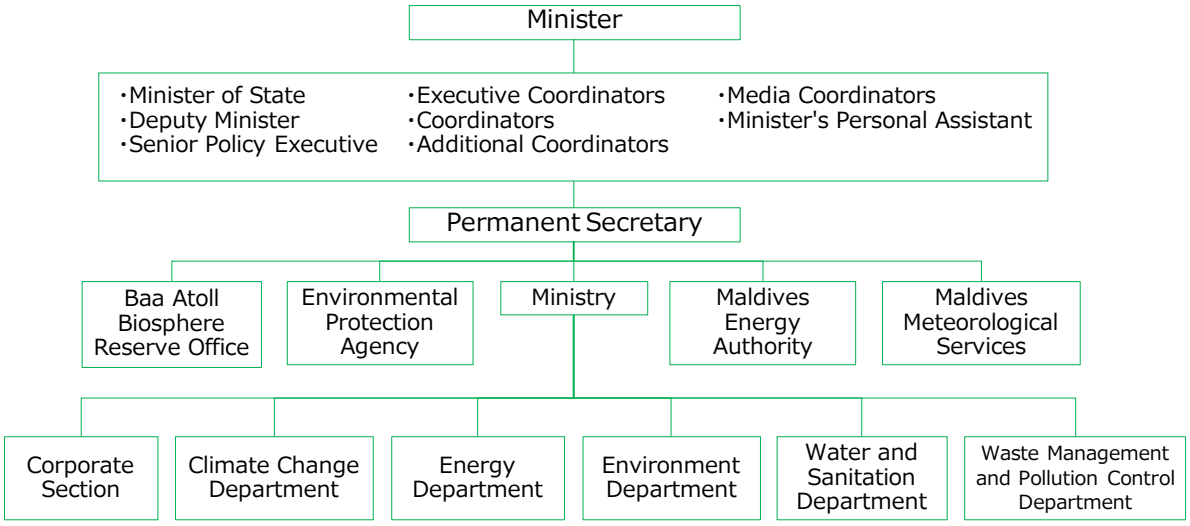


Figure3. Organization of the Environmental administration (source: MEE Home page)

4.2 Relevant laws and regulations of Maldives

In the Environmental Impact Assessment Regulation, which is under Environment for Protection and Preservation Act of Maldives (Law No:4/93) enacted by the Ministry of Environment and Energy (MEE), the administrative instruction related to procedure of Environment and social consideration and authorization of projects is stipulated. The Environmental Protection Agency (EPA) is responsible for EIA.

The following projects require an Environmental Impact Assessment (EIA) in fisheries sector.

- Fishery processing project
- Aquaculture/ Mariculture project
- Harbor project
- Sewerage system project
- Waste management project

The Environmental Impact Assessment and Initial Environmental Examination (IEE) are regulated to be implemented for the large-scale projects, but small-scale development projects and/or artisanal fish processing plants construction are not required to implement these assessment.

The process of EIA is shown Attachment 2.

4.3 Gap analysis

The Gap analysis was conducted to confirm whether there were differences between Maldivian laws and standards and the JICA guidelines for environment and social consideration. The result of the gap analysis and the approach to fill the gap if any are shown in Attachment3.

5. Outline of targeted projects

The targeted projects include 1) Proposed 26 projects in the SFDPIS (excepting for the 6 on-going projects), and 2) 6 pilot projects. The outline of the projects is shown below.

5.1 Proposed projects in the SFDPIS

Table 2 shows the outline of the proposed projects in the SFDPIS in each of sub-sector. This outline is based on the draft Plan at the time of scoping.

Table 2. Outline of the proposed projects in the SFDPIS

＜Oceanic fisheries sub-sector (OF)＞

Name of project	Outline of project component
OF1. Improvement of MCS system *on-going project	After the revision of the Fisheries Act, the MCS framework is strengthened and expanded, with the deployment of inspectors/observers and in cooperation with other implementing agencies.
OF2. Training on resource management	An appropriate resource management training program is set up, encompassing establishment of a cooperation framework with relevant NGOs, development of training material and capacity development of trainers. Thereafter, practical training programs are implemented for fishers engaged in oceanic fisheries.
OF3. Review and implementation of bait fish management plan	Obstacles to tuna fishing due to shortage of bait fish are eliminated through effective management of the bait fishery resources. This includes identification of the points to be modified in the current bait management plan, subsequent revision of the plan and its enforcement of the plan.
OF4. Extension of improved live bait stocking system in pole-	Based on the results of the respective MASPLAN pilot project, the modified live bait tank associated with improved bait handling methods is extended among pole-and-line fishing vessels through awareness and training

and-line fishery	programs.
OF5. Development of new masdhoni design	Standard design of the 5th generation fishing vessel ("masdhoni") is developed and extended to fishers. It incorporates advanced technologies such as the Japanese type bait tank, modified cooler box, and higher stability etc.
OF6. Promotion of private investment	Investment for new oceanic fishing activities such as longline and deep-sea fishing is promoted among local investors after assessment of their financial feasibility. The project assists promotion of preferential investment policy of the Government and the preparation of business plans of the private sector.
OF7. Development of new deep sea fisheries (Diamondback Squid and other fishes)	The preliminary survey of the respective MASPLAN pilot project showed the existence of potential deep-sea fisheries targeting not only demersal fishes but also Diamondback squid, which have been confirmed as new potential resources in Maldives. Based on such preliminary results, deep sea fisheries are further studied and promoted.
OF8. Establishment of Fisher's Marinas *on-going project	The existing plan by MoFA foresees the establishment of 4 fisher's marina facilities at the major fishing ports.

＜Reef fisheries sub-sector (RF)＞

Name of project	Outline of project component
RF1. Improvement of biological, socio-economic and statistical data collection and analysis system	A data collection system was tested with some resorts in North Malé Atoll as a MASPLAN pilot project. Based on the results of this pilot project as well as other relevant projects currently implemented by MoFA, comprehensive data collection and analysis systems are developed for reef fisheries and implemented nationwide.
RF2. Improvement of relevant legislation about reef fisheries *on-going project	Reef fisheries legislation is revised and completed for proper resource management. It implies that the revised Fisheries Act is enacted, and regulations for reef fisheries, grouper, aquarium fish, sea cucumber, lobster and sharks are reviewed or developed and implemented.
RF3. Enhancement of fisheries compliance/ enforcement	Cooperation between Marine Police, MoFA and Environment Protection Agency (EPA) is strengthened, a licensing system for all reef fishing vessels is designed, implemented and functional and a GSM tracking system for reef fishing vessels is implemented and functional.
RF4. Design and implementation of reef fisheries management plans	Fisheries management plans for reef fisheries, grouper, aquarium fish, sea cucumber and lobster are reviewed or developed and implemented. A National Plan of Actions for sharks is finalized and implemented; A management plan for these species is possibly developed.
RF5. Capacity enhancement on fishery resource management	Stakeholders such as boat owners, fishers, fish middlemen, tourists and the general public develop their skills on marine resource and environmental management through awareness and training sessions. Various types of training materials, e.g. on laws, regulations and enforcement will be prepared. Technical capacity of both MoFA and MRC staff will be improved to address reef fisheries resource management.
RF6. Improvement of boat design and equipment	Possible improvements on boat design / equipment for fish handling, particularly for live grouper fishing, and ice / fish storage are identified; these improvements are subsequently implemented on a pilot basis then disseminated nationwide.
RF7. Awareness on fishing and fish handling techniques	Possible improved fishing and fish handling techniques to be introduced are identified, and subsequently awareness and training materials are developed in collaboration with the post-harvest / value addition sub-sector. Training sessions are conducted for concerned stakeholders.

＜Aquaculture sub-sector (AQ)＞

Name of project	Outline of project component
AQ1. Establishment of multi-species hatchery *on-going project	The development of multi-species hatchery facilities provides required inputs in terms of seed, demonstration and extension services for grow-out operations. This addresses the issue of brood-stock for start-up grow-out operations.
AQ2. Establishment of milkfish seed production facilities to provide bait *on-going project	The bait availability is a constant issue for the pole-and-line fisheries industry. The production of an alternative through successful aquaculture would cater to the need for bait and reduce the stress on the wild stocks of bait species.
AQ3. Development of domestic fish feed using by-product of fish processing	Feeding costs are expected to be one of the highest costs of mariculture operations. The production of aquatic feeds suitable for the target species, using locally available fishmeal resources at a reduced cost, would considerably reduce the cost of aquaculture production. This project aims to identify available resources and tests locally produced feeds to see their efficiency. The tuna processing industry produces significant amount of waste which could be utilized for the production of fishmeal for aquaculture.
AQ4. Refinement of existing aquaculture techniques	The existing technology for seed production and grow-out production are refined to better suit the Maldivian context; this is expected to improve production efficiency and possibly reduce cost of production of selected species. This project is carried out at the newly-established multi-species hatchery as well as at the MTDF /MRC.
AQ5. Training and demonstration capacity building of MTDF/MRC	The capacity of existing facilities for mariculture such as MTDF/MRC is upgraded to facilitate training and demonstration, through both infrastructure and human resource development. These facilities, in addition to training and demonstration activities, carries out research on potential aquaculture species to be developed in the future.
AQ6. Extension of potential mariculture techniques	Mariculture techniques developed through the research and development efforts and for which financial feasibility studies are conducted are extended to the private sector. The research and development as well as training and demonstration facilities contributes to the development of extension services.
AQ7. Promotion of aquaculture through formal education system	The existing level of awareness on aquaculture is increased through the incorporation of aquaculture in the local education system as seen for capture fisheries.
AQ8. Improvement of aquatic animal health management *on-going project	Biosecurity levels are ensured through the construction and operation of an aquatic quarantine facility; aquatic animal health management are ensured through the construction and operation of diagnostic facilities and the implementation of aquatic health surveillance programs.
AQ9. Strengthening institutional mechanism on aquaculture activities	Systems that allow for improved management of aquaculture operations, including improved monitoring mechanisms through the establishment of a certification program, are set in place. Such certification programs could either be adopted from an existing international scheme or formulated to fit the local requirements.
AQ10. Development of financing system for aquaculture	This project assesses the existing financing mechanisms available for aquaculture and evaluate the possibility of developing a mechanism suitable for the sub-sector. The project aims to establish a new investment platform on aquaculture for the private sector, and to investigate the banking policy and the Government policy.

＜Post-harvest/ Value addition sub-sector (PV)＞

Name of project	Outline of project component
PV1. Extension of improved on-board handling techniques for tuna handline fishery	Modified yellowfin tuna on-board handling methods based on the results of the respective MASPLAN pilot project are extended to hand line tuna fishing vessels through awareness and extension programs. This project is implemented in collaboration with the oceanic fishery sub-sector.
PV2. Strengthening capacity of ice plants	A feasibility study is completed for potential sites, as per their socio-economic and environmental conditions as well as their operation and management structure; subsequently the required ice plants are established. Demonstration on proper use of ice is provided.
PV3. Extension of quality improvement methods for traditional processed fish	Technologies on quality improvement of traditional processed fish in view of product safety, a topic which has been developed and verified through the respective MASPLAN pilot project, are extended among cooperatives/SMEs and individuals through trainings.
PV4. Improvement of fish marketing system	Based on the analysis of the current fish marketing system, an advanced market information service system is established to improve the value chain of fishery products. Targets include local, resort and export markets.
PV5. Development of katsuobushi processing technology and facility	Appropriate technology and facility for small-medium-scale fish processors to produce Katsuobushi are developed and extended; it is expected that the products are sold to the Japanese market.
PV6. Development of minimum national standards / regulations for fishery products	The necessary minimum standards/regulations relevant to fishery products are formulated and implemented.
PV7. Establishment of a training system for fish quality assurance	A training system on fish quality assurance is established for government officials, technicians of private companies and fishers.

5.2 Pilot Projects

The following 6 projects were selected as PPs. Table 3 shows their outline.

Table 3. Outline of PP

Name of PP	Outline of Project
PP.1 Technical development and verification of live bait catch and holding for improving their survival rate	The target group of the project is a pole-and-line fishing vessel in Maradhoo, Addu Atoll. The main activities consist in modifying the live bait tank based on Japanese methodology, improving the catch method of live bait and introducing fishing gears and equipment related to those activities.
PP.2 Technical development of tuna hand line on-board handling for fish quality improvement	Target group of the project are ENSIS Fisheries of North Male Atoll and the YFT hand line fishing vessel belonging to ENSIS Fisheries. The main activities are installation of fishing gears/equipment for quality control, improvement of on-board handling, modification of cooling method and so on.
PP.3 Preliminary resource survey on availability of deep-sea resources	This project aims at verifying the availability of new/unutilized deep-sea resources for future exploitation and diversification of the fisheries sector. The expected available resources are bottom fin-fishes (ex. deep-sea snapper's group) and Diamondback squid (*Thysanoteuthis rhombus*) that are distributed in the whole tropical and subtropical area.
PP.4 Monitoring of fish supply to resorts and setting up of an	Target areas of the project are North Malé Atoll. The main activity of this project is to establish a proper data collecting system from the resorts and seafood suppliers because it would be difficult to collect information

ecolabel certification	directly from fishers under the situation where there is presently no systematic market mechanism for Maldives' reef fisheries.
PP.5 Feasibility study on mariculture of selected species in Maldives	A rearing experiment is carried out in the Mariculture Training and Demonstration Facility (MTDF) of MRC at the Maniyafushi Island, South Malé Atoll. The target species of the pilot project are in principle brown-marbled grouper (*Epinephelus fuscoguttatus*) and sandfish (*Holothuria scabra*).
PP.6 Quality improvement of traditional processed fish	The target areas are Male, Kooddoo, and Gemanafushi Island. The Project provides the Cooperative a simple heat sterilization technique, uses heat-resistant packaging materials, and verifies the cost-effectiveness. The Project also develops a label which explains the product is heat-sterilized and put the label on the product's package for the product differentiation.

6. Environment and social consideration of proposed projects in each sub-sector

6.1 Scoping

The result of scoping and reasons for each proposed project are listed in Attachment 4 for each sub-sector. Scoping was carried out separately, targeted for before/during project implementation and after project implementation, and it was described as "before" and "after", respectively. As a result, there was no "A" item (i.e. with serious negative impact), there were 12 "B" items (i.e. with small negative impact), 16 "C" items (i.e. with unknown impacts at the current stage), and others were "D" items (i.e. with no negative impact).
Scoping results are shown as below by each sub-sector.

1) Oceanic fisheries sub-sector

The results of scoping for the proposed 8 projects are listed in Attachment 4-1. "A" item was 0, "B" item was 2, "C" item was 2 and the others were "D" items. The details of the scoping result for "B" or "C" project are explained below (Table 4).

Table 4. Result of scoping by evaluation item (Oceanic fisheries sub-sector)

OF4. Extension of improved live bait stocking system in pole-and-line fishery

Evaluation item	Scoping		Reasons
	Before	After	
Working conditions	C	C	It will be evaluated after the implementation of PP.
Public welfare	B	B	There is a difficulty for fishers who are newcomers due to their low income to introduce the new system.

OF6. Promotion of private investment

Evaluation item	Scoping		Reasons
	Before	After	
Conflicts of interest	B	B	Due to the expansion of the longline fishery accompanying the investment, there is a possibility of conflict with skipjack tuna fishery because of overlaps of the fishing grounds.

OF7. Development of new deep sea fisheries (Diamondback Squid and other fishes)

Evaluation item	Scoping		Reasons
	Before	After	
Ecosystem	C	C	The magnitude of impact will be changed depending on the existence of appropriate resource management plan.

2) Reef fisheries sub-sector

The results of scoping for the proposed 7 projects are listed in Attachment 4-2. "A" item was 0, "B" item was 3, "C" item was 0 and the others were "D" items. The details of the scoping result for "B" or "C" project are explained below (Table 5).

Table 5. Result of scoping by evaluation item (Reef fisheries sub-sector)

RF3. Enhancement of fisheries compliance/ enforcement

Evaluation item	Scoping		Reasons
	Before	After	
Conflicts of interest	D	B	Introduction of GSM may lead to conflicts among fishers because it may be possible to "steal" good fishing locations through GSM.

RF4. Design and implementation of reef fisheries management plans

Evaluation item	Scoping		Reasons
	Before	After	
Living and livelihood	B	B	Possibility of decline of usable fishing grounds due to strengthening of regulative restriction.
Conflicts of interest	B	B	There is a possibility of conflict between reef fishery and tourism sector due to limitation of fishing grounds for fishers.

3) Aquaculture sub-sector

The results of scoping for the proposed 10 projects are listed in Attachment 4-3. "A" item was 0, "B" item was 4, "C" item was 1 and the others were "D" items. The details of the scoping result for "B" or "C" project are explained below (Table 6).

Table 6. Result of scoping by evaluation item (Aquaculture sub-sector)

AQ4. Refinement of existing aquaculture techniques

Evaluation item	Scoping		Reasons
	Before	After	
Ecosystem	B	B	If the target species is exotic species, it may give negative impacts to existing ecosystem. In addition, if the method of selecting seeds adopt the method choosing excellent genetic individuals, the genetic diversity may be different from existing natural species and give negative impacts to closely-related species and native species.

AQ6. Extension of potential mariculture techniques

Evaluation item	Scoping		Reasons
	Before	After	
Water quality	B	B	Possibility of eutrophication and water pollution of the ocean caused by over feeding.
Ecosystem	B	B	If the selected species for aquaculture is an exotic species, there is a possibility that it may affect existing ecosystem. Genetic diversity is unable to be maintained, if selective method is adopted for genetically superior target species, This is because when fish improved genetically escaped, it may affect closely related species and/or endemic species.
Natural disaster	C	C	Since there is not sufficient case in the past in Maldives, careful examination is needed for selecting the location for the facility installation.
Independent management	B	B	Aquaculture has not developed in Maldives yet. Therefore, feasibility and risks for the independent management is uncertain.

4) Post-harvest/Value addition sub-sector

The results of scoping for the proposed 7 projects are listed in Attachment 4-4. “A” item was 0, “B” item was 3, “C” item was 13 and the others were “D” items. The details of the scoping result for “B” or “C” project are explained below (Table 7).

Table 7. Result of scoping by evaluation item (Post-harvest/Value addition sub-sector)

PV1. Extension of improved on-board handling techniques for tuna handline fishery

Evaluation item	Scoping		Reasons
	Before	After	
Working condition	B	B	Sufficient consideration for new techniques is necessary, especially for electric tuna shocker etc.

PV2. Strengthening capacity of ice plants

Evaluation item	Scoping		Reasons
	Before	After	
Water quality	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Waste	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Noise and vibration	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Hydrology	D	B	There is a concern about over usage of groundwater resources.
Natural disaster	D	C	Since there is not sufficient case in the past in Maldives, careful examination is needed for selecting the location for the facility installation.
Working condition	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.

Conflicts of interest	D	C	The occurrence of conflict caused by construction is unknown.
Independent management	C	B	Before construction: method of selection of the targeted islands is unclear. After construction: plan for operation and maintenance is necessary for the stable operation.

PV5. Development of katsuobushi processing technology and facility

Evaluation item	Scoping		Reasons
	Before	After	
Water quality	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Waste	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Noise and vibration	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Working condition	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Conflicts of interest	D	C	The occurrence of conflict between new facility and existing one, which caused by construction is unknown.
Independent management	D	C	Independent Management is unclear after the completion the facility construction.

6.2 TOR of Environment and Social considerations studies

Environment and social consideration studies were implemented in order to understand past examples in Maldives and use them as reference for the final evaluation. The surveyed target was decided to cover several projects which became “B” or “C” projects in the scoping stage. The survey methods were mainly interview to stakeholders and literature survey. Table 8 shows the TOR of environment and social considerations studies.

Table 8. TOR of environment and social considerations studies

	Evaluated item	Covered projects	Survey item	Method of survey (visited site)
1	Water quality	AQ6.: Distribution of aquaculture technique (B) PV2.: Construction of ice plant (C) PV5.: Construction of Katsuobushi factory (C)	1. Confirmation of environmental standard 2. Monitoring on the progress of SFDPIS 3. Estimation of range of environmental impacts	1. Survey on laws, interview to EPA 2. Interview to MASPLAN professionals 3. Interview to MoFA and MRC
2	Waste	PV2.: Construction of ice plant (C) PV5.: Construction of	1. Confirmation of environmental standard 2. Monitoring of	1. Survey on laws, interview to EPA 2. Interview to MASPLAN

		Katsuobushi factory (C)	SFDPIS	professionals
3	Noise and vibration	PV2.: Construction of ice plant (C) PV5.: Construction of Katsuobushi factory (C)	1. Confirmation of environmental standard 2. Monitoring on the progress of SFDPIS	1. Survey on laws, interview to EPA 2. Interview to MASPLAN professionals
6	Ecosystem	OF7. Development of deep sea fisheries (C) AQ4. Refinement of existing aquaculture techniques (B) AQ6. Extension of mariculture techniques(B)	1. Estimation of range of environmental impacts 2. Monitoring on the progress of SFDPIS	1. Survey on laws, interview to staffs of EPA and MRC 2. Interview to MASPLAN professionals
7	Hydrology	PV2. Construction of ice plant (B)	1. Estimation of range of environmental impacts	1. Interview to exiting ice plants (Uklhas and Gemanafushi islands), Interview to EPA staffs.
9	Natural disaster	AQ6. Extension of mariculture techniques (C) PV2. Construction of ice plant (C)	1. Confirmation of result of PP 2. Review of past cases	1. Interview to MASPLAN professionals 2. Collecting past case examples of natural disaster, interview to ice plant managers (Uklhas and Gemanafushi islands)
11	Living and livelihood	RF4. Design and implementation of reef fisheries management plans (B)	1. Review of past cases	1. Interview to Island Council, fishers and small scale fish processors (Uklhas, Gemanafushi islands)
15	Working conditions	OF4. Extension of improved live bait stocking system(C) PV1. Extension of improved on-board handling techniques (B) PV2.: Construction of ice plant (C) PV5.: Construction of Katsuobushi factory (C)	1. Confirmation of working law 2/ Monitoring on the progress of SFDPIS and pilot projects	1. Survey on laws 2. Interview to MASPLAN professionals
16	Conflicts of interest	OF6. Promotion of private investment (B) RF3. Enhancement of fisheries compliance / enforcement (B) RF4. Design and implementation of reef fisheries management plans (B) PV2.: Construction of ice plant (C) PV5.: Construction of Katsuobushi factory (C)	1. Review of past cases and study on current situations 2. Monitoring on the progress of SFDPIS	1. Interview to Island Council, fishers (Uklhas and Gemanafushi islands), existing Katsuobushi factory (Addu island), Interview to MoFA and MRC staffs 2. Interview to MASPLAN professionals
17	Independent management	AQ6. Extension of mariculture techniques (B) PV2.: Construction of ice plants (B,C)	1. Review of past cases and study on current cases 2. Study on cases of	1. Interview to Island Council, fishers, small scale fish processor, ice plant manager (Uklhas,

		PV5.: Construction of Katsuobushi factory (C)	aquaculture 3. Study on successful case of small scale fish processing	Thulhadhoo islands), existing Katsuobushi factory (Addu island), staff of MoFA and MRC 2. Interview to similar aquaculture project (Pearl farming project in Thulhadhoo island) 3. Interview to cooperative society (fish processors cooperative society members in Gemanafushi island)
18	Public welfare	OF4. Extension of improved live bait stocking system（B）	1. Review on the past cases and study on current cases	1. Interview to Island Council, fishers (Uklhas, Thulhadhoo and Gemanafushi islands), staff of MoFA and MRC

7. Environment and Social Consideration of the Pilots Projects

7.1 Scoping of the pilots projects

The results of scoping of the 6 pilot projects are shown in Attachment 5. There was no A, 2 items were rated as B, 2 items were rated as C and others were D. The reasons of evaluation of B and C are indicated in Table 9.

Table 9. Results of scoping of pilot projects

PP.1 Technical development and verification of live bait catch and holding for improving their survival rate

Evaluation Item	Scoping		Reason of evaluation
	before	after	
Working conditions	C	C	The effects on the fishers who use the traditional bait tank is uncertain before introducing Japanese-style bait tank. It is evaluated with actual update after the completion of PP.

PP.2 Technical development of tuna hand line on-board handling for quality improvement

Evaluation Item	Scoping		Reason of evaluation
	before	after	
Working conditions	B	B	In Maldives, the method to keep freshness of fishes by using electric shocker is not used. Therefore, a risk for humans would be anticipated, if the technical instruction to use this equipment is not conducted.

PP.5 Feasibility study on mariculture of selected species in Maldives

Evaluation Item	Scoping		Reason of evaluation
	before	after	
Ecosystem	B	B	If the target species is exotic species, it may give negative impacts to existing ecosystem. In addition, if the method of selecting seeds adopt the method choosing excellent genetic individuals, the genetic diversity may be different from existing natural species and give negative impacts to closely-related species and native species.

Natural disaster	C	C	The possibility of damage to aquaculture facility by tsunami or big wave is a concern.

7.2 Survey TOR of the pilot projects

The survey TOR was drawn to study for the items evaluated as B and C. The details were shown in Table 10. The survey method was interviews mainly.

Table 10. Contents of survey TOR

	Evaluation item	Survey item	Survey method
6	Ecosystem (PP.5)	①Prediction of habitat distribution ②Prediction about the existence of an influence	①document investigation ② interview to aquaculture experts and MRC staffs
9	Natural disaster (PP.5)	①Sea condition at experimental site ②Weather condition at experimental site	①data collection (selecting method of project site, sea condition) ②data collecting (climate condition)
15	Working condition (PP.1, PP.2)	① Risk measurement (at work) ②risk anticipation (during the pilot activity) ③existence of mitigation	①interview to fishing technology expert ②interview to fishing technology expert and MRC staffs ③interview to fishing technology expert and MRC staffs

7.3 Survey results of the pilot projects

Based on the TOR which was drew up in chapter 7.2, the several surveys were implemented. The results are indicated in Table 11.

Table 11. Survey results

	Evaluation item	Results of survey
6	Ecosystem (PP.5)	According to IUCN, sand fish is a native species in Maldives therefore negative impacts are not foreseen even if cultured fish escapes to the wild.
9	Natural disaster (PP.5)	It is difficult to refer to past experiences because aquaculture is a relatively new activity in Maldives. But sufficient attention is required to select the project sites since it is known that the sea condition becomes worse in the south-west monsoon season, particularly in channels.
15	Working conditions (PP.1, PP.2)	It was found out that the modification work of bait tank and cooler box is not a difficult work for the technicians in Maldives. In addition, the introduction of Japanese-style technique could reduce fishers' work load. Otherwise, use of electric shocker requires sufficient attention, it was confirmed that the operation manual was already distributed and the translation of the manual in Dhivehi is planned.

7.4 Impact assessment of the pilot projects

The results of the impact assessment (IA) are indicated in Attachment 6. The followings are the evaluation rates (A, B or C) in the scoping stage and their justification (Table 12).

Table 12. Results of impact assessment of pilot project

PP.1 Technical development and verification of live bait catch and holding for improving their survival rate

Evaluation item	Scoping		IA		Result of studies and the rate justification
	Before	After	Before	After	
Working condition	C	C	D	D	As a result of survey, it was evaluated that there is no risk for technicians and fishers when they modify the bait tank and when they operate with the modified tank.

PP.2 Technical development of tuna hand line on-board handling for fish quality improvement

Evaluation item	Scoping		IA		Result of studies with reasons
	Before	After	Before	After	
Working condition	B	B	B	B	As a result of survey, it was confirmed that the instruction manual was distributed to fishers by the project (there is a plan to translate the manual into Dhivehi). Otherwise, if the appropriate instructions are not be given to fishers, there will be a negative impact on humans.

PP.5 Feasibility study on mariculture of selected species in Maldives

Evaluation Item	Scoping		IA		Reason of evaluation
	before	After	before	After	
Ecosystem	B	B	D	D	According to IUCN, sand fish is a native species in Maldives therefore negative impact is unforeseen even if cultured fish escapes to the wild. In addition, method of producing seed is not the method which select individuals having superior gene, thus negative impacts are not predicted.
Natural disaster	C	C	C	C	The possibility of damage to aquaculture facility by tsunami or big wave is a concern.

7.5 Formulation of mitigation measures for the pilot projects

The mitigation measures for 'Working conditions' of 'PP.2 'Technical development of tuna hand line on-board handling for quality improvement' which was rated 'B' is shown in Table 13.

Table 13. Mitigation measures of pilot project

Evaluation item	Necessary mitigation measures	Implementing agency	Responsible agency	Cost
Working conditions (B)	1. Fishing technology expert gives a lecture to survey observers and fishers about appropriate use of electric shocker.	MoFA	MoFA	No special cost
	2. Fishing technology experts and trained observers give lectures as necessary to manage operation procedures according to the manual.	MoFA	MoFA	No special cost
	3. Translation of the manual contents (using method of electric shocker) into Dhivehi.	MoFA	MoFA	Project supports the necessary cost.

7.6 Formulation of monitoring plan for the pilot projects

The monitoring plan is formulated for 2 PPs rated B or C. The content of the monitoring plan is shown in Table 14.

Table 14. Monitoring plan for PP

PP	Evaluation item	Survey item	Method	Frequency	Responsible agency
PP.2	Working condition (B)	Implementation of the safety procedures during use of electric shocker	・Interview to fishing technology expert ・Examination of monthly report and survey report ・Distribution of instruction manual for PP vessel (translation into Dhivehi)	As necessary	MoFA
PP.5	Natural disaster (C)	Situation of introduced aquaculture cages	・Interview to aquaculture technology expert ・Interview of MoFA/MRC staffs ・Examination of monthly report, survey report and progress report	As necessary	MoFA/MRC

Based on the monitoring plan, interview survey of MASPLAN experts and close examination of the monitoring report and monthly report on PPs were implemented during the pilot activities. The results of the monitoring are shown in Table 15.

Table 15. Monitoring results of PP

PP	Evaluation item	Survey item	Results of monitoring
PP.2	Working condition	Implementation of the safety procedures during use of electric shocker	The lecture about the method of electric shocker by fishing technology expert was conducted for crew members. The instruction manual was distributed to PP vessel and it was translated into Dhivehi. There is no report on accident during the use of the electric shocker.
PP.5	Natural disaster	Situation of introduced aquaculture cages	The aquaculture cages were damaged by big waves due to bad weather condition.

8. The result of environment and social consideration studies and impact assessment

Based on TOR of the environment and social considerations studies, which described in 6-2, an Impact Assessment (IA) on the proposed projects was carried out. IA was conducted for the seven (7) proposed projects shown in Table 16, which related to PPs strongly, reflecting results of evaluation on environment and social considerations. The seven proposed projects examined were cited from a draft SFDPIS as of May 2017. The following tables (Table 17-20) summarize the projects evaluated as B or C in the scoping stage and change of the results with the reasons. The result of the Impact Assessment is shown in Attachment 7.

Table 16. List of proposed projects which are strongly linked to the PPs

PP	Proposed project in SFDPIS
PP.1	OF4. Extension of improved live bait stocking system in pole-and-line fishery
PP.2	PV1. Extension of improved on-board handling techniques for tuna handline fishery
PP.3	OF7. Development of new deep sea fisheries (Diamondback Squid and other fishes)
PP.4	RF1. Improvement of biological, socio-economic and statistical data collection and analysis system
PP.5	AQ5. Training and demonstration capacity building of MTDF/MRC AQ6. Extension of potential mariculture techniques
PP.6	PV3. Extension of quality improvement methods for traditional processed fish

Table 17. Oceanic fishery; The result of IA with evaluation items

OF4. Extension of improved live bait stocking system in pole-and-line fishery

Evaluation item	Scoping		IA		Result of studies and reasons
	Before	After	Before	After	
Working condition	C	C	D	D	By modifying the bait tank, burden to enter in the bait tank to remove the dead bait was avoided. The positive impact for working condition was confirmed. For that reason, the evaluation was changed to D.
Public welfare	B	B	D	D	The new system will be purchased by each boat owner with their own funds and intentions, thus diffusion of the new system will not lead to the unevenly for public welfare.

OF6. Promotion of private investment

Evaluation item	Scoping		IA		Result of studies and reasons
	Before	After	Before	After	
Conflicts of interest	B	B	B	B	As a result of the survey, the possibility of conflict between long-line fishers and YFT fishers remains as a problem to be solved. Mitigation measures are needed.

OF7. Development of new deep sea fisheries (Diamondback Squid and other fishes)

Evaluation item	Scoping		IA		Result of studies and reasons
	Before	After	Before	After	
Ecosystem	C	C	B	B	Except for the Diamondback squid whose life span is 1 year, it is known that other deep-sea fishes are easily prone to be suffered from over-fishing. Through the PP, the existence of unutilized deep-sea fishery resources are confirmed but the appropriate fishery resources management should be introduced to avoid their over-exploitation. Mitigation measures are needed.

Table 18. Reef fishery; The result of IA with evaluation items

RF3. Enhancement of fisheries compliance/ enforcement

Evaluation item	Scoping		IA		Result of studies and reasons
	Before	After	Before	After	
Conflicts of interest	D	B	N/A	B	As a result of the survey, the possibility of conflict of interest among fishers remains as a problem to be solved. Mitigation measures are needed.

RF4. Design and implementation of reef fisheries management plans

Evaluation item	Scoping		IA		Result of studies an reasons
	Before	After	Before	After	
Living and Livelihood	B	B	C	C	Specific content of regulations is formulated after the implementation of SFDPIS, so the impact is unknown. In case the management plans limit the fish catch and increase the operation costs, a negative impact to livelihood of fishers is anticipated. In this case, the Government has to formulate mitigation measures and carry out the monitoring.
Conflicts of interest	B	B	C	C	Specific content of regulations is formulated after the implementation of SFDPIS, so the impact is unknown. In case the effects from the regulations are different for fishers and the industry, conflicts of interest are anticipated. The Government has to formulate mitigation measures and carry out the monitoring.

Table 19. Aquaculture; The result of IA with evaluation items

AQ4. Refinement of existing aquaculture techniques

Evaluation item	Scoping		IA		Result of studies and reasons
	Before	After	Before	After	
Ecosystem	B	B	D	D	From interview to involved stakeholders, the current method of seed production consist in collecting fertilized eggs by spontaneous oviposition of endemic fish species. Therefore, unlike with genetic improvement, the problem of cultured fish has a different genetic character from local fish is not anticipated. The influence of exotic species on endemic species is not anticipated either.

AQ6. Extension of potential mariculture techniques

Evaluation item	Scoping		IA		Result of studies and reasons
	Before	After	Before	After	
Water quality	B	B	B	B	As a result of the survey, the possibility of occurrence of water quality pollution remains as a problem to be solved.
Ecosystem	B	B	D	D	According to IUCN, the sandfish is a native species in Maldives therefore negative impact is not estimated even if cultured fish escape to the wild. In addition, method of seed production is not the method which select individuals having superior gene, thus negative

					impact is not anticipated.
Natural disaster	C	C	B	D	An accident caused by high wave occurred during the implementation of pilot project. It gave damages to the cages for aquaculture. . There are similar risks when the aquaculture industry is developed. Mitigations measures need to be planned.
Independent management	B	B	C	C	Aquaculture business in Maldives is presently underway and there are already some successful projects and companies on sandfish culture, thus there is no definite factor hindering Independent Management. However, since the production scale of future businesses is unknown at present, the project is assessed as "C" and needs a monitoring plan.

Table 20. Post-harvest/Value addition; The result of IA with evaluation items

PV.1 Extension of improved on-board handling techniques for tuna handline fishery

Evaluation item	Scoping		IA		Result of studies and reasons
	Before	After	Before	After	
Working conditions	B	B	B	B	Through the implementation of PP, guidance on handling of electric shocker by MASPLAN experts, and distribution of operation manuals with translation in Dhivehi were implemented. However, since there is no guarantee of the implementation in SFDPIS, there is a risk on effects relevant to human resources, depending on the learning process. Therefore, in the impact assessment, B is kept as it is, and mitigation measures need to be planned.

PV.2 Strengthening capacity of ice plants

Evaluation item	Scoping		IA		Result of studies and reasons
	Before	After	Before	After	
Water quality	C	D	D	N/A	<Before/During> Based on the survey to some of the existing ice plants in Maldives, the foreseeable scale of future ice plants' construction is small, and the construction should not have a negative impact.
Waste	C	D	D	N/A	same
Noise and vibration	C	D	D	N/A	< Before/During > Based on the survey to the some existing ice plants in Maldives, the realistic scale of the construction in PV2 is small, and the construction method should not provide negative impact.
Hydrology	D	B	N/A	B	<After> Mitigation measure is planned.
Natural disaster	D	C	N/A	D	<After> After SFDPIS enacted, a pilot activity is to be conducted, where several sites for the construction of ice plants are to be selected. Therefore, negative impact caused by natural disaster is not estimated.
Working conditions	C	D	D	N/A	Based on the survey to some of the existing ice plants in Maldives, the foreseeable scale of construction of future ice plants is small, and their construction should not have a negative impact.
Conflicts of interest	D	C	N/A	D	<After> After SFDPIS enacted, a pilot activity is to be conducted, where several sites for the construction of ice plants are to be selected. Therefore, conflict of interest is unlikely to occur.
Independent	C	B	D	B	<Before> After SFDPIS enacted, a pilot activity is to

management					be conducted, where several sites for the construction of ice plants are to be selected. Therefore, problem on independent management is unlikely to occur. <After> Mitigation measure is planned.

PV.5 Development of katsuobushi processing technology and facility

Evaluation item	Scoping		IA		Result of studies and reasons
	Before	After	Before	After	
Water quality	C	D	C	N/A	<Before/During> Since the scale and construction method of Katsuobushi processing factory has not been decided yet, it cannot be estimated if the construction work has a negative impact or not. If the facility scale is large, Maldivian side should take mitigation measures and implement the monitoring.
Waste	C	D	C	N/A	same
Noise and vibration	C	D	C	N/A	same
Working conditions	C	D	C	N/A	same
Conflicts of interest	D	C	N/A	C	<After> Since the scale and construction method of Katsuobushi processing factory has not been decided yet, negative impacts cannot be estimated. However, if the land and market overlap between existing industry such as small-scale fish processors and newly established factory, conflict between them may occur. In that case, Maldivian side should take mitigation measures and implement the monitoring.
Independent management	D	C	N/A	C	<After> There is an unclear point on independent management since Katsuobushi processor is not distributed in Maldives. When the scale and management method of Katsuobushi factory is decided, the monitoring needs to be implemented.

9. Mitigations for the proposed projects

Among the 26 projects proposed by the SFDPIS, 8 mitigation measures were formulated in order to cope with the negative impacts evaluated as “B”, as shown in Table 21 below.

Table 21. Mitigations and costs for implementation of mitigation

<Oceanic fishery sub-sector>

OF6. Promotion of private investment

Evaluation item	Implementing agency	Responsible agency	Cost
Conflicts of interest(B)	MoFA	MoFA	No special cost
Details of anticipated negative impact			
Longline fishing is prohibited within the 100 nautical mile area in Maldives. Even now conflicts between longline fishers and hand line fishers are reported within 100 miles and the development of longline fishery may lead to an increase of these conflicts.			

Mitigation
Promotion of VMS introduction and tightening penalties in case of infringement are needed. It is required to formulate strict rules such as deprivation of fishing license for illegal fishing.

OF7. Development of new deep sea fisheries (Diamondback Squid and other fishes)

Evaluation item	Implementing agency	Responsible agency	Cost
Ecosystem(B)	MoFA	MoFA	Included in MoFA annual budget
Details of anticipated negative impact			
As a result of PP, it was revealed that resources with high commercial value exist in Maldives. In addition, a certain amount of resource is expected on the coast of Maldives where deep-sea fishing has hardly been practiced, and it is expected that these resources could be traded at a high price. Among target species, the impact of fishery development on Diamondback squid resources is relatively small because its life span is only one year, but the development of other species such as grouper, with a long lifespan, would have a great influence on fishery resources. Consequently, overfishing due to fishery development is a concern, and the impact on ecosystems cannot be denied.			
Mitigation			
Based on the result of resource survey and experiences in other countries, an appropriate fishery management plan should be formulated such as setting of TAC (Total Allowable Catch) and IQ (Individual Quota) and license system. Additionally, it is required to implement awareness activities and technical training for fishers as well as to control illegal fishery.			

<Reef fishery sub-sector>

RF3. Enhancement of fisheries compliance/ enforcement

Evaluation item	Implementing agency	Responsible agency	Cost
Conflicts of interest(B)	MoFA	MoFA	Included in MoFA annual budget
Details of anticipated negative impact			
The GSM system (Global System for Mobile Communications) is to supply location information of the vessel to the management institution, which is similar to VSM in Oceanic fishery sub-sector (the GMS using mobile phone network targets areas closer from land than VMS). Fishers are afraid that their fishing grounds will be identified via satellite and “hacked” by others, and there is a concern about conflict among fishers.			
Mitigation			
The GSM system is not easy to hack. Therefore the issue to be solved consists in convincing fishers on the merits of the introduction of GSM. The following advantages should be promoted: ・The introduction of the system will lead to the strengthening of the IUU fishing framework ・It supplies to fishers the information provided by MoFA on good fishing grounds (it is necessary that MoFA respects confidentiality of information from specified companies and organizations).			

<Aquaculture sub-sector>

AQ6. Extension of potential mariculture techniques

Evaluation item	Implementing agency	Responsible agency	Cost
Water quality(B)	MoFA	MoFA	Included in MoFA annual budget
Details of anticipated negative impact			

The currently assumed aquaculture candidate species are sandfish and grouper; their main influences to be considered are summarized below.

Problems	Estimated impacts
- Occurrence of residual feed due to over feeding - Accumulation of waste - Mismanagement of chemicals	- Sediment contamination - Water pollution - Loss of food safety

Mitigation

- Using environmental friendly pelt
- Regulating scale of aquaculture
- Introducing Good Aquaculture Practices (GAP); analyzing risks in each step of aquaculture and establishing work flow and recording technique to avoid the risks. This can be helpful to specify the factors leading to damages when a problem occurs.

Fish cultured with environmental friendly methods could possibly be differentiated from other competitors and be branded in China, one of the major targeted countries for selling. It is also expected to get the "ASC (Aquaculture Stewardship Council)" certification in the future.

Evaluation item	Implementation agency	Responsible agency	Cost
National disaster (B)	MoFA	MoFA	Included in MoFA annual budget

Details of anticipated negative impact

The currently assumed aquaculture candidate species are sandfish and grouper; their main influences to be considered are summarized below.

Problems	Estimated impacts
- Strong wave - Strong wind caused by Monsoon - Drastic changes in temperature	- Escape of cultured fish (profit loss) - Death of cultured fish and occurrence of infection - Damage of cage or net

Mitigation

In PP, countermeasures have already been presented for damage suffered from natural disasters. As a countermeasure, choosing a calm place with limited exposure to wave and wind, and setting the cage perpendicular to the wave is recommended to decrease the influence of the wave.

Other possible mitigation measures are being implemented in PP and IFAD projects; they consist in conducting environmental surveys in candidate sites in advance. This allows to select the optimum environment for aquaculture and to select places where natural disasters are unlikely to occur. In addition, it is necessary to observe the net or cage in the sea for a certain period before stocking seeds to the cage, to see if there is any influence from external environment, and modify the installation method or change the installation location if needed. This allows to minimize the loss of seed caused by natural disasters.

Grouper aquaculture was not carried out in PP. As mitigation, using appropriate net depending on marine environment needs to be considered, since there are various kinds of net for general grouper aquaculture such as metal, synthetic fiber, plastic wire etc.

<Post-harvest/Value addition sub-sector>

PV.1 Extension of improved on-board handling techniques for tuna handline fishery

Evaluation item	Implementing agency	Responsible agency	Cost
Working condition (B)	MoFA	MoFA	No special cost

Details of anticipated negative impact

Significant negative impact on human resources is anticipated in case for safety when using electric shocker.

Mitigation

In PP2, guidance on handling of electric shockers by MASPLAN experts, distribution of operation manuals with translation in Dhivehi were implemented. As a follow-up on these activities, similar

measures are necessary when electric shocker is disseminated. In addition, sharing information and techniques between fishers is one of mitigation measures.

PV2. Strengthening capacity of ice plants

Evaluation item	Implementing agency	Responsible agency	Cost
Hydrology (B)	MoFA	MoFA	No special cost

Details of anticipated negative impact

If the ice plants use ground water in large quantities, there might be some over-use of ground water.

Mitigation

	Advantage	Disadvantage
Sea water ice	- High capacity to maintain fish freshness - Least soluble - Securing sea water is easy	- Salt of sea water is absorbed by fish body after ice melts
Fresh water ice	- Keeping freshness of fish even after ice melted	- Securing fresh water is difficult

- Follow EIA regulation about ground water use
- Examine possibilities to use seawater

Evaluated item	Implementing agency	Responsible agency	Cost
Independent Management (B)	MoFA	MoFA	Included in MoFA annual budget

Details of anticipated negative impact

When the ice plant breaks down, there is a risk that stable ice supply is stopped if rapid repair is not ensured. In the survey to existing ice plants, the managers indicated that procurement of spare parts in Malé is not possible so these spare parts always have to be ordered overseas, with the subsequent delays, eventually provoking prolonged interruption of ice production.

Mitigation

Establishing some agent(s) of manufacturer(s) in Malé, or strengthening cooperation with manufacturer(s) or agent(s) in neighboring countries are necessary. In addition, it would be useful to establish maintenance contracts with agent(s) (e.g. for 3 years). When ice machines are installed, training on daily operation and maintenance and troubleshooting needs to be implemented.

10. Monitoring plan for the proposed projects

Table 22 shows the monitoring plans formulated for items rated B and C in the Impact Assessment. C is difficult to evaluate at present but the monitoring will be implemented in response to the scale and content of the projects.

Table 22. Monitoring plan

OF6. Promotion of private investment

Evaluation item	Period	Rate	Monitoring items	Site	Frequency	Responsible agency
Conflicts of interest	On-going	B	Presence of conflict between fishers	At targeted fishing vessel	Once every six months	MoFA
	After	B	Presence of conflict between fishers	At targeted fishing vessel	Once a year	MoFA

OF7. Development of new deep sea fisheries (Diamondback Squid and other fishes)

Evaluation item	Period	Rate	Monitoring items	Site	Frequency	Responsible agency
Ecosystem	On-going	B	Estimation of resource quantities (deep-sea fishes, DBS) Presence of illegal fishing	Sea area of resource survey	Once every two months (at the resource survey)	MoFA/MRC
	After	B	Estimation of resource quantities (deep-sea fishes, DBS) Presence of illegal fishing	Whole sea area of Maldives	Once every six months	MoFA/MRC

RF3. Enhancement of fisheries compliance/ enforcement

Evaluation item	Period	Rate	Monitoring items	Site	Frequency	Responsible agency
Conflicts of interest	Before, On-going	N/A	—	—	—	—
	After	B	Presence of conflict between fishers	Target sea area of project	Once every six months	MoFA

RF4. Design and implementation of reef fisheries management plans

Evaluation item	Period	Rate	Monitoring items	Site	Frequency	Responsible agency
Living and livelihood	On-going	C	Change of fish catch and operation cost	Target sea area of project	Once every three months	MoFA
	After	C	Change of fish catch and operation cost	Target sea area of project	Once every six months	MoFA
Conflicts of interest	On-going	C	Presence of conflict between reef fishery and tourism industry	Target sea area of project	Once every three months	MoFA
	After	C	Presence of conflict between reef fishery and tourism industry Decrease in number of conflicts	Target sea area of project	Once every six months	MoFA

AQ6. Extension of potential mariculture techniques

Evaluation item	Period	Rate	Monitoring items	Site	Frequency	Responsible agency
Water quality	On-going	B	COD, SS, pH, Turbidity	Target sea area of project	Once a month	MoFA/MRC
	After	B	COD, SS, pH, Turbidity	Target sea area of project	Once every three months	MoFA/MRC
Natural disaster	Before	B	Rain, wave, wind strength of and direction	Target sea area of project	Before the implementation of project	MoFA/MRC
	On-going	B	Damage of nets, Number of cultured fish	Target sea area of project	Once a month	MoFA/MRC
	After	D	—	—	—	—
Independent management	On-going	C	Confirmation of management situation	Project site	Once every three months	MoFA/MRC
	After	C	Diffusion of aquaculture business after the implementation of the project	Project site	Once every six months	MoFA/MRC

PV2. Strengthening capacity of ice plants

Evaluation item	Period	Rate	Monitoring items	Site	Frequency	Responsible agency
Hydrology	On-going	N/A	—	—	—	—
	After	B	Use of ground water	Target area of project	Once a month	MoFA/MRC
Independent management	On-going	D	—	—	—	—
	After	B	History of repairing, Confirmation of operation condition	Project site	Once every six months	MoFA

PV5. Development of katsuobushi processing technology and facility

Evaluation item	Period	Rate	Monitoring items	Site	Frequency	Responsible agency
Water quality	On-going	C	BOD, SS, pH, Turbidity	Construction site	Whenever weather is rainy or once a week	Construction company
	After	N/A	—	—	—	—
Waste	On-going	C	Disposal method of waste (interview survey for local residents and construction company)	Construction site	Once in a week	Construction company
	After	N/A	—	—	—	—
Noise and vibration	On-going	C	Noise and vibration (interview for local residents)	Construction site	Once a week	Construction company
	After	N/A	—	—	—	—
Working conditions	On-going	C	Status of implementation of safety measures	Construction site	3 times a week	Construction company
	After	N/A	—	—	—	—

Conflicts of interest	On-going	N/A	—	—	—	—
	After	C	Presence of conflict between interested parties	Small scale fish processors	Once every six months	MoFA
Independent management	On-going	N/A	—	—	—	—
	After	C	Operation condition of the facility, business environment	Project site	Once every six months	MoFA

11. Stakeholder Meeting

A Stakeholder Meeting was implemented twice during MASPLAN' period. The details are described in Table 23.

Table 23. Contents of Stakeholder Meeting

1st Stakeholder Consultation
Date: 10 May 2015
Place: Islamic Centre (Malé)
Participants: Yellow-fin tuna fishers, Skipjack tuna fishers, large scale processors, small-scale processors and MoFA/MRC staff
Agenda: Sharing the progress situation of the Sub-sectors, the progress situation and results of the pilot projects and the result of scoping and impact assessment
Method of invitation: To fishers through Island Council, official procedure to each government agency.
Consideration to vulnerable groups: Preparing accessible room, announcement to women and men together, transportation fee paid for fishers from local islands.
Participants: 44 (JICA, MoFA, fishers, Ministry of Environment, World Bank, NGOs, etc.)

2nd Stakeholder Consultation
Date: 8th May 2017
Place: SHE building (Malé)
Participants: Yellow-fin tuna fishers, Skipjack tuna fishers, large-scale processors, small-scale processors, MoFA/MRC staff and the Ministry of Environment
Agenda: Sharing the progress situation of the Sub-sectors, results of the pilot projects, the result of PP monitoring and mitigation measures for "B" projects.
Method of invitation: To fishers through Island Council, official procedure to each government agency.
Consideration to vulnerable groups: Preparing accessible room, announcement to women and men together, transportation fee paid for fishers from local islands.
Participants: 43 (JICA, MoFA, fishers, the Ministry of Environment, etc.)
Comment from participants (EPA): "SEA" is not applicable according to the Maldivian rule. SEA is normally applicable for large-scale construction work such as bridges or dams
Response to the comment: JICA guideline foresees a "SEA" for Action Plans or Master Plans. However the present English report uses "Environment and social consideration" instead of "SEA", considering that SFDPIS will be utilized by the Maldivian side in the future.

12. Cumulative impacts

This chapter summarizes possible cumulative impacts in the implementation of proposed multiple projects.

12.1 Negative cumulative impacts

The implementation of multiple individual projects may cause further negative impacts (negative cumulative effects) that are not assumed in the impact assessment of the proposed projects considered separately. Table 24 summarizes the cumulative negative impacts and their countermeasures.

Table 24. Assumed negative cumulative impacts

RF2. Improvement of relevant legislation about reef fisheries RF3. Enhancement of fisheries compliance/ enforcement RF4. Design and implementation of reef fisheries management plans
(Assumed negative cumulative impacts and countermeasures) Increasing the regulated species and regulated sea areas may result in loss of income opportunities for fishers. There is also a possibility that illegal fishing may increase if new regulations are not fully disseminated. Therefore, MoFA will work closely with the Ministry of Tourism and the Ministry of Environment and Energy to take measures to minimize loss to fishers and to implement awareness education programs.
AQ Overall projects
(Assumed negative cumulative impacts and countermeasures) Sudden industrial development tends to make regulations loosen and provoke the occurrence of illegal farmers. In addition, a large number of small-scale aquaculture farmers may have a large impact on water quality and ecosystem. In order to enhance competitiveness with other countries for selling cultured fishes, it is suggested to promote the "species cultured with environmentally friendly methods". Regardless of short-term interests, it is important to ensure proper water quality management and density of cages or nets from a long-term perspective.

12.2 Positive cumulative impacts

The implementation of the SFDPIS aims at sustainable fisheries development. Furthermore, it is assumed that a significant contribution to the Maldives society and economy, e.g. creation of employment opportunities and strengthening of management capacity, will be reached. Table 25 below summarizes this expected contribution.

Table 25. Expected positive cumulative impact

Positive cumulative impact	Details
Creation of employment opportunities	● Creation of employment opportunities, in particular for youth, linked to aquaculture development.
Strengthening of management capability	● Strengthening of management capability for Government staff linked to implementation of resource management training. ● Strengthening of resource management capability by aquaculture projects.
Improvement of livelihood and public health	● Creation of new income opportunities through the development of deep-sea fishery. ● Improvement of income opportunities through the development of

	aquaculture. ● Improvement of public health and decrease in risk on food safety through improvement of fisheries products quality. ● Improvement of livelihood for fish processors through improvement of fisheries products quality and value addition.
Development of ability of fishers	● Development of ability of fishers through technical on board training and bait-fish training.
Strengthening of legal framework and resource management	● Strengthening of resource management framework through implementation of projects of the Oceanic fisheries sub-sector and Reef fisheries sub-sector.
Setting-up of a basic data collection and analysis system	● Setting-up of a basic data collection and analysis system for reef fisheries. ● Design and implementation of a market information system.

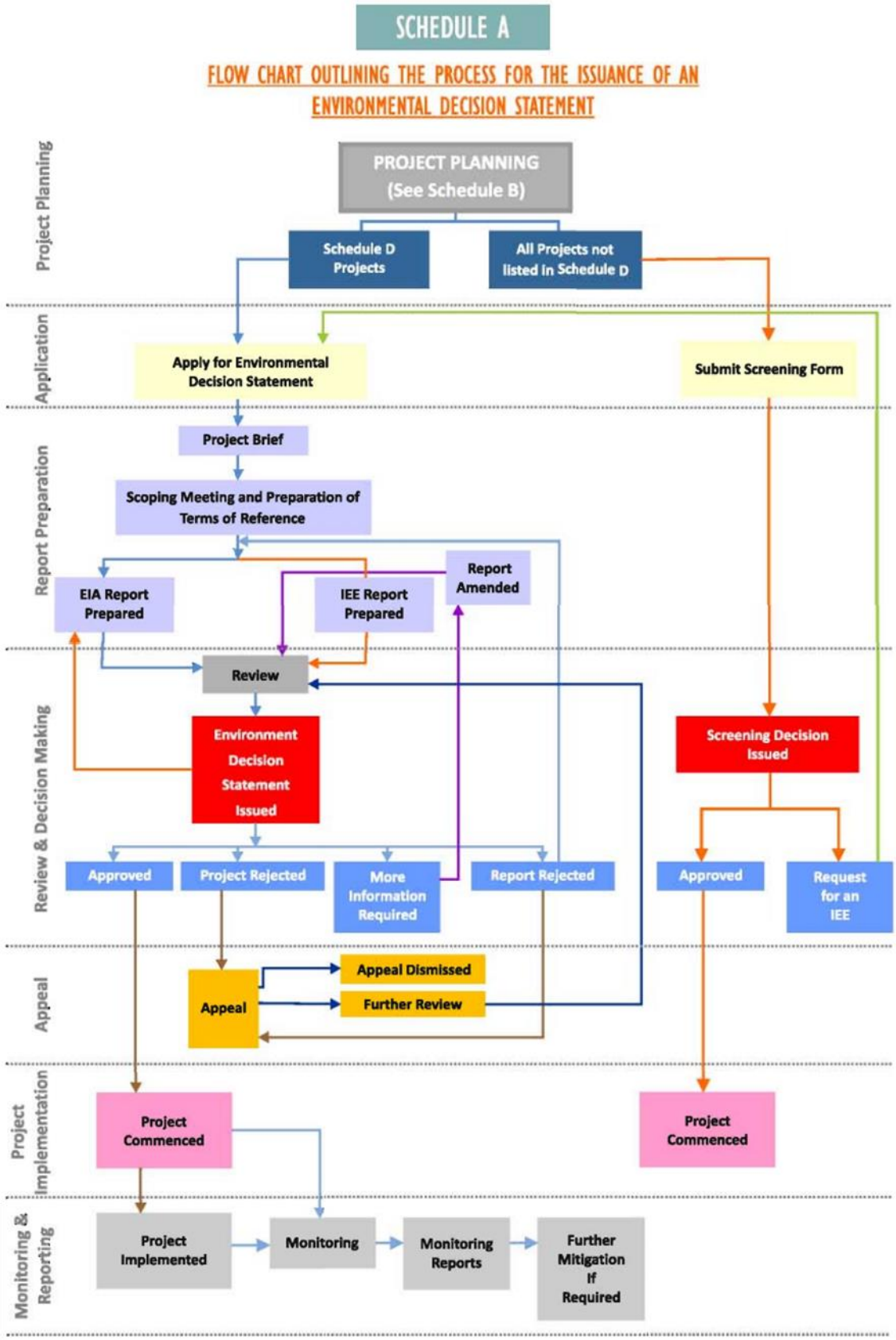
Attachment1: Summary of related laws, regulations and important documents

Document	Outline	Remarks
Related to EIA		
Environment for Protection and Preservation Act of Maldives (Law No:4/93), The Ministry of Planning, Human Resources and Environment	Established nature protected area, EIA , and penalties	
Environmental Impact Assessment Regulation, 2007, Ministry of Environment, Energy and Water./ First Amendment to the EIA Regulation, 2013	Established the process of EIA, obligations to implementer	Wide range of impacts are considered during EIA process, natural environment (sedimentation, water quality, reef, protected areas, groundwater, etc.), living environment (noise, landscape, etc.) and social environment (chance of employment, economy situation, etc.)
EIA ToR (Terms of Reference) for Fish Processing, Environmental Protection Agency	Established necessary process and standards to construct fish processing factory.	Implementer needs to make monitoring plan as well as basic plan including potential impact to environment/society/economy, and alternative (w/. zero option).
EIA ToR for Harbor Project, EPA	Established necessary process and standard to construct harbor or canal.	The EIA sets the details of standard such as salinity, pH, sedimentation, ammonia. In addition, implementer needs to submit seabed topography including tidal change, coast-seabed vegetation map and seabed sectional view with GPS.
EIA ToR for Aquaculture, EPA	Established necessary process and standard to construct aquaculture facility.	
Regulation on the Protection and Conservation of Environment in the Tourism Industry, Law No. 20/98,	Established necessary process and standard to construction for the purpose of tourism.	The proposal is submitted not to EPA but to the Ministry of Tourism and Civil Aviation.
Related to Protected area/ species		
Marine Protected Area, 2014, EPA	Established Marine Protected Area (42 sites as of 2014).	The border line is set on the 15 sites. Buffer zone is set 200m or 1km from the border line of MPA.
Protected Birds List, EPA, 2014 under "Environment Protection and Preservation Act (Act No: 4/93)"	Established protected birds.	
Protected trees of Maldives	Established protected trees.	
Protected Maine Life, EPA.	Established protected marine species.	8 species including marine turtle, whale shark, dolphins, female lobster with the length of less than 25cm.
Ramsar Site, Ramsar HP, http://www.ramsar.org/.	Registered site under Ramsar Convention which is an international treaty for the conservation and sustainable utilization of wetlands	No sites in Maldives.
Important Bird Area, Bird Life International, 2004	Established important areas for habitat of wild birds.	One site (Haa Alif Atoll, 6000ha) has been registered.
Invasive Alien Species, Environmental Newsletter, Ministry of Environment and Energy, 2015	The set of species inhabited in Maldives living in harmony and equilibrium over the generations are now challenged with Invasive Alien Species.	
Valuing Biodiversity The economic case for biodiversity conservation in Maldives, AEC project, 2009	Reported how Maldivian economy is receiving the benefit of biodiversity.	Maldivian economy is much depending on the biodiversity, 71% of the employment and 89% of the GDP, etc.
National Adaptation Program of Action, Ministry of Environment, Energy and Water, 2007	Showed the impact from climate change and response of each sector.	
An Assessment of Damage to Maldivian Coral Reefs and Baitfish Populations from the Indian Ocean Tsunami, AusAID, 2005	Summarized the damage of tsunami occurred on 26 December, 2004.	It showed a map with significance of damages on each Atoll.
Document	Outline	Remarks

	National Plan of Action for the Conservation and Management of Sharks in Maldives, MoFA, 2014.	Summarized the decline of shark population and shark fishery (before the ban of shark catch), suggested Action Plan.	The number of shark fishers before totally banned.
Related to tourism			
	Maldives Tourism Act (Law No. 2/99), 1999, unofficial translation	This Act provides for the determination of zones and islands for the development of tourism in Maldives. The amendments are applied for 5 times so far.	This Act provides for the determination of zones and islands for the development of tourism in Maldives
	Fourth Tourism Masterplan 2013-2017, Ministry of Tourism, Arts & Culture, 2013	VOLUME 1: Strategic Action Plan, VOLUME 2: Background and Analysis	
Related to fishery			
	Baseline Survey on Fishery Sector Development in the Republic of Maldives for Japan International Cooperation Agency (JICA), 2012.	Summarized the current situation of fishery sector such as economic condition, fish catch, employment, income and expense, etc., and suggested potential of fishery sector in the future.	There is a chart with expense and income per a trip for a vessel.
	Manta Ray Protection Announcement (IUL)438-ECAS/438/2014/81, 2014	Banned all fishery of Superorder *Batoidea,* because of the decline in the population of Manta Ray.	Catch of ray is not allowed for any size and any area in Maldives.
	Management Plan for the Maldives Grouper Fishery, MRC, MoFA, 2011	Summarized current situation of grouper fishery such as resources and fish catch, and suggested issues and solution for the resource management.	Indicated the decline of grouper resources and set protected areas for the spawning.
	Review of Grouper Fishery of Maldives with additional note on the Faafu Atoll Fishery, MRC, 2005	Suggested groper fishery management plan at Faafu Atoll.	Established 2 areas for grouper spawning at Faafu Atoll (different sites from Management Plan.).
	General Fisheries Regulations	Established the regulation on fishery.	
	The Fisheries Law of Maldives. Law No. 5/87, 1987	Established obligation to take license and regulated foreign vessels to conduct fishing within EEZ.	
	Review of the Aquarium Fish Trade of Maldives, Marin Research Section, MoFA, 1995。	Summarized basic data of aquarium fish such as species and fish catch, and suggested sustainable method of catch and the size limitation.	
	Maldives Live Bait Fishery Management Plan 2013, Marine Research Centre, MoFA, 2013	Summarized current situation of bait fish and regulations, and set the resource management plan.	The bait fish for export or eating is not allowed. In addition, bait fishing is banned 1km from shoreline of resort under Tourism Act.
	Analysis of Maldives-fish Marketing In Sri Lanka and Maldives; Current Trends and Future Prospects, E.M.R.K.B, etc., 2013	Summarized fish processing, distribution, export and import and domestic consumer, and analyzed with SWOT.	Summarized capacity of fish processor per month and flow of distribution.
	Voucher for VMS_ Dibihi, 2014	Published to distribute VMS system obliged to equip from the end of 2015, with collaboration between MoFA and Dhiraagu.	It explains the obligation and purpose and cost of VMS.
Related to society			
	Employment Act, Labour Relations Authority, 2008, unofficial translation	Established standard for employment.	Discrimination of gender, family situation and nationality is banned.
	Document	Outline	Remarks
	Co-operatives Societies Act (Act No. 2/2007), unofficial translation, 2007	Established rule and regulation for establishment and operation of Cooperative Society.	It decided Cooperative Society is independent institution, and the share is held by member of Cooperative Society.

	Maldives Gender Equality Diagnosis of Selected Sectors, ADB, 2014.	Summarized the differences of employment and average income between men and women.	It shows the differences of role of gender based on the categories on fishery sector, preharvest, Harvesting, Postharvest, Marketing.
	Gender Equality Bill, ongoing	This wasapplied on October 2015. (announced by The Ministry of Law and Gender)	
	NAHAP- Maldives 2015-2020, ENDEVOR, 2014.	Established action plan on public welfare and public health.	

Attachment2: Flow chart of EIA in Maldives



Flow chart of process of EIA in Maldives

(Environmental Impact Assessment Regulation, 2007)

Attachment 3: Gap analysis between JICA guideline and Maldives regulations

JICA Guideline	Corresponding Maldives law or regulation		Gap between JICA and Maldives	Measures to the Gap
	Name	Corresponding sentence		
1. Underlying Principles 1. Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan.	EIA, 2012	Environmental impacts has to be examined before implementation of project. Alternatives to avoid or minimize adverse impacts must be examined.	No gap	
1. Underlying Principles 2. Such examinations must be endeavored to include an analysis of environmental and social costs and benefits in the most quantitative terms possible, as well as a qualitative analysis; these must be conducted in close harmony with the economic, financial, institutional, social, and technical analyses of projects.	EIA, 2012	The EIA should provide substantive and predictive information on the proposed activity, a realistic review of alternatives, measures proposed to mitigate adverse impacts, as well as the opportunities for environmental, economic and social enhancement.	No gap	
1. Underlying Principles 3. The findings of the examination of environmental and social considerations must include alternatives and mitigation measures, and must be recorded as separate documents or as a part of other documents. EIA reports must be produced for projects in which there is a reasonable expectation of particularly large adverse environmental impacts.	EIA, 2012	Reports must be recorded as separate documents or as a part of other documents.	No gap. Alternatives and mitigation measures must be included within the EIA report. Projects which require an EIA is listed in the regulation	
1. Underlying Principles 4. For projects that have a particularly high potential for adverse impacts or that are highly contentious, a committee of experts may be formed so that JICA may seek their opinions, in order to increase accountability.	EIA, 2012	No sentence (not necessary any committee)	There is a gap. EPA has all responsibility to do final decision in Maldives EIA	follow Maldives EIA
2. Examination of Measures 1. Multiple alternatives must be examined in order to avoid or minimize adverse impacts and to choose better project options in terms of environmental and social considerations.	EIA, 2012	Identify and describe at least three alternatives, one of which the no-development option; define clear criteria to evaluate the alternatives, and	No gap	

In the examination of measures, priority is to be given to avoidance of environmental impacts; when this is not possible, minimization and reduction of impacts must be considered next. Compensation measures must be examined only when impacts cannot be avoided by any of the aforementioned measures.		determine the preferred alternative. Identify the major and minor environmental impacts of the preferred alternative and propose measures to mitigate the adverse environmental impacts.		
2. Examination of Measures 2. Appropriate follow-up plans and systems, such as monitoring plans and environmental management plans, must be prepared; the costs of implementing such plans and systems, and the financial methods to fund such costs, must be determined. Plans for projects with particularly large potential adverse impacts must be accompanied by detailed environmental management plans.	EIA, 2012	An Environmental Monitoring Plan should be included, which contains provisions made for on-site monitoring during (1) site preparation, (2) construction/implementation, and (3) decommissioning phases; as well as the longer term maintenance requirements. The cost of the monitoring should be determined and clearly stated in the IEE/EIA report.	No gap	
3. Scope of Impacts to be Assessed 1. The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted 28 through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety.	EIA, 2012	Impacts on the biophysical, economic and human environments, including the impacts on the human well-being should be clearly defined and discussed with special emphasis on the key issues identified during the scoping process. The EMP should include the following components over the different project phases mentioned above (1, 2, 3): - Site characteristics (include plans/photographs/ drawings/ showing the project area, any environmental sensitive receivers, beach profiles and ambient air/water/ sea water qualities) - Works involved and proposed mitigating measures to prevent negative impacts on water course/lagoon/ beach/road users/ immediate neighbors.	No gap	
3. Scope of Impacts to be Assessed 2. In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project	EIA, 2012	No sentence.	There is a gap.	follow Maldives EIA

are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project.				
4. Compliance with Laws, Standards, and Plans 1. Projects must comply with the laws, ordinances, and standards related to environmental and social considerations established by the governments that have jurisdiction over project sites (including both national and local governments). They must also conform to the environmental and social consideration policies and plans of the governments that have such jurisdiction.				
4. Compliance with Laws, Standards, and Plans 2. Projects must, in principle, be undertaken outside of protected areas that are specifically designated by laws or ordinances for the conservation of nature or cultural heritage (excluding projects whose primary objectives are to promote the protection or restoration of such areas). Projects are also not to impose significant adverse impacts on designated conservation areas.	EIA, 2012	Same	No gap.	
5. Social Acceptability 1. Projects must be adequately coordinated so that they are accepted in a manner that is socially appropriate to the country and locality in which they are planned. For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans.	EIA, 2012	Public Consultation is an important part of the EIA process and the report should include: • A list of the persons consulted including persons in statutory bodies, atoll and island offices, community groups and NGOs, local residents, local fishers, tourism operators and any others likely to be affected by the proposed development. • Information on how, when and where the consultations were conducted, e.g. stakeholder meetings in the affected area, individual meetings, questionnaires. • Summary of the outcome of the consultations including the main concerns identified.	No gap.	
5. Social Acceptability 2. Appropriate consideration must be given to vulnerable social groups, such as women, children, the elderly, the poor,	EIA, 2012	No sentence (no specific mention of vulnerable groups)	There is a gap.	Follow JICA guideline.

and ethnic minorities, all members of which are susceptible to environmental and social impacts and may have little access to decision-making processes within society.				
6. Ecosystem and Biota 1. Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests.	EIA, 2012	These guidelines are based on the concept that 'Developing in harmony with the natural environment' is the preferred approach. The checklist covers the following criteria. • Existence or absence of critical ecosystems: see List of Critical Sites prepared by the Ministry.	No gap.	
6. Ecosystem and Biota 2. Illegal logging of forests must be avoided. Project proponents etc. are encouraged to obtain certification by forest certification systems as a way to ensure the prevention of illegal logging.	EIA, 2012	No sentence. But "Large scale deforestation" is included in the list of development proposals requiring an EIA study.	No gap.	
7. Involuntary Resettlement 1. Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the people who will be affected.	No regulation, but World Bank made Resettlement Policy Framework in "Environmental and Social Management Framework". This framework is adapted for project.	Same	No gap	
7. Involuntary Resettlement 2. People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents etc. in a timely manner. Prior compensation, at full replacement cost, must be provided as much as possible. Host countries must make efforts to enable people affected by projects and to improve their standard of living, income opportunities, and production levels, or at least to restore these to pre-project levels. Measures to achieve this may include: providing land and monetary compensation for losses (to cover land and property losses), supporting means for an alternative sustainable livelihood, and providing the expenses necessary for the relocation and re-establishment of communities at resettlement sites.		Same	No gap	
7. Involuntary Resettlement		Same	No gap	

3. Appropriate participation by affected people and their communities must be promoted in the planning, implementation, and monitoring of resettlement action plans and measures to prevent the loss of their means of livelihood. In addition, appropriate and accessible grievance mechanisms must be established for the affected people and their communities.				
7. Involuntary Resettlement 4. For projects that will result in large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.		Same	No gap	
8. Indigenous Peoples		No indigenous people in Maldives		
9. Monitoring 1. After projects begin, project proponents etc. monitor whether any unforeseeable situations occur and whether the performance and effectiveness of mitigation measures are consistent with the assessment's prediction. They then take appropriate measures based on the results of such monitoring.	EIA, 2012	The environmental monitoring plan will include the following components over the different project phases: • Clauses to be included in contract documents to ensure implementation of proposed mitigation measures. • Contingency plan (in case of emergencies such as uncontrolled discharge of pollutants, fire outbreak, natural calamities).	No gap.	
9. Monitoring 2. In cases where sufficient monitoring is deemed essential for appropriate environmental and social considerations, such as projects for which mitigation measures should be implemented while monitoring their effectiveness, project proponents etc. must ensure that project plans include feasible monitoring plans.	EIA, 2012	The environmental monitoring plan is included in the project report.	No gap.	
9. Monitoring 3. Project proponents etc. should make efforts to make the	EIA, 2012	The proponent shall submit regular summary environmental monitoring reports	No gap	

results of the monitoring process available to local project stakeholders.		in the format to the Ministry, with copies to other relevant ministries and authorities as specified in the Environmental Decision Statement. The proponent shall submit a final environmental monitoring and mitigation report to the Ministry in the format included when the project is completed, or at such time as may be specified in the Environmental Decision Statement.		
9. Monitoring 4. When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems.	EIA, 2012	In issuing the Environmental Decision Statement the Ministry will take in to account the comments received from the relevant authorities for the Initial Environmental Examination or Environmental Impact Assessment under review.	No gap	

Attachment 4-1 Results of Scoping (SFDPIS Proposed projects) (Oceanic Fisheries Sub-sector)

OF1. Improvement of MCS system

	be	af	Reason
Water quality	N/A	N/A	
Waste	N/A	N/A	
Noise and vibration	N/A	N/A	
Odor	N/A	N/A	
Protected areas	N/A	N/A	
Ecosystem	N/A	N/A	
Hydrology	N/A	N/A	
Topography and geology	N/A	N/A	
Natural disaster	N/A	N/A	
Resettlement	N/A	N/A	
Living and livelihood	N/A	N/A	
Heritage	N/A	N/A	
Landscape	N/A	N/A	
Ethnic minorities and indigenous peoples	N/A	N/A	
Working conditions	N/A	N/A	
Conflicts of interest	N/A	N/A	
Independent management	N/A	N/A	
Public welfare	N/A	N/A	

OF2. Training on resource management

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

OF3. Review and implementation of bait fish management plan

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

*on-going project

OF4. Extension of improved live bait stocking system in pole-and-line fishery

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	C	C	It will be evaluated after the implementation of PP.
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	B	B	There is a difficulty for fishers who are newcomers due to their low income to introduce the new system.

OF5. Development of new masdhoni design

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

OF6. Promotion of private investment

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	B	B	Due to the expansion of the longline fishery accompanying the investment, there is a possibility of conflict with skipjack tuna fishery because of overlaps of the fishing grounds.
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

OF7. Development of new deep sea fisheries (Diamondback Squid and other fishes)

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	C	C	The magnitude of impact will be changed depending on the existence of appropriate resource management plan.
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

OF8. Establishment of Fisher's Marinas

	be	af	Reason
Water quality	N/A	N/A	
Waste	N/A	N/A	
Noise and vibration	N/A	N/A	
Odor	N/A	N/A	
Protected areas	N/A	N/A	
Ecosystem	N/A	N/A	
Hydrology	N/A	N/A	
Topography and geology	N/A	N/A	
Natural disaster	N/A	N/A	
Resettlement	N/A	N/A	
Living and livelihood	N/A	N/A	
Heritage	N/A	N/A	
Landscape	N/A	N/A	
Ethnic minorities and indigenous peoples	N/A	N/A	
Working conditions	N/A	N/A	
Conflicts of interest	N/A	N/A	
Independent management	N/A	N/A	
Public welfare	N/A	N/A	

*on-going project

Attachment 4-2 Results of Scoping (SFDPIS Proposed projects) (Reef Fisheries Sub-sector)

RF1. Improvement of biological, socio-economic and statistical data collection and analysis system

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

RF2. Improvement of relevant legislation about reef fisheries

	be	af	Reason
Water quality	N/A	N/A	
Waste	N/A	N/A	
Noise and vibration	N/A	N/A	
Odor	N/A	N/A	
Protected areas	N/A	N/A	
Ecosystem	N/A	N/A	
Hydrology	N/A	N/A	
Topography and geology	N/A	N/A	
Natural disaster	N/A	N/A	
Resettlement	N/A	N/A	
Living and livelihood	N/A	N/A	
Heritage	N/A	N/A	
Landscape	N/A	N/A	
Ethnic minorities and indigenous peoples	N/A	N/A	
Working conditions	N/A	N/A	
Conflicts of interest	N/A	N/A	
Independent management	N/A	N/A	
Public welfare	N/A	N/A	

*on-going project

RF3. Enhancement of fisheries compliance/ enforcement

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	B	Introduction of GSM may lead to conflicts among fishers because it may be possible to “steal” good fishing locations through GSM.
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

RF4. Design and implementation of reef fisheries management plans

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	B	B	Possibility of decline of usable fishing grounds due to strengthening of regulative restriction.
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	B	B	There is a possibility of conflict between reef fishery and tourism sector due to limitation of fishing grounds for fishers.
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

RF5. Capacity enhancement on fishery resource management

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

RF6. Improvement of boat design and equipment

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

RF7. Awareness on fishing and fish handling techniques

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

Attachment 4-3　Results of Scoping (SFDPIS Proposed projects) (Aquaculture Sub-sector)

AQ1. Establishment of multi-species hatchery

	be	af	Reason
Water quality	N/A	N/A	
Waste	N/A	N/A	
Noise and vibration	N/A	N/A	
Odor	N/A	N/A	
Protected areas	N/A	N/A	
Ecosystem	N/A	N/A	
Hydrology	N/A	N/A	
Topography and geology	N/A	N/A	
Natural disaster	N/A	N/A	
Resettlement	N/A	N/A	
Living and livelihood	N/A	N/A	
Heritage	N/A	N/A	
Landscape	N/A	N/A	
Ethnic minorities and indigenous peoples	N/A	N/A	
Working conditions	N/A	N/A	
Conflicts of interest	N/A	N/A	
Independent management	N/A	N/A	
Public welfare	N/A	N/A	

* on-going project

AQ2. Establishment of milkfish seed production facilities to provide bait

	be	af	Reason
Water quality	N/A	N/A	
Waste	N/A	N/A	
Noise and vibration	N/A	N/A	
Odor	N/A	N/A	
Protected areas	N/A	N/A	
Ecosystem	N/A	N/A	
Hydrology	N/A	N/A	
Topography and geology	N/A	N/A	
Natural disaster	N/A	N/A	
Resettlement	N/A	N/A	
Living and livelihood	N/A	N/A	
Heritage	N/A	N/A	
Landscape	N/A	N/A	
Ethnic minorities and indigenous peoples	N/A	N/A	
Working conditions	N/A	N/A	
Conflicts of interest	N/A	N/A	
Independent management	N/A	N/A	
Public welfare	N/A	N/A	

* on-going project

AQ3. Development of domestic fish feed using by-product of fish processing

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

AQ4. Refinement of existing aquaculture techniques

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	B	B	If the target species is exotic species, it may give negative impacts to existing ecosystem. In addition, if the method of selecting seeds adopt the method choosing excellent genetic individuals, the genetic diversity may be different from existing natural species and give negative impacts to closely-related species and native species.
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

AQ5. Training and demonstration capacity building of MTDF/MRC

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

AQ6. Extension of potential mariculture techniques

	be	af	Reason
Water quality	B	B	Possibility of eutrophication and water pollution of the ocean caused by over feeding.
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	B	B	If the selected species for aquaculture is an exotic species, there is a possibility that it may affect existing ecosystem. Genetic diversity is unable to be maintained, if selective method is adopted for genetically superior target species, This is because when fish improved genetically escaped, it may affect closely related species and/or endemic species.
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	C	C	Since there is not sufficient case in the past in Maldives, careful examination is needed for selecting the location for the facility installation.
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	B	B	Aquaculture has not developed in Maldives yet. Therefore, feasibility and risks for the independent management is uncertain.
Public welfare	D	D	No prospective impact

AQ7. Promotion of aquaculture through formal education system

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

AQ8. Improvement of aquatic animal health management

	be	af	Reason
Water quality	N/A	N/A	
Waste	N/A	N/A	
Noise and vibration	N/A	N/A	
Odor	N/A	N/A	
Protected areas	N/A	N/A	
Ecosystem	N/A	N/A	
Hydrology	N/A	N/A	
Topography and geology	N/A	N/A	
Natural disaster	N/A	N/A	
Resettlement	N/A	N/A	
Living and livelihood	N/A	N/A	
Heritage	N/A	N/A	
Landscape	N/A	N/A	
Ethnic minorities and indigenous peoples	N/A	N/A	
Working conditions	N/A	N/A	
Conflicts of interest	N/A	N/A	
Independent management	N/A	N/A	
Public welfare	N/A	N/A	

* on-going project

AQ9. Strengthening institutional mechanism on aquaculture activities

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

AQ10. Development of financing system for aquaculture

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

Attachment 4-4　Results of Scoping (SFDPIS Proposed projects) (Post-harvest and Value Addition Sub-sector)

PV1. Extension of improved on-board handling techniques for tuna handline fishery

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	B	B	Sufficient consideration for new techniques is necessary, especially for electric tuna shocker etc.
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

PV2. Strengthening capacity of ice plants

	be	af	Reason
Water quality	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Waste	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Noise and vibration	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	B	There is a concern about over usage of groundwater resources.
Topography and geology	D	D	No prospective impact
Natural disaster	D	C	Since there is not sufficient case in the past in Maldives, careful examination is needed for selecting the location for the facility installation.
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Conflicts of interest	D	C	The occurrence of conflict caused by construction is unknown.
Independent management	C	B	Before construction: method of selection of the targeted islands is unclear. After construction: plan for operation and maintenance is necessary for the stable operation.
Public welfare	D	D	No prospective impact

PV3. Extension of quality improvement methods for traditional processed fish

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

PV4. Improvement of fish marketing system

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

PV5. Development of katsuobushi processing technology and facility

	be	af	Reason
Water quality	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Waste	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Noise and vibration	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	C	D	During construction: impacts are unclear because the sites and scales have not been determined yet. After construction: no impacts.
Conflicts of interest	D	C	The occurrence of conflict between new facility and existing one, which caused by construction is unknown.
Independent management	D	C	Independent Management is unclear after the completion the facility construction.
Public welfare	D	D	No prospective impact

PV6. Development of minimum national standards / regulations for fishery products

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

PV7. Establishment of a training system for fish quality assurance

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

Attachment 5　Results of Scoping (Pilot project)

PP.1　Technical development and verification of live bait catch and holding for improving their survival rate

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	C	C	The effects on the fishers who use the traditional bait tank is uncertain before introducing Japanese-style bait tank. It is evaluated with actual update after the completion of PP.
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

PP.2　Technical development of tuna hand line on-board handling for fish quality improvement

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	B	B	In Maldives, the method to keep freshness of fishes by using electric shocker is not used. Therefore, a risk for humans would be anticipated, if the technical instruction to use this equipment is not conducted.
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

PP.3 Preliminary resource survey on availability of deep-sea resources

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

PP.4 Monitoring of fish supply to resorts and setting up of an ecolabel certification

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

PP.5 Feasibility study on mariculture of selected species in Maldives

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	B	B	If the target species is exotic species, it may give negative impacts to existing ecosystem. In addition, if the method of selecting seeds adopt the method choosing excellent genetic individuals, the genetic diversity may be different from existing natural species and give negative impacts to closely-related species and native species.
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	C	C	The possibility of damage to aquaculture facility by tsunami or big wave is a concern.
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

PP.6 Quality improvement of traditional processed fish

	be	af	Reason
Water quality	D	D	No prospective impact
Waste	D	D	No prospective impact
Noise and vibration	D	D	No prospective impact
Odor	D	D	No prospective impact
Protected areas	D	D	No prospective impact
Ecosystem	D	D	No prospective impact
Hydrology	D	D	No prospective impact
Topography and geology	D	D	No prospective impact
Natural disaster	D	D	No prospective impact
Resettlement	D	D	No prospective impact
Living and livelihood	D	D	No prospective impact
Heritage	D	D	No prospective impact
Landscape	D	D	No prospective impact
Ethnic minorities and indigenous peoples	D	D	No prospective impact
Working conditions	D	D	No prospective impact
Conflicts of interest	D	D	No prospective impact
Independent management	D	D	No prospective impact
Public welfare	D	D	No prospective impact

Attachment 6　Results of Impact Assessment (Pilot projects)

PP.1　Technical development and verification of live bait catch and holding for improving their survival rate

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	C	C	D	D	*See main text
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

PP.2　Technical development of tuna hand line on-board handling for fish quality improvement

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	B	B	B	B	*See main text
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

PP.3 Preliminary resource survey on availability of deep-sea resources

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

PP.4 Monitoring of fish supply to resorts and setting up of an ecolabel certification

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

PP.5 Feasibility study on mariculture of selected species in Maldives

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	B	B	D	D	*See main text
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	C	C	C	C	*See main text
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

PP.6 Quality improvement of traditional processed fish

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

Attachment 7-1　Results of Impact Assessment (SFDPIS Proposed projects) (Oceanic Fisheries Sub-sector)

OF1. Improvement of MCS system

	SP		IA		Reason
	be	af	be	af	
Water quality	N/A	N/A	N/A	N/A	
Waste	N/A	N/A	N/A	N/A	
Noise and vibration	N/A	N/A	N/A	N/A	
Odor	N/A	N/A	N/A	N/A	
Protected areas	N/A	N/A	N/A	N/A	
Ecosystem	N/A	N/A	N/A	N/A	
Hydrology	N/A	N/A	N/A	N/A	
Topography and geology	N/A	N/A	N/A	N/A	
Natural disaster	N/A	N/A	N/A	N/A	
Resettlement	N/A	N/A	N/A	N/A	
Living and livelihood	N/A	N/A	N/A	N/A	
Heritage	N/A	N/A	N/A	N/A	
Landscape	N/A	N/A	N/A	N/A	
Ethnic minorities and indigenous peoples	N/A	N/A	N/A	N/A	
Working conditions	N/A	N/A	N/A	N/A	
Conflicts of interest	N/A	N/A	N/A	N/A	
Independent management	N/A	N/A	N/A	N/A	
Public welfare	N/A	N/A	N/A	N/A	

OF2. Training on resource management

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

OF3. Review and implementation of bait fish management plan

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

OF4. Extension of improved live bait stocking system in pole-and-line fishery

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	C	C	D	D	*See main text
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	B	B	D	D	*See main text

OF5. Development of new masdhoni design

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

OF6. Promotion of private investment

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	B	B	B	B	*See main text
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

OF7. Development of new deep sea fisheries (Diamondback Squid and other fishes)

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	C	C	B	B	*See main text
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

OF8. Establishment of Fisher's Marinas

	SP		IA		Reason
	be	af	be	af	
Water quality	N/A	N/A	N/A	N/A	
Waste	N/A	N/A	N/A	N/A	
Noise and vibration	N/A	N/A	N/A	N/A	
Odor	N/A	N/A	N/A	N/A	
Protected areas	N/A	N/A	N/A	N/A	
Ecosystem	N/A	N/A	N/A	N/A	
Hydrology	N/A	N/A	N/A	N/A	
Topography and geology	N/A	N/A	N/A	N/A	
Natural disaster	N/A	N/A	N/A	N/A	
Resettlement	N/A	N/A	N/A	N/A	
Living and livelihood	N/A	N/A	N/A	N/A	
Heritage	N/A	N/A	N/A	N/A	
Landscape	N/A	N/A	N/A	N/A	
Ethnic minorities and indigenous peoples	N/A	N/A	N/A	N/A	
Working conditions	N/A	N/A	N/A	N/A	
Conflicts of interest	N/A	N/A	N/A	N/A	
Independent management	N/A	N/A	N/A	N/A	
Public welfare	N/A	N/A	N/A	N/A	

Attachment 7-2 Results of Impact Assessment (SFDPIS Proposed projects) (Reef Fisheries Sub-sector)

RF1. Improvement of biological, socio-economic and statistical data collection and analysis system

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

RF2. Improvement of relevant legislation about reef fisheries

	SP		IA		Reason
	be	af	be	af	
Water quality	N/A	N/A	N/A	N/A	
Waste	N/A	N/A	N/A	N/A	
Noise and vibration	N/A	N/A	N/A	N/A	
Odor	N/A	N/A	N/A	N/A	
Protected areas	N/A	N/A	N/A	N/A	
Ecosystem	N/A	N/A	N/A	N/A	
Hydrology	N/A	N/A	N/A	N/A	
Topography and geology	N/A	N/A	N/A	N/A	
Natural disaster	N/A	N/A	N/A	N/A	
Resettlement	N/A	N/A	N/A	N/A	
Living and livelihood	N/A	N/A	N/A	N/A	
Heritage	N/A	N/A	N/A	N/A	
Landscape	N/A	N/A	N/A	N/A	
Ethnic minorities and indigenous peoples	N/A	N/A	N/A	N/A	
Working conditions	N/A	N/A	N/A	N/A	
Conflicts of interest	N/A	N/A	N/A	N/A	
Independent management	N/A	N/A	N/A	N/A	
Public welfare	N/A	N/A	N/A	N/A	

RF3. Enhancement of fisheries compliance/ enforcement

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	B	N/A	B	*See main text
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

RF4. Design and implementation of reef fisheries management plans

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	B	B	C	C	*See main text
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	B	B	C	C	*See main text
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

RF5. Capacity enhancement on fishery resource management

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

RF6. Improvement of boat design and equipment

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

RF7. Awareness on fishing and fish handling techniques

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

Attachment 7-3　Results of Impact Assessment (SFDPIS Proposed projects) (Aquaculture Sub-sector)

AQ1. Establishment of multi-species hatchery

	SP		IA		Reason
	be	af	be	af	
Water quality	N/A	N/A	N/A	N/A	
Waste	N/A	N/A	N/A	N/A	
Noise and vibration	N/A	N/A	N/A	N/A	
Odor	N/A	N/A	N/A	N/A	
Protected areas	N/A	N/A	N/A	N/A	
Ecosystem	N/A	N/A	N/A	N/A	
Hydrology	N/A	N/A	N/A	N/A	
Topography and geology	N/A	N/A	N/A	N/A	
Natural disaster	N/A	N/A	N/A	N/A	
Resettlement	N/A	N/A	N/A	N/A	
Living and livelihood	N/A	N/A	N/A	N/A	
Heritage	N/A	N/A	N/A	N/A	
Landscape	N/A	N/A	N/A	N/A	
Ethnic minorities and indigenous peoples	N/A	N/A	N/A	N/A	
Working conditions	N/A	N/A	N/A	N/A	
Conflicts of interest	N/A	N/A	N/A	N/A	
Independent management	N/A	N/A	N/A	N/A	
Public welfare	N/A	N/A	N/A	N/A	

AQ2. Establishment of milkfish seed production facilities to provide bait

	SP		IA		Reason
	be	af	be	af	
Water quality	N/A	N/A	N/A	N/A	
Waste	N/A	N/A	N/A	N/A	
Noise and vibration	N/A	N/A	N/A	N/A	
Odor	N/A	N/A	N/A	N/A	
Protected areas	N/A	N/A	N/A	N/A	
Ecosystem	N/A	N/A	N/A	N/A	
Hydrology	N/A	N/A	N/A	N/A	
Topography and geology	N/A	N/A	N/A	N/A	
Natural disaster	N/A	N/A	N/A	N/A	
Resettlement	N/A	N/A	N/A	N/A	
Living and livelihood	N/A	N/A	N/A	N/A	
Heritage	N/A	N/A	N/A	N/A	
Landscape	N/A	N/A	N/A	N/A	
Ethnic minorities and indigenous peoples	N/A	N/A	N/A	N/A	
Working conditions	N/A	N/A	N/A	N/A	
Conflicts of interest	N/A	N/A	N/A	N/A	
Independent management	N/A	N/A	N/A	N/A	
Public welfare	N/A	N/A	N/A	N/A	

AQ3. Development of domestic fish feed using by-product of fish processing

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

AQ4. Refinement of existing aquaculture techniques

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	B	B	D	D	*See main text
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

AQ5. Training and demonstration capacity building of MTDF/MRC

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

AQ6. Extension of potential mariculture techniques

	SP		IA		Reason
	be	af	be	af	
Water quality	B	B	B	B	*See main text
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	B	B	D	D	*See main text
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	C	C	B	D	*See main text
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	B	B	C	C	*See main text
Public welfare	D	D	N/A	N/A	

AQ7. Promotion of aquaculture through formal education system

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

AQ8. Improvement of aquatic animal health management

	SP		IA		Reason
	be	af	be	af	
Water quality	N/A	N/A	N/A	N/A	
Waste	N/A	N/A	N/A	N/A	
Noise and vibration	N/A	N/A	N/A	N/A	
Odor	N/A	N/A	N/A	N/A	
Protected areas	N/A	N/A	N/A	N/A	
Ecosystem	N/A	N/A	N/A	N/A	
Hydrology	N/A	N/A	N/A	N/A	
Topography and geology	N/A	N/A	N/A	N/A	
Natural disaster	N/A	N/A	N/A	N/A	
Resettlement	N/A	N/A	N/A	N/A	
Living and livelihood	N/A	N/A	N/A	N/A	
Heritage	N/A	N/A	N/A	N/A	
Landscape	N/A	N/A	N/A	N/A	
Ethnic minorities and indigenous peoples	N/A	N/A	N/A	N/A	
Working conditions	N/A	N/A	N/A	N/A	
Conflicts of interest	N/A	N/A	N/A	N/A	
Independent management	N/A	N/A	N/A	N/A	
Public welfare	N/A	N/A	N/A	N/A	

AQ9. Strengthening institutional mechanism on aquaculture activities

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

AQ10. Development of financing system for aquaculture

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

Attachment 7-4　Results of Impact Assessment (SFDPIS Proposed projects) (Post-harvest and Value Addition Sub-sector)

PV1. Extension of improved on-board handling techniques for tuna handline fishery

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	B	B	B	B	*See main text
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

PV2. Strengthening capacity of ice plants

	SP		IA		Reason
	be	af	be	af	
Water quality	C	D	D	N/A	*See main text
Waste	C	D	D	N/A	*See main text
Noise and vibration	C	D	D	N/A	*See main text
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	B	N/A	B	*See main text
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	C	N/A	D	*See main text
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	C	D	D	N/A	*See main text
Conflicts of interest	D	C	N/A	D	*See main text
Independent management	C	B	D	B	*See main text
Public welfare	D	D	N/A	N/A	

PV3. Extension of quality improvement methods for traditional processed fish

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

PV4. Improvement of fish marketing system

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

PV5. Development of katsuobushi processing technology and facility

	SP		IA		Reason
	be	af	be	af	
Water quality	C	D	C	N/A	*See main text
Waste	C	D	C	N/A	*See main text
Noise and vibration	C	D	C	N/A	*See main text
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	C	D	C	N/A	*See main text
Conflicts of interest	D	C	N/A	C	*See main text
Independent management	D	C	N/A	C	*See main text
Public welfare	D	D	N/A	N/A	

PV6. Development of minimum national standards / regulations for fishery products

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

PV7. Establishment of a training system for fish quality assurance

	SP		IA		Reason
	be	af	be	af	
Water quality	D	D	N/A	N/A	
Waste	D	D	N/A	N/A	
Noise and vibration	D	D	N/A	N/A	
Odor	D	D	N/A	N/A	
Protected areas	D	D	N/A	N/A	
Ecosystem	D	D	N/A	N/A	
Hydrology	D	D	N/A	N/A	
Topography and geology	D	D	N/A	N/A	
Natural disaster	D	D	N/A	N/A	
Resettlement	D	D	N/A	N/A	
Living and livelihood	D	D	N/A	N/A	
Heritage	D	D	N/A	N/A	
Landscape	D	D	N/A	N/A	
Ethnic minorities and indigenous peoples	D	D	N/A	N/A	
Working conditions	D	D	N/A	N/A	
Conflicts of interest	D	D	N/A	N/A	
Independent management	D	D	N/A	N/A	
Public welfare	D	D	N/A	N/A	

Annex 6.

Report of Gender Survey

The Republic of Maldives
Project for the Formulation of Master Plan for Sustainable Fisheries (MASPLAN)

Report of Gender Survey

May, 2017

Misato Ohara (Environment and social consideration1/ Gender)

Contents

1. Purpose of this survey

"Gender equality" means that women and men have equal rights, responsibilities and opportunities. Equality does not mean that women and men become homogeneous, but women and men's rights, responsibilities, and opportunities do not depend on their gender.

This survey was aimed at reaffirming the role of gender in Maldives' fishery industry and understanding gender issues. The results of this survey were expected to contribute to the implementation of SFDPIS with maximum consideration for gender equality and lead to further development of the fishery industry in the future.

2. Basic information on gender

2-1. Laws and policies on gender in Maldives

In 2009, the Maldivian Government formulated the "National Gender Equality Policy and Framework for Operationalization", and it was set for all ministries and agencies to recognize that there are different needs and priorities for women and men and to address the issues for gender equality. However, effective policies and real actions were not implemented.

In August 2016, "Gender Equality Law (Law No. 18/2016)" was issued to promote gender equality, and to set down the responsibilities of all ministries and agencies as well as penalties for violation. It also stipulated that policies and action plans should be formulated to set concrete actions and target standards in this law. According to the Ministry of Gender and Law in an interview held during this survey, a special department has been established to prepare an action plan and this plan is currently being developed in consultation with concerned ministries and agencies. However the action plan is incomplete as of May 2017. In addition, the Employment Act, Labor Relations Authority (2008) prohibits employment discrimination by gender.

Regarding religion, historically Maldives turned from Buddhism to Islam in the 12th century, and established Islam as the official religion of Maldives in 1997. Thus all the citizens are currently Muslim.

2-2. Women advancement rate

According to the latest census conducted by the National Bureau of Statistics in 2014, the ratio of primary school enrollment is almost 100% for both men and women (National Bureau of Statistics, Ministry of Finance & Treasury, Population & Housing Census 2014). There is little difference between men and women in junior high school and high school. Nevertheless, survey results show that girls living in isolated islands are 60% more likely not to go to school than boys and not to be engaged in work. In the 5 years from 2009 to 2014, the rate of women undergraduate students in universities is 61% which is more than men. Master and PhD of women are 49% and 45%, respectively; although they are slightly less than men, nearly the

same educational opportunity is given.

2-3. Women employment rate

Approximately 150,000 people who are over 15 years old are labor force. According to the latest census in 2014, the women employment rate has improved in every age bracket compared to 2006, and the average employment rate of women has increased from 41.6% to 47.6% (National Bureau of Statistics, Ministry of Finance & Treasury, Population & Housing Census 2014). This indicates the possibility of further employment for women. However, the difference in the rate of employment between men and women remains large, especially in the age bracket 30 - 34, men are about 95%, while women are only about 52%. There is also a difference between atolls, and the women's employment rate is the highest at 61.1% in Kolhumadulu Atoll, while the lowest is at 40.0% in Felidhu Atoll. Incidentally Malé Atoll is 48.6% for women.

The percentage of women employees by occupation is 68%, 65%, 65% for the top three criteria "education ", "housekeeping “and "health and social welfare" respectively, the lowest 3 are " quarrying ","construction" and " accommodation and food service”, at 1%, 2% and 10%, respectively. The "agriculture, forestry and fishery” is 11%, but the rate of women employees only in the agriculture and forestry industry is 60%, it means the fishery industry makes the total rate in the agriculture, forestry and fishery be low.

Additionally, this census presents a "potential labor force", corresponding to people not working even they have motivation to work, amounting to 20,000 persons, of whom are 75% are women. The age brackets 20 - 24 for men and 25 - 29 for women have the highest potential labor force respectively.

3. Understanding gender situation in the Maldives fishery industry

3-1. The survey method

The following survey were conducted in addition to analyzing laws/regulations and existing reports.

1. Interview to staff of the Ministry of Gender and Law
2. Interview to staff of MoFA (Ministry of Fisheries and Agriculture), MRC (Marine Research Center) and IFAD (International Fund for Agricultural Development)
3. Interview to women and men who work in the fishery industry in remote islands

The details are given below.

- Date: 28th ~29th April, 2017 (1st survey) and 1st and 2nd May, 2017 (2nd survey)
- Target Islands: Gemanafushi Island (1st survey) and Maandhoo island (2nd survey)
- Method of interview: Interview andquestionnaire survey (refer to Attachment 1)
- Target of interview: Women and men who work in the fishery industry in remote islands
  Family based fish processor at Gemanafushi Island (1st survey)
  Workers in a canning factory at Maandhoo island (2nd survey)
- Point for attention: Interview and filling in of questionnaire were conducted separately for men and women, in Dhivehi ;
  Local staff adequately explains how to answer to the questionnaire, if it is difficult for a target person to fill in the answer sheet by himself/herself, the local staff listens his/her answer and fill in the sheet.

3-2. The results of the survey

・Gender ratio of staff and decision making in MoFA

As per the interview to MoFA, the number of MoFA, female sfaff in 2016 was 41% of the total number of the staff. In the decision making level (including managers and political decision makers), 22% are women (Figure 1). According to the World Bank survey in 2015, the average percentage of women in the Maldivian administrative agencies (including regional administrative agencies such as the Atoll and Island Councils) is 15%, thus MoFA has a higher proportion of female staff. However, the ratio of women at the decision making level i.e. 22% is still low as compared with the women percentage of staff. For example, in Europe, a target value for women in decision-making level is set at 30% for any private companies and governments (Women on the Board Pledge for Europe' EU, 2011), and MoFA's rate is relatively low.

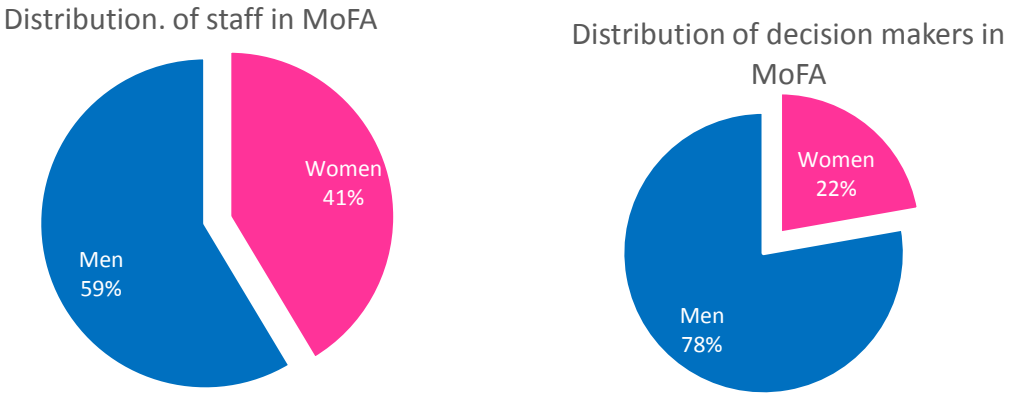


Fig. 1 Gender proportion of staff and decision makers

・Gender role in family based fish processing industry

In Gemanafushi Island, the questionnaire was answered by 20 persons in total (8 men and 12 women). Approximately 90% of the interviewees produce all three major types of products made from skipjack tuna, i.e. fish paste (*Rihaakuru*), smoked fish (*Valhoamas*) and dried fish (*Hikimas*) . As a result of analyzing the questionnaire, it was found that the work sharing by women and men was almost the same (Fig. 2). However, only men engage in fishing operation, but their estimated working hours engaging fishing is smaller than women who are mainly working for fish processing. . As for selling fish, the large difference between role of women and that of men was selling products to other islands: women are responsible for selling products within the island as well as men, but women do not go and sell outside of their home island. However, for many men who answered that they are in charge of selling products outside of the home islands, most of the sales is carried out by specialized purchasers who come to the island. Thus these men answered that the frequency of visiting to the other island for selling was less.

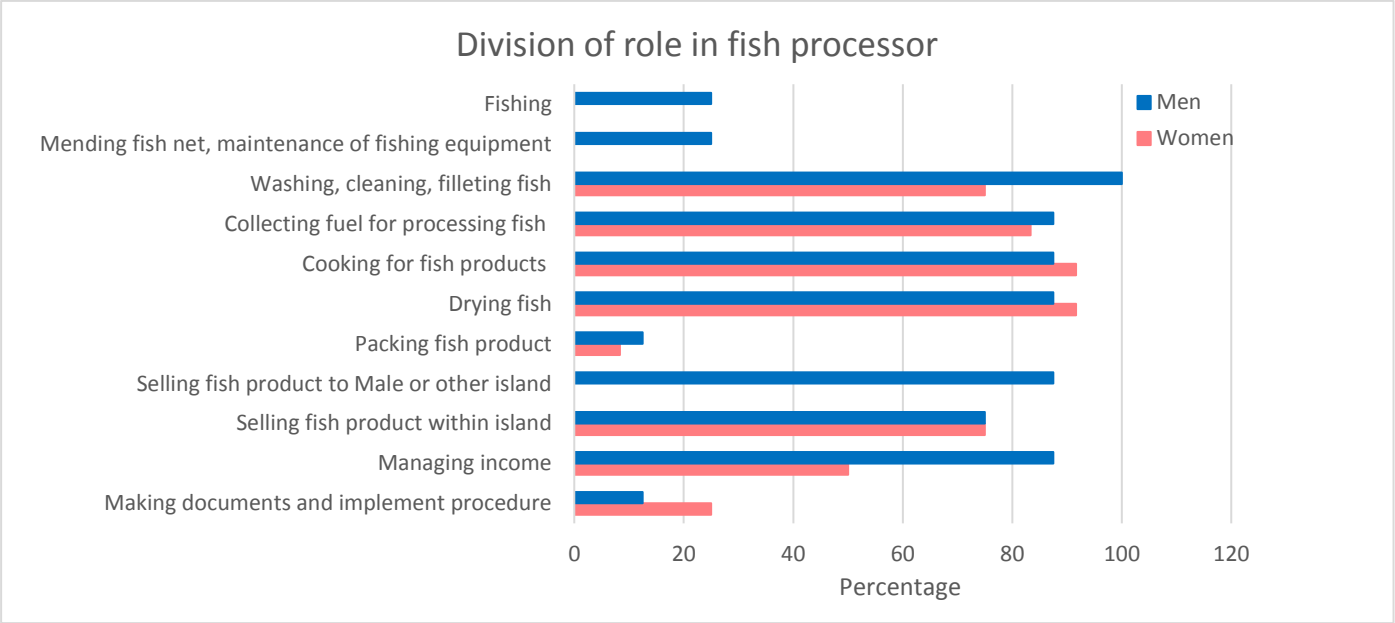


Fig. 2 Gender role for the house based fish processor

There was no significant difference between men and women in spending time of the day (Fig. 3). However, most house works are handled by women, and women tend to do fish processing as well as doing house works. Men tend to do processing work such as smoking or cutting work while the women do house work.

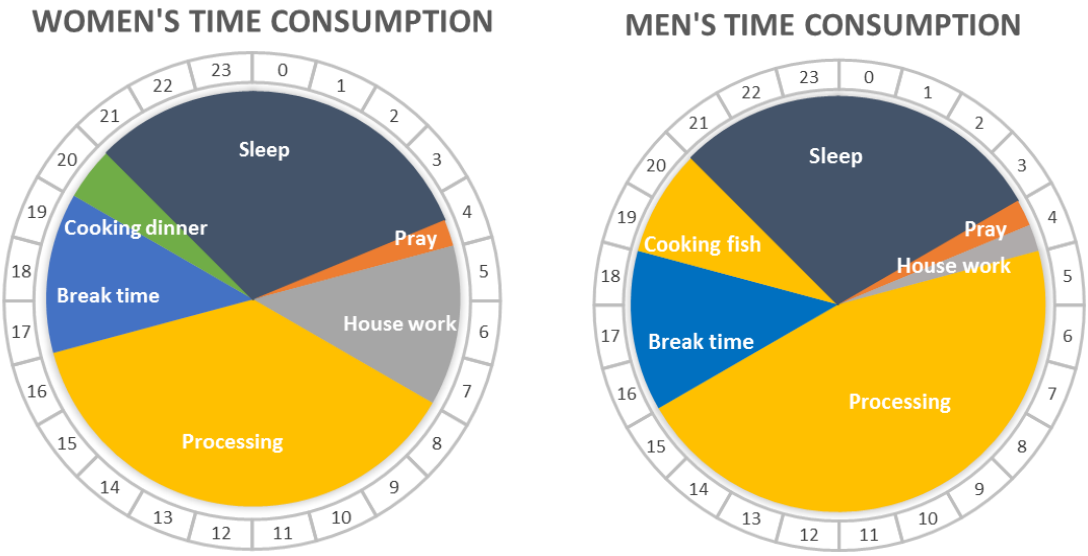


Fig. 3 Time consumption by family based fish processor in a day

Regarding access to family finance in family based fish processing industry, most women and men manage their family finance together (Fig.4). 63% of the interviewees answered that men and women cooperate each other on money management. Meanwhile, 40% of men decide the use of money for work, and women rarely decide the same alone. However, 55% of the

interviewees answered that both men and women have equal right to decide , and it can be said that the management of family income as well as the management of the work are shared by both sexes in this family based fish processing industry.

In addition, regarding decisions for use of family income for “others”, in topics such as education, living and entertainment, 70% answered that “manage by both males and females”, However, when analyzed the answers from women only, 80% of the interviewees responded the management of family income for “others” is handled by women. Thus, it can be said that involvement of women to family finance is high.

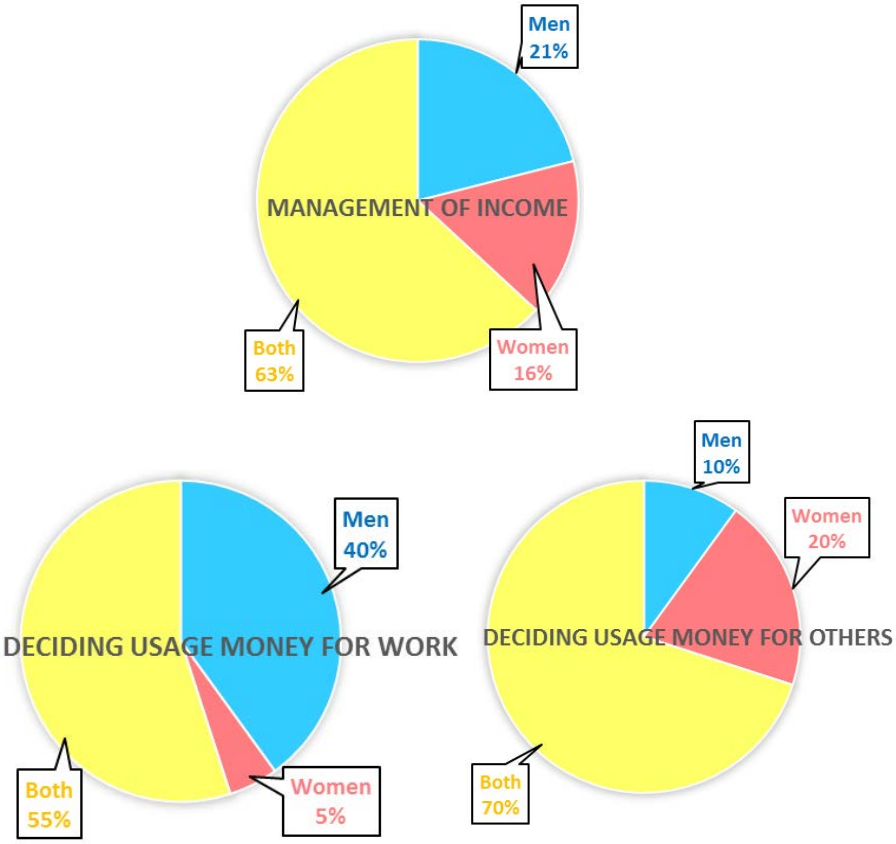


Fig. 4 Role of managing family finance between women and men in family based fish processor

・Gender role in fish processing factory

In Maandhoo Island, the questionnaire was answered from a total of 39 workers, 21 women and 18 men. Among the respondents, 38% of women are engaged in administrative work, 33% in processing work (fish skin removal, cutting, canning, quality inspection), 29% in other works (cooking meals for staff, cleaning rooms, measuring fish, etc.). 22% of men are engaged in administrative work, 39% in processing work, 17% in engineering and 22% in others (cooking meals for staff, cleaning rooms, fishing, ice making, etc.).

Maandhoo Island is connected to three neighboring islands (Gan, Kadhdhoo and Fonadhoo Island) by bridge, and the access to the factory is in good condition. Many Maldivian workers commute from nearby islands, 100% of women and 78% of men answered they go back home after work and the average commuting time is around 15 minutes. Since workers from other atolls or overseas cannot return home on the same day, they stay at the factory's accommodation facility. Workers who can return home by ferry are likely to return home on weekends. At the factory, there are necessary day facilities including canteen for all employees, a medical office with a pharmacy and a small laboratory, a laundry room (washing

and ironing by specific staff), a recreation room, an outdoor resting place, a daily store, a mosque, etc. (Attachment 2: Pictures during survey).

Apart from workers, an interview to the factory manager was conducted. According to the manager, the factory is mainly exporting, and it was answered that there is no gender discrimination or salary gaps, since the factory must comply with world standards such as ISO certification (International Organization for Standardization). Additionally, it was answered that the allowances for holiday work, overtime work, maternity leave, childcare leave are also enhanced in accordance with the Labor Standards Law.

However according to the answers from women, 43%, 43%, and 38% of women indicate that there are differences between women and men in terms of salary, range of responsible work and chance to get higher position, respectively. Overall, more than half of the women felt there are differences between women and men in their jobs (Fig. 5). 67% of men responded to the same question that "there is no difference between men and women" at all. In response to the question “How can more women join and work in the factory?” 76% of women answered “improvement of salary" (Fig. 6). The results was contradictory from the result obtained from the manager. However, this survey could not clarify the cause of this contradiction.

The survey by National Planning showed that the average monthly income in the "manufacturing industry" is 4,463 MVR for males in atolls except Malé atoll, against 1,280 MVR for women. Thus it is understandable that there is a difference between men and women of simple average income in this industry (Department of National Planning, 2012. Household Income and Expenditure Survey 2009-2010.). However, it is normal that wages depends on the type of work and the working hours. It is not clear whether wages differ between women and men despite doing the same work, whether women have less opportunity than men to get works with high wages, or whether there is no difference between men and women by type of labor.

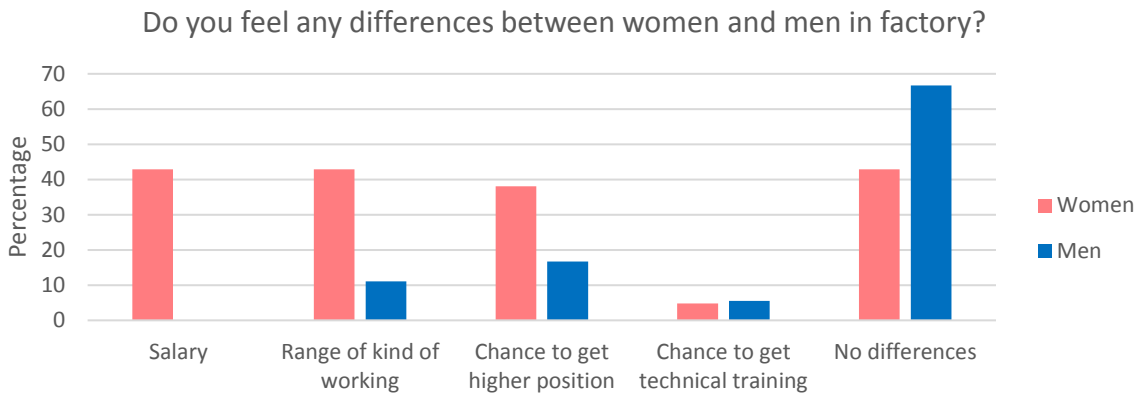


Fig. 5 The result of question about differences on the range of work between women and men

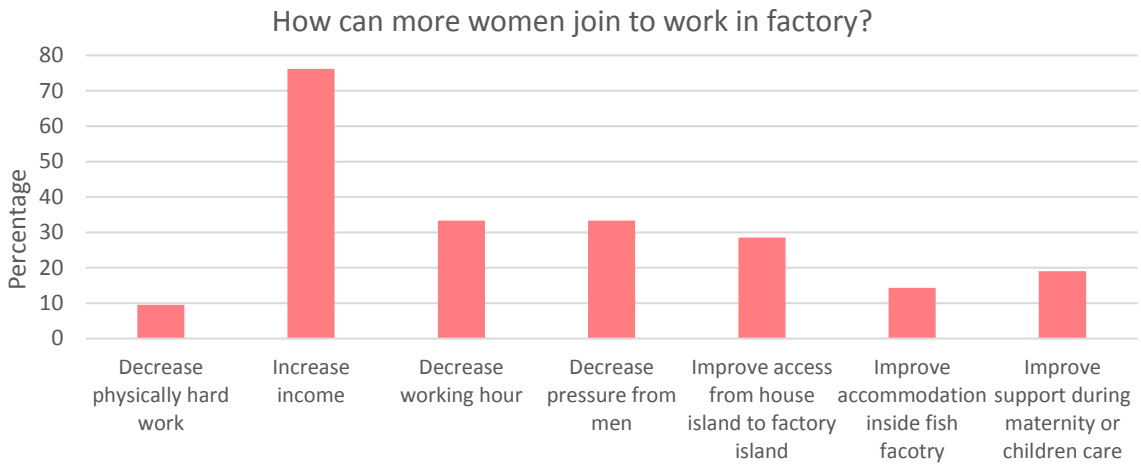


Fig.6 The result of question about improvements for women to work

The average working hours at the factory were longer for men (about 11 hours,including 1.5 hours of break time) than women (about 9.5 hours). However, the median value was 9 hours for both men and women, it can be seen that most workers work on the fixed time.

Both women and men were doing house work before doing their factory work. Nevertheless women are prone to do house work after their factory work as well, while men take a break after coming back home (Fig. 7).

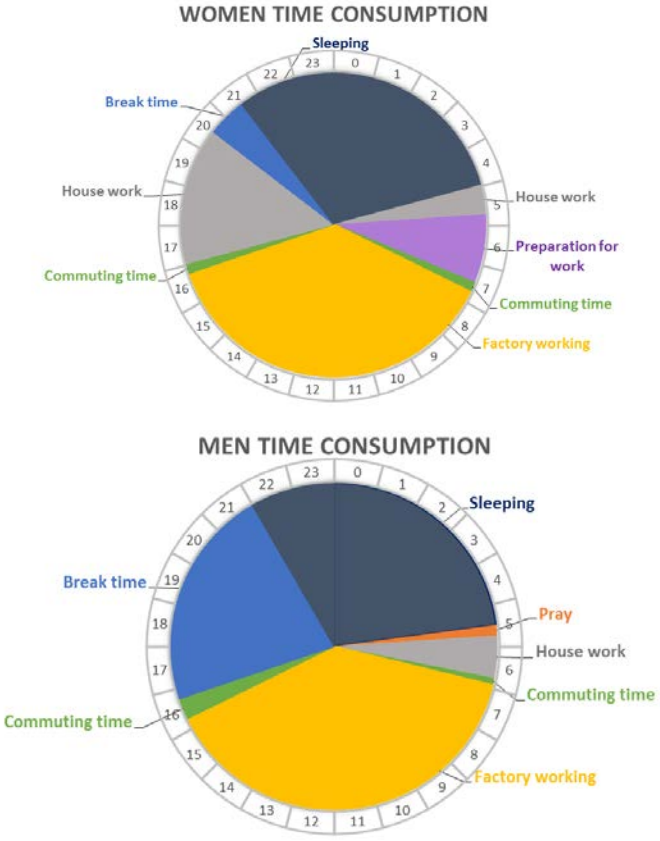


Fig. 7 Time consumption by factory workers in a day

As for access to family finance, the result showed that for more than half respondents, family income is managed by both men and women together (Fig. 8). In addition, 53% answered that both men and women decide on the use of money for job while 13% answered that only women decide on the use, thus the women involvement to the family finance is higher than in the case of the family based fish processor. Besides, 70% decide on the use of money for other than work such as education, living and entertainment, etc. by both women and men and 21% by only women, and men's involvement was found to be lower.

Fig. 8 Role of managing family finance between women and men in factory worker

・A successful case of women's participation to aquaculture project

IFAD is currently implementing a sea cucumber aquaculture project on the three islands of Laamu Atoll (Mariculture Enterprise Development Project -MEDeP). The project activities mainly include support for purchasing equipment and sea cucumber seed by loan and technical support until aquaculture becomes viable. At the first stage of the technical training by IFAD, no women participated although calls for participation were done regardless of gender. MoFA subsequently instructed that "more than 30% of the loan applicants should be women", and then women participated in the training. As a result, 57% of the 100 applicants who received a loan were women (Fig.9). This is considered that the mechanism that specific evaluation score is automatically given in the examination by the bank contributed to increasing in the number of women participants.

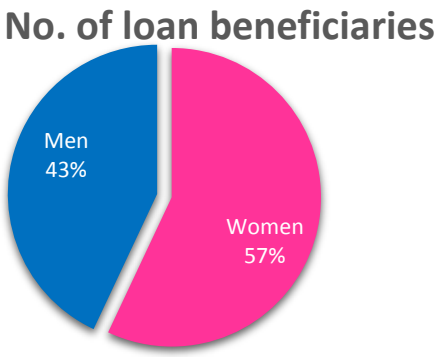


Fig.9 Women and men ratio of loan owner in IFAD aquaculture project

To start aquaculture in the MEDeP project, cage and other equipment for pen type culture as well as sea cucumber seeds are purchased through the loan, and the cage is installed on a sandy beach. This installation work is hardly done by women alone due to the hard labor. It is normally carried out with the cooperation of family members and others. After releasing the seeds, regular feeding work is performed twice a week (about 15 to 30 minutes per time) as well as net cleaning (irregularly, about 15 minutes per time).

At the initial stage of the project, the loans were supposed to be supplied to individuals. However, IFAD changed the system and the loans have to be supplied to household level to better suit Maldives' present conditions. As a result the sustainability has increased, as even when women are busy with housework or men have other works, other family members can help to perform the aquaculture activities.

・Possibility for women to engage into aquaculture

The result of the question "do you want to participate in aquaculture?" asked to both women and men of family-based fish processor and factory worker showed that 42% of men and 24% of women answered "Yes", respectively(Fig.10). The main reason why women answered "No" was "lack of time", then "lack of money and equipment"; "forbidden by family" and "pressure from family (husband)" were 0% (Fig. 11). The result that no women feel limitation by family indicates low or no social obstruction for women's participation to this new industry in Maldives. The answer of "lack of time" was also the highest answer (63%) by men, which is natural as they already have work in the factory or with family based processing.

In addition, among those women who answered not to have interest in aquaculture, 40% indicated that they would be interested if there were some support in money or equipment (Fig. 12). As a result, it can be said women have great potential of participation in aquaculture if an issue that women feel as anxiety or obstacle is solved.

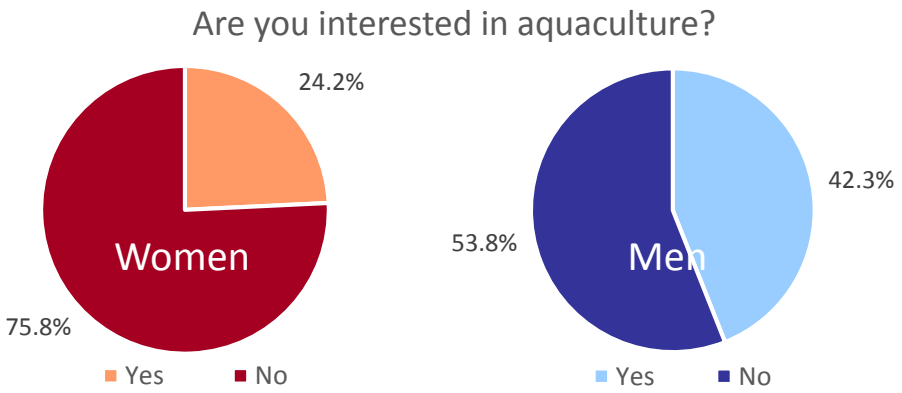


Fig. 10 The result of the question about interest to participate in aquaculture

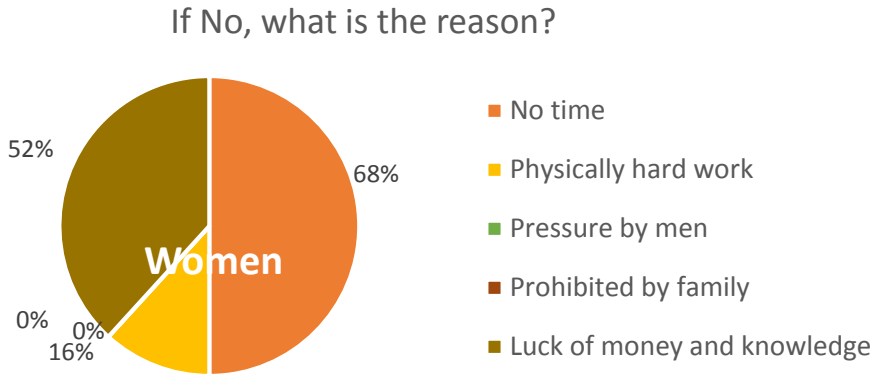


Fig. 11 The reasons why women are not interested to participate in aquaculture

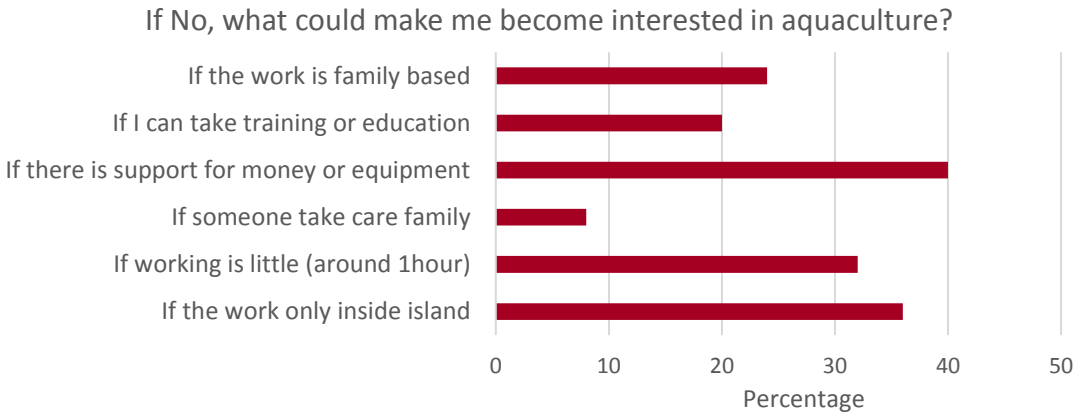


Fig. 12 The result of the question to women who answered "Not interest to participate in aquaculture"

4. Summary and suggestions

This survey showed that family based business and aquaculture industry development could help maximizing women' labor force.

At the moment, it can be said that family based business management is the easiest working environment for women as there is no gender gap. The results of this survey showed even women also engage in fish cutting and men also fish smoking, and This is different from the result of the survey done by another donors about gender role in the past. Although women involve in their house work usually in family based fish processing entity, men engage in processing works while women work for family. Thus gender role sharing could be seen as whole family members help to work each other efficiently.

In sea cucumber aquaculture, regular work is needed only several times in a week and women can contribute to this kind of work. In addition, the fact that family finance is mostly managed by women and men together shows a high possibility for women to get loans and properly manage fund for aquaculture. It means that it is unlikely to happen for family members to hardly procure feed and consumables regularly and cause their business stagnation arisen from women's inaccessibility to household economy.

In general terms, it is more suitable for farmers than fishers to manage small scale aquaculture. The reason is that farmers dedicate to routine work continuously in long term such as such as watering, weeding, and fertilizing. In Maldives a statistical survey showed that 60% of agriculture and forestry workers are women. For these reasons, although this survey did not include interviews to those who work for these sub-sectors, it may be worthwhile to include women dedicated to agriculture and forestry when selecting target women as beneficiaries for a new aquaculture project.

However, as mentioned earlier, no women participated in the technical training at the first stage of the IFAD aquaculture project. The reason is unknown, but as per the result of this survey, women do not have enough time to participate in the training because of their house works and/or women themselves also have the stereotype that aquaculture is not a job for women. Setting the rule of 30% of loan owners to be women may lead all parties involved (Government institutions, funding agencies and women themselves) to understand that women are suitable for aquaculture. Based on these experiences, it is desirable to regulate and target number of women to be participated in the training etc. before the implementation

of projects. This helps an increase of opportunity for women participation for the new project or industry.

One important element to take into consideration to promote women participation in trainings is the time and place of the implementation. In both cases of family based fish processor and factory worker, women are engaged in house work for a longer time than men (It is remarkable that average time could not be calculated because there were many women doing both house work and processing work in family based fish processing). Because women have daily house work to do, starting time for training etc. must be considered.. In addition, since women tend to enjoy their activities on their home island, it is necessary to organize training etc. at their residential island

Furthermore, a credit system are one of the opportunities for women to participate in the fisheries industry. However, since there are cases even though the loan is actually applied under the wife's name but the borrowed money is actually used by the husband, special attention is to be paid to avoid such cases.

Regarding gender, the first challenge for the fishery sector is to increase the percentage of women at the decision-making level. As mentioned above, this percentage in MoFA is lower than of the overall percentage of women among staff level and has not reached the EU standard of 30%. A new gender considerable mechanism is likely to be made by adding women as decision makers. Regarding the differences in consciousness about gender gap between managerial level and female workers revealed at the canning factory, though the real cause was not clear, a system to let management level know women's anxiety and dissatisfaction would create working environment for women to work continuously. To create the system, the shortest way is to add a certain percentage of women to managerial level. At the same time, it is also important to raise gender awareness among men at decision-making level.

In summary, this survey came to the following findings:

- There is little difference between men and women in family based business management, and women's abilities can be utilized.
- The possibility of women's participation in the aquaculture industry is high.
- There is also room to consider farmer women to participate in the aquaculture industry.
- Loans system are effective for women's participation opportunities, but it is necessary to confirm that women are involved in the actual management.
- In order to promote women participation in the project, a certain target value (i.e. percentage of women participants in the total number of the participants) needs to be

decided.

- For training implementation, it is necessary to consider women's house working time schedule etc.
- Increasing the proportion of women at the decision-making level and raising gender awareness for men lead to gender equality as a whole.

Currently there are 20,000 potential labor force in Maldives, of whom 15,000 are women (National Bureau of Statistics, Ministry of Finance & Treasury, Population & Housing Census 2014). Educational opportunities are given equally to men and women, and there is no difference between women's knowledge and/or ability and men's due to lack of education. In other words, it can be said that the proportion of women with ability is the same proportion as of men. Making a fisheries industry easy for women to work contributes to increase not only job opportunity for these potential labor but also possibility of further development of the future fishery industry. Therefore, it is quite important to deal with gender as a focal topic while planning and implementing any new project.

Attachment1 : Questionnaire

Translated into Dhivehi for the interviews

Questionnaire to women who relate to fisheries

1. Basic information

- Age

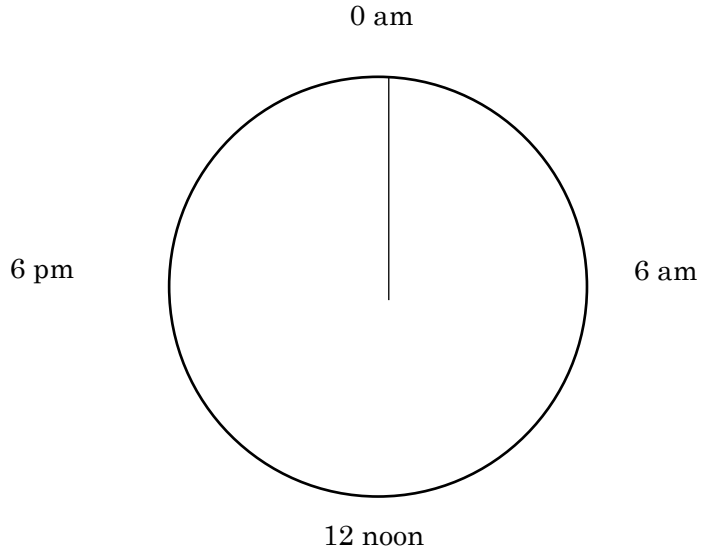
☐10-20 ☐20-40 ☐40 - 50 ☐60-

- Produced fish product

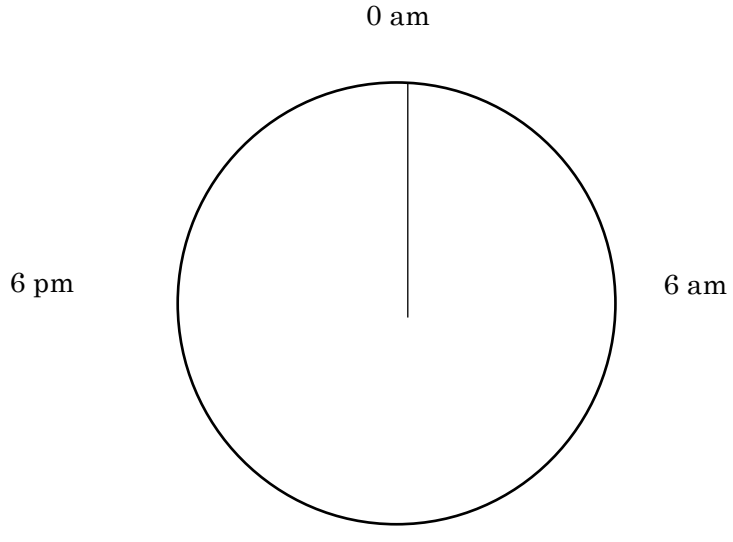
☐Rihaakuru ☐Valhoamas ☐ Hikimas ☐Other

2. Time spent for some activities in a day (How to write is explained by local assistant)

Day which has fish processing
(Average____times/week)



Day which has NO fish processing
(Average____times/week)



3. How do you join fisheries activities? (Check all that apply.)
☐Procurement and maintenance of boat
☐Mending fish net, maintenance of fishing equipment
☐Fishing
☐Washing, cleaning, filleting fish
☐Collecting fuel for processing fish
☐Cooking fish products (with fire)
☐Drying fish
☐Packing fish product
☐Selling fish product to other islands
☐Selling fish product within island
☐Selling raw fish to factory
☐Selling raw fish within island
☐Managing income
☐Documentation work, administration work

4. Do you think family based fish processing is decreasing recently?
☐Yes ⇒ to 4-1~4.3 ☐No ⇒ to 4-4

4-1. If Yes、what is the reason? (Check all that apply.)
☐Fish processing factory is increasing
☐Catch is decreasing
☐Labor who know processing is decreasing
☐Buyer or purchaser is decreasing
☐Others ( )

4-2. If Yes, do you want to continue fish processing when you get some supports?
☐Yes ☐No
If No, what is the reason? (Check all that apply.)
☐Physically hard working
☐Even without processing, livelihood can be sustained

4-3. If Yes, do you want to use the time for other job? (job means cash income)
☐Yes ☐No

4-4. If No, what is the reason? (Check all that apply.)
☐Sufficiency in demand
☐Working hours for processing per person have not changed
☐Cooperative supports the processing
☐No reason

5. Are you interested in aquaculture?

Aquaculture : Nowadays, aquaculture pilot project is started in Maldives. Mainly grouper or sand fish is farmed on the sea with net cages. The works are only feeding and maintaining net cage or equipment.

☐Yes ⇒ to 5-1. ☐No ⇒ 5-2, 5-3

5-1. If Yes, what is the reason? (Check all that apply.)
☐Chance of cash income
☐Sounds interesting
☐Want to change job

5-2. If No, what is the reason? (Check all that apply.)
☐No time
☐Physically hard work
☐Pressure by men
☐Prohibited by family
☐Luck of money and knowledge

5-3. If No, please answer bellow item (Check all that apply.)

☐If the work only inside house, it would be possible
☐If the work only inside island, it would be possible
☐If working is a little (around 1hour), it would be possible.
☐If the responsibility of work is not only me but also family, it would be possible
☐If someone take care family, it would be possible
☐If there is support for money or equipment, it would be possible
☐If I can get training or education, it would be possible

6. Please let us know managing family money.

Cash income	☐Men	☐Women (me)	☐Both
Management of income	☐Men	☐Women (me)	☐Both
Deciding usage money for job	☐Men	☐Women (me)	☐Both
Deciding usage money for others	☐Men	☐Women (me)	☐Both

7. Please let us know network inside island, with other island.
   ☐There is someone who can take care children or family.
      ☐Nursery school
      ☐Relative
      ☐Friend
   ☐We share information on fisheries such as catch and selling fish products
      ☐About catch trend
      ☐About selling place of fish or fish products
      ☐About method of fish processing

8. What do you think women can adapt fisheries sector? or which work do you want to join? (Check all that apply.)
   ☐Offshore fishing
   ☐Near shore fishing
   ☐Fish factory
   ☐Fish processing in house
   ☐Marketing
   ☐Aquaculture
   ☐Ministry level work (deciding policy or decision)
   ☐Island council
   ☐Administrator
   ☐Researcher
   ☐Recreational fishing

Thank you so much!!

Questionnaire to women who work in fish factory

1. Basic information

- Age

☐10-19 ☐20-19 ☐40 - 59 ☐60-

2. What kind of work do you do in your factory? (Check all that apply.)
   ☐Cleaning and cutting fish
   ☐Cooking fish
   ☐Canning
   ☐Quality control
   ☐Engineering
   ☐Administration
   ☐Others ( )

3. Does your family join fisheries work?
   ☐Yes (Check all that apply.)
      ☐Fish factory
      ☐Offshore fisheries
      ☐Reef fisheries
      ☐Fish processing (family based)
      ☐Others ( )
   ☐No

4. Do you join other fisheries work in your home?
   ☐Yes (Check all that apply.)
      ☐Fishing
      ☐Mending net or maintaining fishing equipment
      ☐Fish processing (family based)
      ☐Selling fish or fish products
      ☐Others ( )
   ☐No

5. Please let us know who is managing family money.
   Cash income ☐Men ☐Women (me) ☐Both
   Management of income ☐Men ☐Women (me) ☐Both
   Deciding use of money used for work ☐Men ☐Women (me) ☐Both
   Deciding use of money for other purpose ☐Men ☐Women (me) ☐Both

6. When your family suddenly needs your help (like in case of sickness) on your working day, how do you do? (Check all that apply.)
   ☐Asking other family members to help
   ☐Not to work to help him/her
   ☐Using nursery center or housemaid
   ☐Others ( )

7. Do you feel any differences between women and men in your factory? (Check all that apply.)
   ☐Salary
   ☐Scope of work
   ☐Chance to get higher position
   ☐Chance to get technical training
   ☐No differences

8. How do you think more women could join and work in a factory? (Check all that

apply.)
☐Decrease physically hard work
☐Increase income
☐Decrease working hours
☐Decrease pressure from men
☐Improve access from house island to factory island
☐Improve accommodation inside the factory
☐Improve support during maternity or children care
☐Others ( )

9. Are you interested in aquaculture?

Aquaculture : Nowadays, aquaculture has started in Maldives, mainly for sea cucumber, farmed near the sea shore with nets or cages. The works are only feeding and maintaining net or equipment.

☐Yes ⇒ to 9-1. ☐No ⇒ 9-2, 9-3

9-1. If Yes, what is the reason? (Check all that apply.)
☐Chance of cash income
☐Sounds interesting
☐Want to change job

9-2. If No, what is the reason? (Check all that apply.)
☐No time
☐Physically hard work
☐Pressure by men
☐Prohibited by family
☐Lack of money and knowledge

9-3. If No, please answer below (Check all that apply.)
☐If the work only in the house, it would be possible
☐If the work only inside island, it would be possible
☐If the work is a little (around 1 hour per day), it would be possible.
☐If someone take care of family, it would be possible
☐If there is support for money or equipment, it would be possible
☐If I can get training or education, it would be possible
☐If the work is family based, it would be possible

10. Please let us know about the communication network inside island, with other islands. (Check all that apply.)
☐There is someone who can take care of children or family.
  ☐Nursery school
  ☐Relatives
  ☐Friends
☐We share information on fisheries such as catch and selling fish products
  ☐About catch trend
  ☐About selling place of fish or fish products
  ☐About method of fish processing

11. What do you think if women can be or not accustomed to the fisheries sector? Or which work do you want to join? (Check all that apply.)
☐Offshore fishing
☐Coastal fishing
☐Fish factory
  ☐Canning
  ☐Chilling
  ☐Loin
☐Fish processor in the house

☐Marketing
☐Aquaculture
☐Government work (deciding policy or important decision)
☐Atoll / Island council
☐Administrative work in the company
☐Researcher
☐Recreational fishing

12. Consumption of time in one day

Working day (____days per week)

Activities	From	To
Sleeping		
House work (cleaning house, washing clothes, care of children)		
Rest at home		
Factory working		
Other work		

Non-Working day (____days per week)

Activities	From	To
Sleeping		
House work (cleaning house, washing clothes, care children)		
Other work		

Thank you so much!!

Attachment2：Pictures during survey

1.Interview to men in Gemanafushi Island

2. Interview to women in Gemanafushi Island

3. Interview to women in Gemanafushi Island

4. Processing fish caught a day before the survey. Processing was busy in the peak season of skipjack tuna fishing

5.Kitchen in the fish processing factory at Maandhoo Island

6. Medical office inside the factory site. There are simple laboratory, pharmacy and examination room.

7.Interview to factory women

8.Interview to factory men

Annex 7.

Training in Japan

TRAINING IN JAPAN

The project conducted the trainings in Japan in 2015 and 2016 targeted MoFA/MRC's counterparts and other members related to the project.

1. Training in 2015

1.1 Outline of the Training

(1) Purpose of the training

The training was implemented in Japan for the counterparts of MASPLAN to obtain necessary knowledge and information in order for them to tackle the priority issues in each of the relevant sub-sectors of fisheries and to enable them to formulate fishery sector development plan through sub-sector approach from policy making standpoint in Maldives.

(2) Title of the training course

Co-creation Program on Capacity Development for Formulation of Fishery Sector Development Plan

(3) Duration

June 29, 2015 – July 11, 2015

(4) Participants

Five (5) participants joined. All of the participants are counterparts of MASPLAN, staff of MoFA/MRC. (Table 6.1.1)

Table 1. Members of counterpart training in Japan in 2015

	Name	Position in the MoFA		Position in the Project
1	Ahsan Mohamed	Program officer	Fisheries Training, Extension and Promotion Section	Member of Post-Harvest & Value Addition SSWG
2	Riyaz Jauhary	Senior Research Officer	Marine Research Center (MRC)	Member of Oceanic SSWG
3	Adam Ziyad	Senior Research Officer	Fisheries Compliance Section	Member of multiple sub-sectors
4	Hussain Sinan	Director	Fisheries Management Section	Leader of Reef Fisheries SWG
5	Abdulla Jaufar	Assistant Director	Fisheries Infrastructure Development Section	Member of JCC

（5）Curriculum

The contents of the training were as follows:

＜Lectures＞

Lecture: ”Outline of fishery management system in Japan and fishery administrative activities in 2013” provided by Mr. Hidenao Watanabe, Fisheries Agency

Lecture: “Fishery management system and case study in Japan” provided by Dr. Mitsutaku Makino, National Fisheries Research Center

Lecture: “Quality control of fishery products in Japan” provided by Prof. Dr. Emiko Okazaki, Tokyo University of Marine Science and Technology

Lecture: “Fish distribution system and institution” provided by Prof. Nobuyuki Yagi, The University of Tokyo

Lecture: “Fishery administration of Nagasaki Prefecture” provided by the Fishery Department of Nagasaki Prefecture, which comprised of the following five lectures:

1) Outline of fishery in Nagasaki Prefecture
2) Management system for tuna fishing
3) Branding of Nagasaki Prefecture’s fishery products
4) Development of remote islands’ fishery
5) Basic development plan for fishery of Nagasaki Prefecture

＜Observations＞

Observation: “Misaki Fish Market”

Observation: “Marufukusuisan Co. Ltd.” (fish processing company)

Observation: “Urari” (direct sales center of fishery products)

Observation: “Sajimasuisan” (bait fishery for skipjack tuna pole-and-line fishery)

Observation: “Daijuichi Ryomeimaru” (skipjack pole-and- line fishing vessel) with Prof. Dr. Nobuyuki Yagi

Observation: “Nagasaki Fish Market and Nagasaki Fishing Port” with staff of Nagasaki Prefecture

Observation: “Nagasaki Central Fishery Research Center”

Observation: “Aquaculture farm of blue-fin tuna of Sakata Co. Ltd.” with the company and Nagasaki Prefecture

Observation: “Retail shops of processed fishery products” with Nagasaki Prefecture

＜Others＞

1) Symposium “Ocean health index”
The participants participated in a symposium “Possibility of regional assessment by utilizing Ocean Health Index” which was jointly organized by the University of Tokyo and Conservation International. Mr. Riyaz and Mr. Sinan delivered a presentation about fisheries in Maldives in the symposium.

2) Group discussion held at the University of Tokyo with Prof. Dr. Nobuyuki Yagi and others.
Prof. Dr. Yagi led the group discussion to compile the results of the two-week’s training.

1.2 Results of the Training

（1）Lectures

The training was implemented taking the following two points into consideration:1) the participants are generally knowledgeable about national fishery administration, coastal fishery management, fish processing, and fish distribution and 2) the participants could deeply understand actual activities of local fishery administration. The lectures contained not only theoretical part but also as many case studies as possible. Many topics were actively raised by the participants especially regarding the lectures on coastal fishery management which has become a critical issue in Maldives at present, on upgrading value addition of processed fishery products by branding, and on fishery development plan.

（2）Observations

The participants visited and observed the facilities of fish market and fishing port, fish processing plant, retail shop of processed fish, bait fishery for skipjack tuna pole-and-line fishing, fishing vessel of skipjack tuna pole-and-line fishing, aquaculture farm of blue-fin tuna etc. These visits were considered useful when they dealt with the current issues of the fisheries sector of Maldives. The participants highly evaluated all the places they visited as they could observe actual activity sites; they were, especially satisfied with observation of bait fishery and skipjack tuna pole-and-line fishing vessel. Improvement of survival rate of bait fish is the most prioritized issue of MASPLAN and a pilot project (PP1) tackled this issue. Since most of relevant Maldivians had never seen bait fishery and fishing vessel for skipjack tuna pole-and-line fishing in Japan, this training was useful and effective. The results of the training are reflected in the plan of the said pilot project.

（3）Participation to and presentation at the symposium

The opportunity for the presentation was provided by Prof. Dr. Yagi of the University of Tokyo. In general, participants have little opportunity to present their country's situation of the relevant sectors during any training program in Japan. Since the present training provided them the opportunity, it was expected that the participants as counterparts of MASPLAN would participate in the training as such and also share their knowledge and experiences with the Japanese audience, as a new style of training.

Since the two participants as well as the presenters provided attractive information, many questions and comments were shared by the other participants about current status of fishery in Maldives, issues on coastal resources management and environmental conservation, Ocean Health Index, application and dissemination of "Satoumi", with active discussions altogether. The organizers also appreciated the participation and presentation by the participants. This opportunity was overall assessed as effective by both participants and the organizers.

（4）Group discussion and presentation of the results of the training

The five participants held an internal meeting to confirm what they would report according to their respective specialties before the group discussion was held for summarizing the training. The reporting from the participants was smoothly done and concrete and accurate discussion was made in the group discussion. In the subsequent presentation of the training results, JICA and the participants confirmed the concrete outputs of the training after positive discussion had been made.

1.3 Utilization of the Training's Outputs

（1）Outputs obtained from the training

After the participants came back to Maldives, they reported about outputs of the training to the Minister on July 15, 2015. They compiled the outputs and made slides for presentation by each sub-sector. According to the trainees, it was useful in terms of policy/approach for the management of inshore fishing and the promotion of processed fish products, technical issues such as the structure of live bait tank of skipjack tuna, and formulation of the Master Plan. Also, the information gathered from the observations of live bait fishing and keep long on board influenced strongly the definition of the pilot projects.

（2）How to utilize the outputs

The knowledge and information obtained from the training would be fed back to the process of preparation of the draft master plan. The results of the observation of bait fish tank for skipjack tuna pole-and-line fishing vessel and method for keeping freshness in post-harvest at the blue-fin tuna aquaculture farm could be reflected in the activity plan of the pilot projects that had recently started. The participants proposed in a positive manner to make a model of Japanese-style live bait fish tank to be used as an extension material and conduct an experiment on bait fish rearing in a cage.

2. Training in 2016

2.1 Overall outline of "Knowledge Co-creation Program on Capacity Development Training for Fishery Sector Technology"

Focusing on developing skills to deal with priorities relevant to fisheries management and pilot projects, and aiming to utilize the skills and knowledge gained for formulating the master plan, following three different courses were organized and implemented during the training:

1) Fishing/value-addition course, to gain necessary skills on skipjack tuna and tuna fishing, freshness control, fish processing etc.
2) Fisheries management course, to learn about Japan's fisheries resources management and fishing operation system, and coastal fishery management, monitoring and patrol.
3) Aquaculture course, to acquire skills and knowledge on aquaculture.

Regarding the fishing/value-addition course, INTEM contracted the Faculty of Fisheries, Kagoshima University, and this course was mainly implemented at the Faculty of Fisheries, Kagoshima University, and Shigakukan University. In Kagoshima Prefecture, which is famous for skipjack tuna fishing, the participants learned how to maintain freshness of skipjack tuna and were exposed to fish processing, and activities of Fisheries Cooperative Associations (?) related to tourism as well as fishing skills.

In the fisheries management course, lectures about fisheries resources management were delivered. In addition, field observation trip to Sakaiminato city, Tottori prefecture, was conducted. During this trip, the participants learnt about the approaches of fisheries management at several levels such as central government, prefectural government and Fisheries Cooperative Associations (?). They also observed actual cases of monitoring and patrol.

In the aquaculture course, aside from lectures in Tokyo, observation of aquaculture facilities in Okinawa Prefecture and Kagawa Prefecture was carried out, and the participants were exposed to actual examples of seed production and cage culture. In addition, the participants

practiced a specific method for killing grouper and keep its freshness and shipping of cultured fish in Okinawa Prefecture.

In each course, the participants presented their country reports on the first day of the training and shared various issues regarding their sector in Maldives and goals of the training. On the last day, they presented the results of the training, with insights on their future plans of projects' activities and on knowledge and experiences they obtained. The participants also gave presentations at MoFA after they returned to Maldives. The results of the training are reflected in the Master Plan and activities of the pilot projects.

2.2 Fishing/Value-addition course

1) Outline of the course

a. Objectives of the training

The objectives are to acquire basic knowledge and skills required in response to priority issues identified in the Oceanic Fisheries and Post-harvest/Value-addition sub-sectors and to enable positive participation in the pilot-projects' implementation during the process of formulation of the Master Plan.

b. Title of the training course

Knowledge Co-creation Program on Capacity Development for Fisheries Sector Technology (Fishing/Value-addition)

c. Duration

July 10, 2016 – July 30, 2016

d. Curriculum

The curriculum as shown Table 2.

Table 2. Curriculum of training 2016 (Fishing/Value-addition)

Lectures		
1	Outline of the Skipjack tuna pole-and-line fisheries	Assoc. prof. Ishizaki, Kagoshima University
2	Outline of live-bait fisheries	Assoc. prof. Ishizaki, Kagoshima University
3	Tuna fishery (Long-line / hand line fishing)	Assoc. prof. Habano, Kagoshima University
4	On-board quality control on Tuna fishing boat	Prof. Kaminishi, Kagoshima University

5	Tuna fisheries and freshness control	Assoc. prof. Ebata, Kagoshima University
6	Summary of Japanese Fisheries	Prof. Vazquez, Kagoshima University
7	The general outline of fishing technology	Pres. Matsuoka, Shigakukan University
8	Fisheries Management Policy	Pres. Matsuoka, Shigakukan University
9	Participatory fisheries management	Pres. Matsuoka, Shigakukan University
10	Japan's fisheries management	Pres. Matsuoka, Shigakukan University
11	Fisheries organizations and FCA, the case of CBFM/CM	Assoc. Prof. Torii, Kagoshima University
12	Katsuobushi processing	Prof. Kaminishi, Kagoshima University
Observation		
1	Skipjack tuna pole-and-line fishing vessel" (Implemented in parallel with Lecture 1)	Assoc. prof. Ishizaki, Kagoshima University
2	Purse-seine fishing vessel	Kitaura FCA
3	On-land facilities related SKJ/BFT fisheries	Yamakawa FCA
4	Kagoshima wholesale market	Kagoshima wholesale market
5	A case of fisheries management by local fisheries and FCA	Eguchi FCA
6	Katsuobushi processing factories	Yamakawa FCA
7	Small-scale fish processing factory, Direct sales Center of Fisheries Products	Eguchi FCA
Practice		
1	Practice for making line fishing gear	Mr. Marugi, Kagoshima University
2	Country report presentation	
3	PCM analysis	Pres. Matsuoka, Shigakukan University
	Design and presentation of Action Plan	Pres. Matsuoka, Shigakukan University, Assoc. prof. Ishizaki, Kagoshima University

2) Participants

Five (5) of the participants were dispatched from MoFA/MRC and the other five (5) were fishers who related to the project as following.

Table 3. Participants list of training 2016 (Fishing/Value-addition)

Name	Position / Occupation
Mr. Adam Manik	Deputy Director General, Fisheries Division, MoFA
Mr. Nazim Moosa	Asst. Policy Analyst, Fisheries Training Extension and Promotion Unit, MoFA
Mr. Hussain Rishwan Ismail	Farm Assistant, Marine Research Centre, MoFA
Mr. Ahsan Mohamed	Program Officer, Fisheries Training Extension and Promotion Unit, MoFA
Mr. Nasrulla Mohamed	Assistant Statistical Officer, Statistics, MoFA
Mr. Nadheem Hussain	Diver, Chum Thrower, Hoadhaavaru Fishing Boat
Mr. Ibrahim Ahmed	Fisher, Lh. Nahifaru
Mr. Ahmed Thalhath	Fisher, Gdh. Fiyoree
Mr. Hassan Majdhee	Fisher, Raskuri Dhoani
Mr. Mohamed Idhrees	Captain / Master Fisher, Dhonmohonu Dhoni

3) Review

It appears that this training contributed to the acquisition of techniques used for the implementation of pilot projects (PP.1, PP.2) concerning skipjack tuna fishing, and the collection of information on practical technical issues for the formulation of the Master Plan. The participants were public administration officers and fishers conversant with Maldives fisheries believed to have few chances to learn about outline of fishing, fishing techniques and quality control theoretically .except for some special experts. Especially it was useful for the administration staff to formulate the Master Plan bygetting to understand the content of the training through experiencing advanced Japanese examples actually. The observations on board fishing vessels, in freezing facilities and Katsuobushi processing factories contributed significantly to that purpose. For example, it is widely recognized by people related to Maldives fisheries that there is much difference in the quality of Katsobushi and *Hikimas*, but only a few person understands the reason for that. The participants were able to understand the differences in quality and process for both products through observation of their actual processing and also deepened their understandings what is needed to improve the quality of *Hikimas*. In addition, as the Japanese fishing vessels for skipjack tuna fishery, in particular their fish holding devices are significantly different from the same of vessels in Maldives, they could understand the advantage of the possible application to the the Maldivian fishing industry (i.e. the structure and use of live bait tank and the cold storage for fish holding).

The lectures about PCM method, observations of Fishery Cooperative Associations (?) and case studies of Government's approach for Fishery Cooperative Association (?) were well learnt by the participants. On the other hand, some participants wanted to have a lecture or an

observation on fish paste processing and to physically participate in a fishing operation with Japanese fishers.

During the implementation of the training, Shigakukan University offered several opportunities for exchange between participants and university students. This exchange encouraged both participants to understand Japanese culture and students to improve global understanding. Hence it could be considered that this training was a good experience for both participants and the host university.

2.3 Fisheries Management course

1) Outline of the course

a. Objectives of the training

The objectives are to acquire basic knowledge and skills required in response to priority issues of fisheries management in the fisheries sector of Maldives and to enable positive participation in the pilot-projects' implementation during the process of formulation of the Fishery Sector Development Plan.

b. Title of the training course

Knowledge Co-creation Program on Capacity Development for Fisheries Sector Technology (Fisheries Management)

c. Duration

June 27, 2016 – July 9, 2016

d. Curriculum

The curriculum is as shown in Table 4.

Table 4. Curriculum of training 2016 (Fisheries Management)

Lectures		
1	Japan's contribution to international fisheries resources management	Mr. Tahara and Mr. Tominaga, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries (MAFF)
2	Policy and system of fishery resources management and surveillance in Japan	Mr. Matsuda and Mr. Baba, Fisheries Agency, MAFF
3	Fishery information collection system for TAC management and information offering service for fishers	Mr. Yodoe, Japan Fisheries Information Service Center

4	Fisheries Management in Japan – view from comparing with other countries	Assoc. prof. Yagi, The University of Tokyo
5	The Grand Design of Fisheries and Resources management in Japan	Dr. Kaneko, National Research Institute of Fisheries Science
6	Role of the Fisheries Coordination Office for fisheries management	Mr. Kubodera, Sakaiminato Fisheries Management Office, Fisheries Agency of MAFF
7	Fishery management and surveillance of Tottori Prefecture	Mr. Hosomoto, Sakaiminato Fishery Office
8	Outline of resource and ocean survey, resources management (Bottom trawl)	Mr. Ishihara, Fisheries Experimental Station
9	The activities of purse-seine fisheries organization (Resources management for BFT)	Mr. Kawamoto, San-in purse-seine fisheries FCA
10	Report writing	Dr. Echigo, INTEM Consulting, Inc., et al.
Observations		
1	Shinagawa Aquarium	
2	Sakaiminato fishing port, wholesale market	Mr. Miyabe, Sakaiminato fishery office
3	Fisheries patrol vessel Hakureimaru	
4	Sakaiminato direct sales center for marine products	Mr. Kubodera, Sakaiminato Fisheries Management Office, Fisheries Agency of MAFF
5	AEON Mall Hiedzu	
6	Fisheries patrol vessel "Hayabusa	Mr. Yamamoto, Captain
7	Yodoe fishing port (Set-net fishery)	Mr. Kubodera, Sakaiminato Fisheries Management Office, Fisheries Agency of MAFF
8	Nakano fishing port (Small-scale fishing boat, etc.)	
9	Examination and development for processing of fisheries products	Mr. Kodani, Food Development Research Laboratory, Tottori Institute of Industrial Technology

2) Participants

Five (5) participants dispatched from MoFA/MRC are as below.

Table 5. Participants list for training 2016 (Fishing/Value-addition)

Name	Position in the MoFA

Mr. Muawin Yoosuf	Research Officer, Fisheries Management Section
Ms. Ummu Kulsoom	Project Officer, Fisheries Compliance Division
Mr. Ibrahim Haisam	Administrative Officer, Fisheries Management Section
Ms. Shifana Wafeer	Assistant Statistical Officer, Fisheries Division
Mr. Mohamed Shimal	Senior Research Officer, Marine Research Centre

3) Review

This training was designed in accordance with MoFA's request, focusing especially on fisheries monitoring and surveillance and collection/use of fishing information for advanced fisheries management in Japan. Moreover, it was intended to provide the participants with deep insights, combining actual observation on site and lectures on fisheries management / surveillance. Especially during the training in Tottori-prefecture, knowledge on a number of issues related to the surveillance of foreign fishing vessels was attained. It was indeed quite meaningful that they were able to grasp the function of the Fisheries Information Service Center, which supplies fishing- ground information using satellite and gathers / analyses them for TAC management in real time.

However, the Japanese fishing surveillance and information services are quite advanced, and therefore, there are a lot of issues when they will be applied to the Maldives. It seemed there was a certain effects for the participants to have the future perspective and practical outputs. The technical issues to be solved by the Master Plan became clearer. .

Moreover, the participants positively evaluated the observation of real sites for distribution of fishery products, i.e. the fishing port of Sakaiminato, markets of fish products, Yodoe small-scale fishing port and the surveillance vessels of Tottori-prefecture / Fisheries Agency. On the other hand, it was pointed out that the training schedule should be longer as there is much more to be learnt from Japan.

2.4 Aquaculture course

1) Outline of the Course

a. Objectives of the training

The objectives of the course are to improve the capacity of counterparts to implement the pilot project smoothly and to formulate the Master Plan properly through the acquirement of skills and knowledge necessary for aquaculture development in Maldives.

b. Title of the training course

Knowledge Co-creation Program on Capacity Development for Fisheries Sector Technology (Aquaculture)

c. Duration

July 10, 2016 – July 22, 2016

d. Curriculum

The curriculum is as shown in Table 6.

Table 6. Curriculum of training 2016 (Aquaculture)

Lectures		
1	Mariculture development in Japan	Mr. Terai, Fisheries & Aquaculture International (FAI)
2	The relationship between initial feed and abnormal morphology	Assoc. prof. Haga, Tokyo University of Marine Science and Technology
3	Recirculation system of mariculture	Asst. prof. Endo, Tokyo University of Marine Science and Technology
4	Seed production technology	Mr. Moromizato, Okinawa Sea Farming Center
5	Framework of the Fishery Cooperative Association	Mr. Sunaga, Iheyason Fisheries Cooperative Association
6	Recirculation system	Mr. Yamamoto, National Research Institute of Fisheries and Environment of Inland Sea
7	Report writing	Mr. Terai, FAI, et al.
Observations		
1	Facilities of seed production and initial feed cultivation	Okinawa Sea Farming Center
2	Facilities of grow-out and post-harvest, net-cage for grow-out	Iheyason Fisheries Cooperative Association
3	Kagawa Prefectural Fisheries Experimental Station	Mr. Kawanishi, Kagawa Prefectural Fisheries Experimental Station
4	Facility of marine fish seed production and marine cage culture	Yoshikawa Fisheries Co., Ltd.
5	Shin Yashima Aquarium	
6	Takamatsu Historical Museum	
7	Facilities of recirculation system	National Research Institute of Fisheries and Environment of Inland Sea
Practices		
1	Processing of grouper	Iheyason Fisheries Cooperative Association

2) Participants

Five (5) participants were dispatched from MRC as following.

Table 7. Participants list for training 2016 (Aquaculture)

Name	Position in MoFA
Mr. Adam Haleem	Senior Field Officer, Marine Research Centre
Mr. Ahmed Ibrahim	Mechanic, Marine Research Centre
Mr. Ahmed Mauroof	Launch Driver, Marine Research Centre
Mr. Hussain Ahmed	Aquaculturist, Marine Research Centre
Mr. Ismail Haleem	Research Officer, Marine Research Centre

3) Review

The training program was prepared giving priority to on-site observation of aquaculture/research. This was to confirm the sustainability of aquaculture of groupers and to clarify technical points to be tackled in the Master Plan. In particular, in line with MoFA's request, emphasis was given to seed production techniques and marine cage culture of groupers, which are presently crucial concerns in Maldives. In the aquaculture facilities of a private fish farm and a Fisheries Cooperative Association, large-scale industrial aquaculture was visualized for the future perspective. The observation of the Sea Farming Center was referable to a multi species hatchery which MoFA aims to construct and that of the Fisheries Experimental Station was also good reference to think about strengthening of MRC's role for the aquaculture-related department, respectively. On-the-job training was carried out on fish quality control and processing techniques in the Iheyason Fisheries Cooperative Association, showing the importance of value addition for aquaculture for the future.

Annex 8.

Exhibition on the FISHAGRI EXPO 2015

EXHIBITION ON THE FISHAGRI EXPO 2015

1. Background

Instead of "Fishermen' and Farmer's day", annual event implemented by MoFA in December for producers of fishery and agriculture products, "FISHAGRI EXPO 2015" was implemented jointly between public and private sector celebrating the 50th anniversary of "the Independence of the Republic of Maldives" ., . The event was implemented from 19th to 21st of November 2015 in Malé.

The Minister of Fisheries and Agriculture suggested the idea to exhibit "Japanese type live-bait tank model", when he received the reports on the study trip to Japan from MoFA participants. In response to his suggestion, the Project members started making a concrete plan for fabricating the model live-bait tank in July 2015. Thereafter, it was decided for MASPLAN to fully participate in the exhibition, with a booth exclusively for MASPLAN to display the model tank as well as the Project brochures etc.

2. Fabrication of Live Bait Tank Model

The tank model was made of Fiber Reinforced Plastic (FRP) panels without molding process and assembled in Japan, because of the tight construction schedule and the cost for a single item production.

(1) Requirements of the model structure

The required structure of the live bait tank of Japanese skipjack tuna pole-and-line vessel to ensure survival rate/duration of the live-bait is as follows;

- Water supply from the upper sides and drainage from the bottom of main tank to ensure up and down water circulation
- Structure to drain dead bait from the tank bottom to upper deck and outboard through ditches of drainage
- Structure not to stress live bait with controlling wave rolling and upset-waving of tank water by limiting water surface area

(2) Inspection tour of shipbuilders in Shikoku, Japan

An inspection tour to shipbuilders located in Shikoku was made to investigate and confirm the structure of actual live bait tank equipped in skipjack tuna pole-and-line fishing vessels of Japan.

- In case of Japanese skipjack tuna pole-and-line fishing vessels, several live-bait tanks are installed in the vessel with capacity of 2-3 m^3/unit.

- Cooling water pipes are installed within the heat insulating wall to ensure dissolution of oxygen and low water temperature

（3）Live bait tank model structure

As the result of research and examination, the structure of the tank model was decided as below.

Table 1. Specifications of the tank model

Item	Stuff	Qt'y	Notes
1 Main tank	FPP	1	730x930x1080Hmm, acryl window 2 sides, 574L
2 Receiver tank 1	FRP	1	400x393x343Hmm, acryl window 1 side
3 Receiver tank 2	FRP	1	500x900x500Hmm, 126L
4 Circulation pump		1	Magnet pump, 100V-90W, 70L/min, 8.2mH
5 Air pump		1	Diaphragm pump, 100V-26W, 30L/min
6 Submergible light		2	LED light, 100V-9.3W, installed inside of main tank
7 Control panel		1	400x400x250mm、built-in down transformer（220/100V）

<Dimensional specifications>

- Overall assembly dimension: 1,470mm L x 730mm W x 1,080mm H
- Assembly weight: overall weight 170kg, main tank 140kg, 2 receiver tanks and pumps etc. 30kg

See Fig1 hereafter regarding the design of the tank model.

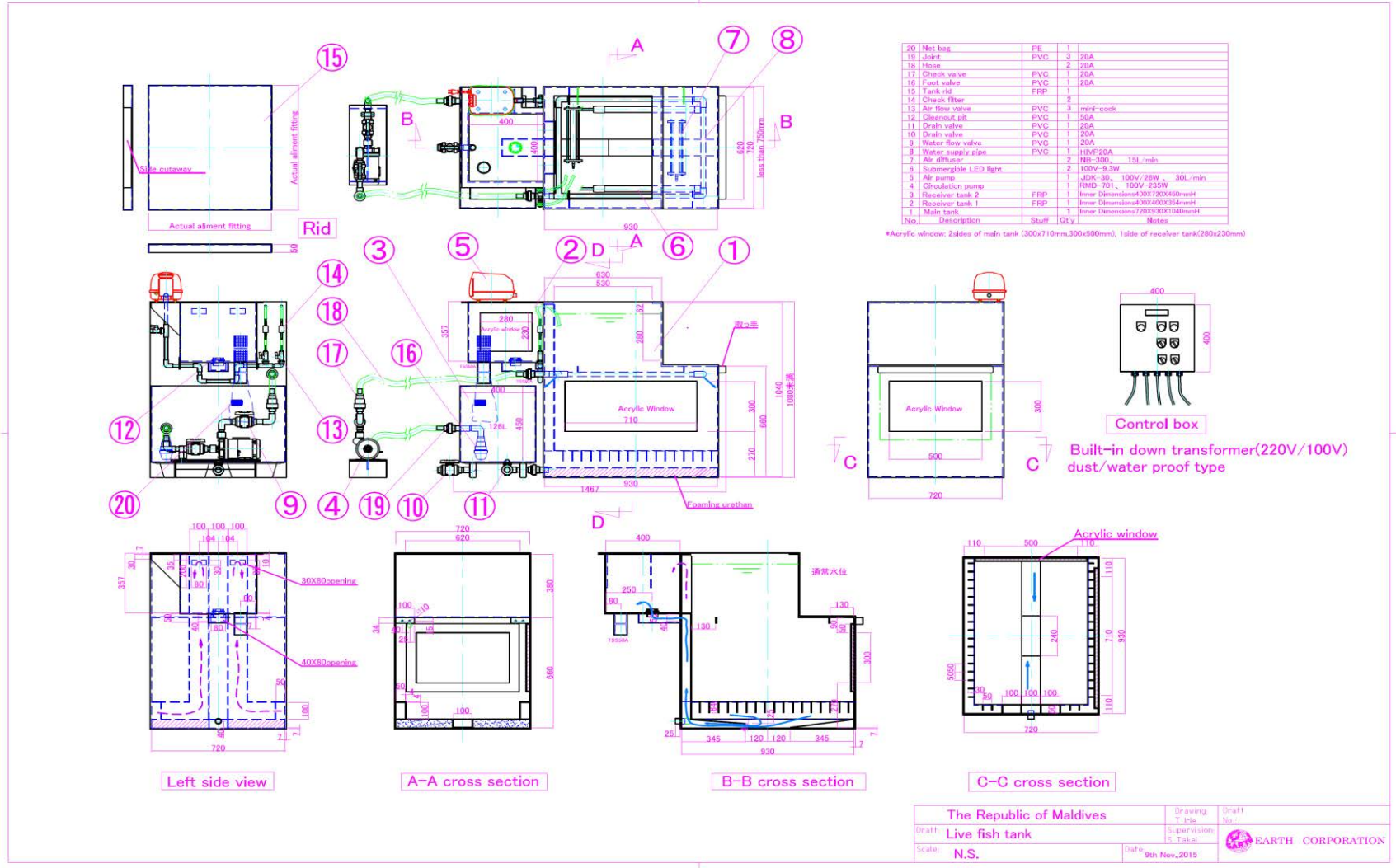


Figure 1. Assembly drawings of live-bait tank model

3. Transportation and Set-up of the Model

On 30th October 2015, a JICA expert at the factory in Japan carried out inspection and test running of the "live-bait tank model". He gained the knowledge of the assembling processes of the model in preparation for the exhibition.

Figure 2. The model arrived in MRC

The model packed in a strong wooden box was shipped from Tokyo/Narita Airport on 8th November and arrived at MRC on 16th November (Fig 2).

On 18th November, one day before the FISHAGRI EXPO 2015 opened, the project members transferred the model to the conference hall where it was to be exhibited, and it was assembled. On the first day of FISHAGRI EXPO, the preparation work to set up MASPLAN booth was held. Furthermore, in addition to exhibiting the model, the booth introduced project activities, e.g. through posters and pictures attached on the wall and setting up a TV monitor to show relevant videos.

4. Exhibition

(1) Schedule and program

FISHAGRI EXPO 2015 was held for 3 days (19 to 21 November 2015) – see Fig 3 and 4. A large number of visitors crowded the hall as well as MASPLAN booth, in particular observing the live bait tank model with great interest.

Figure 3. Displays in the MASPLAN booth

Figure 4. Explaining live-bait tank model

In addition, exhibition materials included the following:

A) Posters introducing the outline of the Project and the MASPLAN logo.

B) Posters and handouts for instruction on live-bait tank modification.

C) A video shows on live-bait tank modification.

D) A video shows on introduction of Japanese pole-and-line fishing.

E) A display of the "water Scoop-net" made by the Project.

F) Around 40 photos attached on the wall to present the Project activities

(2) Impression on the exhibition of the live-bait tank model

The "Japanese type live-bait tank model" is composed of 1) a main tank, 2) two reservoir tanks, 3) a switchboard, 4) an electric pump, 5) a blower and 6) pipes for water circulation and aeration; it has to be assembled for display then dismantled. This is a sensitive task which requires careful attention in manipulating the equipment and connecting the pipes properly, in order to avoid water leakage and/or breakdown of the pump. Therefore MoFA/MRC officers in charge of the model tank had been instructed on the process of assembly by a JICA expert; they took part in the installation work for the display at MRC in order to gain a better knowledge/understanding of the model structure.

To explain the structure of the automatic "dead bait" discharging system, rubber fake bait, called "soft-lure" and which looks like real sprat live-bait was used. It was designed to sink slowly like real live fish by using a small sinker. It was successful in improving the understanding of visitors on the highly effective structure of the Japanese live-bait tank.

Furthermore, to experiment the tank with real live-bait, small freshwater ornamental fish was put into the water tank and was successful for visitors to visualise the real live-bait tank.

Throughout the EXPO, TV and the press reporting extensively on the exhibition. In particular, The MASPLAN booth was reported on the national TV, with the interview of Mr. Riyaz broadcasted in the evening news, and on the on-line news site "Sun Online", with a photo of the booth. The exhibition on MASPLAN was reported by all media, which proved the high interest for the skipjack tuna fishery. MASPLAN was fortunate to take part in the EXPO, not only for the effects of project advertisement, but also impacts to MoFA. Until then, only a few MoFA/MRC officers understood the structure of live bait tank and quite a few officers knowledgeable on skipjack tuna fishery understood the issues of the tank. A number of officers could then understand these issues shown in a real situation. Especially, it was helpful to make understanding of technical agendas in practice to the officers involved in Oceanic Fisheries Sub-sector for formulating Master Plan.

After FISHAGRI EXPO, the model tank was transferred to MRC and shown to the public for the extension of the Japanese live bait tank, as verified in the pilot project.