

CHAPTER 6 Environmental and Social Considerations and Gender Considerations

6.1 Environmental and Social Assessment of the Project

6.1.1 Project Component to be Assessed from Environmental and Social Points of View

(1) Component 1

The Component 1 aims to establish Integrated Coastal Zone Management (ICZM) along with the capacity development of government officials responsible for the enforcement of the ICZM. The proposed adaptation measures do not include the physical development, therefore, there are no adverse impacts for the natural environment. The ICZM plan includes basic plan of coastal and reef conservation, sediment budget control and coastal land use at the national level. Applying the concept of the ICZM at the Island level, the ICZM plans for Gan and Fonadhoo islands in Laamu Atoll are to be formed as a case study. The ICZM at the national level as well as the island level will be examined from the view point of Strategic Environment Assessment (SEA).

(2) Component 2

The component 2 is basic design for physical measures for protecting coastal areas at 5 targeted islands. The project component is presented in Table 6.1.1. (see detail of the project in Chapter 5.4. Examination of the draft basic plan)

Table 6.1.1 Project Component

| Location | Project component | |
|--------------------------------|---|---|
| Isdhoo Island, Laamu Atoll | Revetment (Rubble type) | In order to protect the national cultural heritage area from coastal erosion, 360 m of coastal area at the north tip of the island (ocean side) is to be protected with revetment |
| Gan Island, Laamu Atoll | Revetment (Rubble type) | In order to protect the national cultural heritage area from coastal erosion, 270m of coastal area at the east side (ocean side) of the island is to be protected with revetment |
| Fonadhoo Island, Laamu Atoll | Beach nourishment | 1,600 m of the beach in the east side (ocean side) of island is to be protected by beach nourishment |
| Maamendhoo Island, Laamu Atoll | Beach nourishment with 3 groins Reclamation Revetment (Rubble type) | 400m of the beach in the west side is to be protected by beach nourishment with 3groins 70,000m ³ of the north tip of the island is to be reclaimed for securing an evacuation area 300m of the east costal area is to be protected with revetment |
| Meedhoo Island, Addu City | Beach nourishment with one groin | 1,700m of the north tip of the island is to be protected by beach nourishment with one groin. |

Note: Details of each project component will be finalized at D/D phase.

Source: JICA Expert Team

6.1.2 Condition of Survey Area

(1) Natural Environment

Geography

Maldives is formed from 26 atolls and about 1,200 islands of different shapes and sizes in the Indian Ocean. The characteristics of atolls and reefs vary greatly from north to south depending on latitude. The atolls located in the north are not composed of continuous edge of the atolls, but are composed of a large number of ring-shaped coral reefs which is called faro. The atolls located in the south tend to have a series of islands and fewer Faro.

In the north, beach ridges with coral gravel are often formed on the ocean side, and in the south, there are many low and flat islands. The ground levels of the inhabited areas are about 1.0 to 2.0 m above the average sea level on the northern island, and about 0.6 to 1.6 m on the central and southern islands. The water depth of the lagoon is 30 to 40m in the north, 40 to 60m in the middle, and 60 to 80m in the south.

Climate

Maldives has a hot and humid tropical climate with an average temperature of 26 to 33 ° C (average maximum temperature of 30 to 33, ° C and average minimum temperature of 24 to 28 ° C) throughout the year. The seasons are divided into two periods which are the northeast monsoon season (November to April) and the southwest monsoon season (May to October). Temperature, wind conditions, rainfall and tide level are being observed at the three locations of Hanimaadhoo in Haa Dhaalu Atoll, Male in North Male Atoll, and Gan in Laamu Atoll. Figure 6.1.1 and Figure 6.1.2 show monthly average maximum and minimum temperature at each location.

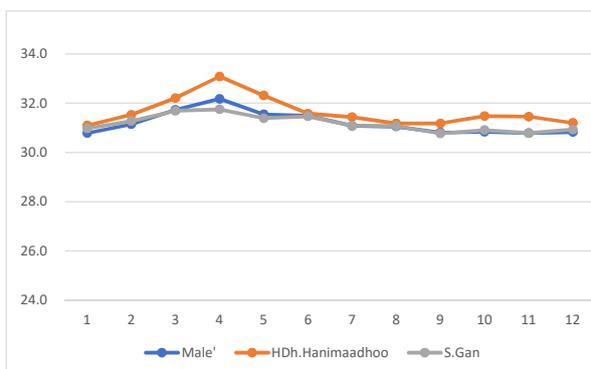


Figure 6.1.1 Average Maximum Temperature at Three Measuring Points

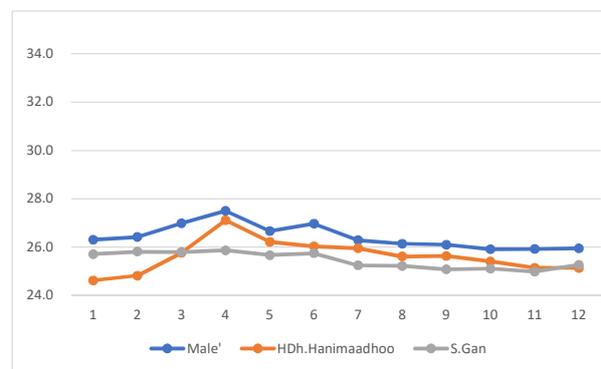


Figure 6.1.2 Average Minimum Temperature at Three Measuring Points

Source: National Bureau of Statics, modified by JICA Expert team

The average monthly rainfall from 2011 to 2020 at three measuring points is shown in Figure 6.1.3. The amount of rainfall in Maldives varies according to the two monsoon seasons. Southwest monsoon season (May to October) has more rainfall than the northeast monsoon season (November to April). As can be seen from the annual average rainfall at the three measuring points shown in Figure 6.1.4, there are no differences in rainfall during the southwest monsoon season (May to October) all over the Maldives, however, rainfall during the northeast monsoon season (November to April) tends to increase from the north to the south in the Maldives.

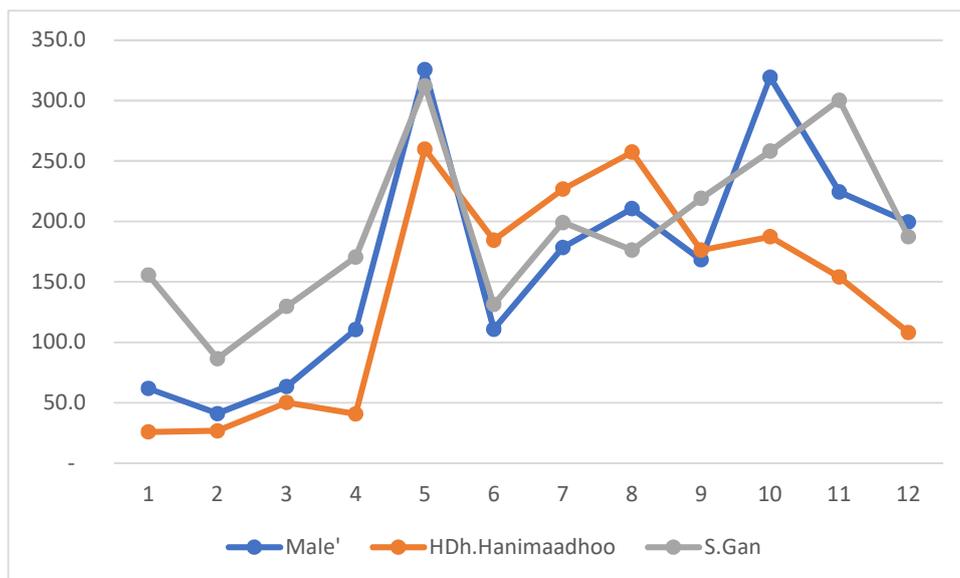


Figure 6.1.3 Average Monthly Rainfall from 2011 to 2020 at Three Measuring Points (2011-2020)

Source: National Bureau of Statics, modified by JICA Expert team

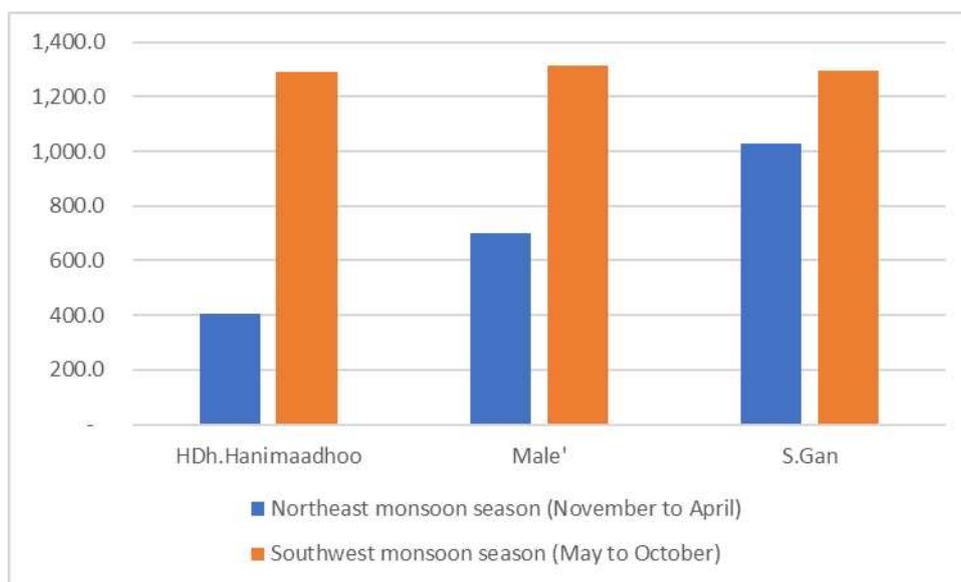


Figure 6.1.4 Annual Average Rainfall at the Three Measuring Points (2011-2020)

Source: National Bureau of Statics, modified by JICA Expert team

Hydrology

Table 6.1.2 shows the tide level conditions at three measuring points in the Maldives obtained from the observation results by Ministry of Environment and Energy (2016). The average tide level difference in Maldives is not so large, and less than 1m in average.

Table 6.1.2 Tide Level Conditions at Three Measuring Points

| Water Level from MSL(m) | Hanimaadhoo (2010-2011) | Male (2007-2011) | Gan (1992-1998) |
|--------------------------------|----------------------------|---------------------|--------------------|
| Highest High Water (HHW) | 0.62 | 0.62 | 0.79 |
| Mean Highest High Water (MHHW) | 0.36 | 0.34 | 0.39 |
| Mean High Water (MHW) | 0.35 | 0.33 | 0.38 |
| Mean Low Water (MLW) | -0.41 | -0.36 | -0.40 |
| Mean Lowest Low Water (MLLW) | -0.42 | -0.37 | -0.41 |
| Lowest Low Water (LLW) | -0.80 | -0.72 | -0.78 |

Source: Second National Communication of Maldives (2016)
University of Hawaii Sea Level Center database.

Source: JICA Expert Team

Protected area

There were no nature reserves, including marine protection areas, established on the target islands of Laamu Atoll, however, in 2021, the seven (7) sites, including coast and coral reef areas around Fairly pond (Boda Fengan' du Area) on Gan Island has been designated as a protected area.

In Addu Atoll, a protected area has been established around Hithadhoo Island and the Kandihera-Maakandu Channel, which is about 7 to 14 km away from the target area in Meedoo island. In 2020, the two (2) sites in Meedhoo (Hulhumeedhoo) island were designated as protected areas: Mathi Kilhi and Maafishi Kilhi, but those two areas are inland wetland, so that there are no adverse impact from the beach nourishment along the northern coast of Meedhoo island.

Protected areas in two atolls are listed as following tables and figures.

Table 6.1.3 Protected Areas in Addu and Laamu Atolls

(1) Laamu Atoll

| Name | Islands | Area (ha) | PA Type |
|--|---------------|-----------|---------------------------|
| L. Gan Boda Fengan' du Area | L. Gan | 15.03ha | Wetland/ Terrestrial |
| L. Maabaidhoo Koaru Area | L. Maabaidhoo | 174.46ha | Wetland |
| L. Fushi Kan' du Area | | 346.62ha | Marine |
| L. Bodu Finolhu and Vadinolhu Kandu Olhi Area | | 706.02ha | Marine |
| L. Gaadhoo Turtle Nesting Area, Mangrove and Seagrass Area | L. Gaadhoo | 614.88ha | Terrestrial/ Marine |
| L. Gaadhoo Hithadhoo Gan' du Area | | 777.04ha | Marine |
| L. Hithadhoo Wetland and Surrounding Marine Area | L. Hithadhoo | 43.3ha | Mangrove/ Wetland/ Marine |

Source: (IUL)438-ENV/438/2021/371

(2) Addu Atoll

| Name | Islands | Area (ha) | PA Type |
|---|--------------------|-----------|-------------------|
| Eidhigali Kilhi And Koatthey Area | S. Hithadhoo | 770.6ha | Mangrove/MPA |
| Kandihera-Maakandu Channel (Addu Manta Point) | Kandihera-Maakandu | 735.0ha | MPA |
| British Loyalty Shipwreck | | 64.7ha | MPA |
| Kuda Kandu | Kuda Kandu | 462.0ha | MPA |
| Maakilhi and Feheli Kilhi | S. Hithadhoo | 25.4ha | Mangrove/ Wetland |

| Name | Islands | Area (ha) | PA Type |
|----------------|-----------------|-----------|----------------------|
| Maafishi Kilhi | S. Hulhumeedhoo | 5.8ha | Mangrove/ Wetland |
| Mathi Kilhi | S. Hulhumeedhoo | 54.1ha | Mangrove/ Wetland |

Source: (IUL)438-ENV/438/2020/162

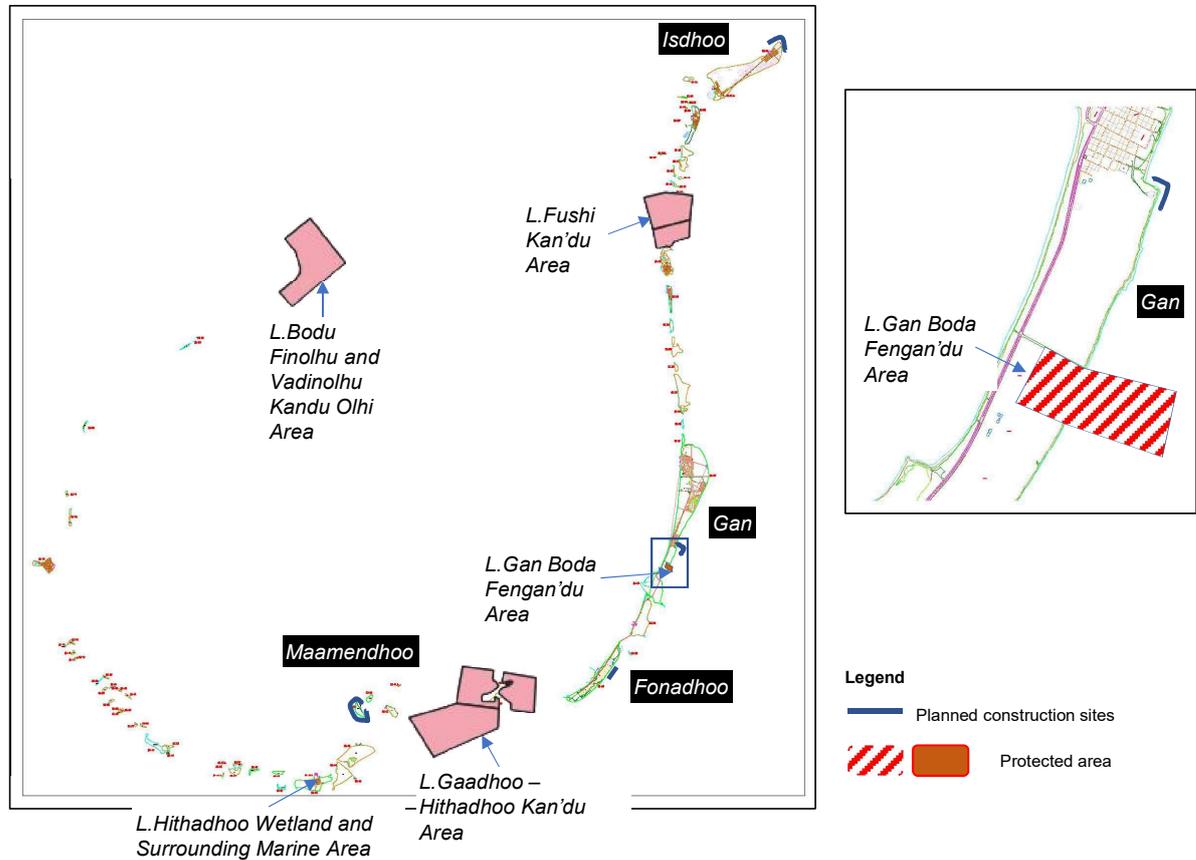


Figure 6.1.5 Location of the Protected Area in Laamu Atoll

Source: EPA (2021), modified by JICA Expert team

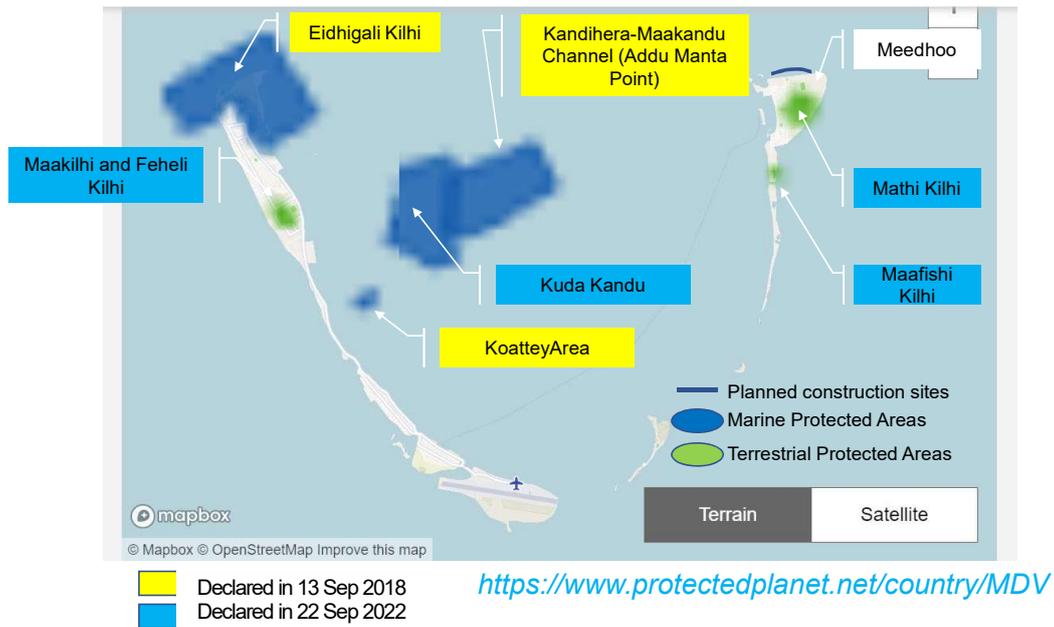


Figure 6.1.6 Location of the Protected Area in Addu Atoll

Source: UNEP-WCMC and IUCN (2022): (<https://www.protectedplanet.net/en/country/MDV>), modified by JICA Expert Team

In Maldives, there is only one Key Biodiversity Area (KBA) site and Important Bird Area (IBA) site in Haa Alifu Atoll, and there is no KBA sites in the project areas.

Also, the whole areas of Addu Atoll were designated as the Addu Atoll Biosphere reserve in October 2020, and all the areas are categorized into three categories: i.e. core zone, buffer zone and transition area. The locations of all of the protected areas are same as the locations of core zones and buffer zones of the Biosphere reserve. The locations of the Addu Atoll Biosphere reserve are shown in the following figure.

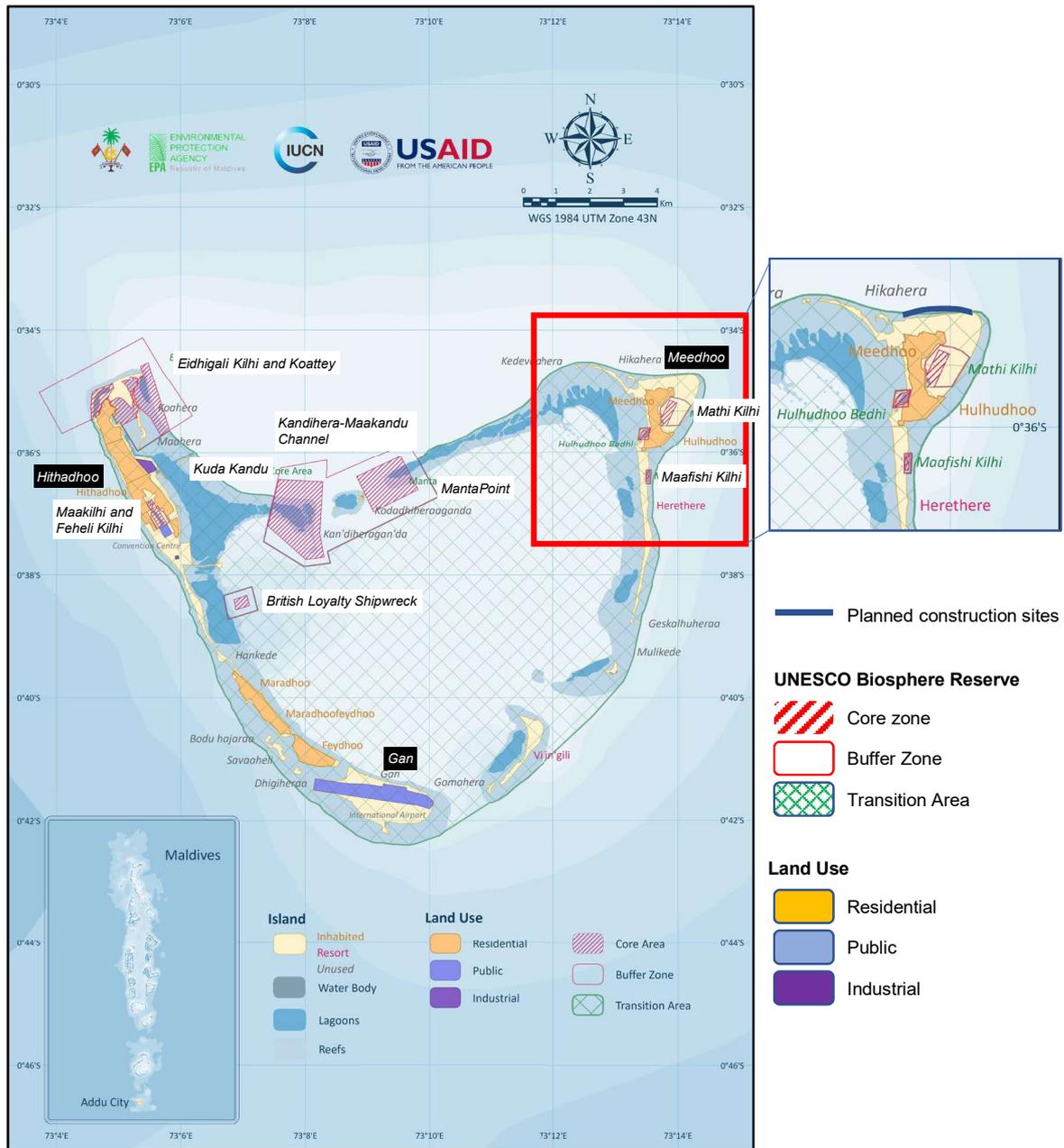


Figure 6.1.7 Location of the Addu Atoll Biosphere reserve

Source: UNESCO (2020) (<https://en.unesco.org/biosphere/aspac/addu-atoll>), modified by JICA Expert Team

(2) Social Environment**Population and Habitat**

Population and population density of 5 targeted islands is shown in Table 6.1.4. The population density in Maamendhoo is prominently high among 5 islands.

Table 6.1.4 Population, Population Density and Number of Households in 5 islands

| Island | Population (male/female) | Population Density (person/m) | Households (number) |
|------------|--------------------------|-------------------------------|---------------------|
| Fonadhoo | 3,010 (1540/1470) | 17.79 | 723 |
| Gan | 5,236 (2687/2349) | 10.13 | 710 |
| Isdhoo | 1,425 (N/A) | N/A | N/A |
| Maamendhoo | 1,337 | 68.92 | 250 |
| Meedhoo | 3037 (1549/1488) | 16.16 | 570 |

Source: JICA Expert Team

Religion

All targeted islands are Suni Muslim.

Employment by Sector

Depend upon the island, employment by sector varies. Government services is the most popular sector in Fonadhoo and Gan. Isdhoo is more agriculture-oriented island. The most of the people is engaged in fishery in Maamendhoo. Private business (trading) is the most popular in Meedhoo. The employment by sector in 5 islands is presented in Table 6.1.5 .

Table 6.1.5 Employment by Sector in 5 islands

| Island | Sector | % in total employment |
|------------|------------------------------|-----------------------|
| Fonadhoo | 1.Government Services | 90 |
| | 2.Private business (trading) | 9 |
| | 3.Tourism | 1 |
| Gan | 1.Government Services | N/A |
| | 2.Fishery | |
| | 3.Agriculture | |
| | 4.Private business | |
| | 5.Tourism | |
| Isdhoo | 1.Agriculture | 90 |
| | 2.Government Services | N/A |
| | 3.Fisheries | N/A |
| Maamendhoo | 1.Fishery | 70 |
| | 2.Government Services | 15 |
| | 3.Tourism | 15 |
| Meedhoo | 1.Private business (trading) | 36 |
| | 2. Tourism | 35 |
| | 3.Government Services | 25 |
| | 3.Agriculture | 2 |
| | 4.Fishery | 2 |

Source: JICA Expert Team

Source of Water

Well water and rain water is the most popular water source in 5 islands. Supply water is available in Fonadhoo, Gan and Meedhoo islands. There is a plan to construct water treatment plant in Isdhoo and Maamendhoo. The water source in 5 islands is presented in Table 6.1.6.

Table 6.1.6 Water Source in 5 islands

| Island | Water Source | Remarks |
|------------|--|---|
| Fonadhoo | Well water Rain water Supply water | Ground water is treated at the water treatment plant in the Island and supplied through distribution pipe. 27% of the household is contracted to the supply water system. Rain water is used for cooking, washing, and farming Bottled water for drinking is also popular |
| Gan | Well water Rain water | Rain water is used for cooking, washing, and farming In case of emergency (draught), water is to be distributed from the desalination plant through water distribution pipe covering all houses in the Island. |
| Isdhoo | Well water Rain Water | Rain water is used for cooking, washing, and farming |
| Maamendhoo | Well water Rain water | Rain water is used for cooking, washing, and farming |
| Meedhoo | Well water Rain water Supply water | Well water is used for washing and cooking Rain water is used for drinking Bottled water is also popular for drinking Most of the household is connected to the desalination plant. |

Source: JICA Expert Team

Energy Consumption

All island is electrified by diesel generators. Energy source for cooking is gas (Butane), electricity and firewood in all islands. Electrification rate and energy source for cooking in 5 islands is presented in Table 6.1.7.

Table 6.1.7 Electrification Rate and Energy Source for Cooking

| Island | Electrification Rate (%) | Energy Source for Cooking |
|------------|--------------------------|--|
| Fonadhoo | 100 | Gas (Butane: main source) |
| Gan | Diesel generator | Electricity |
| Isdhoo | | Firewood (only when cooking large amounts to save gas) |
| Maamendhoo | | |
| Meedhoo | | |

Source: JICA Expert Team

Transportation

More than 1 sea port is in operation in 5 islands. Number of seaport and airport in 5 islands is presented in Table 6.1.8.

Table 6.1.8 Number of Seaport and Airport in 5 islands

| Island | Seaport | Airport |
|------------|---------|---------|
| Fonadhoo | 1 | 0 |
| Gan | 2 | 0 |
| Isdhoo | 1 | 0 |
| Maamendhoo | 1 | 0 |
| Meedhoo | 2 | 0 |

Source: JICA Expert Team

Education

There is a school covering up to the 12th grade (higher secondary level) in all islands except Isdhoo (up to 7th grade primary level) and Meedhoo (up to 10th grade lower secondary level). Number of schools in 5 islands is presented in Table 6.1.9.

Table 6.1.9 Number of School in 5 islands

| Island | Type and number of schools |
|------------|--|
| Fonadhoo | Pre-school 1, School (primary and secondary) 1, Islamic University 1 |
| Gan | Pre-school 1, School 1 |
| Isdhoo | Pre-school 1, School up to 7 th grade 1 |
| Maamendhoo | Pre-school 1, School 1 |
| Meedhoo | Pre-school 2, School up to 10 th grade 1 |

Source: JICA Expert Team

Waste Management

There is one open dumping site prepared for each island. Starting from the 1st June 2022, waste segregation (organic waste, plastics, others such as papers, cans and glasses) become compulsory¹⁾ at generated points such as household and commercial facilities in the capital city Malé and it will be gradually adapted to other Atolls. In Addu city and Laamu Atoll, the waste segregation has not practiced formally yet. In Meedhoo Island, waste needs to be segregated in 7 items, food residues, paper, plastic bottle, glass, steel, aluminum and hazardous waste and collected once in a week. Number of dumping site and method of collection is shown in Table 6.1.10.

Table 6.1.10 Number of Dumping Site and Method of Collection

| Island | Number and location of the dumping site | Method of collection | Collection fee |
|------------|---|--|---|
| Fonadhoo | 1 End of south east side of the Island | Collected everyday About 70% of houses are registered for the service | 150MVR/Month |
| Gan | 1 Middle part along east shoreline | Collected everyday 80% of houses are registered for the service | 150MVR/Month |
| Isdhoo | 1 North east of the Island | Collected every day except Friday Isdhoo Island Council is in charge of waste collection service 234 houses and 15 café/shops registered for the service | 140MVR/Month |
| Maamendhoo | 1 West tip of the Island | Collected every day except Friday Maamendhoo Island Council is in charge of waste collection service | 100MVR/Month from Household 200MVR/Month from Government organizations |
| Meedhoo | 1 North east of the Island | WAMCO (Gov. company) Waste is to be segregated as food residues, plastic bottle, glass, steel, iron, hazardous waste and collected once in a week | 100 MVR |

Source: JICA Expert Team

Cultural Heritage

Gamu Hath'theli in Gan Island and Isdhoo Bodu Hath'theli in Isdhoo Island are ancient Buddhist heritages declared as National Cultural Heritage in 2019. In Meedhoo Island, the oldest Muslim cemetery in the Maldives called Koagannu Cemetery dating back 900 years is declared as National Cultural Heritage.

6.1.3 Legal and Institutional Framework in Maldives

(1) Legislation relevant to Environmental and Social Considerations

Laws and Regulations

Law and regulations relevant to environmental and social considerations are listed in Table 6.1.11

Table 6.1.11 Law and Regulations Relevant to Environmental and Social Considerations

| Regulations |
|---|
| Environmental Protection and Preservation Act (Act No.4/93) First amendment (2014) |
| Environmental Assessment Regulation (2012) First amendment (2013/ R-18) Second amendment (2015/ R-174) Third amendment (2016/ R-66) Fourth amendment (2017/ R-7) Fifth amendment (2018/ R-131) |
| Regulation for the Determination of Penalties and Obtaining Compensation for Damages Caused to the Environment (2011/R-9) |
| Waste Management Regulation (2013/R-58) |
| Dredging and Reclamation Regulation (Regulation 2013/R15) First amendment (2014) |
| Cultural and Historical Places and Object Act (Act No.27/79) |
| Regulation on Cutting Down and Export of Trees and Coconut Palms (Regulation 7-R/2014) |
| Coral and Sand Mining Regulation (2000) |
| Regulation on Protected Areas (2018/R-78) |
| Protect Species Regulation (2021 R-25) |

Source: JICA Expert Team

Environmental Protection and Preservation Act (Act No.4/1993)²⁾

The Environmental Protection and Preservation Act of the Maldives (Law No. 4/93), provides the basic framework for environmental management including the Environmental Impact Assessment (EIA) process in the Maldives, which is currently being implemented by the Environmental Protection Agency (EPA) on behalf of Ministry of Planning, Human Resources and Environment. It gives the Government of the Maldives the right to claim compensation for all damages caused by activities that are detrimental to the environment.

1st Amendment to Environmental Protection and Preservation Act (2014)³⁾

The Clause 3 of the Environment Act was amended by the first amendment of the Environmental Protection and Preservation Act in 2014, which defines duties of the state institution mandated with executing the environment policies of the Maldives. It shall formulate policies, regulations and standards with consultation from relevant

authorities to protect biodiversity, access to benefit sharing, to protect freshwater lens of islands and mangroves within, to protect from waste and hazardous gases and protect and conserve the environment.

Environmental Impact Assessment Regulation (2012)⁴

The Ministry of Environment issued the EIA regulation in May 2012, which guides the process of undertaking the Environmental Impact Assessment in the Maldives. This guideline also provides a comprehensive outline of the EIA process, including the roles and responsibilities of the consultants and the proponents. This regulation outlines every step of the EIA process beginning from the application to undertake an EIA, details on the contents, minimum requirements for consultants undertaking the EIA, format of the EIA/IEE report, and many more. The guidance provided in this Regulation was followed in the preparation of this EIA report. The EIA has also been prepared by registered consultants.

First Amendment to the Environmental Impact Assessment Regulation (Regulation 2013/R-18)⁵

This first amendment was gazetted on 9th April 2013. This amendment stipulates that the responsible authority has to check the submitted EIA report for everything mentioned in the Regulation's article (Kaafu) and inform the proponent whether the EIA Report has been accepted or rejected within two working days. The penalty for repetitive offenses has also been updated in this amendment of the regulation.

Second Amendment to Environmental Impact Assessment Regulation (Regulation 2015/R-174)⁶

The second amendment gazetted on 30th August 2015 includes the following important points:

Some procedural changes have been made to the EIA process: e.g., shifting the tourism related developmental project EIAs to the Ministry of Tourism, ii) changes in the process such as finalization of the Terms of Reference during the scoping meeting, and iii) changes in the fees structure for the review process have been made to include three different categories.

Third Amendment to the Environmental Impact Assessment Regulation (Regulation 2016/R-66)⁷

The third amendment gazetted on 11th August 2016 includes the following important points:

- The point system for consultants, categories of the consultants, and amendment of the penalties to consultants and proponents who fail to follow the regulation.

Fourth Amendment to the Environmental Impact Assessment Regulation (Regulation 2017/R-7)⁸

The fourth amendment gazetted on 19th January 2017 includes the following points:

The projects that can be preceded without an Environmental Impact Assessment when the proponent requests to the Ministry of Environment and Energy in writing along with commitments or guarantee that the Proponent will carry out the mitigation measures that may impact the Environment due to such projects. A list of such projects given in the amendment is as follows:

- 1) Removal of deposited sand inside the harbor
- 2) Trees and palms present on lands left for the purpose of building houses need to be taken by the owner of the land.
- 3) If trees/palms present on lands left for building purposes obstruct the roads need to be removed.

(Such cases will be handled by the council of the island).

- 4) Creating boreholes on land for the uptake of water.
- 5) On lands, which are connected to naturally formed islands, projects that are carried out before three years since the reclamation of land.
- 6) On lands, which are newly reclaimed in the middle of a lagoon, projects which are carried out for before five years since the reclamation.

Even on the lands mentioned in numbers 5 and 6 of clause a) of this regulation, the projects listed down below can only be carried out under the EIA regulation (2012) with the approval of the ministry.

- 1) Projects involving hazardous/toxic chemicals
- 2) Projects involving the storage of oil
- 3) Projects involving the usage of incinerators
- 4) Projects which would release any kind of toxic fumes into the atmosphere

Fifth Amendment to Environmental Impact Assessment Regulation (Regulation 2018/R-131)⁹⁾

The fifth amendment gazetted in 2018 includes the following points:

Some procedural changes have been made to the EIA process. The EIA procedure is changed re-including the tourism related developmental project EIAs to the Ministry of Environment from the Ministry of Tourism.

Regulation for the Determination of Penalties and Obtaining Compensation for Damages Caused to the Environment (2011/R-9)¹⁰⁾

The Regulation for the Determination of Penalties and Obtaining Compensation for Damages Caused to the Environment (Regulation No. R-9/2011) was published with the aim of stopping the violations under the Environment Protection and Preservation Act of the Maldives and setting out the procedures and guidelines on how to determine penalties and obtain compensation for damages caused to the environment.

Waste Management Regulation (Regulation 2013 R-58)¹¹⁾

Waste Management Regulation is purposed to implement the national waste policy. It contains five main sections: (i) Waste management standards, ii) Waste management Permits, (iii) Standards and permits required for waste transport on land and sea, including transboundary movements, (iv) Reporting and monitoring requirements and procedures, (v) Procedures to implement waste management regulation and penalties for noncompliance.

It is stipulated that domestic waste produced during the construction and operation phase of the project must be disposed through the existing waste management system in the City/Island Council concerned and, chemical waste or hazardous waste such as used oil or any other chemical used for the project must be transported to Thilafushi Waste Management Centre for disposal.

Dredging and Reclamation Regulation (Regulation 2013/R-15)²⁾

The regulation of Dredging and Land Reclamation was published on 2 April 2013 with the aim of minimizing environmental impacts associated with dredging activities in islands and reefs across the Maldives. It requires that all dredging and reclamation activities must be approved by EPA in writing. The process includes the submission

of project information to EPA along with a scaled before and after map. The regulation defines rationales for reclamation as those absolutely necessary for social, economic, or safety purposes.

Dredging is restricted in the following areas:

- a) 500 m from reef edge to outer reef;
- b) 100 m from reef edge towards island;
- c) 50 m from shoreline;
- d) An environmentally sensitive site;
- e) Land reclamation is restricted within 200 m of a sensitive area; and
- f) Land reclamation cannot exceed 30% of the house reef area.

The regulation requires producing scaled-maps of the island before and after the proposed project. Land use plan and the details of essential requirement should be submitted to EPA as a part of EIA report. Along with these details, a geo-referenced scale map (1:10,000) should be also submitted. Permission of dredging is to be granted by EPA when the submitted EIA report was approved.

Special provisions have been made on protected and sensitive area restricting changes to the environment of the islands.

First Amendment to the Dredging and Reclamation Regulation (2014)¹³⁾

This amendment to the regulation came into force on 9 February 2014 and has brought changes to Clause 13 (d) of the Dredging Regulation. The amendment explains that the developmental projects planned under the cabinet decision or run under government developmental projects can be preceded even after it falls under Clause 13 (d) number 4, which prohibits sand removal for reclamation at environmental sensitive areas, along with the conditions given in the First Amendment. The conditions given in the amendment are as follows:

- a) Carry out a study on the existence of living flora, fauna, and threatened species.
- b) Submit a plan and obtain permission for such plans on how to transfer, shift, and farm the threatened species.
- c) Develop a natural area not smaller than the existing area with the existing characteristics or develop an area with such characteristics that are instructed by the Implementation Agency as per the policy, regulation, and standards and set arrangements to protect, manage, and monitor such areas.
- d) Carry out a study to monitor the impact on the existing aquifer and to take mitigation measures to prevent the occurrence of likely impacts. Additionally, these activities should be monitored by the implementation Agency.
- e) Carry out a study on possible flooding and implement a suitable drainage system as a mitigation measure.

Cultural and Historical Places and Objects Act (Act No.27/79)¹⁴⁾

The Law on Cultural and Historical Places and Objects of the Maldives (27/79) prohibits destroying or damaging any historical and cultural places, sites, objects, and artifacts belonging to the sovereign area of the Maldives.

The cultural sites mentioned in this regulation are things or places used by locals or foreign ancestors who had resided in the Maldives. Monuments or idols, which have been created in honor of certain personalities or idols that people used to worship in the past, are also protected under this regulation. However, with the permission from the relevant authorities of the government, it is stipulated that cultural sites are allowed to be touched and studied in such a way that their original identity is not lost.

Regulation on Cutting Down and Export of Trees and Coconut Palms (Regulation No. 7-R/2014)¹⁵⁾

The Regulation on Cutting Down and Export of Trees and Palms (Regulation No. 7-R/2014) specifies that the cutting down, uprooting, digging out, and export of trees and palms from one island to another can only be done if it is absolutely necessary and if there is no other alternative. It further states that for every tree or palm removed in the Maldives two more should be planted and grown in the island.

The regulation prohibits the removal of the following tree types;

- a) The coastal vegetation growing around the islands extending to about 15 meters into the island;
- b) All the trees and palms growing in mangrove and wetlands spreading to 15 meters of land area;
- c) All the trees that are in a government designated protected areas;
- d) Trees that are being protected by the government in order to protect species of animal/organisms that live in such trees; and
- e) Trees/palms that are abnormal in structure.

Coral and Sand Mining Regulation (2000)¹⁶⁾

The Regulation on Sand and Coral Mining was issued by the Ministry of Fisheries, Agriculture, and Marine Resources (MOFA) on 13 March 2000. Prior to this regulation, coral mining from house reef and atoll rim has been banned through a directive from the President's Office dated 26 September 1990.

This regulation covers sand mining from uninhabited islands that have been leased; sand mining from the coastal zone of other uninhabited islands; and aggregate mining from uninhabited islands that have been leased and from the coastal zone of other uninhabited islands. It stipulated that sand should not be mined from any parts of the existing island, beach, or the newly reclaimed island beach. Sand should also not be mined from within 100 feet of the shoreline.

Regulation on Protected Areas (2018/R-78)¹⁷⁾

The regulation on protected areas categories the protected areas in the Maldives as Category 1) Internationally recognized areas, Category 2) Strict Nature Reserve, Category 3) Wilderness Areas, Category 4) National Park, Category 5) Natural Monument, Category 6) Habitat/Species Management Area and Category 7) Protected Area with Sustainable Use

Regulation on Protect Species (2021 R-25)¹⁸⁾

The regulation on protect species stipulates the protected species in the Maldives. It provides guidelines on designating protected species, permits to handle protected species, procedure to research protected species and fines on capturing and handling protected species or damaging habitats of protected species. In total of 214 species including birds, marine species are listed in this regulation.

Multilateral Agreement

The Maldives is the party of the following multilateral agreement.

- a) United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol¹⁹⁾
- b) United Nations Convention on Biological Diversity (UNCBD)²⁰⁾
- c) United Nations Convention to Combat Desertification (UNCCD)²¹⁾
- d) United Nations Convention on the Law of the Sea (UNCLOS)²²⁾

Environmental Standards

Air Quality

No ambient air quality standards are set in the Maldives. As for the Project, the standards in WHO Global Air Quality Guidelines (2021) are applied as reference standards as shown Table 6.1.12.

Table 6.1.12 Ambient Air Quality Standards

| Pollutant | Averaging time | Interim target | | | | AQG level |
|---------------------------------------|--------------------------|----------------|-----|------|----|-----------|
| | | 1 | 2 | 3 | 4 | |
| PM _{2.5} , µg/m ³ | Annual | 35 | 25 | 15 | 10 | 5 |
| | 24-hour ^a | 75 | 50 | 37.5 | 25 | 15 |
| PM ₁₀ , µg/m ³ | Annual | 70 | 50 | 30 | 20 | 15 |
| | 24-hour ^a | 150 | 100 | 75 | 50 | 45 |
| O ₃ , µg/m ³ | Peak season ^b | 100 | 70 | – | – | 60 |
| | 8-hour ^a | 160 | 120 | – | – | 100 |
| NO ₂ , µg/m ³ | Annual | 40 | 30 | 20 | – | 10 |
| | 24-hour ^a | 120 | 50 | – | – | 25 |
| SO ₂ , µg/m ³ | 24-hour ^a | 125 | 50 | – | – | 40 |
| CO, mg/m ³ | 24-hour ^a | 7 | – | – | – | 4 |

^a 99th percentile (i.e. 3–4 exceedance days per year).

^b Average of daily maximum 8-hour mean O₃ concentration in the six consecutive months with the highest six-month running-average O₃ concentration.

Source: WHO Global Air Quality Guidelines (2021)

Noise

No ambient noise standard is set in the Maldives. As for the site survey for the Component 2, WHO Noise Environmental Health Criteria 12 (EHC 12, 1980)²³⁾ which recommends noise exposure limits for general outdoor noise levels is 55 dB as well as WHO Environmental Noise Guidelines for EU Region (2018)²⁴⁾ which indicates 53dB as the threshold for desirable road traffic noise levels were applied as reference standards.

Water Quality

Water quality standards for drinking water and marine water quality standards are set by EPA as shown in Table 6.1.13 and Table 6.1.14 respectively. As for the treated waste water, indicative values for treated sanitary sewage discharges in General EHS Guidelines: Environmental, Wastewater and Ambient Water Quality (2007) is applied for the Project as shown in Table 6.1.15.

Table 6.1.13 Drinking Water Quality Parameter Optimum Conditions

| Parameter | Optimal Range |
|-------------------------|------------------|
| Temperature | - |
| Salinity | - |
| pH | 6.5 – 8.5 |
| Electrical Conductivity | <1000 uS/cm |
| Total Dissolved Solids | <500 mg/L |
| Turbidity | <1 NTU |
| Iron | <0.3 mg/L |
| Ammonia | <0.02 – 2.5 mg/L |
| Suspended Solids | 5 – 750 mg/L |
| Total Hardness | <75 mg/L |
| Hydrogen Sulphide | <0.05 mg/L |
| Nitrates | <50 mg/L |
| Chlorides | <200 mg/L |
| Fecal Coliform | 0/100ml CFU |
| Total Coliform | 0/100ml CFU |
| Free Chlorine | 0.04 – 0.2 mg/L |

Source: Data collection guideline EPA²⁵⁾**Table 6.1.14 Marine Water Quality Parameter Optimum Conditions**

| Parameter | Optimal Range | Reference |
|---------------|---|---------------------------|
| Temperature | 18°C and 32°C *Changes should not surpass 10C above the average long-term maximum | GBRMPA, 2009 |
| Salinity | 3.2‰ - 4.2‰ (32‰ - 42‰) | GBRMPA, 2009 |
| pH | 8.0-8.3 *Levels below 7.4 pH cause stress | |
| Turbidity | 3-5 NTU >5 NTU causes stress | Cooper <i>et al.</i> 2008 |
| Sedimentation | Maximum mean annual rate 3mg/cm ² /day Daily maximum of 15mg/cm ² /day | GBRMPA, 2009 |
| Nitrates | <5 mg l-1 NO -N | UNESCO/WHO/UNEP, 1996 |
| Ammonia | Max. 2-3 mg l-1 N | UNESCO/WHO/UNEP, 1996 |
| Phosphate | 0.005 - 0.020 mg l-1 PO -P | UNESCO/WHO/UNEP, 1996 |
| Sulphate | 2 mg l-1 and 80 mg l-1 | UNESCO/WHO/UNEP, 1996 |
| BOD | < 2 mg l-1 O ₃ | UNESCO/WHO/UNEP, 1996 |
| COD | < 20 mg l-1 O ₂ | UNESCO/WHO/UNEP, 1996 |

Source: Data Collection Guidelines EPA

Table 6.1.15 Waste Water Standards

| Pollutants | Units | Guideline Value |
|-------------------------|-------------------------|-----------------|
| pH | pH | 6-9 |
| BOD | mg/l | 30 |
| COD | mg/l | 125 |
| Total Nitrogen | mg/l | 10 |
| Total Phosphorus | mg/l | 2 |
| Oil and Grease | mg/l | 10 |
| Total Suspended Solids | mg/l | 50 |
| Total Coliform Bacteria | MPN ^a /100ml | 400 |

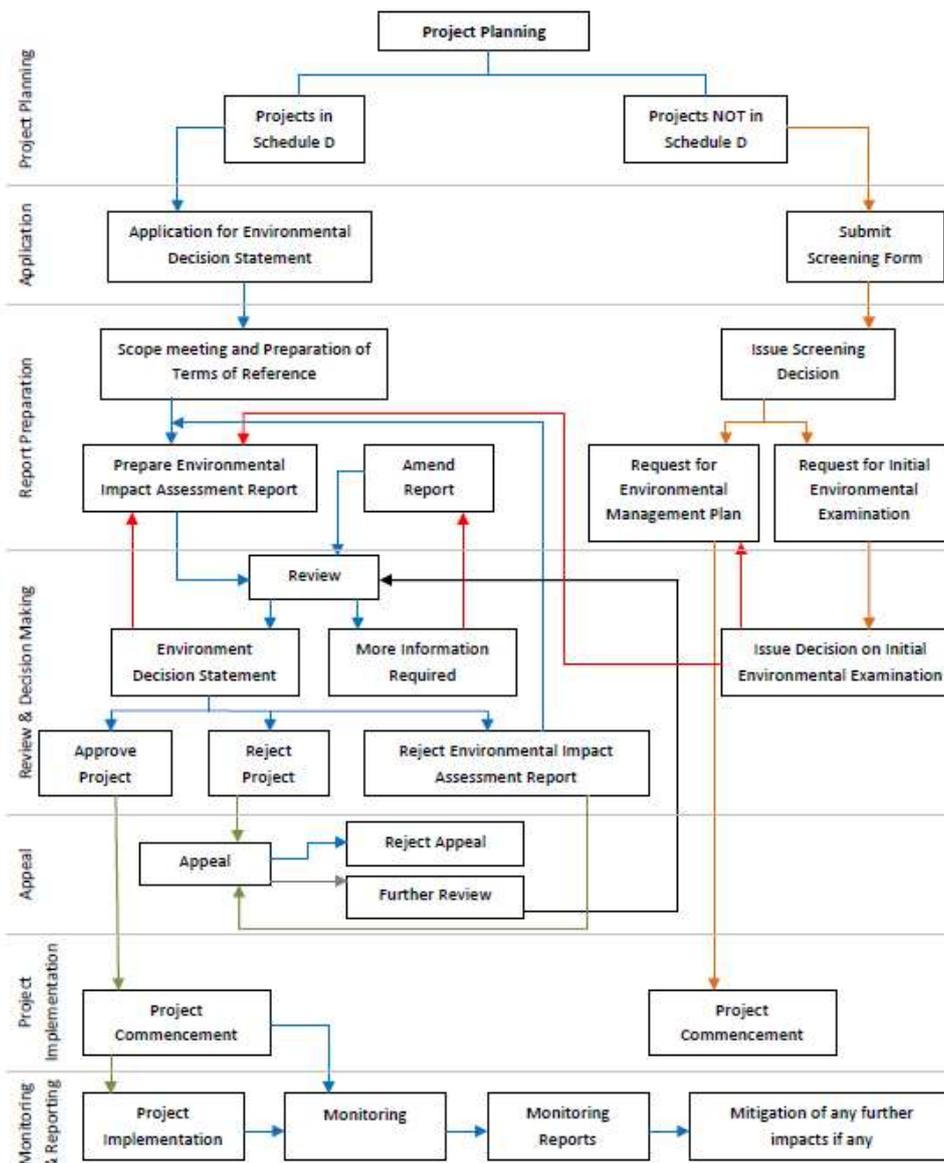
a: Most probable number

Source: IFC General EHS Guidelines: Environmental, Wastewater and Ambient Water Quality

Environment Assessment Process

Under Article 5 (a) of the EPPA, an Environmental Impact Assessment (EIA) has to be submitted by the developer of a project, which may have potential impacts on the environment, to the Environment Protection Agency (EPA) of MECCT for approval before the commencement of the project. The EIA process is coordinated by EPA in consultation with other relevant government agencies and the National Commission for the Protection of the Environment (NCPE).

The EIA process is initiated when the proponent submits a Screening Form to the ministry. This stage identifies if the project requires an Initial Environmental Examination (IEE) or a full Environmental Impact Assessment (EIA). Subsequently, the scope of the EIA will be discussed in a Scoping Meeting attended by representatives from the ministry and the proponent. Once the scope is identified, baseline surveys will be carried out and a report submitted to the ministry according to the guidelines provided in the EIA Regulation. The main components of the report are project description, existing environment, public consultation, impact assessment, alternatives, mitigation, and monitoring. A decision statement is then issued by the ministry stating whether the project is approved, needs further information, or is rejected. The EIA process is schematically shown on Figure 6.1.8. The proposed activities such as land reclamation, sea wall construction projects, beach nourishment projects, and sand mining using machinery are included in the list of activities requiring an EIA of the EIA Regulations.



Source: Environmental Impact Assessment Regulation 2012

Figure 6.1.8 EIA Process in the Maldives

Comparing Government of Maldives and JICA on Environmental Assessment Requirements

The gap analysis between JICA Guidelines and the environmental legislations of the Maldives was conducted. As a result, the following measures are to be applied for bridging the identified gaps.

- There is no specific stipulation on the timing of conducting a stakeholder meeting in the environmental legislations in Maldives. As for the Project, the consultation meeting is to be organized at least twice, at the time of examining the items for environmental assessment and at the time of drafting the environmental assessment in accordance with the JICA Guidelines.
- The required assessment items in the JICA Guidelines are more detailed. Accordingly, all required items in JICA Guidelines are to be assessed.
- There is no specification on the requirement of sharing the result of monitoring among the stakeholders in the Maldivian environmental legislations. In comply with the JICA Guidelines, it is to be incorporated into the

monitoring plan

- There is no specification on the requirement of setting up the grievance redress system in the environmental assessment report of the Maldives. In comply with the JICA Guidelines, the grievance redress system of the Project is to be established.

The results of the gap analysis between the JICA guidelines and the Maldivian environmental legislations and the measures taken for the Project to the gaps are summarized in Table 6.1.16.

Table 6.1.16 The Gap Analysis between the JICA Guidelines and Environmental Legislations in Maldives

| No. | JICA Guidelines | Maldivian Legislation | Measures Taken for the Project |
|-----|--|---|--------------------------------|
| 1 | Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. | An impact assessment study shall be submitted to the Ministry of Planning, Human Resources and Environment (at present the task is taken over by the Environmental Protection Agency) before implementing any developing project that may have a potential impact on the environment (Environmental Protection and Preservation Act, Law No.4/93) | No gap. |
| 2 | Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan. (JICA Guideline (Appendix) | The Environmental Impact Assessment report should not comprise statements of general nature but instead shall provide substantive and predictive information on the proposed activity, a realistic review of alternatives, measures proposed to mitigate all adverse impacts, as well as the opportunities for environmental, economic and social enhancement. (Article 12, Regulation on the Preparation of EIA report 2012) | No gap. |
| 3 | EIA reports (which may be referred to differently indifferent systems) must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to local residents, written materials must be provided in a language and form understandable to them. (JICA Guideline Appendix) | The Environmental Impact Assessment Report may be submitted in Dhivehi (official language) and English. Non-technical summary should be submitted in both Dhivehi and English languages and it should: be concise and use simple, non-technical language; include an outline of the project and its location; and focus primarily upon selection of alternatives, key impacts and mitigation measures (Schedule E ((1)) Regulation on the Preparation of EIA report 2012) | No gap. |
| 4 | 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. | While the Environmental Impact Assessment report as per the format in Schedule E (1) requires the project proponent to conduct public consultation, some projects may be sufficiently controversial or complex to require further public input before an Environmental Decision Statement can be issued; in such instances the proponent will be notified and requested to arrange, and pay for a public meeting or meetings at a location or locations to be determined by the | No gap. |

| No. | JICA Guidelines | Maldivian Legislation | Measures Taken for the Project |
|-----|---|---|--|
| | (JICA Guideline Appendix) | Ministry. (Article 13 (g), Regulation on the Preparation of EIA report 2012) | |
| 5 | In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared. (JICA Guideline Appendix) | This (public consultation) is an important part of the Environmental Impact Analysis Report process and should include: -A list of the persons consulted including persons in statutory bodies, province offices and councils, community groups and NGOs, local residents, local fishermen, tourism operators and any others likely to be affected by the proposed development, -Information on how, when and where the consultations were conducted and if the consultations were conducted in group stakeholder meetings, one-on-one meetings or in the form of written questionnaires, -Summary of the outcome of the consultations including the main concerns identified (Schedule E ((1)) Regulation on the Preparation of EIA report 2012) | No gap. |
| 6 | Consultations with relevant stakeholders, such as local residents, should take place, if necessary, throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared. (JICA Guideline Appendix) | While the Environmental Impact Assessment report as per the format in Schedule E (1) requires the project proponent to conduct public consultation, some projects may be sufficiently controversial or complex to require further public input before an Environmental Decision Statement can be issued; in such instances the proponent will be notified and requested to arrange, and pay for a public meeting or meetings at a location or locations to be determined by the Ministry. (Article 13 (g), Regulation on the Preparation of EIA report 2012) | As for the Project, the consultation meeting is to be organized at least twice, at the time of examining the items for environmental assessment and at the time of drafting the EIA . |
| 7 | 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 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, | Description of the natural, economic and human environment should include: -Certified and comprehensive site plans drawn to scale (by a Sworn Land Surveyor) with known landmarks as reference points, and showing Valued Ecosystem Components, water bodies, wetlands, low water mark, high water mark and beach frontage, -Aerial photographs of the site, - Description of site characteristics including soil type, relief, landforms, present land use, drainage systems, -Type of flora and fauna, rare or endangered species, sensitive habitats of ecological importance including wetlands and mangroves, - Marine environment including sand and rocky bottoms, coral reefs, sea grass beds, -Beach systems; composition; stability; current, tide and wave dynamics, -Description of surrounding infrastructure, including utilities, - Socio-economic characteristics including population (numbers, ages, density, distribution), | The items to be assessed is more detailed in the JICA Guidelines than in the Maldivian legislation. As for the assessment of the Project, the items in the JICA Guidelines shall be covered. |

| No. | JICA Guidelines | Maldivian Legislation | Measures Taken for the Project |
|-----|---|---|--|
| | 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. (JICA Guideline Appendix) | economic activities, housing and utilities, employment statistics, skill and labour availability and unique cultural characteristics, - Other attributes of the locality e.g. amenities, recreational values (Schedule E ((1)) Regulation on the Preparation of EIA report 2012) | |
| 8 | 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 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. (JICA Guideline Appendix) | Assessment of the Direct and Indirect Environmental Impacts: Impacts on the biophysical, economic and human environments, including clear details of any impacts on the human wellbeing with special emphasis on the key issues identified during the scoping process. Less important impacts should be mentioned but the amount of space devoted to them should be proportional to their perceived importance. (Schedule E ((1)) Regulation on the Preparation of EIA report 2012) | No gap. |
| 9 | Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders. (JICA Guideline Appendix) | Description on sharing monitoring result among stakeholders are not specifically mentioned. | As for the Project, the sharing process on the monitoring result with local stakeholders is to be included in the Project's monitoring plan. |
| 10 | 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. (JICA Guideline Appendix) | Description on the grievance redress system is not specifically mentioned. | As for the Project, a provision of the grievance redress system is to be prepared. |
| 11 | Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests. (JICA Guideline Appendix) | If the site/island or surrounding reef or any part of the island or its reef ecosystem included in the areas protected under Act no.4/93 (Maldives Environmental Protection and Preservation Act) or the list of environmental sensitive areas, this site or island should be removed from consideration. (Schedule B, Regulation on the Preparation of EIA report 2012) | No gap. |
| 12 | Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring | There are no indigenous people involved in the Project. | Not applicable to the Project. |

| No. | JICA Guidelines | Maldivian Legislation | Measures Taken for the Project |
|-----|---|-----------------------|--------------------------------|
| | all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses. (JICA Guideline Appendix) | | |

Source: JICA Expert Team

Other Permits and Approvals

Prior to any coastal works that required dredging or reclamation, a special permit has to be obtained from EPA. Depend on the jurisdiction of barrow area, permission of dredging needs to be obtained from the Atoll or Island Council. At the time of submitting the EIA report to EPA, the application form of dredging and reclamation including the information of location, area, volume, alternative location shall be attached with the obtained permission from Atoll/Island Council. After examining the application form together with the EIA report, the permission is to be granted as an approval of the EIA report by EPA.

(2) Institutional Framework

Ministry of Environment, Climate Change and Technology (MECCT)

The Ministry of Environment, Climate Change and Technology (MECCT) is the primary environmental institution in the Maldives. MECCT is mandated with formulating policies, strategies, laws, and regulations concerning environmental management, protection, conservation, and sustainable development for the effective implementation of the Environmental Protection Act of the Maldives and has the statutory power over issues related to the environment. MECCT is also responsible for formulating relevant laws and regulations, policies, and strategies concerning energy, water, sanitation, and waste management. It has the central control over environmental protection, management, conservation, and environmental emergencies. The ministry operates mainly at a policy level and the more regulatory and technical assessment activities are mandated to the Environmental Protection Agency (EPA).

Ministry of National Planning, Housing and Infrastructure (MNPHI)

The Ministry of National Planning, housing and Infrastructure (MNPHI) formulates the National Development Plan and the development plans of all islands in the Maldives. It plans infrastructure development projects in the Maldives, prepares land related policies and establish the rules and regulations of land reclamation and dredging. It formulates, manages, and monitors projects on public infrastructure (which includes roads, bridge, potable water and sewage service, establishment of energy and communication networks, airports, ports, harbors, land reclamation and coastal protection) and make sure that they are being carried out as per the National Development Plan.

Environmental Protection Agency (EPA)

The Environment Protection Agency (EPA) of MECCT has responsibilities for the efficient operation of the EIA process. This encompasses a number of tasks, including screening of projects and provision of general procedural advice to the project EIA for any kind of development projects in the Maldives. EPA manages the review of the EIA report and is responsible for any approvals or recommendations associated with the EIA. It is also responsible

for verifying that environmental protection measures are properly implemented by undertaking environmental audits in collaboration with other governments as well as non-government agencies with a role for environmental protection and preservation.

Addu City Council and Laamu Atoll Council

Under the Decentralization Act, the Maldives is grouped into 20 administrative areas under a new local governance system. In line with this, Addu Atoll has an elected City Council located on Hithadhoo Island, while Laamu Atoll has an elected Atoll Council located in Fonadhoo Island. The Council Offices are the main focal point of the Government Ministries and they coordinate and liaises with the Government Ministries and elected island councils on all issues relating to the atoll.

6.1.4 Alternatives

All proposed projects were purposed to protect coastal area from erosion. In case of “Without project”, it meant to be no protection measures applying against on-going erosion at each project site.

Minimizing negative impact on natural and social environment was taken account throughout the process of finalizing basic design in each targeted island. In order to protect coastal area from erosion, a design was selected not to alter natural condition as much as possible and let nature to act as it supposed to be without interruption of man-made structure. The effort was reflected on the basic design from preliminary design as decreasing the number of groins (beach nourishment site at Maamendhoo Island and Meedhoo Island) or not construct groins at all (beach nourishment site in Fonadhoo Island) (see details in Chapter 5.4 Examination of the draft basic design).

Furthermore, the measures such as avoiding protected area, minimizing cutting down trees (consideration on natural environment) and avoiding resettlement or land acquisition (consideration on social environment) were applied for selecting the stock pile sites in terms of storing supplemental sand for the nourished beach in Fonadhoo Island, Maamendhoo, Meedhoo Island and Gan Island (see details in Chapter 5.8 Consideration of construction plan and cost estimation).

Moreover, environmental consideration was also given at the time of selecting borrow sites for collecting sand to nourish beach. Among alternatives, the sites were selected with the conditions as location be at outer reef and deeper seabed in order to minimize any negative impacts on the natural environment at and surrounding areas. (see details in Chapter 5.7 Study for Sand Barrow Area)

6.1.5 Scoping and TOR of an Environmental and Social Survey

(1) Scoping

Component 1

Pilot works will be planned and implemented by applying the knowledge on coastal engineering acquired through the Project. Since the specific countermeasures mentioned in ICZM will be identified and selected during the 2nd stage of the Project implementation, the provisional scoping was carried out based on general structural measures for coastal protection included in ICZM. It is also necessary to consider the alternatives of proposed activity, based on Strategic Environment Assessment, in the process of development of ICZM plan at national level as well as island-level. Table 6.1.17 is the result of the scoping. However, since the contents/details of pilot works are not determined at this stage, it should be updated next phase of the Project.

Table 6.1.17 Scoping Result on Component 1

| | Environmental Items | Phase | | Scoping Result |
|----------------------------|--|-------|----|--|
| | | BC/DC | OP | |
| Pollution Control | | | | |
| 1 | Air Pollution | - | - | No adverse effects to the air quality would be occurred, as there are no sources by the activities. |
| 2 | Water Pollution | ✓ | ✓ | For the implementation of sediment budget control plan, the water quality may be affected to some extent, due to the improper implementation. |
| 3 | Soil Contamination | - | - | No adverse effects to the soil contamination would be occurred, as there are no sources by the activities. |
| 4 | Noise/Vibration | - | - | No adverse effects to the noise and vibration would be occurred, as there are no sources by the activities. |
| 5 | Ground Subsidence | - | - | No adverse effects to the ground subsidence would be occurred, as there are no sources by the activities. |
| 6 | Offensive Odors | - | - | No adverse effects to the offensive odors would be occurred, as there are no order sources by the activities. |
| 7 | Bottom Sediment | ✓ | ✓ | For the implementation of sediment budget control plan, sediment may be affected to some extent, due to the improper implementation. |
| 8 | Waste | - | - | No adverse effects to the waste management would be occurred, as there are no sources by the activities. |
| Natural Environment | | | | |
| 9 | Topography and Geographical Features | - | - | No adverse effects to the topography or geographical features would be occurred, as there are no activities which affect to topography and geographical features. |
| 10 | Hydrological Situation | - | - | No adverse effects to the hydrological situation would be occurred, as there are no activities which affect to hydrological situation. |
| 11 | Groundwater | - | - | No adverse effects to the groundwater would be occurred, as there are no activities which affect to groundwater. |
| 12 | Flora, Fauna, and Biodiversity | ✓ | ✓ | For the establishment of coastal and reef conservation plan and implementation of sediment budget control plan, the marine system in the coastal areas may be affected to some extent, due to the improper implementation. |
| 13 | Protected Area | - | - | There are no protected areas or Marine Protected Areas (MPA) around the proposed project sites. |
| 14 | Coastal Zone | ✓ | ✓ | For the establishment of coastal and reef conservation plan and implementation of sediment budget control plan, the marine system in the coastal areas may be affected to some extent, due to the improper implementation. |
| Social Environment | | | | |
| 15 | Involuntary Resettlement/Land Acquisition | - | - | No involuntary resettlement or land acquisition will be occurred by implementing the ICZM as there are no activities which cause involuntary resettlement or land acquisition. |
| 16 | Poor | ✓ | ✓ | If the target areas are used by the local people regularly, there would be possibilities for the local people not to be able to use the areas for their livelihood activities due to the coastal and reef conservation plan. |
| 17 | Indigenous, or Ethnic People | - | - | No Indigenous or ethnic people confirmed in the targeted islands. There are no issues related to Indigenous or ethnic people by implementing the ICZM. |
| 18 | Local Economies such as Employment, Livelihood, etc. | ✓ | ✓ | If the target areas are used by the local people regularly, there would be possibilities for the local people not to be able to use the areas for their livelihood activities due to the coastal and reef conservation plan. |

| | Environmental Items | Phase | | Scoping Result |
|--------|--|-------|----|--|
| | | BC/DC | OP | |
| 19 | Land Use and Utilization of Local Resources | ✓ | ✓ | If the target areas are used by the local people regularly, there would be possibilities for the local people not to be able to use the areas due to the coastal and reef conservation plan. |
| 20 | Water Usage or Water Rights and Communal Rights | - | - | There would be no construction works or operation activities which will limit water use, or cause impact on water use. |
| 21 | Existing Social Infrastructures and Services | - | - | There would be no construction works or operation activities which will cause impact on infrastructures. |
| 22 | Social Institutions such as Social Infrastructure and Local Decision-making Institutions | ✓ | ✓ | Potential gender discrimination in participating in formulating ICZM. |
| 23 | Misdistribution of Benefits and Damages | ✓ | ✓ | If the target areas are used by the local people regularly, there would be possibilities for the local people not to be able to use the areas due to the coastal and reef conservation plan. |
| 24 | Local Conflicts of Interest | ✓ | ✓ | If the target areas are used by the local people regularly, there would be possibilities for the local people not to be able to use the areas due to the coastal and reef conservation plan. |
| 25 | Religious Facility | - | - | There would be no construction works or operation activities which will cause impact on religious facility. |
| 26 | Cultural Heritage | ✓ | ✓ | The future ICZM Plan may raise any impacts to the existing heritage site, if not properly planned. |
| 27 | Landscape | - | - | There would be no construction works or operation activities which will cause impact on landscape. |
| 28 | Gender | ✓ | ✓ | Potential gender discrimination in participating in formulating ICZM and the training related to ICZM. |
| 29 | Children's Rights | - | - | There would be no operation activities which will affect right of children. |
| 30 | Hazards (risk) Infectious Diseases such as HIV/AIDS | - | - | There would be no construction works or operation activities which will cause infectious diseases. |
| 31 | Occupational Safety and Health | - | - | There would be no construction works or operation activities which will affect labour environment. |
| Others | | | | |
| 32 | Accident | - | - | There would be no construction works or operation activities which will raise risk of accident. |
| 33 | Climate Change | - | - | There would be no construction works or operation activities which will affect climate change. |

Source: JICA Expert Team

Component 2

Environmental Impact resulting from the Component 2 is examined based on the existing documents. The scoping result is represented in Table 6.1.18.

Table 6.1.18 Scoping Result on Component 2

| | Environmental Items | Phase | | Scoping Result |
|----------------------------|---|-------|----|--|
| | | BC/DC | OP | |
| Pollution Control | | | | |
| 1 | Air Pollution | ✓ | ✓ | BC/DC: Limited air pollution is expected due to heavy machinery operation and construction activities. OP : Unproper management of stocked supplementary sand will cause dust generation. |
| 2 | Water Pollution | ✓ | ✓ | BC/DC: Dredging for collecting sand for nourishing beach, revetment for the coast and reclamation along the coast will cause water pollution temporarily. OP: Unproper management of stocked supplementary sand will cause water pollution. |
| 3 | Soil Contamination | ✓ | - | BC/DC: Oil leakage from construction vehicles will cause soil contamination. OP: No activities expected to contaminate soil resulting from the Project. |
| 4 | Noise/Vibration | ✓ | - | BC/DC: Noise and vibration will be generated from construction equipment. However, the impact of noise and vibration will be limited because the project sites are coastal area where is not adjacent to the residential area. Land transportation of construction vehicles and machinery may impact on traffic and noise. OP: No activities expected to make noise or vibration by the Project. |
| 5 | Ground Subsidence | - | - | BC/DC/OP: No activities are expected to extract groundwater resulting the Project. |
| 6 | Offensive Odors | - | - | BC/DC/OP: No activities are expected to emit offensive odors resulting from the Project. |
| 7 | Bottom Sediment | ✓ | ✓ | BC/DC: Beach nourishment and reclamation will cause soil sedimentation near construction sites. OP: Soil sedimentation will occur near the nourished beach. |
| 8 | Waste | ✓ | - | BC/DC: Construction waste such as removed materials from old revetment will be generated. Hazardous waste such as used engine oil will be generated from construction vehicles. OP: No activities are expected to generate waste resulting from the Project. |
| Natural Environment | | | | |
| 9 | Topography and geographical Features | ✓ | ✓ | BC/DC: Reclamation at Maamendhoo island will alter the geographical features. OP: Due to nourishing, revetment or reclamation, geographical features near the Project area may be changed. |
| 10 | Hydrological Situation | - | ✓ | BC/DC: No construction activities are expected to alter hydrological situation. OP: Due to nourishing, revetment or reclamation, hydrological situation around the Project area may be changed. |
| 11 | Groundwater | - | - | BC/DC/OP: No activities are expected to effect groundwater resulting from the Project. |
| 12 | Flora, Fauna, and Biodiversity | ✓ | ✓ | BC/DC: During construction, limited disturbance to terrestrial and marine ecosystem is expected around the project sites and/or sand borrow sites. OP: Due to nourishing, revetment or reclamation, marine ecosystem around the Project area may be disturbed. |
| 13 | Protected Area | - | - | BC/DC/OP: There are no protected areas or Marine Protected Areas (MPA) around the proposed project sites. The project site in Meedhoo Island is located near Core Zone/Buffer Zone in Biosphere, however, negative impact is not expected since the Core Zone/Buffer Zone is covered inland area, not coastal area where the Project would be implemented. |
| 14 | Coastal Zone | ✓ | ✓ | BC/DC: All project sites are located in the coastal zone. Therefore, the construction activities at the project sites will disturb coastal ecosystem. OP: Currents and waves or ecosystem around the Project area will be impacted from the beach nourishment, revetment or reclamation. |
| Social Environment | | | | |
| 15 | Involuntary Resettlement/Land Acquisition (if needed) | ✓ | - | BC: There will be no involuntary resettlement or land acquisition due to the Project. However, three temporary structures without walls and foundation installed along the coast at the Project site of Maamendhoo Island need to be removed or set backed. It is necessary to discuss about this matter with the owner of these structures. DC/OP: No activities are expected to occur involuntary resettlement or land acquisition. |
| 16 | Poor | ✓ | - | BC/DC: Due to the disruption of access to the coastal area resulting from the construction, vulnerable residents would be affected to their economic activities temporarily. OP: No activities are expected to give negative impact on the poor near the Project sites. |
| 17 | Indigenous, or Ethnic People | - | - | BC/DC/OP: The project area does not include the residential area of indigenous or ethnic minorities at present. |
| 18 | Local Economies such as Employment, Livelihood, etc. | ✓ | - | BC/DC: Due to the disruption of access to the coastal area resulting from the construction, local residents would be affected to their economic activities temporarily. OP: No activities are expected to affect local economies. |
| 19 | | ✓ | ✓ | BC/DC: Due to the disruption of access to the coastal area resulting from the construction, local residents would be affected to use local resources temporarily. |

| | Environmental Items | Phase | | Scoping Result |
|---------------|--|-------|----|---|
| | | BC/DC | OP | |
| | Land Use and Utilization of Local Resources | | | OP: The beach nourishment and revetment will contribute to stabilize the utilization of local resources in the coastal areas. The reclamation will create evacuation place for the local residents in case of disaster such as hazard of swell and Tsunami. |
| 20 | Water Usage or Water Rights and Communal Rights | - | - | BC/DC/OP: There is no activities to affect water usage or water rights and communal rights resulting from the Project. |
| 21 | Existing Social Infrastructures and Services | - | - | BC/DC/OP: There is no activities to affect existing social infrastructures and services resulting from the Project. |
| 22 | Social Institutions such as Social Infrastructure and Local Decision-making Institutions | - | - | BC/DC/OP: There is no activities to affect social infrastructure and local decision-making institutions resulting from the Project. |
| 23 | Misdistribution of Benefits and Damages | ✓ | - | BC/DC: Due to the disruption of access to the coastal area resulting from the construction, mistribution of benefits and damages would occur to the users of the Project areas temporarily. |
| | | | | OP: There is no activities to lead mistribution of benefits or damages resulting from the Project. |
| 24 | Local Conflicts of Interest | ✓ | - | BC/DC : Due to the disruption of access to the coastal area resulting from the construction, there will be possibility to break out local conflicts of interest among local residents near the Project site temporarily. |
| | | | | OP : There is no activities to affect local conflict of interest resulting from the Project. |
| 25 | Religious Facility | - | - | BC/DC/OP: No religious facilities are identified in the vicinity of the Project sites. |
| 26 | Cultural Heritage | - | ✓ | BC/DC/OP: No cultural heritage is identified in the vicinity of the Project sites except the Project site of Gan and Isdhoo Islands which purposed for protecting the cultural heritage sites against erosion in terms of constructing a revetment. |
| 27 | Landscape | - | - | BC/DC/OP: No disturbance of landscape is expected resulting from the Project. |
| 28 | Gender | ✓ | ✓ | BC/DC: Equal opportunity for employment or equal payment for equal jobs might be distorted by gender discrimination. |
| | | | | OP: Maintenance and management activities might be distorted by gender discrimination. |
| 29 | Children's Rights | ✓ | - | BC/DC: In case child labor is customarily practiced, it would obstruct schooling opportunities. |
| | | | | OP : No activities are planned to affect children's right resulting from the Project. |
| 30 | Hazards (risk) Infectious Diseases such as HIV/AIDS | ✓ | - | BC/DC: Inflow of construction workers to local communities would raise risks of communicable diseases. |
| | | | | OP: No increase in risk of communicable diseases is expected. |
| 31 | Occupational Safety and Health | ✓ | - | BC/DC: Inappropriate management of working environment would raise the risk of accidents and disease. |
| | | | | OP: No increase in risks in the work environment is expected. |
| Others | | | | |
| 32 | Accident | ✓ | - | BC/DC: Construction activities along public roads would increase the risk of accidents to the public. Inappropriate management and inappropriate operation of the construction vehicles would increase the risk of accidents. |
| | | | | OP: No increase in risks of accident would be expected. |
| 33 | Climate Change | - | ✓ | BC/DC: The amount of global warming substances generated by the operation of construction machinery and the driving of construction vehicles is very small and is not expected to have a significant impact on climate change. |
| | | | | OP: The Project will contribute to decrease the negative affect from climate change. |

Source: JICA Expert Team

(2) TOR for Environmental and Social Survey

Based on the scoping result, the TOR for the environmental and social survey is prepared as shown in Table 6.1.19.

Table 6.1.19 TOR for Environmental and Social Survey

| No. | Impacts | Items for Study | Methodology |
|----------------------------|--------------------------------------|--|--|
| Pollution Control | | | |
| 1 | Air Pollution | 1.Present air quality 2.Present condition in the project area 3.Impacts during construction | 1.Collect existing information 2.Site investigation and interviews with relevant authorities 3.Confirm content, method, period, location of construction activities and access for construction vehicles |
| 2 | Water Pollution | 1.Water quality standard in Maldives 2.Present condition in project area 3.Impacts during construction 4.Impacts during operation | 1.Collect information on existing standards. 2.Conduct field survey (Sea water quality: temperature, pH, salinity, turbidity, phosphate, nitrate, ammonia, sulphate, BOD at the Project sites, Ground water quality: temperature, pH, salinity) 3.Confirm content, method, period, location of construction activities including dredging area for collecting sand using beach nourishment, site for beach nourishment, revetment and reclamation. 4.Confirm proposed area for storing supplementary sand for beach nourishment |
| 3 | Soil Contamination | 1.Impacts during construction | 1.Confirm content, method, period, location of construction activities. |
| 4 | Noise and Vibration | 1.Noise standard in Maldives 2.Present condition in the project area 3.Impacts during construction | 1.Collect information on existing standards 2.Conduct field survey (Noise measurement at the Project sites) 3.Confirm content, method, period, location of construction activities |
| 7 | Bottom Sediment | 1.Impacts during construction 2.Impacts during operation | 1.Confirm content, method, period, location of construction activities 2.Confirm content of activities during operation. |
| 8 | Waste | 1.Information on present waste management 2.Impacts during construction | 1.Collect existing information on waste management in Maldives 2.Confirm content, method, period, location of construction activities |
| Natural Environment | | | |
| 9 | Topography and Geographical Features | 1.Present condition in the Project area 2.Impact during construction 3.Impact during operation | 1.Collect existing information 2.Confirm content, method, period, location of construction activities 3.Confirm content of activities during operation |
| 10 | Hydrological Situation | 1.Impact during operation | 1.Confirm content of activities during operation |
| 12 | Flora, Fauna and Biodiversity | 1.Present condition in the Project area 2.Impact during construction 3.Impact during operation | 1.Conduct field survey (Territorial survey including territorial faunal and flora survey and Marine survey including marine seabed condition survey, reef fish visual census, Line intercept transects survey and photo quadrat analysis) at the Project site 2.Confirm content, method, period, location of construction activities 3.Confirm content of activities during operation |
| 14 | Coastal Zone | 1.Present condition in the Project area | 1.Collect existing information 2.Confirm content, method, period, location of |

| No. | Impacts | Items for Study | Methodology |
|--------------------|---|---|--|
| | | 2.Impact during construction 3.Impact during operation | construction activities 3.Confirm content of activities during operation |
| Social Environment | | | |
| 15 | Involuntary Resettlement/Land Acquisition | 1.Information on the owner of three huts at the Project area of Maamendhoo Island | 1. Interview with the owner of these huts |
| 16 | Poor | 1.Present condition in the Project area 2.Impacts during construction | 1.Interview with Island councils on the economic and social activities along the coastal area in the Project site 2. Confirm content, method, period, location of construction activities |
| 18 | Local Economy such as Employment, Livelihood etc. | 1.Present condition in the Project area 2.Impacts during construction | 1.Interview with Island councils on the economic and social activities along the coastal area in the Project site 2. Confirm content, method, period, location of construction activities |
| 19 | Land Use and Utilization of Local Resources | 1.Present condition in the Project area 2.Impacts during construction 3.Impacts during operation | 1.Interview with Island councils on the economic and social activities along the coastal area in the Project site 2. Confirm content, method, period, location of construction activities 3.Confirm content of activities during operation |
| 23 | Misdistribution of Benefits and Damages | 1.Present condition in the Project area 2.Impacts during construction | 1.Interview with Island councils on the economic and social activities along the coastal area in the Project site 2. Confirm content, method, period, location of construction activities |
| 24 | Local Conflict | 1.Present condition in the Project area 2.Impacts during construction | 1.Interview with Island councils on the economic and social activities along the coastal area in the Project site 2. Confirm content, method, period, location of construction activities |
| 26 | Cultural Heritage | 1. Present condition of the Project area at Gan Island and Isdhoo Island | 1.Interview with Island councils on the economic and social activities along the coastal area in the Project site |
| 28 | Gender | 1.Present condition of the employment from gender mainstreaming points of view 2.Impacts during construction 3.Impacts during operation | 1.Interview with Island councils and women's development committee (WDC) on the economic and social activities along the coastal area in the Project site 2. Confirm content, method, period, location of construction activities 3.Confirm content of activities during operation |
| 29 | Children's Rights | 1.Present condition of the children's rights in the Project area | 1.Interview with Island councils on the economic and social activities along the coastal area in the Project site |
| 30 | Hazardous (Risk) Infectious Diseases such as HIV/AIDS | 1.Impacts during construction | 1.Confirm content, method, period, location, area of construction activities |
| 31 | Occupational Safety and Health | 1.Confirm legislations on working environment in Maldives | 1.Confirm existing legislations on working environment |
| Others | | | |
| 32 | Accidents | 1.Impacts during construction | 1.Confirm content, method, period, location, of construction activities |
| 33 | Climate Change | 1.Impacts during operation | 2.Confirm content of activities during operation |

Source: JICA Expert Team

6.1.6 Result of Survey

(1) Field Survey

The field surveys on the baseline for EIA were conducted during February and July 2022 by the sub-contracting works.

1) Terrestrial environmental survey information

Under terrestrial environmental survey information about terrestrial flora, terrestrial fauna and groundwater quality data were collected.

i) Terrestrial flora

Along the coastal lines for the proposed construction sites, terrestrial vegetation surveys were conducted through visual observation. The survey lengths, numbers of observed species and main observed species are described in Table 6.1.20. In the five target islands, 8 to 13 kinds of vegetations are observed, and such species as sea hibiscus, coconut palm, and sea lettuce are dominant. Among them, the observed plants were neither in the protected species under the Maldivian Law or in the IUCN Red List.

Table 6.1.20 Observed Flora at the Five Target Islands

| Island | Survey length | Numbers observed | Main observed species (English name/ Divehi name/ Scientific name) |
|------------|---------------|------------------|---|
| Fonadhoo | 2,000m | 13 species | Sea Hibiscus (Dhigga/ <i>Hibiscus tiliaceus</i>) Coconut Palm (Ruh/ <i>Cocos nucifera</i>) Indian Tulip tree (Hirudhu/ <i>Thespesia populnea</i>) Sea Lettuce (Magoo/ <i>Scaevola taccada</i>) Tahitian Screw Pine (Boakashikeyo/ <i>Pandanus tectorius</i>) |
| Gan | 1,000m | 13 species | Sea Hibiscus (Dhigga/ <i>Hibiscus tiliaceus</i>) Sea Lettuce (Magoo/ <i>Scaevola taccada</i>) Fish Poison Tree (Kinbi/ <i>Barringtonia racemose</i>) Tahitian Screw Pine (Boakashikeyo/ <i>Pandanus tectorius</i>) Grass (Vina/ <i>Poaceae</i>) |
| Ishdhoo | 1,000m | 8 species | Sea Lettuce (Magoo/ <i>Scaevola taccada</i>) Tahitian Screw Pine (Boakashikeyo/ <i>Pandanus tectorius</i>) Sea Hibiscus (Dhigga/ <i>Hibiscus tiliaceus</i>) Coconut Palm (Ruh/ <i>Cocos nucifera</i>) Beach Gardenia (Uni/ <i>Guettarda speciosa</i>) |
| Maamendhoo | 1,500m | 8 species | Sea Lettuce (Magoo/ <i>Scaevola taccada</i>) Tahitian Screw Pine (Boakashikeyo/ <i>Pandanus tectorius</i>) Sea Hibiscus (Dhigga/ <i>Hibiscus tiliaceus</i>) Coconut Palm (Ruh/ <i>Cocos nucifera</i>) Beach Gardenia (Uni/ <i>Guettarda speciosa</i>) |
| Meedhoo | 3,000m | 13 species | Sea Lettuce (Magoo/ <i>Scaevola taccada</i>) Tahitian Screw Pine (Boakashikeyo/ <i>Pandanus tectorius</i>) Coconut Palm (Ruh/ <i>Cocos nucifera</i>) Alexandrian Laurel (Funa/ <i>Calophyllum inophyllum</i>) Sea Hibiscus (Dhigga/ <i>Hibiscus tiliaceus</i>) |

Source: JICA Expert Team

Flora species observed during the terrestrial flora survey at Fonadhoo island are shown in Figure 6.1.9.

| | | |
|--|--|--|
|  |  |  |
| Beach Gardenia (<i>Hernandia nymphaeifolia</i>) | Lantern tree (<i>Scaevola taccada</i>) | Tahitian Screw Pine (<i>Pandanus tectorius</i>) |
|  |  |  |
| Sea Hibiscus (<i>Hibiscus tiliaceus</i>) | Coconut Palm (<i>Cocos nucifera</i>) | Indian Almond Tree (<i>Terminalia catappa</i>) |
|  |  |  |
| Octopus Bush (<i>Heliotropium foertherianum</i>) | Cordia (<i>Cordia subcordata</i>) | Headache Tree (<i>Premna serratifolia</i>) |

Source: JICA Expert Team

Figure 6.1.9 Flora Species Observed during the Terrestrial Flora Survey at Fonadhoo Island

ii) Terrestrial fauna

At the same locations with the terrestrial flora survey, the terrestrial fauna surveys were conducted through visual observation. The numbers of observed species, main observed species and numbers of observed species listed under the Maldivian laws and IUCN Red List are described in Table 6.1.20. In the five target islands, 5 to 7 kinds of avian species are observed, and such species as Grey Heron, Black Crowned Night Hero are dominant. Among them, 3 to 5 avian species subject to be protected under the Maldivian law are observed, however, observed avian were in the protected species under the IUCN Red List.

Table 6.1.21 Observed Fauna at the Five Target Islands

| Island | Numbers observed | Observed species (English name/ Divehi name/ Scientific name) | Protected under Maldivian Law | IUCN Redlist |
|----------|------------------|---|-------------------------------|--------------|
| Fonadhoo | 7 species | Grey Heron (Maakanaa/ <i>Ardea cinerea</i>) Black Crowned Night Heron (Raabon'dhi/ <i>Nycticorax nycticorax</i>) Asian Koel (Kaalhu Koveeli/ <i>Eudynamis scolopaceus</i>) Maldivian Water Hen (Kan'bili/ <i>Amaurornis phoenicurus</i>) | 5 species | 0 species |
| Gan | 5 species | Grey Heron (Maakanaa/ <i>Ardea cinerea</i>) | 3 species | 0 species |

| Island | Numbers observed | Observed species (English name/ Divehi name/ Scientific name) | Protected under Maldivian Law | IUCN Redlist |
|------------|------------------|--|-------------------------------|--------------|
| | | Black Crowned Night Heron (Raabon'dhi/ <i>Nycticorax nycticorax</i>) Kentish Plover (Kiru Bondana/ <i>Charadrius alexandrinus</i>) | | |
| Ishdhoo | 5 species | Grey Heron (Maakanaa/ <i>Ardea cinerea</i>) Black Crowned Night Heron (Raabon'dhi/ <i>Nycticorax nycticorax</i>) Ruddy Turnstone (Rathafai/ <i>Arenaria interpres</i>) | 3 species | 0 species |
| Maamendhoo | 6 species | Grey Heron (Maakanaa/ <i>Ardea cinerea</i>) Black Crowned Night Heron (Raabon'dhi/ <i>Nycticorax nycticorax</i>) Maldivian Water Hen (Kan'bili/ <i>Amauornis phoenicurus</i>) | 3 species | 0 species |
| Meedhoo | 6 species | White Tern (Dhondheeni/ <i>Gygis alba</i>) Crowned Night Heron (Raabon'dhi/ <i>Nycticorax nycticorax</i>) Kentish Plover (Kiru Bondana/ <i>Charadrius alexandrinus</i>) Whimbrel (Bulhithun'bi/ <i>Numenius phaeopus</i>) | 4 species | 0 species |

Source: JICA Expert Team

Fauna species observed during the terrestrial flora survey at Fonadhoo island are shown in Figure 6.1.10.

| | | |
|---|---|---|
|  |  |  |
| Grey Heron (<i>Ardea cinerea</i>) | Common Sandpiper (<i>Actitis hypoleucos</i>) | Black Crowned Night Heron (<i>Nycticorax nycticorax</i>) |
|  |  |  |
| Asian Koel (<i>Eudynamis scolopaceus</i>) | White-Tailed Tropicbird (<i>Phaethon lepturus</i>) | Maldivian Water Hen (<i>Amauornis phoenicurus</i>) |
|  | | |
| Common Crow / House Crow (<i>Corvus Splendens</i> Vieillot) | | |

Source: JICA Expert Team

Figure 6.1.10 Fauna (Avian) Species Observed during the Terrestrial Fauna Survey at Fonadhoo Island

iii) Ground water quality survey

In order to obtain the current conditions before construction, the groundwaters are collected at several points nearby the proposed construction sites at each target island, and the water taken from the sites are analyzed at MWSC Water Quality Assurance Laboratory in Male. Drinking water quality by the Maldives EPA guideline and/or Utility Regulatory Authority of Maldives are used and given as reference standards in Table 6.1.22, and among those parameters, pH and salinity of each sample were analyzed.

Table 6.1.22 Drinking water quality parameters optimum conditions under EPA data collection guideline of Maldives

| Parameter | Optimal Range |
|-------------------------|------------------|
| Temperature | - |
| Salinity | - |
| pH | 6.5 – 8.5 |
| Electrical Conductivity | <1000 uS/cm |
| Total Dissolved Solids | <500 mg/L |
| Turbidity | <1 NTU |
| Iron | <0.3 mg/L |
| Ammonia | <0.02 – 2.5 mg/L |
| Suspended Solids | 5 – 750 mg/L |
| Total Hardness | <75 mg/L |
| Hydrogen Sulphide | <0.05 mg/L |
| Nitrates | <50 mg/L |
| Chlorides | <200 mg/L |
| Fecal Coliform | 0/100ml CFU |
| Total Coliform | 0/100ml CFU |
| Free Chlorine | 0.04 – 0.2 mg/L |

Source: EPA data collection guideline / Utility Regulatory Authority of Maldives

Table 6.1.23 shows the results of the sampled water at each target island. Comparing the pH levels of the tested groundwater, all the readings fall within the optimum range of drinking water.

Table 6.1.23 Groundwater Analysis Results at Five Target Islands

| Island | | pH | Salinity | Remarks |
|------------|-----------|---------|-----------|---|
| Fonadhoo | High tide | 7.3~7.6 | 0.51~2.91 | |
| | Low tide | 7.2~7.7 | 0.53~2.88 | |
| Gan | High tide | 7.3~7.6 | 0.30~8.39 | The highest is taken from Paree fengandu |
| | Low tide | 7.4~7.6 | 0.30~8.31 | |
| Ishdhoo | High tide | 7.2~7.6 | 0.18~0.35 | |
| | Low tide | 7.0~7.6 | 0.18~0.34 | |
| Maamendhoo | High tide | 7.7~7.8 | 0.25~1.14 | The highest is taken at the western edge of the island. |
| | Low tide | 7.4~7.9 | 0.25~1.13 | |
| Meedhoo | High tide | 7.4~7.5 | 0.21~0.41 | |
| | Low tide | 7.4~7.5 | 0.20~0.40 | |

Source: JICA Expert Team

2) Pollution

i) Noise Survey

In order to obtain the current conditions before construction, the noise survey was conducted and data was taken from near the beach area where there are few residential houses nearby. According to WHO Noise Environmental Health Criteria 12 (EHC 12, 1980) recommended noise exposure limits for general outdoor noise levels is 55 dB and it is a desirable level to prevent significant community annoyance. WHO Environmental Noise Guidelines for EU Region (2018) indicates 53dB as the threshold for desirable road traffic noise levels.

Most of the noise recorded were from people talking and motor vehicles (motorbikes). Noise data was taken from a single location three time period of the day (8-9 am in the morning, 12-1 pm in the noon and 5-6 in the evening). The data's recorded are within the normal range.

Table 6.1.24 Noise Survey Results at Five Target Islands

| Island | | Average | Maximum | Minimum | Remarks |
|------------|----------------------|---------|---------|---------|---|
| Fonadhoo | Day 1 (Feb 22, 2022) | 47.43 | 53 | 49 | |
| | Day 2 (Feb 23, 2022) | 50.40 | 43 | 37 | |
| | Day 3 (Feb 24, 2022) | 47.47 | 53 | 48 | |
| Gan | Day 1 (Feb 22, 2022) | 50.35 | 61 | 45 | |
| | Day 2 (Feb 23, 2022) | 51.45 | 64 | 48 | |
| | Day 3 (Feb 24, 2022) | 48.82 | 52 | 46 | |
| Ishdhoo | Day 1 (Mar 01, 2022) | 52.48 | 68 | 48 | |
| | Day 2 (Mar 02, 2022) | 52.50 | 69 | 47 | |
| | Day 3 (Mar 03, 2022) | 52.08 | 64 | 45 | |
| Maamendhoo | Day 1 (Feb 24, 2022) | 47.13 | 59 | 44 | |
| | Day 2 (Feb 26, 2022) | 46.28 | 48 | 40 | |
| | Day 3 (Feb 27, 2022) | 49.00 | 62 | 45 | |
| Meedhoo | Day 1 (Mar 05, 2022) | 53.70 | 66 | 47 | busy road located 160m from the project site. |
| | Day 2 (Mar 06, 2022) | 59.18 | 68 | 48 | |
| | Day 3 (Mar 07, 2022) | 56.05 | 65 | 46 | |

Source: JICA Expert Team

3) Marine Environment

The marine survey was conducted by using five different methods, which are Line Intercept Transect Survey (LIT), Photo Quadrant Survey, Fish Belt Survey, Seabed Condition Survey and Seawater Sampling.

i) Line Intercept Transect Survey (LIT)

To assess the benthic composition of the survey site, LIT transects of 100 m were undertaken at both inside the reefs (below 1m depth) and outside reefs (at around 10 m depth) as per EPA guidelines.

Table 6.1.25 shows that the benthic compositions at most of site comprised mostly of a hard coral substrate followed by rubble and rock outside reefs, and rock and rubble inside reefs.

Table 6.1.25 Results of the Line Intercept Transect Survey (LIT) at Five Target Islands

| Benthic composition | | Fonadhoo | | Gan | |
|---------------------|--------------------------|-------------|--------------|-------------|--------------|
| | | Inside Reef | Outside Reef | Inside Reef | Outside Reef |
| HC | Hard Coral | 0-3% | 26-55% | 1% | 26-27% |
| SC | Soft Coral | 0% | 0-1% | 0% | 0% |
| RKC | Recently Killed Coral | 0% | 6-16% | 0% | 16-28% |
| NIA | Nutrient Indicator Algae | 0-16% | 0% | 3% | 0% |
| SP | Sponge | 0% | 0-1% | 0% | 0-1% |
| RC | Rock | 6-33% | 7-36% | 45-93% | 24-27% |
| RB | Rubble | 6-53% | 6-29% | 5-6% | 19-29% |
| SD | Sand | 6-21% | 0-1% | 0-35% | 1-2% |
| SI | Silt | 0% | 0% | 0% | 0% |
| OT | Others | 26-44% | 0-1% | 1-11% | 0% |

| Benthic composition | | Ishdhoo | | Maamendhoo | |
|---------------------|--------------------------|-------------|--------------|-------------|--------------|
| | | Inside Reef | Outside Reef | Inside Reef | Outside Reef |
| HC | Hard Coral | 4-11% | 44-65% | 0-16% | 7-21% |
| SC | Soft Coral | 0% | 0% | 0% | 0-1% |
| RKC | Recently Killed Coral | 0% | 15-22% | 0% | 0-3% |
| NIA | Nutrient Indicator Algae | 14-24% | 0% | 0-19% | 1-54% |
| SP | Sponge | 0% | 2-5% | 0% | 0% |
| RC | Rock | 22-73% | 8-26% | 0-41% | 4-25% |
| RB | Rubble | 0-13% | 3% | 0-48% | 2-61% |
| SD | Sand | 0% | 2-4% | 0-92% | 3-56% |
| SI | Silt | 0% | 0% | 0% | 0-24% |
| OT | Others | 9-31% | 0% | 0-83% | 0-8% |

| Benthic composition | | Meedhoo | |
|---------------------|--------------------------|-------------|--------------|
| | | Inside Reef | Outside Reef |
| HC | Hard Coral | 1-3% | 26-34% |
| SC | Soft Coral | 0% | 1-2% |
| RKC | Recently Killed Coral | 0% | 1-8% |
| NIA | Nutrient Indicator Algae | 0-10% | 3-5% |
| SP | Sponge | 0% | 0-1% |
| RC | Rock | 0-63% | 27-36% |
| RB | Rubble | 13-58% | 21-28% |
| SD | Sand | 6-14% | 3-7% |
| SI | Silt | 0% | 0% |
| OT | Others | 3-28% | 0-1% |

Source: JICA Expert Team

ii) Detail photo quadrant analysis

At every 20 m along a transect line at each site, a half a metre quadrat is made and a photo was taken and benthic compositions were analyzed. Table 6.1.26 shows that the benthic compositions at most of site of 10m depth comprised mostly of a hard coral outside reefs, and algae (sea weeds) and rock inside reefs.

Table 6.1.26 Results of the Detail photo quadrant analysis at Five Target Islands

| Benthic composition | | Fonadhoo | | Gan | |
|------------------------------|-------------|-------------|--------------|-------------|--------------|
| | | Inside Reef | Outside Reef | Inside Reef | Outside Reef |
| Live reef cover | | 11~67% | 35~84% | 2~74% | 26~48% |
| HC | Hard Corals | 0% | 32~84% | 0% | 25~46% |
| SC | Soft Corals | 0% | 0% | 0% | 0% |
| ALG | Algae | 0~53% | 0~3% | 0~74% | 0~7% |
| SP | Sponges | 0% | 0% | 0% | 0~1% |
| OT | Others | 0~62% | 0% | 0~28% | 0% |
| Non-living reef cover | | 33~89% | 16~65% | 26~98% | 52~74% |
| DC | Dead Corals | 0~1% | 0~9% | 0% | 0~4% |
| RC | Rock | 0~46% | 16~62% | 24~96% | 17~58% |
| RB | Rubble | 0~39% | 0~44% | 0~2% | 4~43% |
| SD | Sand | 9~70% | 0~8% | 0~6% | 0~8% |
| SI | Silt | 0~8% | 0~1% | 0~1% | 0% |

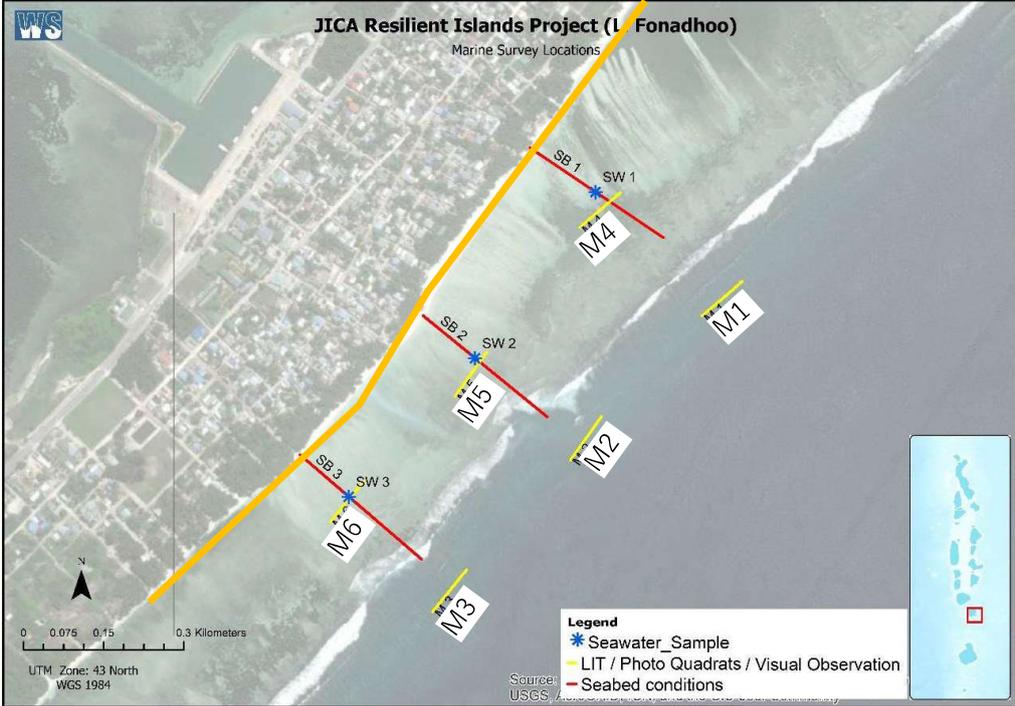
| Benthic composition | | Ishdhoo | | Maamendhoo | |
|------------------------------|-------------|-------------|--------------|-------------|--------------|
| | | Inside Reef | Outside Reef | Inside Reef | Outside Reef |
| Live reef cover | | 23~74% | 22~53% | 0~100% | 6~68% |
| HC | Hard Corals | 0~6% | 22~52% | 0~8% | 3~62% |
| SC | Soft Corals | 0% | 0% | 0~3% | 0~1% |
| ALG | Algae | 17~57% | 0~3% | 0~26% | 0~43% |
| SP | Sponges | 0% | 0% | 0% | 0% |
| OT | Others | 0~17% | 0~1% | 0~100% | 0~4% |
| Non-living reef cover | | 26~77% | 47~78% | 0~100% | 32~94% |
| DC | Dead Corals | 0% | 1~18% | 0~4% | 0~5% |
| RC | Rock | 2~65% | 28~70% | 0~58% | 9~74% |
| RB | Rubble | 0~11% | 12~10% | 0~49% | 0~44% |
| SD | Sand | 1~45% | 0~2% | 0~95% | 0~37% |
| SI | Silt | 0% | 0~5% | 0~1% | 0~10% |

| Benthic composition | | Meedhoo | |
|------------------------------|-------------|-------------|--------------|
| | | Inside Reef | Outside Reef |
| Live reef cover | | 0~55% | 28~79% |
| HC | Hard Corals | 0~7% | 28~79% |
| SC | Soft Corals | 0% | 0% |
| ALG | Algae | 0~12% | 0% |
| SP | Sponges | 0% | 0% |
| OT | Others | 0~55% | 0~2% |
| Non-living reef cover | | 44~100% | 21~72% |
| DC | Dead Corals | 0% | 0~5% |
| RC | Rock | 1~20% | 10~53% |
| RB | Rubble | 0~60% | 2~26% |
| SD | Sand | 18~81% | 0~8% |
| SI | Silt | 0% | 0~11% |

Source: JICA Expert Team

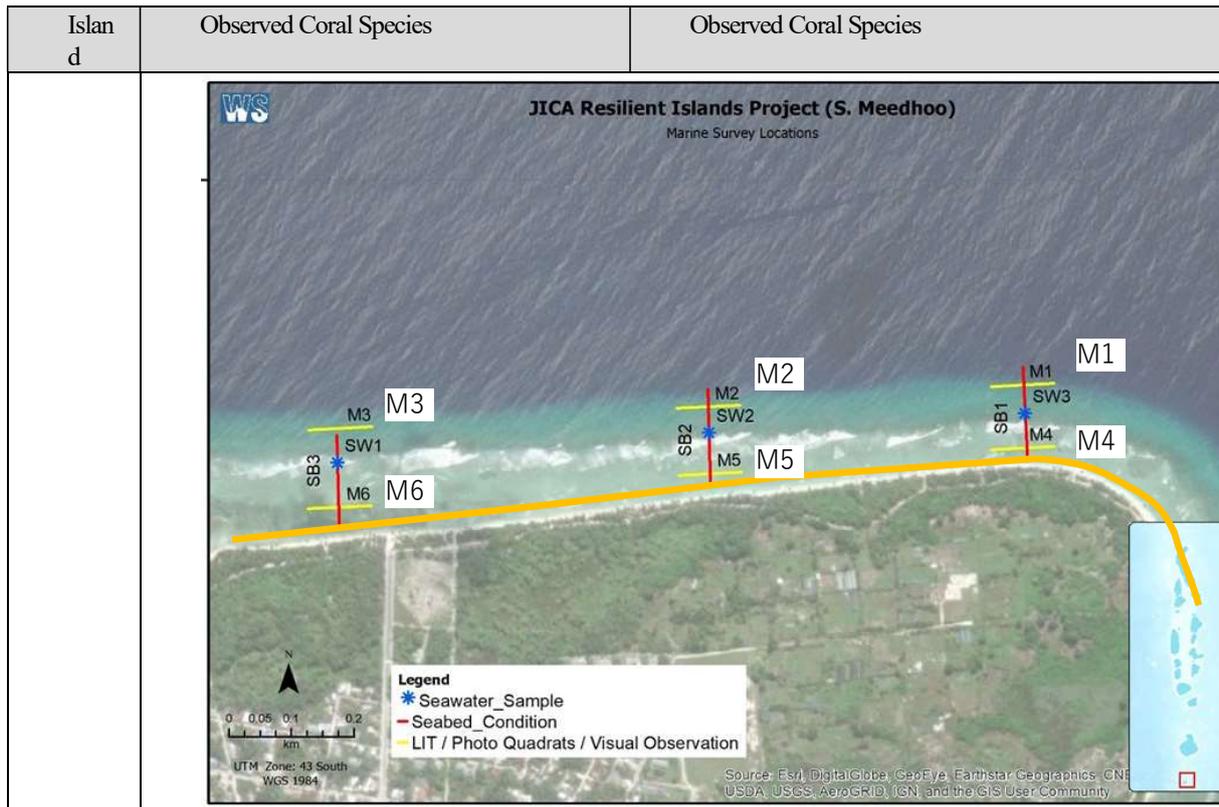
The following coral species that were found at the site, especially outside reefs. And some crown-of-thorns starfish were recorded at some sites in Maamendhoo.

Table 6.1.27 Observed Coral Species at Five Target Islands

| Island | Observed Coral Species | Observed Coral Species |
|---|---|---|
| Fonadhoo | Inside Reef (M4, M5, M6) <i>None</i> | Outside Reef (M1, M2, M3) <i>Pocillopora verrucosa, Porites lutea, Acropora hyacinthus, Stylophora pistillata, Acropora nasuta, Stylophora pistillata, Pachyseris sp, Porites cylinderica, Acropora hyacinthus, Platygera synensis, Platygera synensis, Lobophyllia recta</i> |
|  | | |
| Gan | Inside Reef (M3, M4) <i>Poritidae (M3)</i> | Outside Reef (M1, M2) <i>Stylophora pistillata, Pocillopora verrucosa, Montipora undata, Stylophora pistillata, Acropora latistella, Astreopora myriophthalma, Favites halicora, Platygyra daedalea, Porites lutea, Leptoria Phrygia, Acropora nasuta, Platygera synensis., Porites ru</i> |

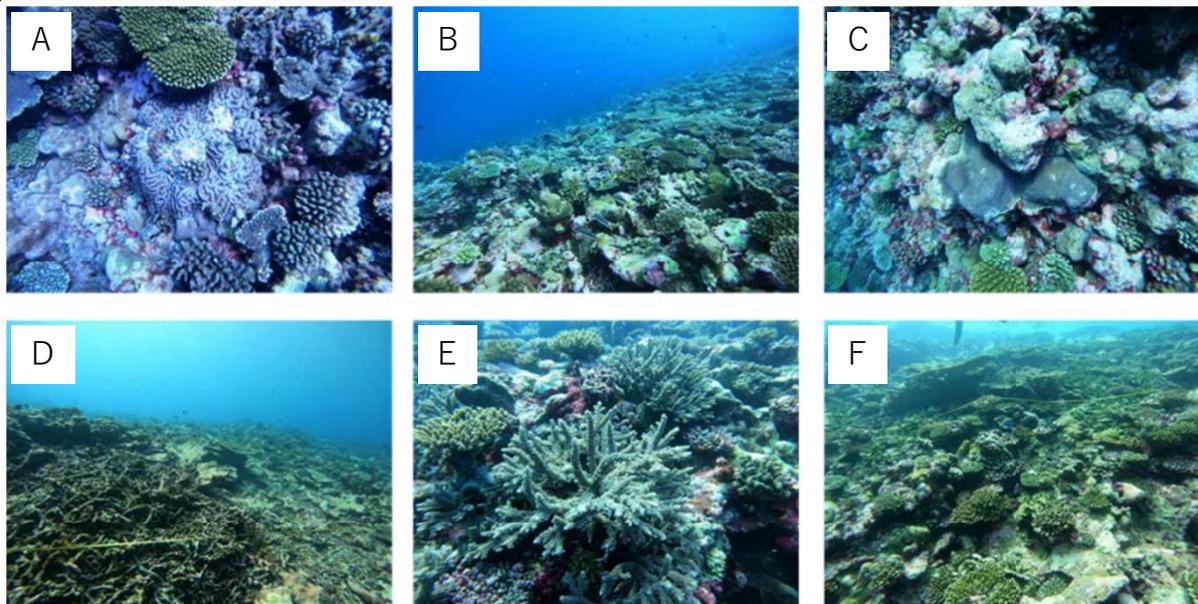
| Island | Observed Coral Species | Observed Coral Species |
|---------------|--|---|
| | | |
| Ishdhoo | Inside Reef (M3, M4) <i>Poritidae, Pocilloporidae and Acroporidae</i> <i>Poritidae</i> | Outside Reef (M1, M2) <i>Stylophora pistillata, Pocillopora verrucosa, Porites lutea, Leptoria Phrygia, Pachyseris sp, Acropora nasuta, Plerogyra sinuosa, Platygera synensis, Platygera synensis,</i> |
| | | |
| Maa mendoohoo | Inside Reef (M9, m10, M11) <i>Poritidae, Acroporidae</i> | Outside Reef (M1, M2, M3) <i>Acropora hyacinthus, Acropora nasuta, Platygera synensis, Pocillopora verrucosa, Porites lutea, Porites rus, Stylophora pistillata</i> |
| | Inside Reef (M8, M14) | Outside Reef (M4, M5) |

| Island | Observed Coral Species | Observed Coral Species |
|----------|---|--|
| | <i>Poritidae</i> | <i>Acropora nasuta</i> , <i>Annella mollis</i> , <i>Lobophytum sp.</i> , <i>Pocillopora verrucosa</i> , <i>Porites lutea</i> , <i>Porites rus</i> , <i>Sarcophyton sp.</i> |
| | Inside Reef (M12, M13) <i>None</i> | Outside Reef (M6, M7) <i>Acropora nasuta</i> , <i>Favites halicora</i> , <i>Herpolitha limax</i> , <i>Lobophyllia dimiduta</i> , <i>Pachyseris speciosa</i> , <i>Pocillopora verrucosa</i> , <i>Porites rus</i> |
| Meed hoo |  | |
| | Inside Reef (M4, M5, M6) <i>Poritidae</i> | Outside Reef (M1, M2, M3) <i>Acropora tenuis</i> , <i>Stylophora pistillata</i> , <i>Acropora clathrate</i> , <i>Stylophora pistilla</i> , <i>Dipsastrea favus</i> , <i>Platygera synensis</i> |



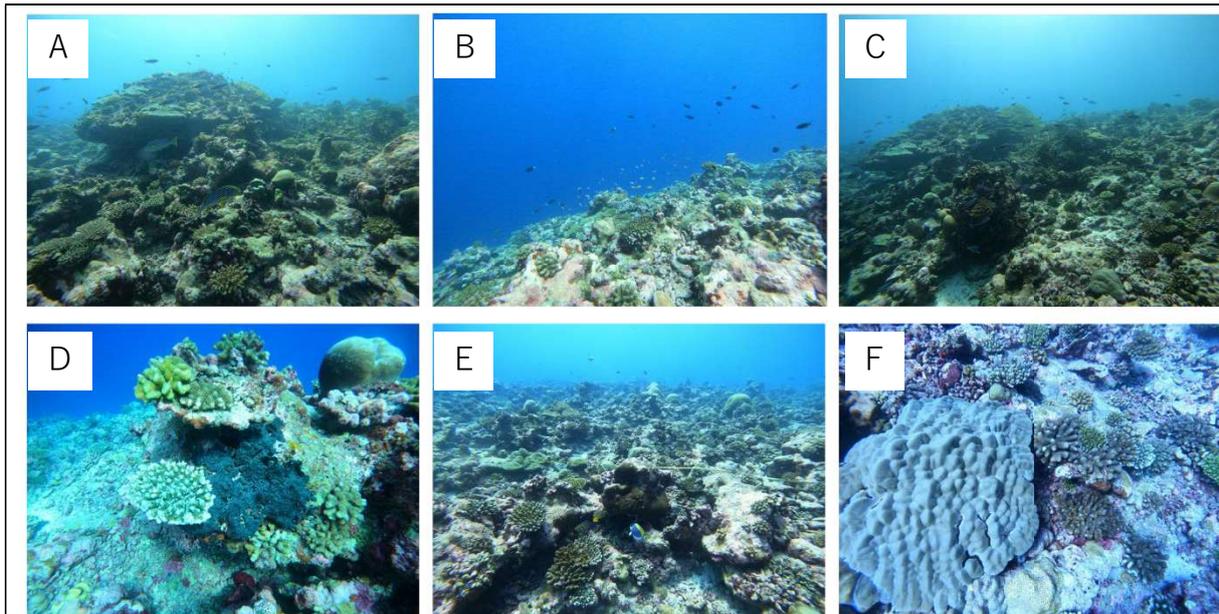
Source: JICA Expert Team

(1) Fonadhoo, Laamu



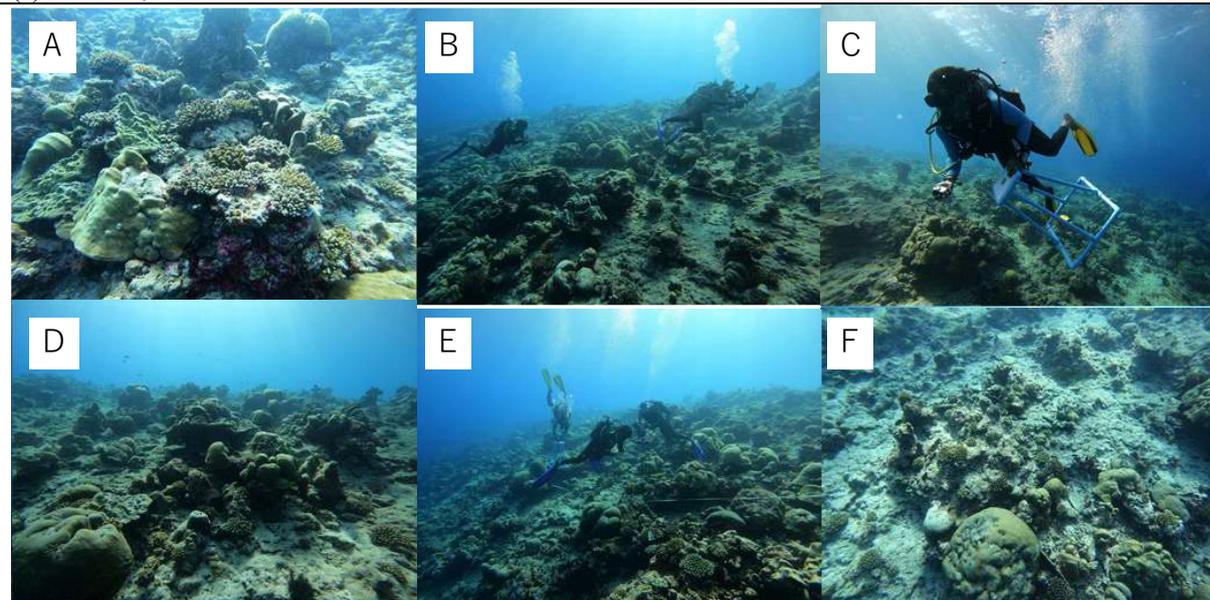
Site M1. A – Species of *Acroporidae* and *Pocilloporidae*. B – Photo of the site showing high live coral cover. C - Photos of corals spotted at site, including species of *Poritidae*. D – RKC found at the site. E, F Different species of hard coral cover at the site.

(2) Gan, Laamu



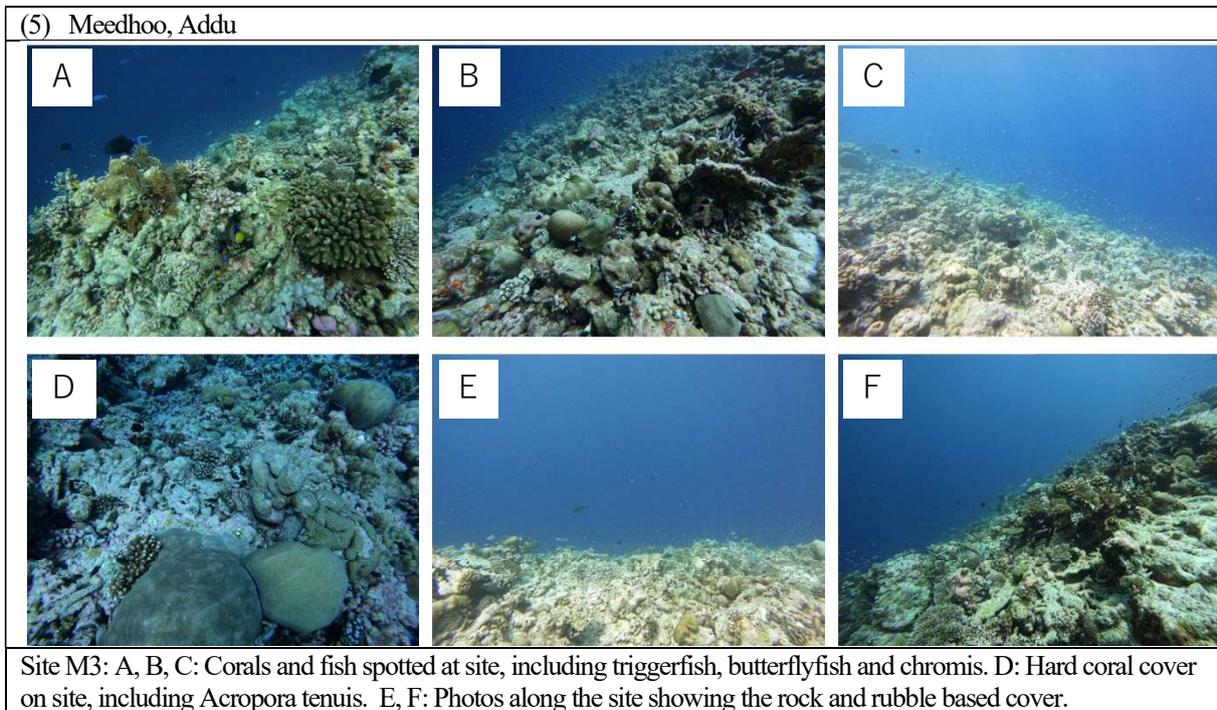
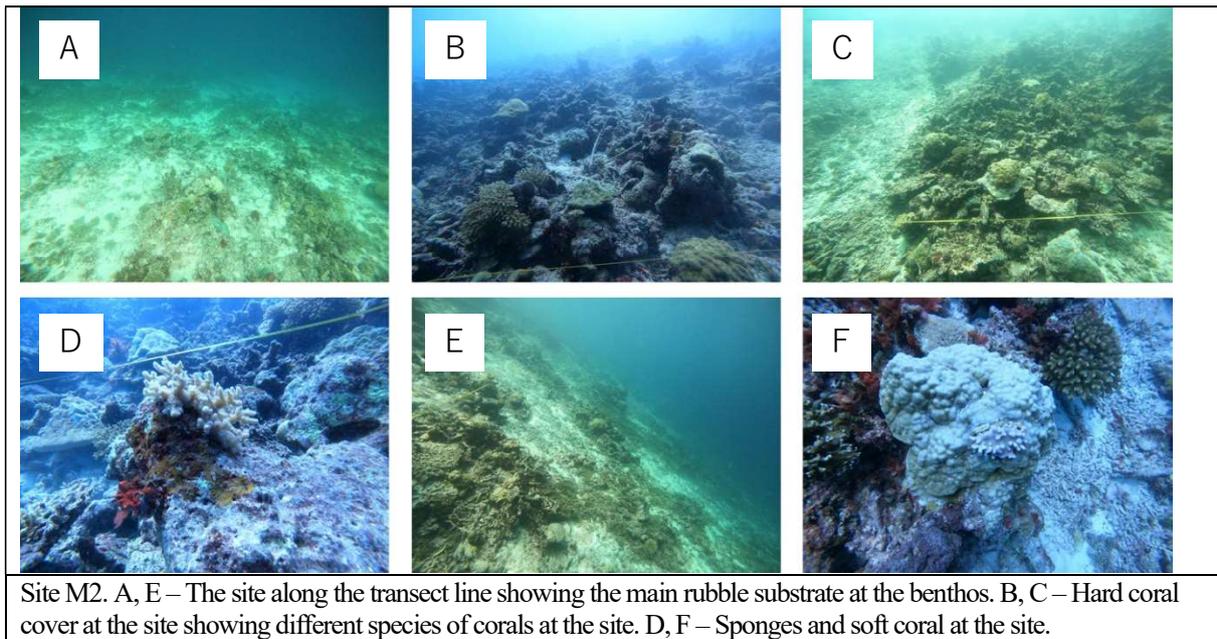
Site M1. A, B, C, E – General condition of the site showing high coral cover with different species of coral. D – *Acroporidae* and *Pocilloporidae* at site. F – *Poritidae* and *Pocilloporidae* at site

(3) Ishdhoo, Laamu



Site M1: A. Photo of the corals taken during the survey; B. LIT survey undertaken; C. Photo quadrat survey undertaken; D. Photo of the survey site; E. LIT and Photo quadrat survey undertaken; F. Photo of the survey site

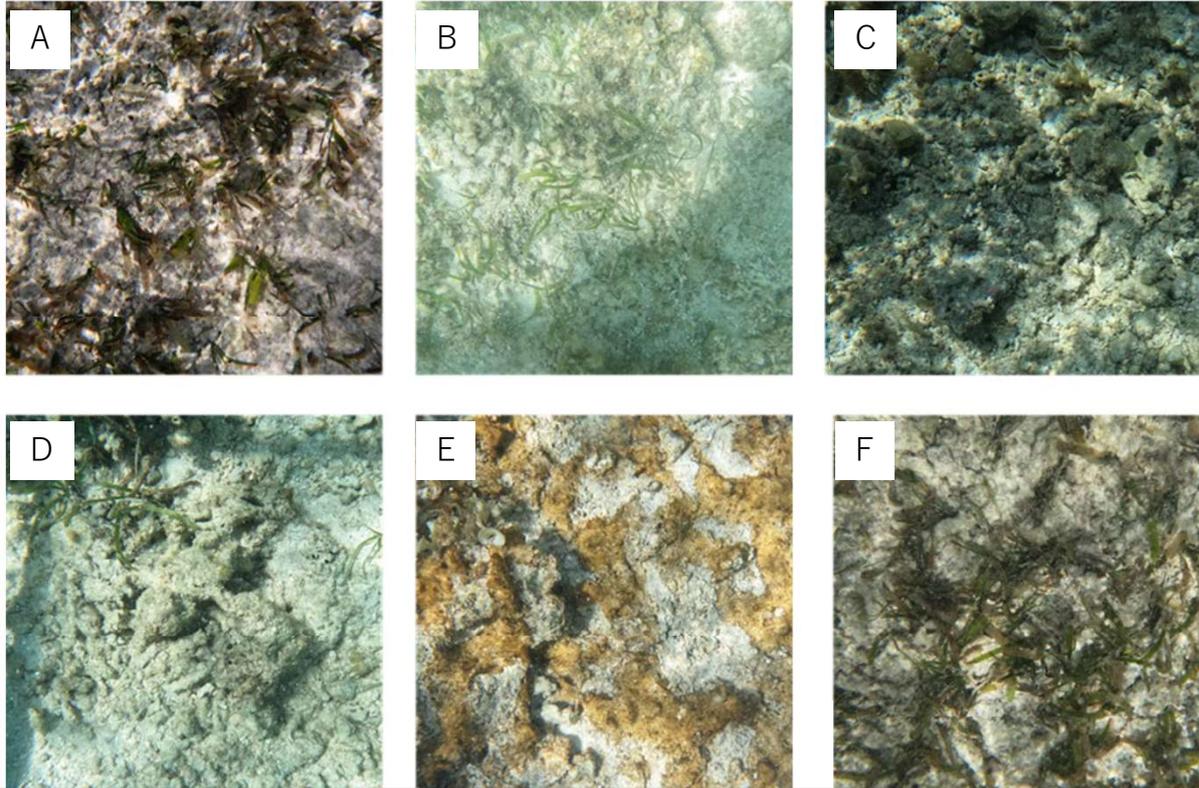
(4) Maamendhoo, Laamu



Source: JICA Expert Team

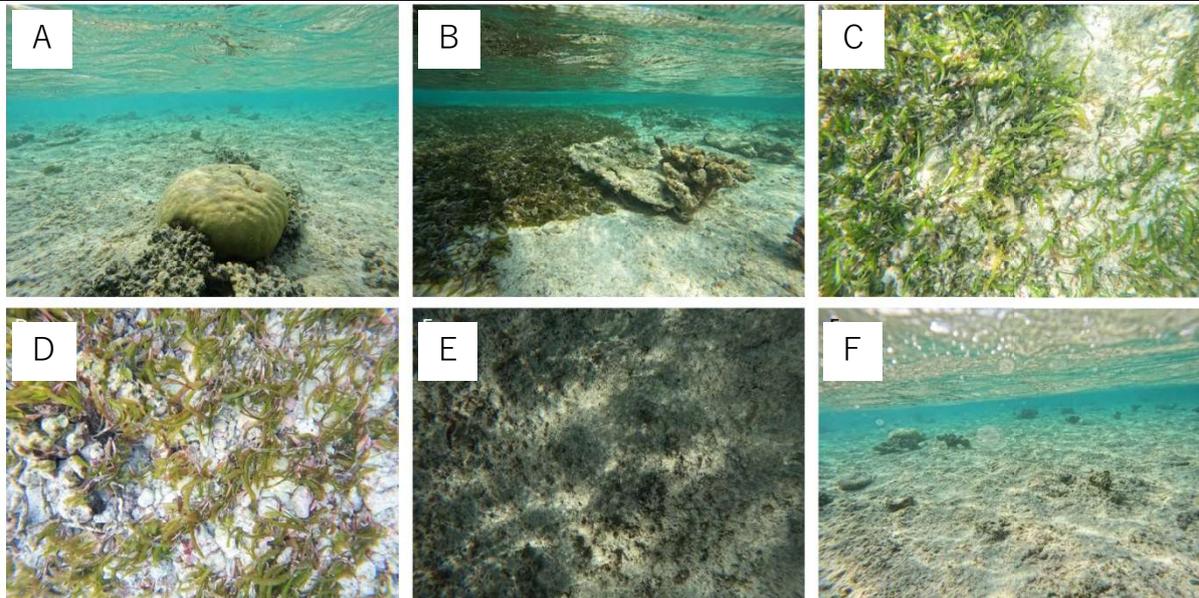
Figure 6.1.12 Sea Bed Situations outside the Reef at Five Target Islands

(1) Fonadhoo, Laamu

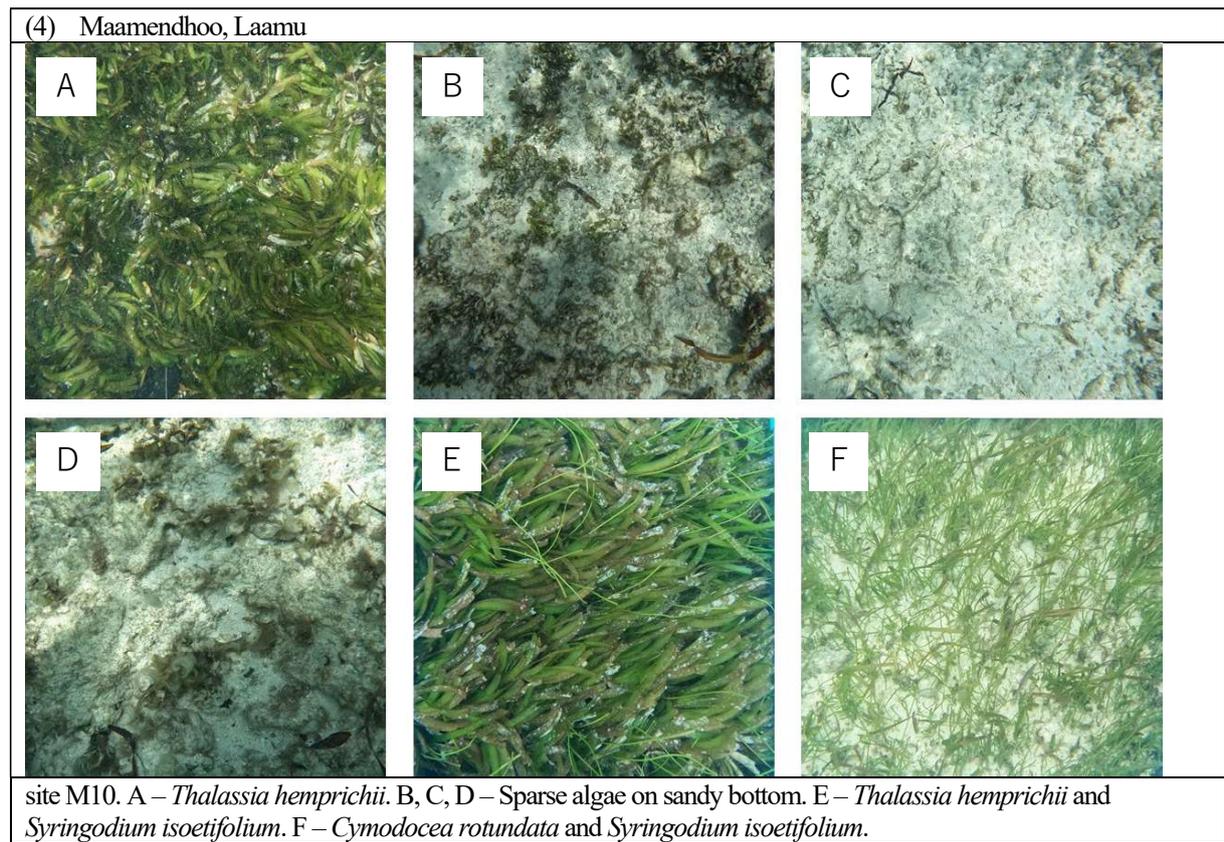
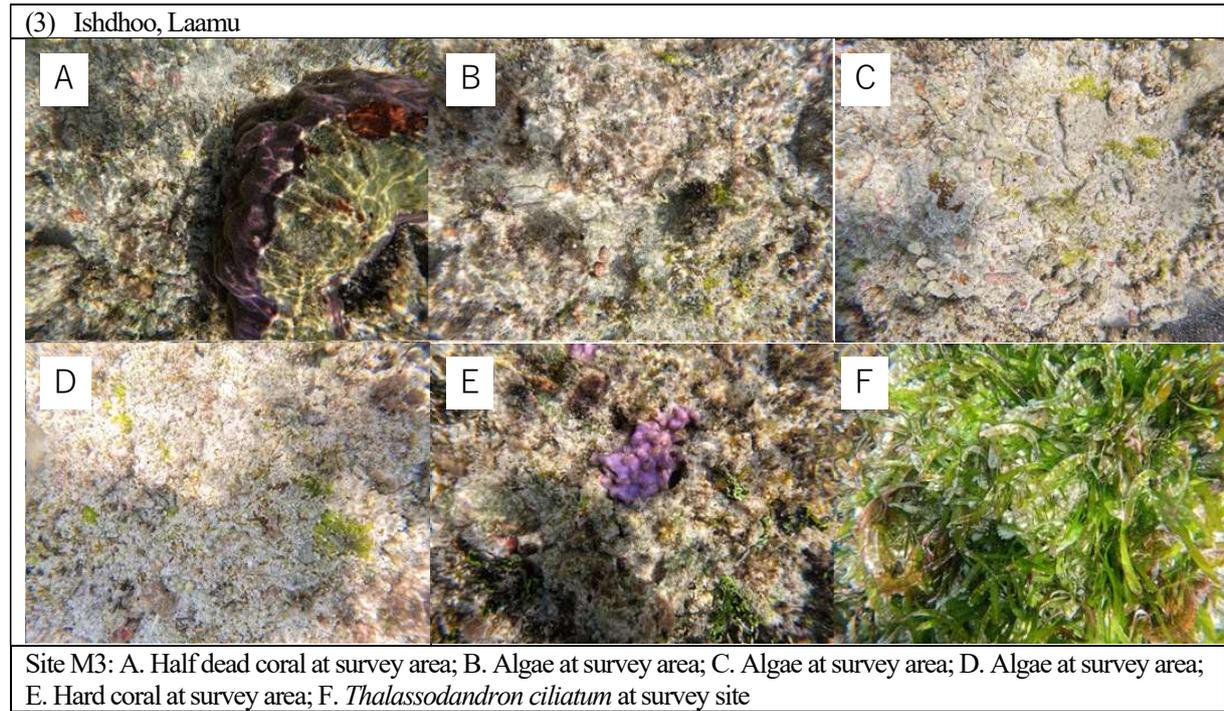


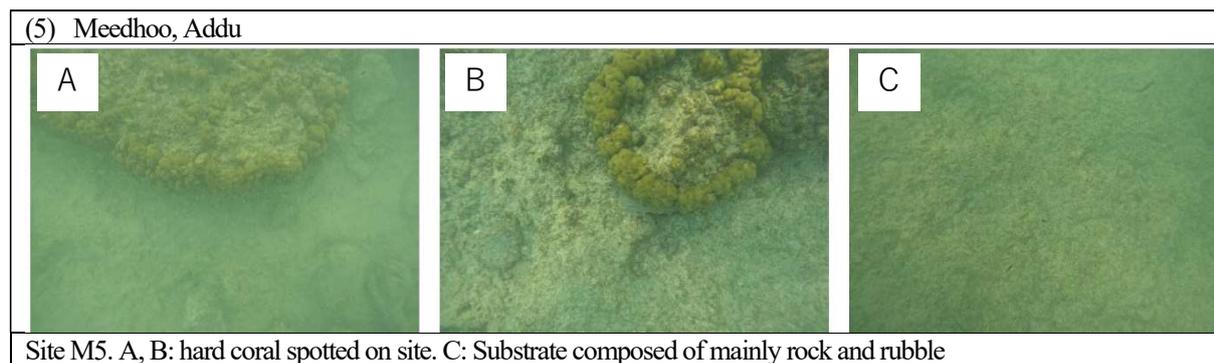
Site M4. A, B, C, D: Shows rubble and sand-based composition of the sediment at the site with sparse seagrass patches. E – Encrusting coral at the site. F: Seagrass at the site.

(2) Gan, Laamu



Site M3. A – Live coral (Poritidae) at site. B – Seagrass at the site showing rock substrate. C, D – Seagrass *Thalassodendron ciliatum* at the site. E, F – Rocky substrate with sparse rubble at the site.





Source: JICA Expert Team

Figure 6.1.13 Sea Bed Situations inside the Reef at Five Target Islands

iii) Threatened coral species in the Red List of International Union for Conservation of Nature (IUCN)

Threatened coral species in the Red List of International Union for Conservation of Nature (IUCN) observed through the Line Intercept Transect Survey and Photo Quadrat Surveys at the target five islands are listed in the following table. All of those threatened species are found along the survey lines outside reef edges, and no species are found inside the reefs, where are nearby the proposed construction sites.

Table 6.1.28 Coral species under “Threatened” category, found at target Five Islands

| Scientific Name | Category | Number of survey lines, where endangered coral species are found (upper: outside reef, lower: inside reef) | Fonadhoo | Gan | Maamendhoo | Isdhoo | Meedhoo |
|------------------------------|----------|--|------------|------------|------------|------------|------------|
| <i>Acropora Clathrata</i> | CR | 1/17 0/17 | 0/3 0/3 | 0/2 0/2 | 0/7 0/7 | 0/2 0/2 | 1/3 0/3 |
| <i>Acropora Hyacinthus</i> | CR | 3/17 0/17 | 2/3 0/3 | 0/2 0/2 | 1/7 0/7 | 0/2 0/2 | 0/3 0/3 |
| <i>Pachyseris Speciosa</i> | CR | 2/17 0/17 | 0/3 0/3 | 0/2 0/2 | 2/7 0/7 | 0/2 0/2 | 0/3 0/3 |
| <i>Plerogyra Sinuosa</i> | CR | 1/17 0/17 | 0/3 0/3 | 0/2 0/2 | 0/7 0/7 | 1/2 0/2 | 0/3 0/3 |
| <i>Pocillopora Verrucosa</i> | VU | 13/17 0/17 | 3/3 0/3 | 2/2 0/2 | 6/7 0/7 | 2/2 0/2 | 0/3 0/3 |
| <i>Porites Cylindrica</i> | EN | 1/17 0/17 | 1/3 0/3 | 0/2 0/2 | 0/7 0/7 | 0/2 0/2 | 0/3 0/3 |
| <i>Porites Rus</i> | NT | 7/17 0/17 | 0/3 0/3 | 1/2 0/2 | 6/7 0/7 | 0/2 0/2 | 0/3 0/3 |
| <i>Stylophora Pistillata</i> | CR | 10/17 0/17 | 3/3 0/3 | 2/2 0/2 | 1/7 0/7 | 2/2 0/2 | 2/3 0/3 |

Source: JICA Expert Team

Note: Numbers of survey lines, on which coral species under category “Threatened”: upper is outside reef edge, and lower is inside reef edge.

Category of IUCN Red List: "Endangered Class IA (CR)", "Endangered Class IB (EN)", Vulnerable (VU), and Near Threatened (NT) under "Threatened"

In accordance with Frequent Questions and Answers (FAQs) for JICA's Environmental and Social Consideration Guidelines (July 2011, revised February 2016), among "Important natural habitats or important forests", by referring the definition in the World Bank's Safeguard Policy, etc., "Natural habitats" are defined as (1) terrestrial and water areas (including sea areas) where natural ecosystems are formed mainly by native domestic fauna and flora species, and (2) terrestrial and water areas (including sea areas) where no alterations are added essentially. Furthermore, among the "natural habitats", five (5) criteria are indicated for "important natural habitats", and it was confirmed that all the five criteria are not applicable to the target five islands. The results are summarized in Table 6.1.29. Regarding criteria (5), it is unknown because it cannot be determined based on the information collected at this time.

Table 6.1.29 Current Situations for Five Target Islands to be considered as “Important Natural Habitats” among the Natural Habitats

| Standard | Current Situations |
|---|--|
| (1) Important habitats for species under "Threatened", "Endangered Class IA (CR)", "Endangered Class IB (EN)", Vulnerable (VU), and Near Threatened (NT) species in the Red List of the International Union for Conservation of Nature (IUCN) | Outside the Reef edges, along 16 out of the 17 survey lines on the 5 target islands, 5 species classified as “Critically Endangered (CR)”, 1 species under "Endangered Class IB (EN)", 1 species under “Vulnerable II (VU)”, and 1 species under “Near Threatened (NT)” on the IUCN Red List were observed. Inside the reef edges, no 'threatened' coral species were found on 17 survey lines on the 5 target islands. |
| (2) Important habitats for endemic species and/or species with limited distribution | As there are no KBA areas in the target islands, there are no important habitats for the species described in the left. |
| (3) Habitats that support migratory species and/or globally important assemblages of herd fauna species | As there are no IBA areas in the target islands, there are no habitats for the species described in the left. |
| (4) Areas where extremely critical ecosystems and/or unique ecosystems are recognized | As there are no KBA/IBA areas, nor protected areas and/or marine protected areas in the target islands, there are no areas described in the left. |
| (5) Areas associated with important evolutionary processes | N/A |

Source: JICA Expert Team

iv) Fish belt survey

Fish belt transects (FBT) surveys were conducted to count (quantify) the abundance and community composition of fish along a transect line for Line Intercept Transect (LIT). The numbers of fish counted by functional groups, such as herbivores (*Acanthuridae*, *Scaridae*), omnivores (selected *Labridae*), corallivores (*Chaetodontidae*) as well as habitat specialists (*Pomacentridae*).

At the sites outside reef, 6 to 25 kinds of fish were observed, and browsers and predators are most abundant groups of fish at the site, and only 1 to 5 kinds of fish were observed inside the reefs.

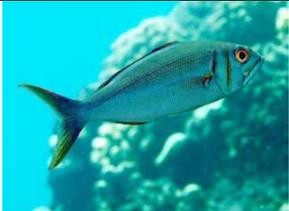
Table 6.1.30 Numbers of Recorded Fish at Five Target Islands

| Island | Site | Total numbers | Functional groups | | | | | |
|------------|--------------|---------------|-------------------|--------|----------|-------------|------------|----------|
| | | | Browser | Grazer | Predator | Planktivore | Coralivore | Omnivore |
| Fonadhoo | Inside Reef | 1~2 | 1 | 0 | 0 | 0~1 | 0 | 0 |
| | Outside Reef | 15~18 | 3~6 | 2~3 | 2~5 | 4~6 | 1~2 | 0 |
| Gan | Inside Reef | 3 | 2 | 0~1 | 0 | 0~1 | 0 | 0 |
| | Outside Reef | 19~25 | 6~8 | 5 | 3~5 | 5 | 0~2 | 0 |
| Ishdhoo | Inside Reef | 3~4 | 2~4 | 0~1 | 0 | 0 | 0 | 0 |
| | Outside Reef | 22~25 | 6~8 | 4~4 | 6~11 | 2~4 | 2~5 | 0 |
| Maamendhoo | Inside Reef | 1~3 | 1~3 | 0~1 | 0~1 | 0 | 0 | 0 |
| | Outside Reef | 6~13 | 3~8 | 1 | 0~5 | 0~3 | 0~3 | 0 |
| Meedhoo | Inside Reef | 2~5 | 1~2 | 0~1 | 0~1 | 0 | 0 | 1~2 |
| | Outside Reef | 22~24 | 3~4 | 4~6 | 9~12 | 2~4 | 0~1 | 0~1 |

Source: JICA Expert Team

Fish species observed during the terrestrial flora survey at Fonadhoo island are shown in Figure 6.1.14.

| | | |
|---|---|---|
|  |  |  |
| Trumpetfish (<i>Aulostomidae chiensis</i>) | Yellow-black fusilier (<i>Caesio xanthonota</i>) | Violet soldierfish (<i>Myripristis violacea</i>) |
|  |  |  |
| Philippine damsel (<i>Pomacentrus philippinus</i>) | Flower grouper (<i>Epinephelus fuscoguttatus</i>) | Blue-striped snapper (<i>Lutjanus kasmira</i>) |
|  |  |  |
| Indian damsel (<i>Pomacentrus indicus</i>) | Two-tone puller (<i>Chromis dimidiata</i>) | Clown triggerfish (<i>Balistoides conspicillum</i>) |
|  |  |  |
| Herringbone butterflyfish (<i>Chaetodon Triangulum</i>) | Powder blue tang (<i>Acanthurus leucosternon</i>) | Epaulette surgeonfish (<i>Acanthurus nigricauda</i>) |

| | | |
|---|---|---|
|  |  |  |
| Convict tang (<i>Acanthurus triostegus</i>) | Redtoothed triggerfish (<i>Odonus niger</i>) | Redtail butterflyfish (<i>Chaetodon collare</i>) |
|  |  |  |
| Forster's Hawkfish (<i>Paracirrhites forsteri</i>) | Humpback snapper (<i>Lutjanus gibbus</i>) | Small-toothed jobfish (<i>Aphareus furca</i>) |
|  |  |  |
| Steephead parrotfish (<i>Chlorurus strongylocephalus</i>) | Tricolor parrotfish (<i>Scarus tricolor</i>) | Yellow-tail basslet (<i>Pseudanthias evansi</i>) |
|  |  |  |
| Orange basslet (<i>Pseudanthias squamipinnis</i>) | Moorish idol (<i>Zanclus cornutus</i>) | Thompson's surgeonfish (<i>Acanthurus thompsoni</i>) |
|  | | |
| Indian triggerfish (<i>Melichthys indicus</i>) | | |

Source: JICA Expert Team

Figure 6.1.14 Fish Species Observed during the Fish-belt Survey at Fonadhoo Island

v) Marine water quality survey

The marine waters are collected at several points mainly inside reefs nearby the proposed construction sites at each target island, and the water taken from the sites are analyzed at MWSC Water Quality Assurance Laboratory in Male. marine water quality parameter optimum conditions set by the Maldives EPA guideline is given as reference standards in the following table.

Table 6.1.31 Marine Water Quality Parameters Optimum Conditions under EPA Data Collection Guideline

| Parameter | Optimal Range | Reference |
|-----------------------|---|-----------------------|
| Temperature | 18°C and 32°C *Changes should not surpass 10C above the average long-term maximum | GBRMPA, 2009 |
| Salinity | 3.2% - 4.2% | GBRMPA, 2009 |
| pH | 8.0-8.3 *Levels below 7.4 pH cause stress | |
| Turbidity | 3-5 NTU >5 NTU causes stress | Cooper et al. 2008 |
| Sedimentation | Maximum mean annual rate 3mg/cm ² /day Daily maximum of 15mg/cm ² /day | GBRMPA, 2009 |
| Nitrates | <5 mg l-1 NO -N | UNESCO/WHO/UNEP, 1996 |
| Ammonia | Max. 2-3 mg l-1 N | UNESCO/WHO/UNEP, 1996 |
| Phosphate | 0.005 - 0.020 mg l-1 PO -P | UNESCO/WHO/UNEP, 1996 |
| Sulphate ¹ | 2 mg l-1 and 80 mg l-1 | UNESCO/WHO/UNEP, 1996 |
| BOD | < 2 mg l-1 O ₃ | UNESCO/WHO/UNEP, 1996 |
| COD | < 20 mg l-1 O ₂ | UNESCO/WHO/UNEP, 1996 |

Source: EPA data collection guideline

Except Sulphate and Phosphate, the results of other parameters comply with the standards set by the EPA.

Table 6.1.32 Marine Water Analysis Results at Five Target Islands

| Parameter | Unit | Fonadhoo | Gan | Ishdhoo | Maamendhoo | Meedhoo |
|---------------------|------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | | 3 samples | 2 samples | 2 samples | 7 samples | 3 samples |
| Physical Appearance | | Clear with particles |
| Temperature | °C | 23.6~24.1 | 23.8~24.0 | 24.0~24.2 | 24.0~24.2 | 24.3~25.0 |
| Salinity | ‰ | 33.33~33.94 | 33.55~33.52 | 33.69~33.80 | 33.64~34.24 | 34.05~34.41 |
| pH | | 8.1~8.1 | 8.0~8.1 | 8.0~8.1 | 8.0~8.2 | 8.2~8.5 |
| Turbidity | NTU | 0.148~0.246 | 0.148~0.236 | 0.182~0.280 | 0.206~0.424 | 0.207~0.324 |
| Nitrates | mg/L | 3.9~4.9 | 3.5~4.8 | 4.2~4.6 | 4.1~6.0 | 5.6~6.1 |
| Ammonia | mg/L | 0.06~0.09 | 0.04~0.06 | 0.06~0.23 | 0.06~0.23 | 0.08~0.11 |
| Phosphate | mg/L | 0.05~0.10 | <0.05~0.05 | <0.05~0.05 | 0.03~0.20 | 0.13~0.16 |
| Sulphate | mg/L | 2400~2500 | 2500~2550 | 2400~2450 | 2350~2500 | 2650~3100 |
| BOD | mg/L | 1~1 | 1~1 | 1~1 | 1~3 | - |

Source: JICA Expert Team

All survey results in each island are attached as Appendix.6.

¹ According to www.britannica.com/science/seawater/Dissolved-inorganic-substances, Sulphate concentration levels in normal seawater are in the range of around 2500 mg/l.

(2) Survey Result of Environmental and Social Considerations

The survey result of environmental and social considerations is shown in Table 6.1.33.

Table 6.1.33 Survey Result of Environmental and Social Considerations

| Pollution | | |
|---------------------|--------------------------------------|---|
| 1 | Air Pollution | Based on the site reconnaissance as well as hearing from Island Council at each targeted island, it was found that there was no source of air pollution in and around the Project areas because the proposed sites were located along the coast and some distance from residential area and public roads at present. During construction phase, air pollution would be expected due to heavy machinery operation and construction activities, however, it would be limited considering the scale of construction. In the case of beach nourishment project in Maamendhoo Island, Fonadhoo Island, and Meedhoo Island, air quality would be affected near the site for stocked supplementary sand due to unproper management during operation phase. |
| 2 | Water Pollution | Ground water as well as sea water at all targeted islands were analyzed and found all parameters satisfying with the national standards. Based on the site reconnaissance and hearing form Island Council at each targeted island, no pollution sources were confirmed in and around the Project area. During construction phase, turbidity shall be constantly checked when operating construction activities at costal area and borrowed area. In an operation phase, supplementary sand for maintaining nourished beach shall be properly stocked in order to avoid any outflow of sand into the sea. |
| 3. | Soil Contamination | Based on the site reconnaissance as well as hearing from Island Council at each targeted island, it was found that there was no source of soil contamination in and around the Project areas. During construction phase, soil contamination would be occurred from construction vehicles due to poor maintenance. |
| 4 | Noise and Vibration | Noise survey was conducted at the location along the road to the project site and closer to the residential area in each target island. The results of all islands are around 55dB which is mostly satisfied with the standards set by WHO. Only the result in Meedhoo Island was slightly higher (around 60dB). Main source of the noise is from vehicles and voices of people passing by. During construction phase, noise and vibration would be generated from the construction activities and vehicles transporting construction materials. However, any blasting or drilling works are not planned, so the effects from noise or vibration would be limited. Furthermore, the effects of noise or vibration from the construction activities would be limited since the construction site is not adjacent to residential areas. Effect of noise from vehicles transporting construction materials is to be predicted, but it would be limited considering the scale of construction. |
| 7 | Bottom Sediment | Construction activities at the project for beach nourishment and reclamation would cause soil sedimentation during construction phase. Soil sedimentation would be occurred around the nourished beach in the operation phase. |
| 8 | Waste | At the project site in Fonadhoo Island, Isdhoo Island, Gan Island and Meedhoo Island, soft measures such as geo-bags installing already for the projection of coast line would be removed and transported from the sites during construction phase. Hazardous waste such as used engine oil would be generated from construction vehicles during construction phase as well. |
| Natural Environment | | |
| 9 | Topography and Geographical Features | During construction phase, the location for reclamation at Maamendhoo Island shall be constantly checked in order to avoid any unnecessary reclamation. During the operation phase, the coastal line around the Project area shall be regularly monitored in order to grasp any changes of geographical features. |
| 10 | Hydrological Situation | During the operation phase, the waves and current around the Project area shall be regularly monitored in order to grasp any effect on the island's geographical features. |
| 12 | Flora and Fauna/ Biodiversity | Based on the field survey and hearing from the island council at each targeted island, there is no designated environmentally protected area near the project site at all targeted islands. Based on the marine survey, no threatened species (rare species) of corals were confirmed and the conditions of |

| | | <p>seabed were dominated rocky bottom with rubble, sand or seagrass and the coverage of corals were low and not concentrated in the project areas. Therefore, it is concluded that the project areas are considered to be not biologically important. According to Appendix 1 “Ecosystem and Biota” in JICA Guidelines for environmental and social considerations, it is stipulated that Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests. By referring IFC’s standards, it was confirmed that the following conditions were fulfilled by applying mitigation measures.</p> <table border="1" data-bbox="448 465 1391 1473"> <thead> <tr> <th data-bbox="448 465 922 501">Required considerations</th> <th data-bbox="922 465 1391 501">Mitigation measures</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 501 922 846">(1) Project shall not exert significant adverse impacts on biodiversity values existing in “critical habitat” and key functions of the ecosystems.</td> <td data-bbox="922 501 1391 846">“Threatened” species in IUCN Red List were confirmed in outer reef area which was several hundred meters away from the project sites, and it was not confirmed any along the coastal area or inside of reef in the project areas. In order to avoid any effect from construction activities or dredging on corals, temporary provisions to reduce turbid water flow to surrounding areas such as installing silt fence.</td> </tr> <tr> <td data-bbox="448 846 922 1227">(2) Over a reasonable period of time, projects shall not cause net reduction in endangered species population listed below; Species classified into “Critically Endangered (CR)” and “Endangered (EN) out of “Threatened” species listed on the IUCN Red List of Threatened Species, or those that fall under such classifications in accordance with the host country’s rules and regulations</td> <td data-bbox="922 846 1391 1227">“Threatened” species in IUCN Red List were confirmed in outer reef area which was several hundred meters away from the project sites, and it was not confirmed any along the coastal area or inside of reef in the project areas. In order to avoid any effect from construction activities or dredging on corals, temporary provisions to reduce turbid water flow to surrounding areas such as installing silt fence.</td> </tr> <tr> <td data-bbox="448 1227 922 1473">(3) Long-term and effective mitigation measures and monitoring shall be put in place be performed with regard to (1) and (2) above.</td> <td data-bbox="922 1227 1391 1473">Due to nourishing, revetment or reclamation, marine ecosystem around the Project area may be disturbed. However, considering the scale of projects, the impacts would be limited and site-specific. The impact needs to be monitored regularly.</td> </tr> </tbody> </table> <p>Terrestrial and marine environment in and around projects sites would be disturbed by the construction activities, however, the impact would be minor considering the scale of the projects. In an operation phase, the state of marine ecosystem around the project sites shall be regularly monitored in order to grasp any changes made by the Project.</p> | Required considerations | Mitigation measures | (1) Project shall not exert significant adverse impacts on biodiversity values existing in “critical habitat” and key functions of the ecosystems. | “Threatened” species in IUCN Red List were confirmed in outer reef area which was several hundred meters away from the project sites, and it was not confirmed any along the coastal area or inside of reef in the project areas. In order to avoid any effect from construction activities or dredging on corals, temporary provisions to reduce turbid water flow to surrounding areas such as installing silt fence. | (2) Over a reasonable period of time, projects shall not cause net reduction in endangered species population listed below; Species classified into “Critically Endangered (CR)” and “Endangered (EN) out of “Threatened” species listed on the IUCN Red List of Threatened Species, or those that fall under such classifications in accordance with the host country’s rules and regulations | “Threatened” species in IUCN Red List were confirmed in outer reef area which was several hundred meters away from the project sites, and it was not confirmed any along the coastal area or inside of reef in the project areas. In order to avoid any effect from construction activities or dredging on corals, temporary provisions to reduce turbid water flow to surrounding areas such as installing silt fence. | (3) Long-term and effective mitigation measures and monitoring shall be put in place be performed with regard to (1) and (2) above. | Due to nourishing, revetment or reclamation, marine ecosystem around the Project area may be disturbed. However, considering the scale of projects, the impacts would be limited and site-specific. The impact needs to be monitored regularly. |
|---|---|---|-------------------------|---------------------|--|---|---|---|---|---|
| Required considerations | Mitigation measures | | | | | | | | | |
| (1) Project shall not exert significant adverse impacts on biodiversity values existing in “critical habitat” and key functions of the ecosystems. | “Threatened” species in IUCN Red List were confirmed in outer reef area which was several hundred meters away from the project sites, and it was not confirmed any along the coastal area or inside of reef in the project areas. In order to avoid any effect from construction activities or dredging on corals, temporary provisions to reduce turbid water flow to surrounding areas such as installing silt fence. | | | | | | | | | |
| (2) Over a reasonable period of time, projects shall not cause net reduction in endangered species population listed below; Species classified into “Critically Endangered (CR)” and “Endangered (EN) out of “Threatened” species listed on the IUCN Red List of Threatened Species, or those that fall under such classifications in accordance with the host country’s rules and regulations | “Threatened” species in IUCN Red List were confirmed in outer reef area which was several hundred meters away from the project sites, and it was not confirmed any along the coastal area or inside of reef in the project areas. In order to avoid any effect from construction activities or dredging on corals, temporary provisions to reduce turbid water flow to surrounding areas such as installing silt fence. | | | | | | | | | |
| (3) Long-term and effective mitigation measures and monitoring shall be put in place be performed with regard to (1) and (2) above. | Due to nourishing, revetment or reclamation, marine ecosystem around the Project area may be disturbed. However, considering the scale of projects, the impacts would be limited and site-specific. The impact needs to be monitored regularly. | | | | | | | | | |
| 14 | Coastal Zone | Since projects’ purpose is costal protection, all project sites are located along the coastal area. Construction activities would disturb coastal ecosystem, however, considering the scale of construction, the effect would be limited. | | | | | | | | |
| Social Environment | | | | | | | | | | |
| 15 | Involuntary Resettlement | Involuntary resettlement or land acquisition is not expected under the Project. There was no illegal occupant found in the Project area. Based on the hearing from the Island Council members in Maamendhoo, there are three temporary structures without walls and foundation installed at the sea adjacent to the proposed reclamation area in which two of them are used for resting area of enjoying sea view by the owner of the structures and his neighbors. These are not used for the purpose of making a living or residence. The rest of the structure is located along the coastline and used for a working space of processing tuna fish. The land adjacent to these structures is belong to the Island and two structures installed at the sea and the extended part of the one located along the coastline | | | | | | | | |

| | | |
|----|--|---|
| | | <p>are installed illegally without permission of the Island Council. Two structures installed at the sea, where to be reclaimed need to be moved and one temporary structure installed along the coast need to be set back 1m or 2m from existing location. The owner of the three structures is the lessee to the land managed by Island Council. Agreement was made among the owner of the structures, Island Council and MECCT that disassembling and moving the structures with the physical support from the Island Council prior to the commencement of the construction activities would be applied as an alternative compensation measure instead of providing compensation for the loss of structures at a replacement cost.</p> <p>As for the access to the construction sites on land, construction materials will be transported by using existing roads at all targeted islands except the project for protecting cultural heritage site at Gan Island. In the case of revetment project at Gan Island, about 150m of the existing road may need to be expanded 3m width to reach the proposed revetment site for construction vehicle to transport construction materials such as rocks. Details of necessity for the expansion will be examined in the D/D phase. The trees can be cutting down with the consent of Island Council and the owner of the trees (if there is). In addition, tree must be planted in comply with the stipulation in the regulation No.7/2014 that “every tree or palm removed two more should be planted and grown in the island and compensate to the owner of the trees (if there is).</p> |
| 16 | Poor | Based on the site reconnaissance and hearings from Island Council members, it was found that there are no residents within the project sites or no commercial activities along the coastal area in all targeted islands. |
| 18 | Local Economy such as Employment, and Livelihood etc., | Based on the site reconnaissance and hearings from Island Council members, it was found that there are no commercial activities along the coastal area in all targeted islands. However, locals are using coastal area for recreational purposes such as walking, swimming, fishing, surfing, snookering, collecting seashells and catching octopus. During construing phase, these activities would be disrupted temporarily. |
| 19 | Land use and u Utilization of Local Resources | Based on the site reconnaissance and hearings from Island Council members, it was found that locals are using coastal area for recreational purposes such as walking, swimming, fishing, surfing, snookering, collecting seashells and catching octopus. During construing phase, these activities would be disrupted temporarily. |
| 23 | Misdistribution of Benefits and Damages | Based on the site reconnaissance and hearings from Island Council members, it was found that there are no commercial activities along the coastal area in all targeted islands. No activities are expected to lead to misdistribution of benefits and damages due to the Project. |
| 24 | Local Conflicts of Interest | Based on the site reconnaissance and hearings from Island Council members, it was found that there are no commercial activities along the coastal area in all targeted islands. No activities are expected to raise to local conflicts of interest due to the Project. |
| 26 | Cultural Heritage | There are three national cultural heritages found in the Project area, namely at Gan Island (ancient Buddhist heritage), Isdhoo Island (ancient Buddhist heritage) and Meedhoo Island (oldest Islamic cemetery in the Maldives). As for the two Buddhist heritages, it is the project purpose to protect these sites from costal erosion. The oldest Islamic cemetery is not in the Project site. Therefore, no negative effects are expected from the Project. |
| 28 | Gender | Based on the gender assessment meeting implementing at all targeted islands, it was found that there is no gender discrimination on job opportunity or payment by gender at present. However, the decision on the Island is rather made by male than female. |
| 29 | Children’s Rights | Based on the hearing from Island Council members, it was found that there is no custom of child labor exist in all targeted islands. |
| 30 | Hazardous (Risk) Infectious Diseases such as HIV/AIDS | Some public health impacts are expected due to the influx of construction workers, as well as increased risks related to sexually transmitted diseases (STDs/STIs), HIV/AIDS and COVID-19 between workers and the local population. |
| 31 | Occupational Health and Safety | Inappropriate management of working environment would raise the risk of accidents and disease. The contractor shall observe legislations such as Construction Safety Standards (2019) to manage the working environment during construction phase. |

| Other | | |
|-------|----------------|--|
| 32 | Accidents | During construction phase, increase traffic due to transporting construction materials would increase the risk of accidents. Inappropriate management and operation of construction vehicles would increase the risk of accidents during construction phase. |
| 33 | Climate Change | During construction phase, generation of greenhouse gases due to the operation of construction equipment and vehicles is minor and is not expected to have a significant impact on climate change. Adopting coastal protection measures will decrease the negative affect from climate change. |

Source: JICA Expert Team

6.1.7 Environmental Impact Assessment

Based on the survey, the result of environmental impact assessment on the Component 1 and the Component 2 are shown in Table 6.1.34 and Table 6.1.35 respectively.

Table 6.1.34 Result of Environmental Impact Assessment on the Component 1

| | Environmental Items | Phase | | Evaluation Based on Survey Results | | Reason of Evaluation |
|---------------------|--------------------------------------|-------|----|------------------------------------|-----|---|
| | | BC/DC | OP | BC/DC | OP | |
| Pollution Control | | | | | | |
| 1 | Air Pollution | - | - | N/A | N/A | No adverse effects to the air quality at the target sites would be occurred, as there are no sources by the activities. |
| 2 | Water Pollution | ✓ | ✓ | B- | B- | For the implementation of sediment budget control plan, the water quality may be affected to some extent, due to the improper implementation. |
| 3 | Soil Contamination | - | - | N/A | N/A | No adverse effects to the soil contamination at the target sites would be occurred, as there are no sources by the activities. |
| 4 | Noise/Vibration | - | - | N/A | N/A | No adverse effects to the noise and vibration at the target sites would be occurred, as there are no sources by the activities. |
| 5 | Ground Subsidence | - | - | N/A | N/A | No adverse effects to the ground subsidence at the target sites would be occurred, as there are no sources by the activities. |
| 6 | Offensive Odors | - | - | N/A | N/A | No adverse effects to the offensive odors at the target sites would be occurred, as there are no order sources by the activities. |
| 7 | Bottom Sediment | ✓ | ✓ | B- | B- | For the implementation of sediment budget control plan, sediment may be affected to some extent, due to the improper implementation. |
| 8 | Waste | - | - | N/A | N/A | No adverse effects to the waste management at the target sites would be occurred, as there are no sources by the activities. |
| Natural Environment | | | | | | |
| 9 | Topography and Geographical Features | - | - | N/A | N/A | No adverse effects to the topography or geographical features at the target sites would be occurred, as there are no activities which affect to topography and geographical features. |

| | Environmental Items | Phase | | Evaluation Based on Survey Results | | Reason of Evaluation |
|--------------------|--|-------|----|------------------------------------|-----|---|
| | | BC/DC | OP | BC/DC | OP | |
| 10 | Hydrological Situation | - | - | N/A | N/A | No adverse effects to the hydrological situation at the target sites would be occurred, as there are no activities which affect to hydrological situation. |
| 11 | Groundwater | - | - | N/A | N/A | No adverse effects to the groundwater at the targeted sites would be occurred, as there is no extraction of a large volume of groundwater by the activities. |
| 12 | Flora, Fauna, and Biodiversity | ✓ | ✓ | B- | B- | For the establishment of coastal and reef conservation plan and implementation of sediment budget control plan, the marine system in the coastal areas may be affected to some extent, due to the improper implementation. |
| 13 | Protected Area | - | - | N/A | N/A | There are no protected areas or Marine Protected Areas (MPA) around the proposed project sites. |
| 14 | Coastal Zone | ✓ | ✓ | B- | B- | For the establishment of coastal and reef conservation plan and implementation of sediment budget control plan, the marine system in the coastal areas may be affected to some extent, due to the improper implementation. |
| Social Environment | | | | | | |
| 15 | Involuntary Resettlement/Land Acquisition (if needed) | - | - | N/A | N/A | No involuntary resettlement will be occurred by implementing any proposed projects, as there are no residents and residential areas at all the project sites. |
| 16 | Poor | ✓ | ✓ | B- | B- | If the target areas area used by the local people regularly, there will be possibilities of misdistribution of benefit and damages by restrictions for the local peoples' livelihood, especially for the low-income group, due to the coastal and reef conservation plan. |
| 17 | Indigenous, or Ethnic People | - | - | N/A | N/A | The project area does not include the residential area of indigenous or ethnic minorities at present. |
| 18 | Local Economies such as Employment, Livelihood, etc. | ✓ | ✓ | N/A | N/A | If the target areas area used by the local people regularly, there will be possibilities for the local people not to be able to use the areas for their livelihood activities due to the coastal and reef conservation plan. |
| 19 | Land Use and Utilization of Local Resources | ✓ | ✓ | N/A | N/A | If the target areas area used by the local people regularly, there will be possibilities for the local people not to be able to use the areas or local resources due to the coastal and reef conservation plan. |
| 20 | Water Usage or Water Rights and Communal Rights | - | - | N/A | N/A | There would be no construction works or operation activities which will limit water use, or cause impact on water use. |
| 21 | Existing Social Infrastructures and Services | - | - | N/A | N/A | There would be no construction works or operation activities which will cause impact on infrastructures. |
| 22 | Social Institutions such as Social Infrastructure and Local Decision-making Institutions | ✓ | ✓ | B- | B- | There would be potential gender discrimination in participating in formulating ICZM. |

| | Environmental Items | Phase | | Evaluation Based on Survey Results | | Reason of Evaluation |
|--------|---|-------|----|------------------------------------|-----|--|
| | | BC/DC | OP | BC/DC | OP | |
| 23 | Misdistribution of Benefits and Damages | ✓ | ✓ | B- | B- | If the target areas area used by the local people regularly, there will be possibilities of misdistribution of benefit and damages by restrictions for the local peoples' livelihood, due to the coastal and reef conservation plan. |
| 24 | Local Conflicts of Interest | ✓ | ✓ | B- | B- | If the target areas area used by the local people regularly, there will be possibilities of local conflict of interest by restrictions for the local peoples' livelihood, due to the coastal and reef conservation plan. |
| 25 | Religious Facility | - | - | N/A | N/A | No religious facilities are identified in the coastal area of the Project sites. |
| 26 | Cultural Heritage | ✓ | ✓ | B- | B- | There would be a risk that the future ICZM Plan may raise any impacts to the existing heritage site, if not properly planned. |
| 27 | Landscape | - | - | N/A | N/A | No adverse effects to the landscapes at the target sites would be occurred, as all the projects are in small scale. |
| 28 | Gender | ✓ | ✓ | B- | B- | Potential gender discrimination in participating in formulating ICZM and the training related to ICZM. |
| 29 | Children's Rights | - | - | N/A | N/A | There would be no operation activities which will affect right of children. |
| 30 | Hazards (risk) Infectious Diseases such as HIV/AIDS | - | - | N/A | N/A | There would be no construction works or operation activities which will cause infectious diseases. |
| 31 | Occupational Safety and Health | - | - | N/A | N/A | There would be no construction works or operation activities which will affect labour environment. |
| Others | | | | | | |
| 32 | Accident | - | - | N/A | N/A | No adverse effects to the accidents at the targeted areas would be occurred, as there are no sources by the activities. |
| 33 | Climate Change | - | - | N/A | N/A | No adverse effects to the climate change at the targeted areas would be occurred, as there are no activities which affect to the climate. |

A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

C: Extent of impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)

D: No impact is expected.

N/A : Impact assessment isn't conducted because the item was categorized as no impact in scoping phase.

Source: JICA Expert Team

Table 6.1.35 Result of Environmental Impact Assessment on Component 2

| | Environmental Items | Phase | | Evaluation Based on Survey Results | | Reason of Evaluation |
|--------------------------|---------------------|-------|----|------------------------------------|-----|--|
| | | BC/DC | OP | BC/DC | OP | |
| Pollution Control | | | | | | |
| 1 | Air Pollution | ✓ | ✓ | B- | B- | BC/DC: Project sites are located along the coast and some distance from residential area and public roads. Air pollution is expected due to heavy machinery operation and construction activities. However, impacts would be site specific and temporarily. As for the site of reclamation in Maamendhoo, measure to minimize impact of generated dust to the adjacent area shall be applied by installing dust proof sheet etc. OP : Unproper management of stocked supplementary sand will cause dust generation in case of beach nourishment project in Maamendhoo Island, Fonadhoo Island, and Meedhoo Island . |
| 2 | Water Pollution | ✓ | ✓ | B- | B- | BC/DC: Dredging for collecting sand for nourishing beach (Maamendhoo Island, Fonadhoo Island, Meedhoo Island), revetment for the coast (Gan Island, Isdhoo Island, Maamendhoo Island) and reclamation along the coast (Maamendhoo Island) would cause water pollution near the Project area. However, impacts would be site specific and temporarily. OP: Unproper management of stocked supplementary sand would cause water pollution in case of beach nourishment project in Maamendhoo Island, Fonadhoo Island, and Meedhoo Island. |
| 3 | Soil Contamination | ✓ | - | B- | N/A | BC/DC: Unproper management of construction vehicles would cause soil contamination. OP: No activities expected to contaminate soil resulting from the Project. |
| 4 | Noise/Vibration | ✓ | - | B- | N/A | BC/DC: Since any blasting or drilling works are not planned, impact from vibration or noise would be limited. Furthermore, the effect of noise or vibration from the construction activities would be limited since the construction site is not adjacent to residential areas. Impact of noise from vehicles transporting construction materials would be predicted, but its effect would be site specific and temporarily considering the scale of construction. OP: No activities expected to make noise or vibration by the Project. |
| 5 | Ground Subsidence | - | - | N/A | N/A | BC/DC/OP: No activities are expected to extract groundwater resulting the Project. |
| 6 | Offensive Odors | - | - | N/A | N/A | BC/DC/OP: No activities are expected to emit offensive odors resulting from the Project. |
| 7 | Bottom Sediment | ✓ | ✓ | B- | B- | BC/DC: Unproper beach nourishment or reclamation would cause soil sedimentation near construction sites. |

| | Environmental Items | Phase | | Evaluation Based on Survey Results | | Reason of Evaluation |
|---------------------|--------------------------------------|-------|----|------------------------------------|-----|--|
| | | BC/DC | OP | BC/DC | OP | |
| | | | | | | OP: Soil sedimentation would be occurred near the nourished beach. The impact needs to be monitored regularly. |
| 8 | Waste | ✓ | - | B- | N/A | BC/DC: Unproper management of construction waste such as removed materials from old revetment or hazardous waste such as used engine oil would cause negative impacts on the project areas. OP: No activities are expected to generate waste resulting from the Project. |
| Natural Environment | | | | | | |
| 9 | Topography and Geographical Features | ✓ | ✓ | B- | B- | BC/DC: Unproper reclamation at Maamendhoo island would alter the geographical features. OP: Due to nourishing, revetment or reclamation, topography and geographical features near the Project area may be changed. However, considering the scale of projects, the impacts would be limited and site-specific. The impact needs to be monitored regularly. |
| 10 | Hydrological Situation | - | ✓ | N/A | B- | BC/DC: No construction activities to alter hydrological situation. OP: Due to nourishing, revetment or reclamation, hydrological situation around the Project area may be changed. However, considering the scale of projects, the impacts would be limited and site-specific. The impact needs to be monitored regularly. |
| 11 | Groundwater | - | - | N/A | N/A | BC/DC/OP: No activities are expected to effect groundwater resulting from the Project. |
| 12 | Flora, Fauna, and Biodiversity | ✓ | ✓ | B- | B- | BC/DC: During construction, terrestrial and marine ecosystem around the project sites and/or sand borrow sites are disturbed. However, considering the scale of projects, the impacts would be limited and site-specific. OP: Due to nourishing, revetment or reclamation, marine ecosystem around the Project area may be disturbed. However, considering the scale of projects, the impacts would be limited and site-specific. The impact needs to be monitored regularly. |
| 13 | Protected Area | - | - | N/A | N/A | BC/DC/OP: There are no protected areas, Marine Protected Areas (MPA) or KBA/IBA around the proposed project sites. The project site in Meedhoo Island is located near protected area, however, negative impact is not expected since the protected area is located inland area, not northern coastal area where the Project would be implemented. |
| 14 | Coastal Zone | ✓ | ✓ | B- | B- | BC/DC: The construction activities at the project sites will disturb coastal ecosystem, however, it is temporarily and site-specific. |

| | Environmental Items | Phase | | Evaluation Based on Survey Results | | Reason of Evaluation | | | | | | | | | | | | | | | |
|---------------------------|---|--|---|------------------------------------|-----|--|--------------|------------------|-------------|----------------------------------|--------------------------|---------------------------|--|--|--|--|-------------------------|-------------------------------|--|---|-------|
| | | BC/DC | OP | BC/DC | OP | | | | | | | | | | | | | | | | |
| | | | | | | OP: Currents and waves or ecosystem around the Project area would be impacted from the beach nourishment, revetment or reclamation. However, considering the scale of projects, the impacts would be limited and site-specific. The impact needs to be monitored regularly. | | | | | | | | | | | | | | | |
| Social Environment | | | | | | | | | | | | | | | | | | | | | |
| 15 | Involuntary Resettlement/Land Acquisition (if needed) | ✓ | - | B- | N/A | <p>BC: There will be no involuntary resettlement or land acquisition due to the Project. However, three temporary structures (without wall and foundation) installed illegally at the sea need to be moved because these structures are located at the reclamation area by the Project in Maamendhoo. No economic loss would occur from the moving of two structures because these structures are not used for commercial purpose of making a living. There is no cost for resettlement since these structures are not used for residential purpose. The remaining structure is used for working space of tuna fish processing, however, alternative space can be secured in the same area. Thus, economic loss would be avoided. Agreement was made among the owner of the structures, Island Council and MECCT that dissembling and moving the structures with the physical support from the Island Council prior to the commencement of the construction activities. This would be applied instead of providing compensation for the loss of structures at a replacement cost.</p> <p>The entitlement policy for the affected temporary structures are as follows;</p> <table border="1"> <thead> <tr> <th>Type of Loss</th> <th>Entitled Persons</th> <th>Entitlement</th> <th>Implementation Issues/Guidelines</th> <th>Responsible Organization</th> </tr> </thead> <tbody> <tr> <td colspan="5">Temporary Loss Assistance</td> </tr> <tr> <td>1 Relocation Assistance</td> <td>Owner of temporary structures</td> <td>- Physical support for dissembling and moving the temporary structures by Island Council of Maamendhoo</td> <td>Prior to the commencement of construction, Island Council will notify and provide support to the owner of temporary structures for dissembling and moving</td> <td>MECCT</td> </tr> </tbody> </table> <p>In case the trees need cutting down for expanding existing road near proposed site for protecting cultural heritage at Gan Island, permission shall be obtained from Gan Island Council (and the owner of the trees, if there is). In addition, doubled number of cutting down trees shall be planted in the Island and compensation of loss of the tree shall be provided to the owner of the tree (if there is).</p> <p>DC/OP: No activities are expected to occur involuntary resettlement or land acquisition.</p> | Type of Loss | Entitled Persons | Entitlement | Implementation Issues/Guidelines | Responsible Organization | Temporary Loss Assistance | | | | | 1 Relocation Assistance | Owner of temporary structures | - Physical support for dissembling and moving the temporary structures by Island Council of Maamendhoo | Prior to the commencement of construction, Island Council will notify and provide support to the owner of temporary structures for dissembling and moving | MECCT |
| Type of Loss | Entitled Persons | Entitlement | Implementation Issues/Guidelines | Responsible Organization | | | | | | | | | | | | | | | | | |
| Temporary Loss Assistance | | | | | | | | | | | | | | | | | | | | | |
| 1 Relocation Assistance | Owner of temporary structures | - Physical support for dissembling and moving the temporary structures by Island Council of Maamendhoo | Prior to the commencement of construction, Island Council will notify and provide support to the owner of temporary structures for dissembling and moving | MECCT | | | | | | | | | | | | | | | | | |
| 16 | Poor | ✓ | - | D | N/A | <p>BC/DC: No residents or commercial activities are found in the project areas.</p> <p>OP: No activities are expected to give negative impact on poor near the Project sites.</p> | | | | | | | | | | | | | | | |

| | Environmental Items | Phase | | Evaluation Based on Survey Results | | Reason of Evaluation |
|----|--|-------|----|------------------------------------|-----|---|
| | | BC/DC | OP | BC/DC | OP | |
| 17 | Indigenous, or Ethnic People | - | - | N/A | N/A | BC/DC/OP: The project area does not include the residential area of indigenous or ethnic minorities at present. |
| 18 | Local Economies such as Employment, Livelihood, etc. | ✓ | - | D | N/A | BC/DC: No commercial activities found in the project areas. OP: No activities are expected to affect local economies. |
| 19 | Land Use and Utilization of Local Resources | ✓ | ✓ | B- | B+ | BC/DC: Coastal area in project sites is used for recreation purposes such as walking, swimming, fishing, surfing, snookering, collecting seashells and catching octopus. Due to the disruption of access to the coastal area resulting from the construction, local residents would be disturbed to do these activities. However, the impacts will be site-specific and temporarily. OP: The beach nourishment and revetment will contribute to stabilize the utilization of local resources in the coastal areas. The reclamation will create evacuation place for the local residents in case of disaster such as hazard of swell and Tsunami. |
| 20 | Water Usage or Water Rights and Communal Rights | - | - | N/A | N/A | BC/DC/OP: There is no activities to affect water usage or water rights and communal rights resulting from the Project. |
| 21 | Existing Social Infrastructures and Services | - | - | N/A | N/A | BC/DC/OP: There is no activities to affect existing social infrastructures and services resulting from the Project. |
| 22 | Social Institutions such as Social Infrastructure and Local Decision-making Institutions | - | - | N/A | N/A | BC/DC/OP: There is no activities to affect social infrastructure and local decision-making institutions resulting from the Project. |
| 23 | Misdistribution of Benefits and Damages | ✓ | - | D | N/A | BC/DC: No commercial activities found along the coastal area in project sites. OP: There is no activities to lead misdistribution of benefits or damages resulting from the Project. |
| 24 | Local Conflicts of Interest | ✓ | - | D | N/A | BC/DC : No commercial activities found along the coastal area in project sites. OP : There is no activities to affect local conflict of interest resulting from the Project. |
| 25 | Religious Facility | - | - | N/A | N/A | BC/DC/OP: No religious facilities are identified in the vicinity of the Project sites. |
| 26 | Cultural Heritage | - | ✓ | N/A | B+ | BC/DC/OP: No cultural heritage is identified in the vicinity of the Project sites except the Project site of Gan and Isdhoo Islands which purposed for protecting the cultural heritage sites against erosion in terms of constructing a revetment. |
| 27 | Landscape | - | - | N/A | N/A | BC/DC/OP: No disturbance of landscape is expected resulting from the Project. |

| | Environmental Items | Phase | | Evaluation Based on Survey Results | | Reason of Evaluation |
|--------|---|-------|----|------------------------------------|-----|--|
| | | BC/DC | OP | BC/DC | OP | |
| 28 | Gender | ✓ | ✓ | D | B- | BC/DC: No gender discrimination on job opportunity or payment by gender found in the targeted Islands for the Project. OP: The decision related to the Island policy are tended to be made by male than female. |
| 29 | Children's Rights | ✓ | - | D | N/A | BC/DC: No custom of child labor found in all targeted island for the Project. OP : No activities are planned to affect children's right resulting from the Project. |
| 30 | Hazards (risk) Infectious Diseases such as HIV/AIDS | ✓ | - | B- | N/A | BC/DC: Inflow of construction workers to local communities would raise risks of communicable diseases. OP: No increase in risk of communicable diseases is expected. |
| 31 | Occupational Safety and Health | ✓ | - | B- | N/A | BC/DC: Inappropriate management of working environment would raise the risk of accidents and disease. OP: No increase in risks in the work environment is expected. |
| Others | | | | | | |
| 32 | Accident | ✓ | - | B- | N/A | BC/DC: Construction activities along public roads would increase the risk of accidents to the public. Inappropriate management and inappropriate operation of the construction vehicles would increase the risk of accidents. OP: No increase in risks of accident would be expected. |
| 33 | Climate Change | - | ✓ | N/A | B+ | BC/DC: The amount of global warming substances generated by the operation of construction machinery and the driving of construction vehicles is very small and is not expected to have a significant impact on climate change. OP: The Project will contribute to decrease the negative affect from climate change. |

A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

C: Extent of impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)

D: No impact is expected.

N/A : Impact assessment isn't conducted because the item was categorized as no impact in scoping phase.

Source: JICA Expert Team

6.1.8 Environmental Management Plan and Mitigation Measures

Component 1

In the process of formulating the ICZM including coastal and reef conservation plan and implementation of sediment budget control plan, particular attention shall be paid for avoiding or minimizing negative impact on water quality, bottom sediment and marine environment in the coastal areas.

In addition, consideration on local economies, land use/utilization of local resources, social institutions, misdistribution of benefit/damages and local conflicts of interest, protection of cultural heritage and gender discrimination shall be made both at the formulation and implementation phases of the ICZM.

Mitigation measures for each identified impact with implementing organization, which is to carry out formulated coastal and reef conservation plan and sediment budget control plan and responsible organization, which is to support for implementing organization to carry out those plans are shown in Table 6.1.36. Since the ICZM including coastal and reef conservation plan and implementation of sediment budget control plan will be discussed and developed among stakeholders in the next phase, these mitigation measures shall be updated time to time.

Table 6.1.36 Environmental Mitigation Measures on Component 1

| No. | Item (Impacts) | Proposed Mitigation Measures | Implementing Organization | Responsible Organization |
|-----|--|--|---------------------------|--------------------------|
| 2 | Water Pollution | - Water pollution prevention plan shall be included in the sediment budget control plan to avoid water pollution at the time of dredging sand, stock the sand and renourishing beach | Island Council | MECCT |
| 7 | Bottom Sediment | - Soil sedimentation prevention plan shall be included in the sediment budget control plan to avoid soil sedimentation at the time of dredging sand, stock the sand and renourishing beach | Island Council | MECCT |
| 12 | Flora/Fauna/Biodiversity | - Flora/Fauna/Biodiversity protection plan shall be included in the sediment budget control plan to avoid any damage from dredging sand, stock the sand and renourishing beach | Island Council | MECCT |
| 14 | Coastal Zone | - Marine system protection plan shall be included in the sediment budget control plan as well as coastal and reef conservation plan to avoid any damage from dredging sand, stock the sand and renourishing beach to marine system | Island Council | MECCT |
| 16 | Poor | The coastal and reef conservation plan shall include the provision of social considerations to avoid any negative effects on low-income group in the target area. | Island Council | MECCT |
| 22 | Social Institutions such as Social Infrastructure and Local Decision-making Institutions | All segments of population including women, youth, the elderly and the disabled are equitably represented in the decision-making process as planned Stakeholder Engagement Plan (SEP) and Gender Action Plan (GAP). | Island Council | MECCT |
| 23 | Misdistribution of Benefits and Damages | The coastal and reef conservation plan shall include the provision of social considerations to avoid any misdistribution of benefits and damages in the target area. | Island Council | MECCT |
| 24 | Local Conflict of Benefit | The coastal and reef conservation plan shall include the provision of social considerations to avoid any local conflict of benefit in the target area. | Island Council | MECCT |
| 26 | Cultural Heritage | At the time of planning ICZM, it shall be avoided any physical impact to cultural | Island Council | MECCT |

| No. | Item (Impacts) | Proposed Mitigation Measures | Implementing Organization | Responsible Organization |
|-----|----------------|---|---------------------------|--------------------------|
| | | heritage in case it locates in the target area. | | |
| 28 | Gender | All segments of population including women, youth, the elderly and the disabled are equitably represented in the decision-making process as planned Stakeholder Engagement Plan (SEP) and Gender Action Plan (GAP). | Island Council | MECCT |

Source: JICA Expert Team

Component 2

Mitigation measures for each identified impact are proposed together with implementing organization, responsible organization and cost in Table 6.1.37.

In the construction phase, the Contractor is to carry out mitigation measures and PMU is to supervise the effectiveness of the Contractor's applied measures. During the operation phase, measures to mitigate negative impacts such as dust generation, water pollution from location of stocked supplementary sand for the maintenance of nourished beach shall be applied. Moreover, shorelines and marine environment in and around the project sites shall be regularly monitored to grasp any changes and apply appropriate restoration measures if necessary. The environmental management during the operation phase is to be implemented by the Island Council with the support of MECCT and MNPHI. The details of the mitigation measure and its institutional arrangement will be finalized at the further phase.

Table 6.1.37 Environmental Mitigation Measures on Component 2

| No. | Item (Impacts) | Proposed Mitigation Measures | Implementing Organization | Responsible Organization | Cost |
|-------------------------------------|---|---|---------------------------|--------------------------|-----------------------------------|
| Pre-Construction/Construction Phase | | | | | |
| 1 | Air Pollution | | | | |
| | -Emission from construction vehicles | - Maintain vehicles in good condition to minimize exhaust emissions - Use fuels and lubricants of good quality in compliance with national standards | Contractor | PMU | Included in the contract document |
| | -Dust especially when the weather is dry | - Cover load-carrying platforms properly when carrying earth/sand - Spray water at construction sites - Install dust proof sheet at the adjacent area to reclamation as appropriate | Contractor | PMU | Included in the contract document |
| 2 | Water Pollution | | | | |
| | - Dredging for collecting sand, revetment and reclamation | - Conduct baseline survey to record state of water quality prior to the commencement of any construction activities | Contractor | PMU | Included in the contract document |

| No. | Item (Impacts) | Proposed Mitigation Measures | Implementing Organization | Responsible Organization | Cost |
|-----|---|--|---------------------------|--------------------------|-----------------------------------|
| | | <ul style="list-style-type: none"> - Conduct water/sediment quality monitoring - Provide and maintain temporary provisions adequately such as setting ponds, sediment trap, geotextile at installed spillway for reclamation site in order to reduce turbid water flow to surrounding areas - Select dredging/dumping equipment taking account for minimizing turbidity - Install silt fence as required - Minimize dredging time | | | |
| 3 | Soil Contamination | | | | |
| | - Oil leakage from construction vehicles | - Maintain vehicles in good condition | Contractor | PMU | Included in the contract document |
| 4 | Noise/Vibration | | | | |
| | - Generating from vehicles transporting construction materials | <ul style="list-style-type: none"> - Conduct baseline survey to record state of noise level prior to the commencement of any construction activities - Avoid construction works at night | Contractor | PMU | Included in the contract document |
| 7 | Bottom Sediment | | | | |
| | - Soil sedimentation resulting from improper management of construction sites for beach nourishment and reclamation | <ul style="list-style-type: none"> - Implement nourishing sand or reclamation at precise location - Install silt fence as appropriate | Contractor | PMU | Included in the contract document |
| 8 | Waste | | | | |
| | - Generating construction waste | - Disposed of generated waste such as removed materials from old revetment, engine oil at dumping places designated by local authority | Contractor | PMU | Included in the contract document |
| 9 | Topography and Geographical Features | | | | |
| | - Altering geographical features | - Implement reclamation at precise location | Contractor | PMU | Included in the contract document |
| 12 | Flora/Fauna/Biodiversity | | | | |
| | - Disturbance on terrestrial and marine ecosystem | - Conduct baseline survey to record state of terrestrial and marine ecosystem prior to the commencement of any construction activities | Contractor | PMU | Included in the contract document |

| No. | Item (Impacts) | Proposed Mitigation Measures | Implementing Organization | Responsible Organization | Cost |
|-----|---|---|---------------------------|--------------------------|-----------------------------------|
| | | <ul style="list-style-type: none"> - Carry out construction activities at precise location - Provide and maintain temporary provisions adequately such as setting ponds, sediment trap, geotextile at installed spillway for reclamation site in order to reduce turbid water flow to surrounding areas - Install silt fence as required | | | |
| 14 | Coastal Area | | | | |
| | - Disturbance on terrestrial and marine ecosystem | <ul style="list-style-type: none"> - Conduct baseline survey to record state of terrestrial and marine ecosystem prior to the commencement of any construction activities - Carry out construction activities at precise location | Contractor | PMU | Included in the contract document |
| 15 | Involuntary Resettlement | | | | |
| | - Improper handling of structure removal from the project site | <ul style="list-style-type: none"> - Inform construction schedule prior to the commencement of construction activities - Support removal and set back of three temporary structures | Island Council | PMU | - |
| 19 | Land Use and Utilization of Local Resources | | | | |
| | - Disruption of access to the coastal area | <ul style="list-style-type: none"> - Establish a grievance desk in PMU and the Contractor's office for mediating construction related complain by local people - Inform the construction schedule prior to the commencement of construction activities - Distribute information on the construction project by signboards and circular | Contractor/PMU | PMU | Included in the contract document |
| 30 | Hazardous (Risk) Infectious Diseases such as HIV/AIDS | | | | |
| | - Increase the risk of infectious diseases resulting from influx of workers to the project area | <ul style="list-style-type: none"> - Conduct awareness/training program on HIV/AIDS and STDs | Contractor | PMU | Included in the contract document |
| 31 | Occupational Health and Safety | | | | |
| | - Inappropriate management of working environment would raise the risk of accidents and | <ul style="list-style-type: none"> - Prioritize employment opportunities for local people as much as possible - Maintain hygienic accommodation in work camps - Carry out measures against | Contractor | PMU | Included in the contract document |

| No. | Item (Impacts) | Proposed Mitigation Measures | Implementing Organization | Responsible Organization | Cost |
|-----|--|---|---------------------------|--------------------------|-----------------------------------|
| | disease | COVID-19 | | | |
| 32 | Accidents | | | | |
| | - Inappropriate management and operation of the construction vehicles would increase the risk of accidents | - Announce a safety notice regarding the dredging and reclamation operation works to the public - Provide the dredger operating route and the schedule to the public, coast guard and marine police - Install barricades in the project site as appropriate | Contractor | PMU | Included in the contract document |

Source: JICA Expert Team

6.1.9 Environmental Monitoring Plan

Environmental monitoring plan for the Component 2 is shown in Table 6.1.38

During the construction phase, monitoring result is to be submitted to GCF/MNPFI from the construction contractor via PMU together with the report of construction progress. MNPFI shall submit the summary of monitoring result to EPA at every three months throughout the construction phase. The monitoring result will be also shared with the Island Council as appropriate. The monitoring implementing during the construction phase will be continued till the end of defect period of the construction, which is one year after the completion of the construction. After the defect period, the monitoring will be carried out by the Island Council where the Project locates with the support of MECCT and MNPFI. Similar to the environmental management plan, the details of the monitoring plan and its institutional arrangement will be finalized at the further phase.

Table 6.1.38 Environmental Monitoring Plan

| Item (Impacts) | Monitoring Item | Monitoring Site | Method of Monitoring | Frequency | Implementing Organization | Responsible Organization | Cost (USD) |
|----------------------------|---|--|---|---|---------------------------|--------------------------|-----------------------------------|
| Construction Phase | | | | | | | |
| Air Pollution | Maintain vehicles in good condition to minimize exhaust emissions | Project Sites in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | Visual inspection on site | Monthly | Contractor | PMU | Included in the contract document |
| | Spray water at the construction sites, on unpaved roads, and adjacent to restaurant/shops during dry conditions | Along the Project Sites in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | Visual inspection on site | Monthly | Contractor | PMU | Included in the contract document |
| Marine Environment (Water) | Percent of live coral cover and fish species | Along the Project Sites in Isdhoo Island Maamendhoo Island | LIT, Fish census and visual observation | Once prior to commencement of construction activities | Contractor | PMU | 13,175/time |

| Item (Impacts) | Monitoring Item | Monitoring Site | Method of Monitoring | Frequency | Implementing Organization | Responsible Organization | Cost (USD) |
|---|--|--|--|---|------------------------------|--------------------------|-----------------------------------|
| Pollution, Bottom Sediment, Flora/Fauna/Biodiversity) | abundance and composition | Gan Island Fonadhoo Island Meedhoo Island | | and after completion of construction activities | | | |
| | pH, Salinity, Temperature, Turbidity, Ammonia, Nitrate, Phosphate, Sulphate, BOD | Along the Project Sites in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | On-site and Lab testing | Once prior to commencement of construction activities and after completion of construction activities | Contractor | PMU | |
| | Turbidity/Location (GPS logs) | Dredging sites (2) | On-site testing | Every day during dredging operation | Contractor | PMU | 7,000/site |
| Coastal Area (Topography and Geographical Features, Flora/Fauna/Biodiversity) | Shoreline, vegetation line, reef line | Along the Project Sites in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | High resolution aerial imagery and surveying | Once prior to commencement of construction activities and after completion of construction activities | Contractor | PMU | 12,250/time |
| Soil Contamination | Maintain vehicles in good condition | Project Sites in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | Visual inspection on site | Monthly | Contractor | PMU | Included in the contract document |
| Noise | Noise from vehicles transporting construction materials | Along the Project Sites in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | Noise measurement | Once/ Quarter | Contractor | PMU | 15,000/time |
| Waste | Disposed of generated waste such as removed materials from old revetment, engine oil at dumping places designated by local authority | Project Sites in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | Visual inspection on site | Monthly | Contractor | PMU | Included in the contract document |
| Involuntary Resettlement | Inform construction schedule prior to the commencement of construction activities | Project site in Maamendhoo Island | Record of announcement | Prior to commencement of construction | Island Council | PMU | - |
| | Support move and set back of three temporary structures | Project Site in Maamendhoo Island | Record of move/set back | Prior to commencement of construction | Island Council in Maamendhoo | PMU | - |

| Item (Impacts) | Monitoring Item | Monitoring Site | Method of Monitoring | Frequency | Implementing Organization | Responsible Organization | Cost (USD) |
|---|---|--|----------------------------|--|---------------------------|--------------------------|-----------------------------------|
| Land Use and Utilization of Local Resources | Establish a grievance desk in PMU and the Contractor's office for mediating construction related complain by local people | Contractor's Office in the Project Sites and PMU | Record of establishment | Prior to commencement of construction | Contractor/ PMU | PMU | - |
| | Inform the construction schedule prior to the commencement of construction activities | Along the Project Sites in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | Record of announcement | Prior to commencement of construction | Contractor | PMU | Included in the contract document |
| | Distribute information on the construction project by signboards and circular | Along the Project Sites in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | Record of announcement | Prior to commencement of construction | Contractor | PMU | Included in the contract document |
| Hazardous (Risk) Infectious Diseases such as HIV/AIDS | Conduct awareness/training program on HIV/AIDS and STDs | Project Sites in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | Record of training/program | Monthly | Contractor | PMU | Included in the contract document |
| Occupational Health and Safety | Prioritize employment opportunities for local people as much as possible | Project Sites in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | Record of employment | Monthly | Contractor | PMU | Included in the contract document |
| | Maintain hygienic accommodation in work camps | Project Sites in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | Visual inspection on site | Monthly | Contractor | PMU | Included in the contract document |
| | Carry out measures against COVID-19 | Project Sites in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | Visual inspection on site | Monthly | Contractor | PMU | Included in the contract document |
| Accidents | Announce a safety notice regarding the dredging and reclamation | Project Sites in Maamendhoo Island Fonadhoo Island Meedhoo Island | Record of announcement | Prior to the commencement of construction activities | Contractor | PMU | Included in the contract document |

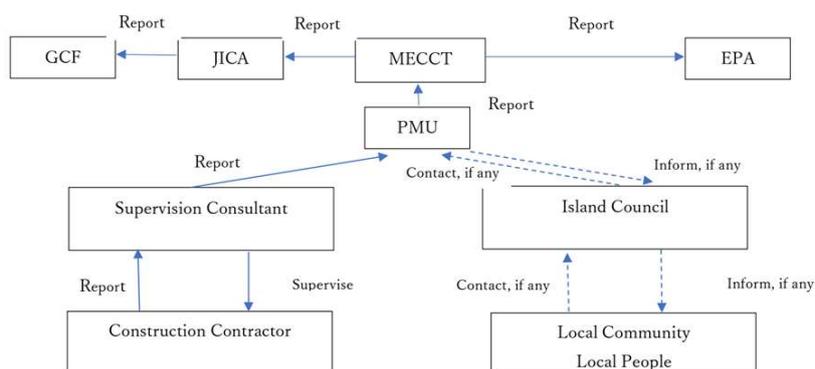
| Item (Impacts) | Monitoring Item | Monitoring Site | Method of Monitoring | Frequency | Implementing Organization | Responsible Organization | Cost (USD) |
|----------------|---|---|---------------------------|---|---------------------------|--------------------------|-----------------------------------|
| | operation works to the public | | | | | | |
| | Provide the dredger operating route and the schedule to the public, coast guard and marine police | Project Sies in Maamendhoo Island Fonadhoo Island Meedhoo Island | Record of announcement | Prior to the commencement of construction activities | Contractor | PMU | Included in the contract document |
| | Install barricades in the project site as appropriate | Project Sies in Isdhoo Island Maamendhoo Island Gan Island Fonadhoo Island Meedhoo Island | Visual inspection on site | Prior to the commencement of construction activities/ Monthly throughout construction period | Contractor | PMU | Included in the contract document |

Source : JICA Expert Team

6.1.10 Institutional Arrangement

(1) Institutional Arrangement on Environmental Management

Institutional arrangement for the environmental management during construction phase is shown Figure 6.1.15. During the construction phase of the Component 2, PMU is to supervise construction activities and receive the report by the Contractor on the progress of construction through the supervision consultant. The progress of the construction is to be informed to GCF via JICA by MECCT. Also, the progress is to be reported to EPA by MECCT. During the operation phase, the Island Council at the Project site will carry out environmental management with the support of MECCT and MNPHI. The details task and responsibility of each party will be formulated at the further phase.



Source: JICA Expert Team

Figure 6.1.15 Institutional Arrangement during the Construction Phase

(2) Grievance Redress Mechanism

Grievance redress mechanism process for the Project is divided into three tiers. In the Tier 1, grievance is informed to the community leaders and/or Atoll/Island Council. The grievance is discussed at the Community Advisory

Board through Atoll/Island Council in order to find solution. The decision made at the Advisory Board is to be informed to the complainant through Atoll/Island Council. In case not satisfied with the decision, the complainant is to submit the complaint to the Tier 2 (MECCT). MECCT is to collect information through PMU and inform the decision to the complainant through PMU. In case not satisfied with the decision, the complainant is to inform his/her dissatisfaction and to go to the established judiciary system of the country. The grievance redress mechanism is shown in Table 6.1.39. As for the Project, the grievance redress mechanism will be started activating after the establishment of PMU.

Table 6.1.39 Grievance Redress Mechanism

| Tiers of Grievance Mechanism | Nodal Person for Contact | Communication and Other Facilitation by the Project | Timeframe to Address Grievance |
|---|--|---|--------------------------------|
| First Tier (Tier 1): (Atoll/City Council/ Island Council/ Community Advisory board | Atoll Councils/ City Council will be the first point of contact for any grievances. Once the community advisory board is formed, complaints received by the Atoll/City council will be sent to the community advisory board for advice | <ul style="list-style-type: none"> - In the Council Offices and at the project locations, there will be an Information Board listing the names and contact telephones/emails. - Grievances can be addressed informally by contacting the Councils. - If the grievance cannot be resolved informally, an aggrieved party must submit a complaint on the Tier 1 Complaint Form. A copy of the form should be provided to the aggrieved party as evidence of receipt. The complaint form should be available from the website of MECCT and from the Atoll/ City Councils. - For those who cannot write, a council staff will assist them to fill the form. - The council may pass the grievance to the Community Advisory Board for comments and input. - A meeting (if required, a public meeting) must be held by the Community Advisory Board to discuss a complaint submitted on a Complaint Form. - If the complaint is resolved within 15 days, the Atoll/ City Council must communicate the decision to the aggrieved party in writing. - The aggrieved party must acknowledge the receipt of decision and submit their agreement or disagreement with the decision within 10 days. - If no acknowledgement is submitted from the aggrieved party, then the decision will be considered as accepted. - If a complaint requires more time to address, this requirement must be communicated to the aggrieved party in writing and the aggrieved party must consent and sign-off the request for the extension to take effect. An extension can be made to an additional 15 days. | 15 days |
| Second Tier (Tier 2): (MECCT) | MECCT, Social Environmental and Gender Officer (SEGO) at the Project Management Unit (PMU) will be the focal point. | <ul style="list-style-type: none"> - MECCT will forward the grievance to PMU. - PMU will screen the grievance to determine if it is related to GCF project. If it is unrelated, the aggrieved party must be notified in writing and the way forwarded must be outlined to them including the necessary government institutions to follow up, like the Police. - Social Environmental and Gender Officer at PMU will be the contact person in processing a grievance through the Tier 2. - If required, MECCT must arrange a public meeting to address the Tier 2 grievance and notify the nature of the grievance and the meeting venue to the aggrieved party. - ME may also visit the site and hold onsite discussions and meetings. - PMU will be responsible to ensure that there is no cost imposed on the | 15 days |

| Tiers of Grievance Mechanism | Nodal Person for Contact | Communication and Other Facilitation by the Project | Timeframe to Address Grievance |
|--|--|---|--|
| | | <p>aggrieved person, due to the grievance mechanism at the second tier.</p> <ul style="list-style-type: none"> - If the complaint is resolved within 15 working days, PMU must communicate the decision to the aggrieved party in writing. - The aggrieved party must acknowledge the receipt of decision and submit their agreement or disagreement with the decision within 10 days. - If no acknowledgement is submitted from the aggrieved party, then the decision will be considered as accepted. - If the grievance is not resolved to the satisfaction of the aggrieved party within 15 working days of submission of the grievance to Tier 2 then the aggrieved party may notify MECCT, in writing, of the intention to move to Tier 3. | |
| Third Tier (Tier 3): Judiciary Power /Assistance to Vulnerable Persons beyond the Project's Grievance Redress Mechanism | An individual has the option of going to established judiciary system of the country | <ul style="list-style-type: none"> - The legal system is accessible to all aggrieved persons. - Assistance from GCF project is available only for vulnerable person(s) as per this grievance mechanism. - In cases where vulnerable person(s) are unable to access the legal system, the Attorney General's office will provide legal support to the vulnerable person(s). PMU must assist the vulnerable person(s) in getting this support from Attorney General's Office. PMU must also ensure that there is no cost imposed on the aggrieved person if the person belongs to the vulnerable groups. The list of vulnerable groups is as defined in the footnote but may be further defined by MECCT. - The verdict of the Courts will be final | As per the judicial procedure of the Maldives. |

Source: JICA Expert Team

6.1.11 Stakeholder Meeting

(1) First Stakeholder Meeting

The first stakeholder meeting (SHM) was organized at each targeted island from 22 May to 29 May, 2022. The purpose of the meeting was 1) to share the results of the environmental surveys, 2) to explain the latest project basic design of the component 2 by the coastal engineer (JET) and 3) to collect opinions/suggestions on the Project from the stakeholders. Throughout the discussion among stakeholders, the concept of the Project as well as the basic design of the Component 2 were shared. Collected opinions were helped to finalize the basic design. The summary of the SHM is presented in Table 6.1.40 and photos taken at the SHM is shown in Figure 6.1.16. Details of the SHM in each island is included as Minute of Meeting in Appendix.6.

Table 6.1.40 Summary of the 1st SHM

| | |
|-------------------|-----------------------|
| Date and Location | May 22 Isdhoo Island |
| Time | 12:30-14:00 |
| Venue | Isdhoo Island Council |

| | |
|---|---|
| Participants | 15 (Males 8/Females 7) including Island Council, Atoll Council, officials representing government organizations and Women Development Committee of Isdhoo Island. |
| Main subjects raised at the question and answer session | <p>Location of the revetment</p> <p><i>Q: Concern on impact to the littoral movement due to constructing the revetment</i></p> <p>A: (JET) The revetment will be constructed along with the existing shoreline, therefore, disruption to the littoral movement will be to a minimum.</p> <p><i>Q: Request to extend the area for revetment</i></p> <p>A:(JET) After confirming the proposed site with the Island President, critical erosion area in the west side was already included in the original design and the extension of 70m in the east side of proposed revetment would cover the concerned area where the Island council has been requested to add to the original design.</p> <p>A:(METT) The request of the extension of the project area will be discussed internally since the project will be funded by the Maldivian Government.</p> <p>Revetment design</p> <p><i>Q: Request for easy accessibility from the revetment to the beach</i></p> <p>A: (JET) The request of easy accessibility from the revetment to the beach will be taken account for the revetment design such as constructing gentle slope to reach the beach.</p> |
| Date and Location | May 23 Maamendhoo Island |
| Time | 12:30-14:00 |
| Venue | Maamendhoo School |
| Participants | 17 (Males 11/Females 6) including Island Council, Atoll Council, officials representing government organizations and Women Development Committee of Maamendhoo Island. |
| Main subjects raised at the question and answer session | <p>Project Design</p> <p><i>Q: (Island Council) Request to do reclamation for expanding Island area at the west side of coastal area, instead of beach nourishment</i></p> <p>A: (JET) The project purpose is not the expansion of the Island's residential area by the reclamation but the protection of coastal area by nourishing the beach. The idea of reclamation at the west side of coastal area is contradict to the project purpose.</p> <p><i>Q: (JET) Preference to reclamation or evacuation tower for evacuation area</i></p> <p>A: (Island Council) Creating evacuation area by reclamation is preferable to constructing the evacuation tower at the north corner of the island.</p> |
| Date and Location | May 24 Gan Island |
| Time | 12:30-14:00 |
| Venue | Island Council |
| Participants | 10 (Males 5/ Females 5) including Island Council, officials representing government organizations and Women Development Committee of Gan Island. |
| Main subjects raised at the question and answer session | <p>Project location</p> <p><i>Q: Request to include "Paree Fengandu" mangrove area in this project</i></p> <p>A: (JET) It shall be discussed with GCF, the Government of Maldives and JICA.</p> <p><i>Q: Request to include the west side of Thundi beach area in this project</i></p> <p>A: (JET) Using Y shaped groynes to protect the west side of Thundi beach area, near the Reveries guest house would not stop the erosion in this area but might lead to erosion in other areas of the island.</p> <p>A: (MECCT) To add this area in the project needs further discussion with GCF, the Government of Maldives and JICA.</p> <p><i>Q: Request to include the Mukurimagu harbor area in this project</i></p> <p>A: (JET) The port construction was the main reason for the erosion and stated that introducing the sand bypassing method to this area would be good case study for applying the ICZM to actual coastal protection. It is worth considering to realize this project since the Gan Island is selected one of the pilot sites for preparing ICZM.</p> |
| Date and Location | May 25 Fonadhoo Island |
| Time | 12:30-14:00 |
| Venue | Fonadhoo Island Council |

| | |
|---|---|
| Participants | 11 (Males 3/Females 8) including Island Council, officials representing government organizations and Women Development Committee of Fonadhoo Island |
| Main subjects raised at the question and answer session | <p>Project Design</p> <p><i>Q: Concerns on removal of groyne from original design</i></p> <p>A: (JET) Numerical modelling using 30 years of data shows that sand can be retained without any hard structures in this area. However, the sand will be retained in the area only if there are no other major detrimental projects to the environment within the project vicinity.</p> <p>Borrow area for beach nourishment</p> <p><i>Q: Place for borrow area</i></p> <p>A: (JET) It will be decided at a later stage in the project. However, it will be proposed far from the shoreline as possible as it could worsen the erosion otherwise.</p> |
| Date and Location | May 29 Meedhoo Island |
| Time | 9:30-11:30 |
| Venue | Meedhoo Island Council |
| Participants | 6 (Males 3/ Females 3) stakeholders including Meedhoo Town Office, officials representing government organizations and ‘Nalafehi’ NGOs Meedhoo island. |
| Main subjects raised at the question and answer session | <p>Project Design</p> <p><i>Q: (NGOs) Concerns on removal of groyne from original design</i></p> <p>A: (JET) After conducting the survey, it was found that there has not been a drastic change of wave condition in the past few years. The numerical analysis shows that the nourished sand will remain in the project area unless there is severe erosion due to a storm. However, enough sand will be stockpiled in the island which can be used for emergency nourishment as well as regular nourishment.</p> <p>Maintenance of the nourished beach</p> <p><i>Q: (NGOs) Institutional arrangement for maintaining the nourished beach</i></p> <p>A: (JET) After the completion of construction, the city council with the help of the community will be responsible to maintenance of nourished beach by using the stockpiled sand. The vehicles and other necessary equipment for the maintenance of the beach will be necessary to consider in the Project’s budget. Also, the capacity building of city council as well as community in the project area for the maintaining the nourishment is included in this project.</p> |

Source: JICA Expert Team



SHM at Gan Island Council

SHM at Isdhoo Island Council

Source: JICA Expert Team

Figure 6.1.16 The 1st SHM at the Targeted Islands

(2) Second Stakeholder Meeting

After building a consent on the basic design for the Component 2 at the central government level (the 1st ICZM seminar on 28 August, 2022), the series of second stakeholder meeting (SHM) was organized at each targeted island

from 3 September to 11 September, 2022. The purpose of the meeting was 1) to share the results of the environmental impact assessment based on the findings of environmental surveys and information collection at each targeted island (JET), 2) to explain the latest project basic design of the component 2 by the coastal engineer (JET) and 3) to collect opinions/suggestions on the Project from the stakeholders and build consensus for the latest basic design of the component 2 among the stakeholders. The summary of the SHM is presented in Table 6.1.41 and the photos taken at the SHM is shown in Figure 6.1.17. Details is shown in Appendix.7.

Table 6.1.41 Summary of the 2nd SHM

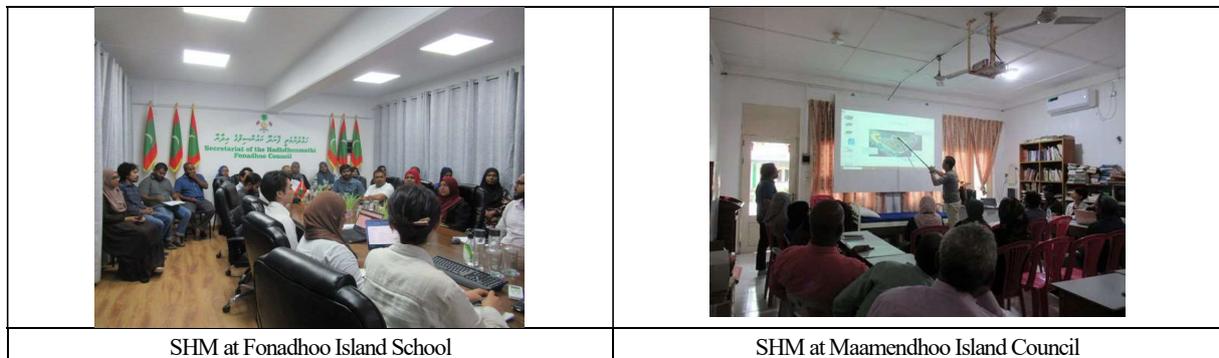
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| Date and Location | September 3 Fonadhoo Island |
| Time | 20:30-22:25 |
| Venue | Fonadhoo Island Council |
| Participants | 22 (Males 9/Females 13) including Island Council, Atoll Council, officials representing government organizations and Women Development Committee of Fonadhoo Island. |
| Main subjects raised on the meeting | <p>Impact from beach nourishment</p> <p><i>Q: Concern on impact to the adjacent area to the Project site</i></p> <p>A: (JET) There will be not much impact to the adjacent beach. Based on the numerical analysis, the sand in the beach nourishment area will be eventually spreading both adjacent sides.</p> <p>Due to the less incline of wave in the project area, it will only allow the sediment to spread along the island. Based on the numerical analysis it estimated that the spread of the sand from the nourished beach will be about 500m- 1000m in both sides.</p> <p>At the west side of the project site, there is a jetty for the sea cucumber bed which will act as a groynes., which would stop the sand going beyond and falling into the hole made from past dredging activities. At the west side of the project site, the distance between the hole made from past dredging activities and the project site is far. Therefore, the sand will not reach to the dredged area.</p> <p>Borrow area</p> <p><i>Q: Location of borrow area</i></p> <p>A: (JET) There are several candidate areas selected but not yet finalized. Sand would be dredged deeper sea about 40 to 45m depth.</p> <p>Implementation schedule</p> <p><i>Q: Construction schedule</i></p> <p>A: (JET) Construction is scheduled to start from mid of 2024. Before the commencement of construction, the condition of the project area will be checked again at the detailed design stage and any changes would be reflected on the design.</p> <p>Maintenance for the nourished beach</p> <p><i>Q: Method and frequency of the maintenance</i></p> <p>A: (JET) In the scope of the project there is a plan to stock pile sand for future maintenance. The frequency of the maintenance is difficult to determine but usually it is typically within every 5 years.</p> <p>Stocked Sand</p> <p><i>Q: Concern on keeping the sand only for the maintenance of the project because there are a lot of demand for the sand for Island's public works such as road construction</i></p> <p>A: (JET) Fonadhoo island is one of the target islands for ICZM. Sediment management is the one of the ICZM plan, which purposes to manage demand and supply of the sand based on the Island's (infrastructure) development plan.</p> |
| Date and Location | September 5 Gan Island |
| Time | 12:30-14:15 |
| Venue | Gan Council |
| Participants | 7 (Males 4/Females 3) including Island Council, Atoll Council, officials representing |

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| | government organizations and Women Development Committee of Isdhoo Island. |
| Main subjects raised on the meeting | <p>Sand bypassing at west side of the Island</p> <p><i>Comment: (Island council) It is not preferable to implement the sand bypassing plan because it would transfer rubble in the accumulated sand to the sandy beach and it would degrade the touristic value of the beach. There is a plan for the reclamation in order to widen the buffer area between seashore and the link road.</i></p> <p>A: (JET) The sand bypassing is the one of the suggestions. If you have already submitted a proposal (reclamation), we can incorporate it in ICZM.</p> <p>Impact of Revetment</p> <p><i>Q: Concern impact from revetment to adjacent area</i></p> <p>A: (JET) In the lagoon side the dominant wave direction is from south to north. If there is any hard structure the impact will only occur at the downstream. The residential area of the adjacent side is located at the upstream side of the revetment. Therefore, the residential area will not have much negative impact due to construction of this revetment.</p> <p>Beach nourishment at “Paree fenganda”</p> <p><i>Q: Concern on the beach nourishment without groynes</i></p> <p>A: (JET) The erosion of the ‘Paree Fenganda ‘area has suffered about 10M in the last 20 years based on the analysis of the satellite images from past years. The erosion rate is not so significant here.</p> |
| Date and Location | September 6 Maamendhoo Island |
| Time | 12:30-14:45 |
| Venue | Maamendhoo School |
| Participants | 18 (Males 10/ Females 8) including Island Council, officials representing government organizations and Women Development Committee of Gan Island. |
| Main subjects raised on the meeting | <p>Overlapping project locations</p> <p><i>Q: Request to provide update on the reclamation project which overlapped the location of reclamation and beach nourishment of the GCF project</i></p> <p>A: (MECCT) MHPHI mentioned that there is no allocated budget for Maamendhoo at present. So, we decided to go on with the current plan.</p> <p>A: (Council President) From the council a letter was sent to the president’s office requesting for the possibility of the land reclamation in Maamendhoo. President’s office has shared the concern with MNPHI to see the possibility of reclamation. MNPHI has not responded yet.</p> <p><i>Q: (JET) Request to the Island Council for choosing either reclamation project or beach nourishment project</i></p> <p>A: (Attendee) As a citizen of the island, I want the island to be protected.</p> <p>A: (Attendee) We want both reclamation and coastal protection. So, we don’t want to stop the coastal protection project.</p> <p>Basic design</p> <p><i>Q: Request to construct stairways for easy access to the beach from the proposed reclamation and revetment site.</i></p> <p>A: (JET) It is possible to include a walkway for the east coast. The strength of the structure can be weakened if stairs were included but can be taken into consideration after carrying out more survey. But for the north coast it might be difficult as it is the evacuation area and the structure should be persistent.</p> <p>Impact from groynes</p> <p><i>Q: Concerns on the groynes in the beach nourishment to give negative impact to other areas.</i></p> <p>A: (JET) Based on the numerical analysis, some negative impact is expected in the north side. However, the south side has no significant impact because the area would be protected by the reclamation area.</p> <p>Sand Borrow area</p> <p><i>Q: Location of sand borrow site</i></p> <p>A: (JET) It is not finalized yet. It is planned to borrow from deeper point (water depth 40m) outside the lagoon in order to minimize the impact on the natural environment.</p> |

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| | <p>Impact from revetment</p> <p><i>Q: Concerns on the impact from the revetment to on-going eroded area next to the harbor</i></p> <p>A: (JET) The revetment area is rocky shoreline without sand at present. Therefore, the revetment would not affect to the area next to the harbor since there is no sand movement.</p> <p>Construction waste</p> <p><i>Q: Handling of generated construction waste</i></p> <p>A: (JET) the detail will be finalized at the detailed design phase. However, this project is not expected to generate a lot of construction waste since there is no concrete work or demolition.</p> <p>Maintenance for the nourished beach</p> <p><i>Q: Concern on the maintenance for the nourished beach</i></p> <p>A: (JET) Sand will be stocked at places such as the proposed excavation area to supply to the beach.</p> |
| Date and Location | September 7 Isdhoo Island |
| Time | 10:30-12:00 |
| Venue | Isdhoo Council |
| Participants | 10 (Males 8/Females 2) including Island Council and officials representing government organizations |
| Main subjects raised on the meeting | <p>Project Design</p> <p><i>Q: Concerns on the size of armor stones for the revetment</i></p> <p>A:(JET) The size of the armor stones will be taken into considerations based on further surveys.</p> <p>The armor stone size will be decided after analyzing the size of stone needed for the foot part of the revetment as this would be the most crucial area. If we installed bigger stone at the foot part, we would apply the same size of stone to all revetment area.</p> <p><i>Q: Length of buffer area between vegetation line and revetment</i></p> <p>A: (JET) If location of revetment would move to ocean side, it would affect to the other part of the beach adjacent to the project site The exact line is not yet fixed but it will be decided after careful analysis to minimize the risks to affect existing geography. The ideal distance would be less than 5M.</p> <p><i>Q: Shape at the end of the revetment</i></p> <p>A: (JET) It will be smoothly cut to reach the ground. The walkway on the revetment will be also reach to the ground with gentle slope.</p> |
| Date and Location | September 11 Meedhoo Island |
| Time | 12:45-14:09 |
| Venue | Meedhoo Island Council |
| Participants | 8 (Males 6/ Females 2) stakeholders including Meedhoo Town Office, officials representing government organizations and ‘Nalafehi’ NGOs Meedhoo island. |
| Main subjects raised on the meeting | <p>Project Design</p> <p><i>Q: Concerns on the present design and the number of the groynes’ effectivity against strong wave energy around the north tip of the island</i></p> <p>A: (JET) Sand movement is from south to west. We assume that if a hard structure is constructed at the upstream side (north tip of the island), it would have less sand supply for the downstream side and it would cause erosion. We assume that the constructed rock revetment for protecting the waste management center has been blocked sand supply and caused erosion in the west side of the island. Based on our field survey at site and the results from numerical analysis, we believe that beach nourishment with one groyne is the best solution for this site. However, the natural condition can change from what is expected. Hence, our suggestion is after implementation, monitoring will be continued in corporation with the government and island council. Based on the changes, if necessary, we will propose adaptive measures.</p> <p><i>Q: Proposing offshore breakwater as a second option</i></p> <p>A: (JET) The natural sandy beach has the function of reducing the wave energy. We expect</p> |

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| | <p>some nourished area would lose sand however for the most part we expect to have a wide beach for 20-30 years. In our plan, sand at eroded part would be supplied regularly with maintenance work.</p> <p>Impact from climate change</p> <p><i>Q: Concerns if the impact from the climate change was taken accounts for the basic design</i></p> <p>A: (JET) Sea level rise in the future is considered. It depends on the scenario but by 2100 the predicted level of sea level rise is about 30-40M after considering high and low tide.</p> <p>Beach Nourishment</p> <p><i>Q: Type of sand for beach nourishment</i></p> <p>A: (JET) Only sand is used, not with the mixture of sand and corals/rocks</p> <p><i>Q: Maintenance Works</i></p> <p>A: (JET) If sand would be accumulated around the groynes, we would transfer the accumulated sand to the eroded area. We propose sand bypassing combine with beach nourishment. Maintenance work will be not difficult by using excavator and track. Moreover, the frequency of the maintenance will not be every year.</p> |
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Source: JICA Expert Team



Source: JICA Expert Team

Figure 6.1.17 The 2nd SHM at the Targeted Islands

6.2 State of Obtaining Approval for EIA and Other Environmental Permits

As described in 6.1.3 (1) Environmental Assessment Process, the Projects of the Component 2 need to be reviewed and approved by EPA since the Projects contains physical development. MNPFI need to appoint registered environmental consultant for conducting EIA, preparing EIA reports and then submit to EPA for obtaining approval during the D/D phase. When submitting the EIA reports, permission of dredging obtained from the Atoll or Island Council concerned with the information of location, area, volume, alternative locations (at least two locations) shall be attached.

6.3 Feedback for Other Projects on Environmental and Social Considerations

Following information on environmental monitoring was obtained in the course of implementing environmental and social considerations for the Project.

Environmental monitoring

Supervising side: Environment compliance and assessment section in EPA is in charge of environmental monitoring. In this section, there are 5 officers handling the works related to the environmental monitoring such as reviewing monitoring reports submitted by project proponents both public and private sector from all over Maldives and conducting inspection for evaluating environmental mitigation activities at project sites. In order to ensure the fairness, cost incurred from the works related to environmental monitoring such as site inspection was budgeted by EPA itself. At present, about 15% in the total ongoing construction sites are inspected at randomly by EPA. Environmental monitoring is carried out throughout the construction phase and during the 5 years of the operation phase including 1 year of defect period. According to the interviewee, at least 5 more officers with sufficient budgetary measures would be necessary to increase the effectiveness of supervising the state of environmental mitigation works at on-going construction sites considering the present situation. In addition, technical assistance on the strategic environmental assessment (SEA) is helpful to improve the capacity for environmental management since only EIA is practiced at present. (Hearing from EPA on 15 Sep, 2022)

Implementing side: MNPFI is in charge of all development projects in public sector. Therefore, these projects shall be implemented environmental monitoring by MNPFI. Environmental monitoring is carried out by the section concerned in MNPFI depends on the project's feature. As for the environmental monitoring on the coastal protection project, the coastal protection and reclamation unit in the infrastructure department is in charge. Task of environmental monitoring is included in the contract between the construction contractor and MNPFI during the construction phase. The contracted contractors monitor the construction sites regularly and report the result to the section concerned in MNPFI till the end of defect period of the construction in comply with EPA approved environmental management and monitoring plan in the EIA report. However, due to lack of human resources (i.e.2 officer is handling 26 projects at the same time in the coastal protection and reclamation unit) and budgetary constraints, environmental monitoring for the most of the public sector development projects are not able to practice except the project with external funding. (Hearing from MNPFI on 15 Sep, 2022)

6.4 Gender Mainstreaming

6.4.1 Women Development Committee at the Targeted Islands

While collecting information on gender mainstreaming in the targeted islands, the Women's Development Committee (WDC) were found as a key player for enhancing women's empowerment. At the time of the site reconnaissance of 4 islands, namely Fonadhoo, Gan, Isdhoo and Maamendhoo, a hearing from members of the WDC was conducted at each island in February, 2022. In total of 13 members (2 from Fonadhoo island, 5 from Isdhoo island, 5 from Gan Island and 1 from Maamendhoo island) were kindly cooperated for the interview. It was found that the WDC is an organization under the island council and its status as well as responsibility is high in the island society. The members are elected by the vote of all islanders aged older than 18 years in every 5 years. Some of the members are also the member of the island council. Its mandate is set by the Local Government Authority as betterment of community and play an important role in each island's public services. The WDC's activities varies such as providing vocational training for women, organizing awareness program on health consciousness, etc. It is considered that the involvement of the WDCs through the process of project planning is vital.

The photos at the hearing are shown in Figure 6.4.1, the summary of the hearing at each island are shown in Table 6.4.1.



Source: JICA Expert Team

Figure 6.4.1 Hearing with WDC members

Table 6.4.1 Summary of the Hearing

| No. | Date | Organization |
|-----|---|---|
| 1 | Feb 2, 2022 | Fonadhoo Women's Development Committee |
| | Participants | |
| | Ms.Rishma (President) Ms.Shakeela | |
| | Minutes | |
| | General information about the Fonadhoo WDC <ul style="list-style-type: none"> • It is comprised of 5 members elected by islanders over 18 years old and their terms is 5 years. The last election was held in May, 2021. Number of the members were set depending on island's population • It is under the Local Government Authority (LGA). • 5% of the island budget is allocated to the WDC yearly and it includes the salary of the WDC members. • In case the budget is not enough to cover the activities, the WDC seek funding from private sectors. • The WDC act as an implementor for awareness program financed by the public sector such as health center | |
| | Activities <ul style="list-style-type: none"> • On-going Vocational training for women (short course program for entrepreneurship i.e. Pastry making, Sewing, Farming etc.) Awareness Program (raising health consciousness, support for disability etc.) Organize conference together with other members of the WDC in the Laamu Atoll for betterment of community in the filed of security, education, health Provide scholarship to be a lecturer for the vocational training for women | |
| 2 | Feb 3, 2022 | Isdhoo WDC |
| | Participants | |
| | Ms.Mariyam Shaira (President) Ms.Mariyam Shameema (Vice president) Ms.Fathmath Asiga Ms.Aminath Zumra Ms.Aminath Rasheedha | |
| | Minutes | |
| | General information about the Isdhoo WDC <ul style="list-style-type: none"> • The same as the Fonadhoo WDC • Salary of the WDC (president 6,000/month, vice president 5,000/month, member 4,000/month) | |
| | Activities <ul style="list-style-type: none"> • Cleaning at public area in the island (paid) 80-84 women are employed for the cleaning work once a week from 16:00-18:00 with 20,000-30,000MVR/month divided by the number of employed women • Cleaning at beach area and children park (unpaid volunteer work due to lack of budget) • Due to the pandemic, the activities are limited at present • Following activities are planned after the pandemic; Awareness event for raising health consciousness (check-up on diabetics, blood testing for retired people) Organizing event for Children's Day and Women's Day Provide vocational training (Pastry making, Sewing) Donate TV to Secondary School in the island | |
| 3 | Feb 4, 2022 | Gan WDC (woman's development committee L-Gan (face book)) |
| | Participants | |
| | Ms.Fathimath Ali (President) Ms.Ihusana Saeed (Vice president) Thahumeena Ali Fathimath Raziyya | |
| | Minutes | |
| | General information about the Gan WDC | |

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| | <ul style="list-style-type: none"> • The same as the Fonadhoo WDC <p>Activities</p> <ul style="list-style-type: none"> • Awareness program on DV, • Vocational training (agriculture: hydroponic cultivation using solar energy and rain water) <p>The hydroponic cultivation was selected because it fit for female farmer (requires less physical strength and unsoiled). 20 HHs will be selected for this agriculture after training. Land and the system will provide by the WDC and the selected HHs will pay for utility only.</p> | |
| 4 | Feb 5, 2022 | Maamendhoo WDC |
| | Participants | |
| | Ms.Aishath Neesha | |
| | Minutes | |
| | <p>General information about the Maamendhoo WDC</p> <ul style="list-style-type: none"> • The same as the Fonadhoo WDC <p>Activities</p> <ul style="list-style-type: none"> • Vocational training for financial independence of woman WDC assign trainers for providing short courses such as cooking, sewing, pastry making, electrician Except the course for electrician, applicants pay course fee • Awareness program for raising health consciousness Organize fitness program for women (1,000 MVR/month) • Create business opportunity for women (many projects were implemented or under preparation) Organize a group to weave cloth using fiber taken from Coconut and sell to the Six Senses Resort Hotel (it was not success because the quality of the cloth was not meet the requirement of the Hotel) Make a reusable bag (eco-bag) for shopping and sell to the islanders in order to reduce the use of plastic bag Establish a shop for selling traditional food, traditional goods for tourists • Cleaning guest house owned by the island council and public park (the island council outsourced the work to members of the WDC) • Donate water dispenser to public school in order to reduce the use of disposable plastic bottle for drinking water <p>Beach Cleaning</p> <ul style="list-style-type: none"> • The island council outsources the task for beach cleaning to two organizations (MU and MG) in the island. The beach in the island is cleaned by the people assigned by these organizations 3 times in a week. | |

Source: JICA Expert Team

6.4.2 Stakeholder Meeting

Effort was made for enhancing participation of women in the stakeholder meetings. With the participation from the WDC and women's officer from the governmental institutions, the women's participants in total number of the participants were quite high. The women's participants in the total number of the participants at the SHM is shown in Table 6.4.2. The participation of women in total participants exceed 35% in all targeted islands except Ishdhoo (20% at 2nd SHM) and Meedhoo (25% at 2nd SHM).

Table 6.4.2 SHM Participants by Gender

| | Location | Total number of Participants (Number) | Male (Number) | Female (Number) | Female in Total Number (%) |
|---------------------|-------------------|---------------------------------------|---------------|-----------------|----------------------------|
| 1 st SHM | Isdhoo Island | 15 | 8 | 7 | 47 |
| | Gan Island | 17 | 11 | 6 | 35 |
| | Maamendhoo Island | 10 | 5 | 5 | 50 |
| | Fonadhoo Island | 11 | 3 | 8 | 73 |

| | Location | Total number of Participants (Number) | Male (Number) | Female (Number) | Female in Total Number (%) |
|---------------------|-------------------|---------------------------------------|---------------|-----------------|----------------------------|
| | Meedhoo Island | 6 | 8 | 3 | 50 |
| 2 nd SHM | Isdhoo Island | 10 | 8 | 2 | 20 |
| | Gan Island | 7 | 3 | 4 | 57 |
| | Maamendhoo Island | 17 | 11 | 6 | 35 |
| | Fonadhoo Island | 22 | 9 | 13 | 59 |
| | Meedhoo Island | 8 | 6 | 2 | 25 |

Source: JICA Expert Team

6.4.3 Gender Assessment Meeting

Gender assessment meeting was organized followed by the first stakeholder meeting at each targeted island. It purposed for finding out female role in family as well as society and collecting opinions and suggestions on the project from gender points of view. In order to make easier to speak up, the number of participants was limited around 10 and the meeting was separated by gender.

It was found that the traditional role for women as a manager of family budget and taken domestic tasks and men as a bread earner for the family have been changing, particularly in younger generation with various reasons such as change of working environment during pandemic, increase contribution to family income by women etc. At the female session as well as male session, it was agreed that there is no job discrimination by gender, though some jobs are in particularly taken up by a specific gender based on interest.

As for decision-making, when it comes larger community related projects such as harbor development, it is mainly men who take decision-making roles. On the other hand, women are to be as the main decision makers in the household level.

The summary of the gender assessment meeting at each island is as shown in Table 6.4.3 and photos taken at the meetings are shown in Figure 6.4.2 Minute of meeting at each island is included in Appendix.6.

Table 6.4.3 Summary of the Gender Assessment Meeting

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| Date and Location | May 22 Isdhoo Island |
| Time | 14:30-15:30 (Female session) 16:00-17:00 (Male session) |
| Venue | Isdhoo Island Council |
| Participants | 20 Females (Famer, Housewives, Teachers, WDCs, Council Members) |
| | 10 Males (Engineer, Business owner, Teachers, Fishermen, Famers, Religious Leader) |
| Subjects discussed on the meeting | <p>Gender roles:</p> <p>Majority of people in the Island are engaging in farming which made a married couple to work cooperatively and to commonly recognize earning income together. It used to be wife's role to manage family budget, however, after popularization of E-bank, generated income is saved in their shared account and managed jointly.</p> <p>In terms of job opportunities, both genders have equal opportunities for jobs. However, some jobs are in particularly taken up by a specific gender based on interest. For example, teachers are mainly women and staff at the powerhouse are mainly men.</p> <p>As for larger community related projects such as harbor development, it is mainly men who take decision-making roles. Women is to be as the main decision makers in the household level. As recently women Council have been elected, it is a tendency that Women, especially WDC are involved in community development activities.</p> |

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| | <p>Use of project area: Fishing (In order to catch frying fishes migrating during north west monsoon season, many locals go fishing at the project area. Some of the locals use the caught frying fish for catching bigger fish such as giant trevally), Surfing (youngster), Collecting Sea sells (women), Snorkeling (Foreigners visiting by a tour boat), Lobster fishing at outerleef area</p> <p>Coastal protection activities in the project area: Locals constructed the revetment by cement bags financed by the central government in 1993-1994.</p> <p>Activities against coastal protection: After prohibition, activities such as sand collection and waste dumping into the sea were stopped. Sand generated during construction under the management of the Island Council can be provided to locals after the registration at the Island Council.</p> <p>Management at the Heritage area: It is taken care by the Island Council.</p> <p>Opinions (expectation/concern) on the project: - Support this project because it protects coastal area from erosion. (Female session) - Request to employ women for cleaning and cooking during construction phase (Female session) - Request for good arrangement of maintenance after construction (Female session) - Revetment area need to be extended to east side and to cover the west side where the coastal line is curved (Male session)</p> <p>Others: Request JICA to provide training for appropriate use of agricultural chemicals and testing pesticides residues of our produce (Female session)</p> |
| Date and Location | May 23 Maamendhoo Island |
| Time | 14:30-15:30 (Female session) 16:00-17:00 (Male session) |
| Venue | Maamendhoo School |
| Participants | 10 Females (Teachers, Civil Servants) 6 Males (Construction Contractor, Teachers, Civil Servants) |
| Subjects discussed on the meeting | <p>Gender roles: Ratio of generated income by male and female in family budget varies depending on families, however, the ratio of female income in the family budget tends to be increased in younger generation. Women is the manager of family budget in most married couples and most of the domestic tasks are taken by women (wives). In terms of job opportunities, both genders have equal opportunities for jobs. However, some jobs are in particularly taken up by a specific gender based on interest. As for larger community related projects such as harbor development, it is mainly men who take decision-making roles. Women is to be as the main decision makers in the household level. However, women are slowly showing interest in stakeholder meetings and are attending when they are invited. The introduction of new rule that half of the council members need to be women in every island also encourages this mind set.</p> <p>Use of project area: <i>Reclamation area</i> Bathing, Fishing <i>Beach for nourishment (west)</i> Fishing, Catching octopus <i>Beach for nourishment (east)</i> Bathing, Caching octopus</p> <p>Activities against coastal protection: After prohibition of collecting sand at the beach, the Island Council provide alternative area for the sand collection at uninhibited island near the Maamendhoo Island.</p> <p>Opinions (expectation/concern) on the project: - Prefer to create evacuation area by reclamation (Female and Male sessions) - Intend to use the evacuation area for outdoor activities since there is no public park in the island (Female session)</p> |
| Date and Location | May 24 Gan Island |
| Time | 14:30-15:30 (Female session) 16:00-17:00 (Male session) |
| Venue | Gan Island Council |

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|-----------------------------------|---|
| Participants | 4 Females (Teacher, Civil Servant, Farmer, Housewife) 6 Males (Teacher, Private Business Owners, Fisherman, Council Member) |
| Subjects discussed on the meeting | <p>Gender roles: Ratio of generated income by male and female in family budget varies depending on families. The family budget is managed jointly. Women (wives) used to take most of the domestic tasks, however, men also take some tasks at present. As the case of both parents to earn money, domestic tasks are outsourced such as hiring housekeeper sometimes. In terms of job opportunities, both genders have equal opportunities for jobs. However, some jobs are in particularly taken up by a specific gender based on interest. As for larger community related projects such as harbor development, it is mainly men who take decision-making roles. Women is to be as the main decision makers in the household level.</p> <p>Use of project area: Surfing (youngster), Snorkeling, Reel fishing, Net fishing (illegal), Collecting Sea sells, Catching octopus</p> <p>Coastal protection activities in the project area: There are no regular coastal protection activities carrying out in the project area. Occasionally, students or community clean the beach. The revetment work was done by cement bags in the past.</p> <p>Activities against coastal protection: To date, the sand collection activities at the beach is still on-going for domestic as well as commercial purposes although it has been prohibited. The main cause of not disappearing the illegal activity is lack of officer to monitor long coastline (Gan Island is the biggest island in Maldives) and lack of alternative place for the sand collection.</p> <p>Opinions (expectation/concern) on the project: Concern on the acceleration of coastal erosion at west side of the island due to constructing new port (Male session)</p> |
| Date and Location | May 25 Fonadhoo Island |
| Time | 14:30-15:30 (Female session) 16:00-17:00 (Male session) |
| Venue | Fonadhoo Island Council |
| Participants | 9 Females (Housewives, Private Business Owner, Scholl Staff) 6 Males (Private Business Owners, Council Members) |
| Subjects discussed on the meeting | <p>Gender roles: Under the COVID-19 pandemic, e-commerce via Viber become popular particularly among housewives. Those housewives started business to sell the items such as flower seedlings grown in their home garden and food for delivery. As a result, the ratio of generated income by female in family budget increased. In general, woman is the manager of the family budget. In terms of job opportunities, both genders have equal opportunities for jobs. However, some jobs are in particularly taken up by a specific gender based on interest. Women is to be as the main decision makers in the household level.</p> <p>Use of project area: Recreation (wedding, party etc.), Catching octopus, Collecting Sea sells</p> <p>Coastal protection activities in the project area: Beach cleaning is traditionally carried out by women in community near-by. No regular cleaning is done at the beach locating far from residential area.</p> <p>Activities against coastal protection: Sand collection is prohibited, however, it is still on-going at many places in the coastal area. Although the Island Council designated the sand collection area, it is not popular since the type of the sand from the designated area does not fit the preference of locals.</p> <p>Opinions (expectation/concern) on the project: Request to construct swimming pool including in the Project Concern on the beach nourishment without constructing groyenes (Female session) Request to do reclamation at the project site for expanding Island's area and cover the area</p> |

| | |
|-----------------------------------|---|
| | <p>by robust revetment, instead of just nourishing the beach. (Male session)</p> <p>Others Request JICA to consider forming a project focusing on “Food Security” in Maldives introducing latest technology. (Male session)</p> |
| Date and Location | May 29 Meedhoo Island |
| Time | 14:30-15:30 (Female session) 16:00-17:00 (Male session) |
| Venue | Meedhoo Island Council |
| Participants | <p>7 Females (Civil Servants, NGO members)</p> <p>5 Males (Civil Servants, Construction Contractor, Owner of Trading Company)</p> |
| Subjects discussed on the meeting | <p>Gender roles: Ratio of generated income by male and female in family budget as well as method of managing family budget varies depending on families. Most of domestic tasks used to be taken by women (wives). Similar to other islands, however, men tended to take more part in domestic tasks in younger generation. In terms of job opportunities, both genders have equal opportunities for jobs. However, some jobs are in particularly taken up by a specific gender based on interest. As for larger community related projects such as harbor development, it is mainly men who take decision-making roles. Women is to be as the main decision makers in the household level. However, women are slowly showing interest in stakeholder meetings and are attending when they are invited. Because one of the highest positions such as the president of the Island Council and the headmaster of the school are taken by women, there is an environment where it is easy for women to speak out. In addition to this, there are few female-led NGO’s focusing on betterment of community in the island such as WDC, ‘Cheynu’ and ‘Raafalhaa’</p> <p>Community activities: Community activities are very brisk in Meedhoo Island. There are 4 registered NGOs including organizations for youth activities, women’s empowerment, environmental protection activities. In addition, there is a group actively working for community development focusing on health care for elderly, beach clearing, education for children by creating open-air library on the beach in the project area.</p> <p>Use of project area: Bathing, Collecting Sea shells, Catching octopus, Recreation (barbecue, walking etc), fishing, Diving at outerleef</p> <p>Coastal protection activities in the project area: Install geo bags at the north corner of the Island Install concrete mass generated from demolishing old harbor at the north corner (it was washed away by waves already)</p> <p>Activities against coastal protection: The Island Council provides sand collection area in uninhabited island near-by. However, because it is costly to reach the island by boats and still profitable after paying the fine for trading illegally collected sand, the illegal sand collection at the beach is still on-going.</p> <p>Opinions (expectation/concern) on the project: Concern on the beach nourishment only constructing one groyenes at the end of project area (Female and Male sessions) Concern on the project’s sustainability at the following points; finding borrow area and collecting the sand for maintaining the beach sustainably (Female and Male sessions) management and maintenance after completion of the project construction period securing budget for management and maintenance after completion of the project construction period capability for implementing management and maintenance by the Island Council and community</p> |

Source: JICA Expert Team



Women's session at Fonadhoo Island

Men's session at Meedhoo Island

Source: JICA Expert Team

Figure 6.4.2 Haring with WDC members

CHAPTER 7 Human Resource Development Plan

7.1 Current Status / Issues

Maldives is a small island nation consisting of approximately 1,200 islands, which are vulnerable to the effects of climate change and natural disasters, and many islands are at risk of submergence due to sea level rise and coastal erosion caused by global warming. The country faces many development challenges to achieve sustainable growth, and there is an urgent need to improve the administrative capacity and human resource development of government officials and other relevant organizations that are responsible for overcoming these challenges.

There is no human resource development plan related to promote understanding of coastal erosion mechanisms in the Maldives, and that human resources in this field are limited, with a particular need for technology transfer of basic knowledge and training in effective data application methods. The current status and issues for each organization (EPA, MECCT, MMS, LGA, MNPHI, and NDMA) are as follows.

Table 7.1.1 Current Status and Issues of Each Organization

| organization name | Current Status and Issues |
|-------------------|---|
| EPA | The number of staff is insufficient for the volume of work. The number of staff is expected to be increased in the future. Although some staff members have basic knowledge of the coast, it is not enough. |
| MECCT | Limited human resources with the capacity to properly and effectively collect, process, and manage data in field surveys, etc. Lack of equipment to conduct the survey. |
| MMS | There is no active wave observation network. Currently, tidal forecast maps are obtained from the University of Hawaii based on information from three tide stations. In addition, Italy funded for wave model predictions. MMS has difficulty in obtaining sustainable data and lacks knowledge on how to analyze and utilize the data. |
| LGA | The technical capacity and knowledge on coastal protection and environmental management to cope with the impacts of climate change is lacking. |
| MNPHI | There is a lack of human resources capable of collecting, analyzing, and disseminating data, conducting research, and proposing new standards. Lack of facilities and human resources to conduct field surveys. Few coastal engineers are available. |
| NDMA | Coastal management is an important area that we believe is not being addressed very well. Chronic shortages of human resources and budgets have become an issue. There is a need for more efficient business practices and enhanced staff capacity. |

Source: JICA Expert Team

7.2 Human Resource Development Plan (Draft)

In formulating this human resource development plan, JET organized the roles and responsibilities for related organizations and identified items for capacity building. Then, through interviews and questionnaires to the relevant organizations and persons in charge of the capacity enhancement items, the current status and needs were identified, and human resource development plan (draft) and implementation schedule (draft) were formulated as follows.

Table 7.2.1 Draft Human Resource Development Plan

| Item | Details | |
|--|---|---|
| Capacity Development Items | Basic knowledge on coasts | 1. Formation and source of sandy beach |
| | | 2. Climate change impacts, coastal erosion mechanisms |
| | | 3. Coastal conservation and protection |
| | | 4. Environmental and social impact (including reef environment) |
| | | 5. Coastal maintenance and management |
| | Coastal planning for priority areas | 6. National and regional planning |
| | | 7. Socio-economic conditions |
| | | 8. Land use of hinterland |
| | Benefits expected from the Project | 9. Coastal erosion |
| | | 10. Benefit type to be considered |
| | Wave Observation System | 11. Financial and economic evaluation methods |
| | | 12. Equipment Installation |
| | | 13. Data Acquisition |
| | | 14. Data Analysis |
| | | 15. Data Utilization |
| | Others | 16. Maintenance |
| Environmental Monitoring | | |
| Shoreline analysis using Remote sensing and Geographical information system data | | |
| Project Feasibility / Risk Analysis and Risk Management | | |
| Management and Maintenance of structures | | |
| Coastal Adaptation measures | | |
| Numerical Modelling and Physical Testing | | |
| Performance Monitoring and Design Optimization | | |
| Target Group | MECCT, MNPHI, Local Stakeholders | |
| Objectives | Strengthen the capacity of relevant agency staff to implement coastal protection | |
| Indicators | • Evaluation of the training by the participants' organization | |
| | • Changes in Attitudes and Behaviors of Training Participants at their organization | |
| | • Examples of practical application of training content by trainees | |
| Baseline | Questionnaires, Interview, etc... | |
| Means of Implementation | • OJT (To C/P such as MECCT, MNPI) | |
| | • Off-JT (Lecture by JICA expert) | |
| | • JCC (8 times) | |
| | • Seminar (4 times) | |
| | • Training in Japan (3 times) | |
| | • Training in Indonesia (1 time) | |

Source: JICA Expert Team

7.3 Goals for each organization

Targets and capacity building items were developed through hearings and consultations with relevant agencies (EPA, MECCT, MMS, LGA, MNPHI, and NDMA).

Table 7.3.1 Current status, issues, and goals at the end of the project for each organization

| organization name | Goals at the end of the project | Means of Implementation to Achieve Goals |
|-------------------|--|---|
| EPA | Develop an understanding of sand movement around the island and monitoring methods related to climate change and the impact of development projects on the island. | OJT/Off-JT Seminar |
| MECCT | Establish a data collection, processing, and sharing system that links related institutions. | OJT/Off-JT Seminar JCC Training in Japan Third Country Training |
| MMS | Issue appropriate wave warnings and messages Provide accurate and reliable wave height and current forecasts Use data to improve reliability and parameterization of wave models Provide data to researchers and development projects | OJT/Off-JT Seminar |
| LGA | Strengthen the technical capacity of local councils to take effective environmental measures to ensure the sustainable protection of the coast and its resilience to climate change. | OJT/Off-JT Seminar |
| MNPHI | Obtain the knowledge and ability to conduct surveys, numerical modeling, analyze field data, and propose viable and efficient solutions. Propose solutions for coastal protection and management. | OJT/Off-JT Seminar Training in Japan |
| NDMA | Integrate coastal management and DRR to minimize storm surges, which are considered the main risk on islands. | OJT/Off-JT Seminar |

Source: JICA Expert Team

Table 7.3.2 Items to strengthen the capacity of each organization

| Category | Item | Check | | | | | |
|------------------------------------|--|-------|-------|-----|-----|-------|------|
| | | EPA | MECCT | MMS | LGA | MNPHI | NDMA |
| Basic knowledge on coasts | Formation and source of sandy beach | ✓ | ✓ | | | ✓ | ✓ |
| | Climate change impacts, coastal erosion mechanisms | ✓ | ✓ | | ✓ | ✓ | ✓ |
| | Coastal conservation and protection | ✓ | ✓ | | | ✓ | ✓ |
| | Environmental and social impact (including reef environment) | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Coastal maintenance and management | Coastal maintenance and management | ✓ | ✓ | | | ✓ | ✓ |
| | National and regional planning | | | ✓ | ✓ | ✓ | ✓ |
| | Socio-economic conditions | | | | ✓ | ✓ | ✓ |
| | Land use of hinterland | | | | | ✓ | ✓ |
| Coastal erosion | Coastal erosion | | ✓ | | | ✓ | ✓ |
| | Benefit type to be considered | | ✓ | | | ✓ | ✓ |
| | Financial and economic evaluation methods | | ✓ | | ✓ | ✓ | ✓ |
| | Equipment Installation | | | ✓ | | | |
| Wave Observation System | Data Acquisition | | ✓ | ✓ | | | |
| | Data Analysis | | ✓ | ✓ | | ✓ | |
| | Data Utilization | | ✓ | ✓ | | ✓ | ✓ |
| | Maintenance | | | ✓ | | | |
| Others | Environmental Monitoring | ✓ | | | | | |
| | Shoreline analysis using Remote sensing and Geographical information system data | ✓ | | | | ✓ | |
| | Project Feasibility / Risk Analysis and Risk Management | | | | | ✓ | |
| | Management and Maintenance of structures | | | | | ✓ | |
| Coastal Adaptation measures | Coastal Adaptation measures | | | | | ✓ | |
| | Numerical Modelling and Physical Testing | | | | | ✓ | |
| | Performance Monitoring and Design Optimization | | | | | ✓ | |
| | | | | | | ✓ | |

Source: JICA Expert Team

CHAPTER 8 Cooperation with GCF Projects

8.1 Progress of PSC and PMU Establishment

In the implementation of the entire GCF project, various government agencies are involved, such as MECCT, including EPA and MMS under MECCT, as the Executing Entity (EE) and MNPHI, NDMA, LGA, Laamu Atoll Council and Addu Atoll Council (including target project islands within the atolls) as relevant organizations. To effectively implement the 4 components of the GCF project and facilitate nationwide rollout of the project outcome, Project Steering Committee (PSC) will be established.

The chair of PSC is a senior official from MECCT, and the secretary of PSC will be from the Environmental Department of MECCT. In addition to the 8 organizations mentioned above, the Ministry of Finance and JICA as EE of JICA financing Component 1, 3 and 4 will be participating in the PSC as the member.

The Project Management Unit (PMU) will be established for MECCT executing Component 2 and JICA expert teams will be established for JICA financing Component 1, 3 and 4 for the efficient implementation of these activities and reporting to each EE. At the application of GCF project, it was agreed with MECCT that the PMU members will be procured as individual consultants, Technical Adviser and Senior Procurement Advisor will be procured by JICA as Accredited Entity (AE) and the other members will be procured by MECCT (Refer to Annex 10 of GCF Funding Proposal). Also, it was agreed that the consultant may be entirely of national consultants when the procurement value is less than USD 16,667 or equivalent in accordance with the GCF's interest in encouraging the development and use of national consultants from partner countries of operation.

The establishment of PSC and PMU shall be started by appointing PSC members within the Government of Maldives and procurement of PMU members after the conclusion of the Subsidiary Agreement (SA) which will be agreed between JICA as AE and MECCT as EE. Since the SA is not yet concluded as of September 2022, PSC and PMU are not yet established. The description in 8.2 TOR of PMU Members and 8.3 Reporting Documents to GCF are from the Data Collection Survey on Building Climate Resilient Safer Cities Final Report by JICA in 2021.

8.2 TOR of PMU members

The PMU, established on behalf of the EE for Component 2, are responsible for the procurement of consultant for detail design/construction supervision and contractors and the day-to-day project management including design, construction, monitoring of defect liability period and commencement of beach monitoring and management activities. The members of PMU are composed of various experts such as project manager, technical adviser, social environmental and gender officer, knowledge management officer, procurement/contract manager, senior procurement adviser, and supporting staffs, such as office administrator, accountant, document controller and secretary; all of them are employed from external sources outside of MECCT. The function of PMU will end when the final performance report of the Project is submitted, and the final administration of the Project expenses is settled. The draft TOR of the PMU members are shown in Table 8.2.1.

Table 8.2.1 Draft TOR of PMU Members

| Position | Draft TOR |
|---|--|
| Project Manager | <p>Overall supervision, technical supervision and daily activity management, report preparation</p> <p>As a leader of PMU, responsible for daily management of the activities based on the plan, ensure the activities to be completed within the period and expenses as planned and fulfill the required quality.</p> <p>In case unexpected situation arises, consult with PSC for policy guidance and advice so that the activities will continue to achieve the objectives.</p> <p>When necessary, attend the PSC meeting together with the representative of MECCT.</p> |
| Technical Adviser | <p>Providing technical advice, quality assurance (reviewing bidding documents, evaluation, checking consultant report, etc.), safety management of construction</p> <p>Support PMU work by providing technical expertise on coastal protection/conservation in reviewing and evaluating bidding documents, scrutinizing reports of detailed design/construction supervision consultant regarding civil work and maintenance work and other matters from the technical engineering aspect.</p> <p>Since it works most closely with the activities implementation and assures quality of the activities, the procurement and contract of the technical adviser are carried out by JICA using the GCF fund.</p> <p>The reporting lines of the technical adviser are JICA as employer and the Project Manager as the leader of PMU.</p> |
| Social Environmental and Gender Officer | <p>Environmental and social and gender consideration (necessary administration, coordination with concerned agencies, monitoring)</p> <p>Responsible for the administration necessary for confirming the approval of the Environmental Social Impact Assessment and coordination with concerned agencies for smooth implementation of the activities according to the plan, stakeholder engagement plan and gender action plan.</p> <p>Review the consultant's environmental, social and gender monitoring report and confirm necessary measures are taken.</p> <p>In case unexpected situation is foreseen, report to the project manager with possible countermeasures and implement the measures.</p> <p>When necessary, attend the PSC meeting together with the project manager.</p> |
| Knowledge Management Officer | <p>Communication of the activities, promotion of the activities among stakeholders including preparation of awareness materials, media engagement, and writing update reports etc.</p> <p>Collecting and organizing knowledge and lessons learned from the project activities to improve the activities and reflect to activities to other projects in Maldives and other countries.</p> |
| Procurement/Contract Manager | <p>Procurement administration (reviewing and preparing draft bidding documents, announcement, evaluation, contract negotiation, management of procurement and contract related documents)</p> <p>Lead the procurement of the consultant for detailed design and construction supervision, and the contractors for civil work according to the procurement policy of JICA as AE.</p> <p>Review the draft bidding documents prepared by the MECCT for the selection of the consultant, review the documents prepared by the consultant for the selection of the contractor, finalize and announce bidding documents, evaluate bidders, request PSC approval for evaluation report, discuss contract conditions during contract negotiation and conclude contract with successful bidder, and file documents regarding procurement and contracts.</p> |
| Senior Procurement Advisor | <p>Procurement supervision</p> <p>Confirm that the activities led by the procurement/contract manager comply with procurement policy of AE, by providing technical expertise on AE's procurement system.</p> <p>Since it works as a double check function within PMU, the procurement and contract of the technical adviser are carried out by JICA using the GCF fund.</p> <p>The reporting lines of the senior procurement adviser are JICA as employer and the project manager as the leader of PMU.</p> |
| Office Administrator | Logistics arrangement |
| Accountant | <p>Management of project budget and project management budget, disbursement request, management of accounting documents</p> <p>Manage project budget and Maldives co-financed activity budget including project management</p> |

| | |
|---------------------|--|
| | budget, preparing the disbursement request, file accounting records and documents throughout the project period under the supervision of the project manager |
| Document Controller | Support day-to-day documentation work of Procurement/Contract Manager in preparation of bidding documents, reports, and contract related documents |
| Secretary | Administration work other than above |

Source: JICA (2021) Data Collection Survey on Building Climate Resilient Safer Cities Final Report

8.3 Reporting Documents to GCF

For the implementation of the Project, reporting to the GCF Secretariat through certain documents is required. The outline of the documents, the organizations in charge of preparing the documents, and the approvers are shown in Table 8.3.1.

Table 8.3.1 Documents of the GCF Project Submitted to the GCF Secretariat

| Type of Documents | Outline | Organizations in Charge of Preparation | Approvers |
|---------------------------|--|---|----------------------------|
| Annual Performance Report | Project information, Project cost, progress, performance against GCF investment criteria, progress updates of the indicators of logical framework, changes, issues and lessons learned after commencement of the Project, environmental, social and gender impact, compliance status with the rules and regulations, implementation status of environmental and social management plans, monitoring and gender action plans and planned activities, updated project schedule, financial information and evaluation report. | PMU, JICA Expert Team, EE (MECCT/ JICA-1&4/ JICA-3) | Chairman of PSC, JICA (AE) |
| Evaluation Reports | Evaluation of the Project (mid-term and final) | Evaluator | JICA |
| Financial Information | Financial information of each component | PMU, JICA Expert Team, EE (MECCT/ JICA-1&4/ JICA-3) | Chairman of PSC, JICA (AE) |
| External Audit Report | Audit of financial information | Independent auditor selected by JICA | JICA (AE) |

Source: JICA (2021) Data Collection Survey on Building Climate Resilient Safer Cities Final Report

8.4 Progress of Component 3 (JICA)

In the Component 3: Development of Disaster Warning and Information Dissemination, a system for disaster warning and information dissemination that widely covers the residents for protecting their lives will be developed and operated. In addition to the development of a hard system, the component includes a soft system such as capacity development of relevant organization on system operation, public education and awareness raising activities. These activities are under implementation through The Project for the Digital Terrestrial Television Broadcasting Network Development (Grant Aid Project) and the Digital Terrestrial Television Broadcasting Operational Capacity Improvement Project (Technical Assistance Project) as a sub-set of activity financed by JICA. Table 8.4.1 shows the outline of the activities and the relevant grant aid project and technical assistance project of JICA.

Table 8.4.1 Outline of Component 3 Activities and Sub-set of Activity Financed by JICA

| | | |
|---|--|-------------------------------------|
| Activity 3.1: Installment of terrestrial digital broadcasting system ISDB-T television network will be installed to allow broadcasting digital television broadcasts throughout the Maldives. | Sub-activity 3.1.1: Standardization of Disaster Warning and Information Dissemination System | Grant Aid |
| | Sub-activity 3.1.2: Awareness Raising on Disaster Warning and Information Dissemination | Technical Assistance (Output 3) |
| Activity 3.2: Establishment of Disaster Early Warning and Information Broadcasting System In the Maldives, including Laamu Atoll, the access to weather/disaster information through a digital terrestrial television broadcasting system will be improved by implementing digital broadcasting that takes advantage of its features and is suited to the situation of the Maldives. The activity will be carried out while keeping it in line with the progress of the grant aid project of Sub-activity 3.1.1. | Sub-activity 3.2.1: Examination of Operational System for Disaster Warning and Information Dissemination | Technical Assistance (Output 4) |
| | Sub-activity 3.2.2: Establishment of the Structure to Operate Disaster Warning and Information Dissemination through the Terrestrial Digital Broadcasting System | Technical Assistance (Output 1,2,3) |

Source: JICA Expert Team

According to the persons in charge of both projects, the schedules are delaying due to the Covid-19. Regarding the grant aid project, the construction work is on-going with expected hand-over to be in August 2023 (as of September 2022) and the progress rate as of July 2022 at 63.5%. For the technical assistance project, progress rate is 55.2% and expected to be completed in January 2025.

8.4.1 Sub-activity 3.1.1: Standardization of Disaster Warning and Information Dissemination System (Grant Aid)

In this sub-activity, the facilities equipment listed in the Table 8.4.2 and Table 8.4.3 are under constructed/installed nationwide, including Gan island of Laamu Atoll, for obtaining and disseminating necessary information related to coastal and ocean disaster for the central- and atoll-level concerned authorities.

Table 8.4.2 Construction Facilities and Quantity of Target Atoll in the Grant Aid Project

| Facility | Quantity | Remarks |
|-------------------------------|-----------|---|
| Network operation center | 1 atoll | Villingili (Male) (K) |
| Microwave relay stations | 3 atolls | Maafushi (K), Feeali (F), Fiyoari (GDh) |
| Digital transmitting stations | 18 atolls | Dhidhdhoo (Ha), Kulhudhuffushi (HDH), Funadhoo (Sh)*1, Manadhoo (N), Ungoofaaru (R), Eydhafushi (B), Naifaru (Lh)*2, Villingili (Male) (K), Felidhoo (V), Dhangethi (ADh), Nilandhoo (F), Gan (L), Guraidhoo (Th), Gadhadhoo (GDh), Thinadhoo (GDh)*3, Villigili (Ga), Fovammulah (Gn), Hithadhoo (S) |
| | | Note: *1: Funadhoo (Sh) was replaced with Maaungdhoo (Sh), *2: Naifaru (Lh) was replaced with Hinnavaru (Lh), *3: Thinadhoo (GDh) was cancelled. |

Source: JICA (2021) Data Collection Survey on Building Climate Resilient Safer Cities Final Report

Table 8.4.3 Facilities and Equipment to be Introduced in the Grant Aid Project

| Item | Detail |
|-----------|--|
| Facility | Antenna tower, transmission center building, etc. |
| Equipment | Digital transmission system, equipment for network operation center, PSM equipment, etc. |

Source: JICA (2021) Data Collection Survey on Building Climate Resilient Safer Cities Final Report

8.4.2 Sub-activity 3.1.2: Awareness Raising on Disaster Warning and Information Dissemination (Technical Assistance Project Output 3)

In this sub-activity, pilot evacuation drills with test transmission of EWBS will be organized in selected towns, with participation of communities for practical disaster information transmission. Through this activity, familiarize, as well as raise awareness of, municipalities and local residents with the categories and contents of warning/information and appropriate responsive actions. Lesson learned from the pilot evacuation drills will be reviewed for further improvement of EWBS. The progress of this sub-activity is as shown in Table 8.4.4.

Table 8.4.4 Progress of Sub-activity 3.1.2

| Activities | Progress |
|--|--|
| Raise the awareness of the broadcasters on data broadcasting service | Completed. |
| Conduct training on handling Broadcast Markup Language (BML) | Temporarily halted. TO be resumed after the installation of GAP's equipment. |
| Operate programmes for region-specific data broadcasting which are not linked to TV programmes | To be conducted later. |
| Prepare a scheduling plan for data broadcasting programmes | To be conducted later. |
| Conduct OJT on transmission of data broadcasting programmes | To be conducted later. |
| Prepare a manual for operation of data broadcasting programme | To be conducted later. |
| Hold workshops on operation of data broadcasting programmes | To be conducted later. |

Source: Digital Terrestrial Television Broadcasting Operational Capacity Improvement Project JICA Expert Team

The achievement of the technical assistance project output for this sub-activity is as shown in Table 8.4.5.

Table 8.4.5 Achievement of Technical Assistance Project Output for Sub-activity 3.1.2

| Output | Objectively Verifiable Indicator | Status of Achievement |
|---|--|---|
| Capability is upgraded in operating data broadcasting programmes. | Sections that handle data broadcasting are established in PSM. | IT, News and Graphic Design Sections are currently operational with five members of staff. |
| | At least 4 templates / contents for data broadcasting are available. | None of the templates have been produced yet, and required specifications of the templates have not been finalized in the GAP yet either. Thirteen members of Data Broadcasting team were briefed about the fundamentals of BML programming via OJTs conducted online. |
| | Manual for operation of data broadcasting program is prepared. | Preparation has been suspended until installation of equipment by GAP is completed. Therefore, no progress to this indicator is recognized. |

Source: Digital Terrestrial Television Broadcasting Operational Capacity Improvement Project JICA Expert Team

8.4.3 Sub-activity 3.2.1: Examination of Operational System for Disaster Warning and Information Dissemination (Technical Assistance Output 4)

In this sub-activity, appropriate disaster alert information dissemination system will be developed and its appropriate operation will be assisted in order to transmit the necessary information properly in the event of a disaster. Real-time warnings can be provided through the Early Warning Broadcasting System (EWBS) and can be received even for vessels under sea navigation which is expected to result to prompt and appropriate evacuation behavior. At the same time, the equipment such as digital signages, etc., will be procured for EWBS, as well as necessary equipment for production of appropriate data broadcasting programs.

At the same time, necessary equipment such as 3 units of Data Broadcasting Operation Equipment with necessary licenses, EWBS receivers with monitors and antennas, and digital signages, etc. will be procured.

For the assistance of proper operation of the EWBS, the mechanism of the disaster broadcast should be clarified at first, and then the operation of EWBS will be assisted as a part of the disaster broadcast. The operating organizations of EWBS are PSM, MMS and NDMA. The expected roles for each organization are as in Table 8.4.6.

Table 8.4.6 Roles Expected for EWBS Operating Organization (PSM, MMS, NDMA)

| Operating Organization | Expected Role |
|------------------------|--|
| MMS | Announce weather warnings/advisories and send the information to PSM |
| PSM | Announce the alarm through the EWBS |
| NDMA | Announce evacuation information/disaster information in response to an alarm |

Source: JICA (2021) Data Collection Survey on Building Climate Resilient Safer Cities Final Report

When issuing an alarm through EWBS, real-time wave information obtained from the wave observation system proposed in Component 4 of GCF Project will be utilized.

The progress of this sub-activity is as shown in Table 8.4.7. The working group for EWBS operation were established and the EWBS operation guidelines were developed. The table of contents for the EWBS operation manual is under preparation at present. Also, the plan of evacuation drill is at the planning stage. Regarding the procurement of necessary equipment for EWBS, procurement of the Data Broadcasting Operation Equipment was completed, and the training is under implementation. The digital signage will be expected to be procured within the year 2022. Further, the software of EWBS receivers was updated to appropriately show in Divehi language. EWBS receivers are to be procured by PSM.

Table 8.4.7 Progress of Sub-activity 3.2.1

| Activities | Progress |
|--|--|
| Establish a working group for operation of EWBS | Completed. |
| Develop guidelines for EWBS operation | Completed. |
| Prepare a manual for EWBS operation | The members of WG are working on developing the Table of Contents for the EWBS Operation Manual. |
| Conduct training on activating alerts / warning through EWBS | This activity will be conducted later amongst parties, such as: NDMA, MMS and PSM – after the equipment installation by GAP. |
| Conduct OJT on operation of EWBS-related equipment | This activity will be conducted later on by PSM and MMS – after equipment installation by GAP. |
| Implement pilot evacuation drill(s) with test | The members of the Working Group and JET traveled to H. Dh |

| | |
|--|---|
| transmission of EWBS and participation of those who are concerned such as NDMA and MMS | <p>Kulhudhuhffushi and S. Hithadhoo to survey the islands and meet the council members in August. The purpose of these trips was to plan for the Evacuation Drills in the future.</p> <p>Also, NDMA has proposed an alternative Island, K. Dhiffushi for the evacuation drill, the one which was confirmed in the Working Group (WG). However, WG would like to still keep V. Keyodhoo as a backup since a community-based disaster management plan in Dhiffushi is not finalized yet.</p> <p>Meanwhile, WG has recognized providing information on execution of the drill – before the drill – to be of high importance; especially for Dhiffushi. Since the radio waves in Dhiffushi will be propagated from the Male’ transmitting station, and it would be necessary to take preemptive measure to avoid any confusions during the drill.</p> |
|--|---|

Source: Digital Terrestrial Television Broadcasting Operational Capacity Improvement Project JICA Expert Team

The achievement of the technical assistance project output for this sub-activity is as shown in Table 8.4.8.

Table 8.4.8 Achievement of Technical Assistance Project Output for Sub-activity 3.2.1

| Output | Objectively Verifiable Indicator | Status of Achievement |
|--|---|--|
| Emergency Warning Broadcasting System (EWBS) is properly established and operated. | Necessary documents, i.e., guidelines and manual, are developed. | EWBS guidelines were prepared. The EWBS operation manual is currently under development. Alert messages and voice message of EWBS have been confirmed. |
| | At least 12 DBNO staff possess the capability to operate EWBS-related equipment on their own. | Due to the delay in GAP, no achievement to this indicator is recognized. |
| | At least 3 time(s) of evacuation drill(s) are carried out in collaboration with the concerned organizations. Besides evacuation drills, operational drills should be conducted at least once a month between PSM and MMS. | The initial meetings for the evacuation drills were held at two shortlisted Islands, Kulhudhuhffushi and Hithadhoo. Also, K. Dhiffushi has been confirmed as the third candidate whilst V. Keyodhoo remains as a backup. |

Source: Digital Terrestrial Television Broadcasting Operational Capacity Improvement Project JICA Expert Team

8.4.4 Sub-activity 3.2.2: Establishment of the Structure to Operate Disaster Warning and Information Dissemination through the Terrestrial Digital Broadcasting System (Technical Assistance Project Output 1, 2, 3)

The terrestrial digital broadcasting technology is a completely new technology that will be introduced to the Maldives. As a first step to implement the terrestrial digital broadcasting system in the Maldives, a system for promoting and spreading terrestrial digital broadcasting system will be established. Technical transfer to improve the capacity to operate and maintain the equipment and facilities to the staff and engineers on broadcasting should be done in order to operate the equipment and facilities properly. The assistance for the production of data broadcasting program in consideration of regional characteristics and the program-unlinked data broadcasting program, the creation of the program scheduling plan, and the preparation of program production manuals will be conducted. The progress of this sub-activity is as shown in Table 8.4.9.

Table 8.4.9 Progress of Sub-activity 3.2.2

| Activities | Progress |
|---|--|
| Develop Public Relations Plan for Digital Migration | The contents of draft Public Relations Plan (PR Plan) are 85% completed, with the exception of budget section. A few details regarding PR activities such as logo, slogan and their guidelines were confirmed. Digital Broadcasting Experts Group (DiBEG) has handed the Test Stream items for transfer to a JET member who is currently active in Male'. In the meantime DiBEG is drafting the terms of use contract for prospective tenderers. Furthermore, PSM is currently preparing the procurement of STBs for the bid. The estimated duration of the tender process was aligned with four phases. |
| Conduct public relations activities in accordance with the Public Relations Plan | Due to prioritization of Digital Signage and STB Procurement, the budget allocation for PR Plan is under consideration and no PR activities have commenced as of yet. Currently, PSM members are developing spot contents for the TV and radio broadcasts for the launch of PR activities. So far, PSM has only managed to confirm the usage guidelines of the logo and slogan in respect to PR activities. |
| Establish a call centre for viewers support | The current call centre, PSM Connect, will be integrated with DTTB services once launched. |
| Prepare a manual for call centre operation | There is no progress in this activity due to the prioritization of Digital Signage and STB Procurement. JET has confirmed the revised draft Call Center Training Participation Plan which was provided from PSM on August, 2021. |
| Disseminate outputs of the Project, nationally and internationally, which fully utilizes the advantage of digital terrestrial broadcasting (ISDB-T), i.e. EWBS, to mitigate information gap on natural disasters. | This activity will be conducted later. |
| Conduct On-the-Job Training (OJT) on periodical inspection and spare parts replacement upon equipment failure of transmitter systems | No OJTs were conducted related to this item during this monitoring period. |
| Prepare a manual for operation and maintenance of transmitter systems | From 15th to 28th May, 2022, JET managed to conduct 5 in-person OJTs to study the GAP approved drawings. Drawings were studied and several questions were drafted accordingly with the help of PSM's technical team. Subsequently, the questions were emailed to GAP contractors for further clarification. Also, some of the concerns related to the smooth operation of EWBS was discussed in the GAP drawing analysis sessions; and questions regarding the concerns that were raised was included in the questionnaire to GAP. By 21st July, GAP contractors had provided answers to all the queries which were presented to them. Currently, WG2 members are working on preparing follow up questions to GAP replies. |
| Conduct OJT on radio wave measurement | There was no online OJTs for radio wave measurement in this monitoring period, and further OJTs will be provided after GAP is completed. |
| Prepare a manual for management of DTTB coverage area | This activity will be conducted later. |
| Prepare a plan for constructing additional transmitting stations | Upon amending their request with the correct specifications, PSM were able to negotiate a permit with CAA to build a 55m Tower in M. Muli – which does not interfere with the obstacle limited surface. For the time being PSM is estimating the budget for constructing additional stations and working on attaining permits from relevant authorities. JET and PSM have also been discussing with each other to produce ideas to come up with solutions on existing concerns regarding the expansion plans. During this monitoring period, the topics discussed were the predicted receiving levels in remote islands, and the viability of existing analog stations as potential DTTB stations in selected islands. |
| Conduct OJT on operation and | PSM with the support of JET has finished analyzing the consultant approved |

| | |
|--|---|
| maintenance of NOC equipment | documents of GAP, and the results will be utilized for considering operation and maintenance methods. However, the drafting work has not begun as of yet. |
| Conduct training on taking emergency measures upon failure of NOC equipment as well as transmitter systems | Same as activity 11 mentioned above. |
| Conduct OJT on production of electronic programme guides (EPG) and Superimpose | Same as activity 11 and 12 mentioned above. |
| Prepare a manual for operation and maintenance of NOC equipment | As mentioned in activity 9, JET has completed the analysis of the construction documents provided by GAP. |

Source: Digital Terrestrial Television Broadcasting Operational Capacity Improvement Project JICA Expert Team

The achievement of the technical assistance project output for this sub-activity is as shown in Table 8.4.10.

Table 8.4.10 Achievement of Technical Assistance Project Output for Sub-activity 3.2.2

| Output | Objectively Verifiable Indicator | Status of Achievement |
|---|---|---|
| A system for facilitating viewers' digital migration is established. | Public Relation Plan is developed. | The contents of the plan are 85 % completed. |
| | Call centre is established and properly functioning. | OJTs are being planned, although not executed as of yet. |
| | Operation manual for the call centre is prepared. | Due to having prioritized other activities, the preparation of the manual is halted. |
| Technical capability is upgraded in the field of the operation and maintenance of the equipment for digital terrestrial broadcasting. | At least 27 DBNO staff possess capability to properly operate and maintain the equipment for digital terrestrial broadcasting on their own. | A total of 42 staff members participated for each of the OJTs: "operation and maintenance of transmitters" and "conducting radio wave measurement." Further OJTs will be planned when the equipment provided by GAP is installed. The Director of DBNO has already been officially appointed. |
| | Necessary documents, i.e., manuals and plans, are prepared. | The table of contents for the manuals have been drafted. Members of PSM have been analyzing the documents of GAP comprehensively, and the results of analysis will be incorporated into the manuals. Currently PSM has been communicating with GAP querying on several points especially the things related to the establishment of the additional transmitting stations – to be installed by PSM. |
| Capability is upgraded in operating data broadcasting programmed. | Sections that handle data broadcasting are established in PSM. | IT, News and Graphic Design Sections are currently operational with five members of staff. |
| | At least 4 templates / contents for data broadcasting are available. | None of the templates have been produced yet, and required specifications of the templates have not been finalized in the GAP yet either. Thirteen members of Data Broadcasting team were briefed about the fundamentals of BML programming via OJTs conducted online. |
| | Manual for operation of data broadcasting program is prepared. | Preparation has been suspended until installation of equipment by GAP is completed. Therefore, no progress to this indicator is recognized. |

Source: Digital Terrestrial Television Broadcasting Operational Capacity Improvement Project JICA Expert Team

CHAPTER 9 Outline of Cooperation

9.1 Basic Plan of Cooperation

9.1.1 Name of the Project

The Project for Building Climate Resilient Safer Islands in the Maldives

9.1.2 Period of Cooperation

October 2021 to October 2025 (48 months)

9.1.3 Overall Goal

| Overall Goal | Objectively Verifiable Indicators |
|---|--|
| National resiliency and safety against climate change is promoted due to the implementation of coastal protection measures considering climate change in the Maldives | <ul style="list-style-type: none"> ICZM plans based on the information on monitoring of wave, coast, reef and land use are formulated in more than 3 inhabited islands except target islands of the Project |
| | <ul style="list-style-type: none"> Countermeasures are implemented in target islands in accordance with formulated ICZM plans |

(Supplementary explanation on indicators)

The indicator for project purpose is that coastal protection measures will be incorporated into the annual plans of the concerned organizations. The overall goal envisages that, as a mid- to long-term development effect, coastal protection measures will be implemented based on the ICZM plan, in accordance with the annual plans of the relevant ministries and agencies. It is also envisioned that ICZM plans will be developed for the three inhabited islands other than the target islands in the mid- to long-term as a result of strengthening the capacity of the officers of the concerned organizations.

9.1.4 Project Purpose

| Project Purpose | Objectively Verifiable Indicators |
|--|--|
| Capacity of related organizations to implement coastal protection measures considering climate change is strengthened. | Coastal protection measures considering climate change and countermeasures to implement ICZM plans in the targeted inhabited islands are applied to annual plans of related ministries |

(Supplementary explanation on indicators)

Possible measures for ICZM are related to coastal protection, land use, sediment management, and reef environment protection. It is envisioned that the division of responsibilities among relevant ministries and agencies for these measures will be clarified, and that the measures will be incorporated into the annual plans of each relevant ministry and agency and budgeted for in their budgets.

9.1.5 Outputs and Activities

| Output 1 | Objectively Verifiable Indicators |
|---|---|
| Cooperation among related organizations to prepare basic policy of ICZM at national level and countermeasures in targeted inhabited islands are strengthened. | a. Basic policy of ICZM is agreed among related organizations b. Basic policy of ICZM is applied to ICZM plans including climate change adaptation measures such as coastal protection/adaptation measures in the targeted inhabited islands c. Basic design of coastal protection is developed in targeted inhabited islands d. Level 2 of ICZM integration: Governments use knowledge about ICZM plan in development plans in 2 islands ¹ |
| Activities | |
| 1-1 | Conduct inventory study on coastal conditions in inhabited islands |
| 1-2 | Prepare basic policy of ICZM at national level |
| 1-3 | Prepare ICZM plan at targeted inhabited islands (Gan, Fohadhoo in Laamu Atoll) |
| 1-4 | Conduct basic design and survey on environmental impact assessment in targeted inhabited islands (Gan, Fonadhoo, Maamendhoo, Ishdhoo in Laamu Atoll and Meedhoo in Addu Atoll) in accordance with the basic policy of ICZM |
| 1-5 | Implement seminars for capacity development on ICZM and its dissemination |

Note: *1: ICZM integration level indicators: Level 0 = No knowledge about ICZM implementation and no plans where ICZM has been integrated, Level 1 = Governments get knowledge about ICZM plan but no plans where ICZM has been integrated, Level 2: Governments use knowledge about ICZM plan in development plans in 2 islands, Level 3: Governments use knowledge about ICZM plan in development plans in 3 islands. (ICZM plan is the one to build resilient and safer islands by harmonizing human lives with nature along coast including coastal conservation, reef conservation, sediment budget management, and land use; development plans are the regional development plans to harmonize between coastal development such as port plans and reclamation plans and natural environment.)

(Supplementary explanation on indicators and activities)

Since ICZM straddles the jurisdiction of not only the main counterpart organization, MECCT, but also multiple concerned organizations such as MNPHI and NDMA, agreement among the concerned organizations is essential for the implementation of ICZM, as indicated in a. of the indicator. It is necessary to consider the basic policy for ICZM at the national level in Activity 1-2 based on specific cases, so it is envisioned that there will also be a process to feed back the results of the ICZM planning in the target islands between Activity 1-3 and Activity 1-2.

| Output 2 | Objectively Verifiable Indicators |
|--|---|
| Structure to implement community-based beach maintenance is established in targeted inhabited islands in accordance with ICZM plan | Countermeasures of community-based beach maintenance is implemented in the targeted inhabited islands |
| Activities | |
| 2-1 | Prepare concrete method, structure and operation for adaptive management and promote agreement among related actors in the targeted inhabited islands (Gan, Fonadhoo, Maamendhoo, Ishdhoo in Laamu Atoll and Meedhoo in Addu Atoll) |
| 2-2 | Prepare concrete method, structure and operation for community-based beach maintenance and promote agreement among related actors in the targeted inhabited islands |
| 2-3 | Implement public education and public relations on beach maintenance and management in the targeted inhabited islands |

(Supplementary explanation on indicators and activities)

The timing of each activity in Output 2 comes before the construction of beach nourishment and revetment, so role-playing and other activities will be incorporated so that community-level stakeholders in the target island can visualize the construction and subsequent maintenance.

| Output 3 | Objectively Verifiable Indicators |
|---|---|
| Wave, beach, coral reef and land use monitoring system is developed and operation capacity of related organizations is promoted in the targeted inhabited islands | a. Monitoring system is installed, managed and operated by related organizations b. Level 2 of Proficiency in Monitoring: Stakeholders will be able to implement monitoring works by themselves ² |
| Activities | |
| 3-1 | Develop wave monitoring system and establish structure for technical transfer, management and monitoring on analysis and data processing |
| 3-2 | Develop coast, reef and land use monitoring system utilizing satellite images and the UAV technology, and establish structure for technical transfer, management and monitoring on analysis and data processing |

Note: *2: Proficiency of monitoring indicators: Level 0 = Stakeholders (MEE, MMS, atoll and Island councils and communities in 5 islands) have no/ insufficient knowledge on monitoring. Level 1= Stakeholders will acquire sufficient knowledge on monitoring methods. Level 2 = Stakeholders will be able to implement monitoring works by themselves, Level 3 = Stakeholders will be able to accumulate monitoring data in proper manner so that the data can be directly applied for coastal planning.

(Supplementary explanation on indicators and activities)

For Activity 3-1, it is assumed that the Wave Observation System will be installed in the northern, central, and southern parts of the Maldives. The concerned organization to be targeted for capacity development is MMS.

9.1.6 Input**(1) Japanese Side****a. Dispatch of Experts**

Team Leader / Regional Planning

Deputy Team Leader / Coastal Conservation Plan/ Integrated Coastal Zone Management (ICZM) 2

Coastal Conservation Plan/ Integrated Coastal Zone Management (ICZM) 1

Coastal Engineering/Shoreline Change Analysis 1

Coastal Management/Coastal Monitoring

Oceanographic Investigation/ Survey 1

Facility Design and Construction Plan/Cost Estimate

Wave Observation System

Reef Environment Planning

Regulatory System/Organizational Cooperation/ GCF Scheme

Capacity Development/Training Plan

Environmental and Social Consideration/ Consensus Building/ Gender 1

Environmental and Social Consideration/ Consensus Building/ Gender 2

- Satellite Image Analysis / GIS
- Coastal Engineering/Shoreline Change Analysis 2/ Coordinator 2
- Oceanographic Investigation/ Survey / Coordinator 1

- b. Training of Counterpart Personnel in Japan and third country
- c. Equipment: Wave hunters, drones, analysis software

(2) Maldivian Side

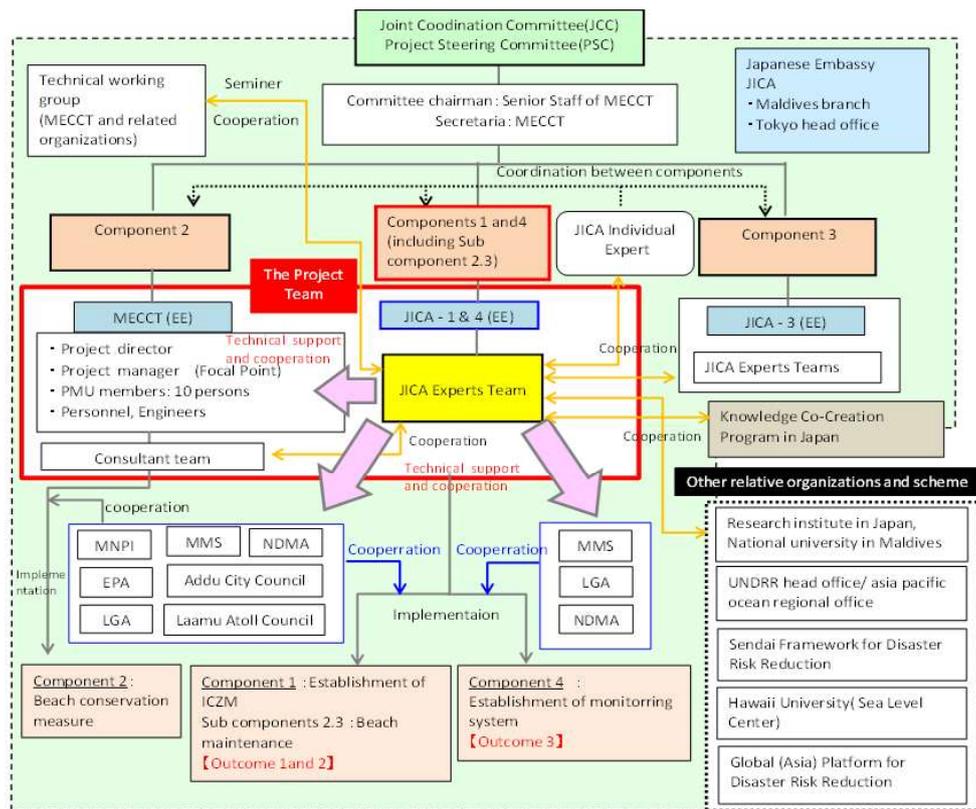
- a. Allocation of Counterpart Personnel
- b. Local cost (domestic travel expenses, office utilities, etc.) other than covered by GCF fund

9.1.7 Important Assumption

No change in Maldives' policy/legislation on coastal protection measures

9.2 Implementation Structure

The implementation structure of this project is shown in the figure below. Since this work is part of the GCF project (Components 1, 4, and Sub-Components 2.3), the structure will be established for close collaboration with the implementing agencies and relevant parties of other components.



Source: JICA Expert Team

Figure 9.2.1 Implementation Structure of the Project

9.3 Plan of Monitoring and Evaluation

(1) Main Indicators to be used in the Evaluation

The indicators were shown in 9.1.

(2) Plan of Evaluation

Post evaluation will be conducted three year after the project completion.

(3) Plan of Monitoring during the Project

Monitoring sheet is prepared every 6 months after starting the project

Confirmation of progress and annual work plan once half year at JCC meetings

Preparation of project completion report at the project completion

CHAPTER 10 Six Evaluation Items

10.1 Relevance

The project is highly appropriate because of its consistency with the relevant policies of the Maldives, the needs of counterpart institutions and the target society, and the appropriateness of its approach.

10.1.1 Consistency with Coastal Conservation Policy in the Maldives

The Constitution of the Republic of Maldives is the basic statement of the principles of the Republic of the Maldives. Article 22 of the Constitution states that "The State has a fundamental duty to protect and preserve the natural environment, biodiversity, resources and beauty of the country for the benefit of present and future generations." and Article 23(d) states that "Every citizen the rights to a healthy and ecologically balanced environment pursuant to this Constitution, and the State undertakes to achieve the progressive realization of these rights by reasonable measures within its ability and resources." Article 67 (h) states that " The exercise and enjoyment of fundamental rights and freedoms is inseparable from the performance of responsibilities and duties, and it is the responsibility: to preserve and protect the natural environment, biodiversity, resources and beauty of the country and to abstain from all forms of pollution and ecological degradation" and Article 232(c) states that "The responsibilities of councils elected to provide for decentralized administration shall include: to establish a safe, healthy and ecologically."

In addition, the Maldives Updated Nationally Determined Contribution (NDC) in 2020 describes the promotion of an eco-based approach in the field of coastal conservation, the promotion of coastal conservation projects, and the acquisition of funds, including from foreign donors. In addition, the Strategic Action Plan 2019-2023 specifies the implementation of eco-based adaptation measures in coastal conservation.

The project intends to strengthen the capacity of five inhabited islands in Addu and Laamu atolls for coastal conservation measures in consideration of climate change, and to promote measures that take advantage of the natural protection functions of sandy beaches and reefs. Therefore, the project approach is appropriate as it is consistent with the policy of the Maldives on coastal conservation projects.

10.1.2 Needs from Society

State of the Environment 2016 reported that coastal erosion has been remarkable in the Maldives since the 1980s, and 116 inhabited islands out of 189 inhabited islands were experiencing coastal erosion, of which 38% were in a severely eroded condition as of 2014. Among 76 inhabited islands that responded to the inventory survey for this detailed planning study conducted in 2022, about half answered that coastal erosion was identified as a problem occurring on the coast, and about 80% of these islands reported that coastal erosion conditions were serious. About 60% of the islands also indicated that they would like to take measures to minimize the impact on the environment. Thus, coastal erosion is recognized as the most typical coastal problem in many inhabited islands in the Maldives, and there is a high social need for coastal protection to prevent and mitigate coastal erosion while also taking less environmental impacts into consideration.

10.1.3 Relevance of Counterpart Agencies

MECCT is responsible for policy development and implementation related to climate change measures both mitigation and adaptation and serves as a focal point for international organizations such as the GCF in the area of climate change. MECCT's mandate includes strengthening activities and opportunities related to climate change adaptation, building infrastructure and communities resilient to the impacts of climate change, including

management in coastal protection. MNPFI is responsible for the implementation of coastal protection and works closely with MECCT to implement coastal protection.

Since this project is to build climate resilient safer islands and also requires coordination with the GCF, it is highly appropriate to have MECCT as the main counterpart agency.

10.1.4 Appropriateness of approach

The project will strengthen coordination among relevant organizations to formulate a national level policy for ICZM and specific measures for the target inhabited islands, and prepare ICZM plans for the target islands in Output 1. Output 2 will establish a community-based beach maintenance and management system on the target islands based on the ICZM plan. A long-term monitoring system for waves, beaches, coral reefs, and land use will be established, and the operational capacity of relevant institutions will be improved in Output 3. Long-term observation and monitoring under Output 3 will capture the effects of climate change and will contribute to ICZM planning and coastal maintenance management on other inhabited islands after the project is completed. The achievement of the three outputs will also strengthen the capacity of officers of the concerned organizations to implement coastal protection measures in which climate change impacts are taken account. It will contribute improving the resilience and safety of the Maldives against climate change. Thus, the logic of the approach is appropriate, as it will improve the resilience and safety of the Maldives against climate change by enhancing the capacity of the officials of the concerned organizations to implement coastal protection measures while taking into climate change impacts.

10.2 Coherence

Japan's "Country Assistance Policy (formulated in April 2020)" for the Maldives sets "support for sustainable economic growth with due consideration for vulnerability" as a major goal, and states that assistance will be provided to achieve sustainable economic growth from a medium- to long-term perspective, while taking into account vulnerability to climate change and natural disasters, etc. The program also includes "Support for sustainable economic growth (including climate change and natural disasters)" in which higher priority will be given. The program also identifies "(2) Environment, Climate Change, and Disaster Management" as one of the priority areas of assistance, with emphasis on support for environmental and climate change countermeasures and disaster risk management, such as addressing climate change and promoting the use of renewable energy, and for disaster risk management, particularly disaster risk management in rural areas.

In this context, the "Data Collection Survey on Building Climate Resilient Safer Cities", which has been implemented by JICA since 2018, investigated climate change and coastal conditions in the Maldives to prevent and mitigate land loss on inhabited islands. Technical support to the project formulation considering utilization of the Green Climate Fund was also carried out in the study. "The Project for the Digital Terrestrial Television Broadcasting Network Development" (grant aid scheme) and the "Digital Terrestrial Television Broadcasting Operational Capacity Improvement Project" (technical assistance scheme) have also been implemented to support filling information gaps and improve the efficiency of disseminating disaster risk related information. This project is part of a collaborative project with the GCF, which was formulated on the basis of the data collection survey, and the two projects related to the digital terrestrial TV broadcasting network are also part of the collaborative project with the GCF. The project purpose of this project is to strengthen the capacity of related organizations to implement coastal protection measures considering climate change, with the supports provided to date and in coordination with ongoing projects. This is consistent with Japan's assistance policy for the Maldives.

10.3 Effectiveness

The effectiveness of this project is expected to be enhanced, as the achievement of each output is expected to enable the achievement of the project goals. The project will strengthen the linkages between the national level policy of Integrated Coastal Zone Management (ICZM) and the relevant agencies for the planning of target islands in Output 1. Community-based coastal maintenance management system will be established on the target islands in Output 1, based on the ICZM plan to be developed in Output 1. A long-term monitoring system for waves, beaches, coral reefs, and land use will be established on the target islands, and the operational capacity of relevant institutions will be improved in Output 3. By achieving these outputs, it is highly likely that the project will achieve its project purpose of "Capacity of related organizations to implement coastal protection measures considering climate change is strengthened."

On the other hand, as for the achievement of outputs within the set input and period, the establishment of the PMU is essential for the implementation of GCF projects and Maldivian government co-financed projects, and activities in Output 1 also need to be coordinated with the PMU, so the early establishment of the PMU is awaited.

10.4 Efficiency

The project is expected to be generally efficient in terms of efforts to take efficient activities through selection and concentration of project components, a smooth implementation structure, appropriate project duration and inputs, and synergies with previous cooperation achievements and related projects in the field concerned. In this project, three working groups will be formed for each output, and discussions will be held between JET members and officers from the concerned organizations on themes related to each output. The efficient and effective development of activities are considered through the establishment of the working groups.

On the other hand, since the COVID-19 infection situation also affects project efficiency, it will be necessary to continue monitoring the situation in order to ensure project efficiency.

Although there is no overlap between this project and the supports provided by other international partners during this detailed planning survey, it is necessary to keep a close eye on the activities by the other international partners.

10.5 Impact

While the project's target area is centered on Laamu and Addu atolls, it is expected to disseminate the project outputs throughout the Maldives. Since the project has activities with a view to nationwide expansion, it is expected to have a high impact on the entire country through the solid implementation of the planned activities.

Furthermore, this project will contribute to the achievement of SDGs Goal 11 "Make cities and human settlements inclusive, safe, resilient and sustainable" and Goal 13 "Take urgent action to combat climate change and its impacts" and to the realization of the Sendai Framework for Disaster Risk Reduction 2015-2030 (Priority Action 1: Understanding disaster risk, Priority Action 2: Strengthening disaster risk governance to manage disaster risk, Priority Action 3: Investing in disaster reduction for resilience, and achieve global targets (a)-(d)).

No negative impacts are envisaged at the time of the detailed planning survey.

10.6 Sustainability

The institutional sustainability is generally high, as coastal conservation is stated as an important issue in various laws and plans of the Maldives. If the importance of the national ICZM policy to be developed in this project is recognized by relevant organizations and leads to policy implementation, the policy institutional sustainability can be further enhanced.

As far as organizational sustainability, the interest and awareness of the main C/P, MECCT, toward the project is high, and other related agencies such as MNPHI are actively participating in the project. There have been few dismissals or transfers at the director level of MECCT, and few dismissals or transfers of staff at the working level. It is also envisioned that members to be employed through the establishment of the PMU will work on the project, and that these individuals will be hired by MECCT after the project. If this plan is realized, organizational sustainability will be further enhanced.

Since there have been no budget cuts in MECCT and MNPHI so far, there should be no major problems with financial sustainability after the end of the cooperation. However, budget reductions are one concern that could hinder the possibility of self-sustaining development. It is necessary to continue closely monitoring situations of the budget.

It is highly likely that the technology will be maintained, as various manuals are planned to be prepared jointly by Japanese experts and C/P staff, and the transfer technology is to be executed and maintained through various training programs to be implemented in the project. On the other hand, the examination of ICZM and the implementation and maintenance of beach nourishment projects on inhabited islands will be a new challenge for the Maldives stakeholders, adequate trainings and the joint preparation of user-friendly manuals in line with C/P needs will be particularly important to ensure technical sustainability.

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CHAPTER 4 Current Status and Issues of Coastal Conservation on Target Islands

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CHAPTER 5 Detailed Survey and Basic Design for Coastal Conservation on the Target Islands

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CHAPTER 6 Environmental and Social Considerations and Gender Considerations

- 1) Fifth Amendment to the Waste Management Regulation (Regulation 2022/R-109)
 - 2) Environmental Protection and Preservation Act (Act No.4/1993)
 - 3) 1st Amendment to Environmental Protection and Preservation Act (2014)
 - 4) Environmental Impact Assessment Regulation 2012
 - 5) First Amendment to the Environmental Impact Assessment Regulation (Regulation 2013/ R-18)
 - 6) Second Amendment to Environmental Impact Assessment Regulation (Regulation 2015/R-174)
 - 7) Third Amendment to the Environmental Impact Assessment Regulation (Regulation 2016/R-66)
 - 8) Fourth Amendment to the Environmental Impact Assessment Regulation (Regulation 2017/R-7)
 - 9) Fifth Amendment to Environmental Impact Assessment Regulation (Regulation 2018/R-131)
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 - 16) Coral and Sand Mining Regulation (1999)
 - 17) Regulation on Protected Areas (2018/R-78)
 - 18) Regulation on Protect Species (2021 R-25)
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