

Report on zonation and boundary demarcation of Proposed Protected Areas in Laamu Atoll



Ministry of Environment,
Climate Change
and Technology



ENDHERI



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environment
programme

Prepared by *Enhancing National Development through Environmentally Resilient Islands* (ENDhERI) Project for the Ministry of Environment, Climate Change and Technology

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ACRONYMS

MECCT	Ministry of Environment, Climate Change and Technology
ENDhERI	Enhancing National Development through Environmentally Resilient Islands
UNEP	United Nation Environment Program
GEF	Global Environment Facility
NC	Natural Capital
UNDP	United Nation Development Program
RTK	Real-time kinematic
EPA	Environmental Protection Agency
GIS	Global Information System
PA	Protected Areas

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INTRODUCTION:

The government of Maldives has pledged to bring 1 island, 1 reef and 1 mangrove under a protected area regime and has committed to establish better management regimes for these areas which is also reflected in the present Strategic Action Plan 2019-2023 and National Resiliency and Recovery Plan. In an effort to conserve key biodiversity habitats of Laamu Atoll for supporting development for better management and decision making, Ministry of Environment, Climate Change and Technology has initiated a process of designating sites of Laamu Atoll as protected areas under the Environmental Protection and Preservation Act 4/93.

The zonation survey was conducted to demarcate the boundaries of the proposed protected areas in Laamu Atoll. The geographically referenced boundary maps developed in the process identifies the protected area zone, total area of PA, specific ecosystems within the area and the areas. The zonation maps would act as a supporting document in protected area declaration, determine category of protection, acts as a guide for resource users and will be published with the protected area declaration directive. The zonation report is developed to fulfil the reporting purpose of the project.

The seven proposed protected areas that have been mapped in the zonation exercise are:

1. L. Gan BodaFengandu
2. L. Gaadhoo (key habitats of turtle nesting beach, seagrass, mangrove, vegetation)
3. L. Hithadhoo Kulhi
4. L. Maabaidhoo Koaru
5. Fushi Kandu (Marine)
6. Hithadhoo Gaadhoo Kandu (Marine)
7. L. Fushi Island with Vadonolhu Kandu Olhi (Sandbank with marine area)

The zonation of Laamu proposed PA sites were conducted by Enhancing National Development through Environmentally Resilient Islands (ENDhERI) project, implemented by Ministry of Environment Climate Change and Technology (MECCT), financed by Global Environment Facility (GEF) and assisted by United Nations Environment Program (UNEP). The main objective of the project is to enhancing reef protection, resilience and ecosystem recovery by reducing development impacts in a selected project site the Maldives, enabled for replication nationally through public awareness and integrating the values of marine biodiversity and other natural capital in national accounting.

This project aims to assist the government of the Maldives in its implementation of new environmental policies and transition towards national adoption of Green Growth atoll development that will sustain marine Natural Capital (NC) and strengthen the resilience and recovery of reef ecosystems. This will be informed by learning from atoll-wide integrated coastal zone management within a Managed Marine Area / Biosphere Reserve framework, and the application of innovative sustainability practices and standards in agriculture, fisheries, tourism and construction sectors as the basis for transforming the human ecological footprint in Laamu Atoll, and taking this up to national level through sector transformation, spatial planning and improved governance based on NC accounting. The intermediate objective of this transformation is to minimize the flows of pollutants from land-based activities into the adjacent marine environment, and reduce marine-based drivers of reef degradation including baitfish and reef fisheries. Overall, the project seeks to enhance reef ecosystem integrity and resilience through sustainable management, reducing development impacts and integrating NC accounting into national planning.



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MAIN OBJECTIVE:

The main objective of the assignment is to demarcate the boundaries of the proposed protected areas in Laamu Atoll and produce geographically referenced maps, which would support the declaration and management of proposed PAs in Laamu Atoll.



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SCOPE OF WORK:

1. Develop zonation maps for seven sites identifies in Laamu Atoll. The survey team is responsible for developing draft maps, participate in stakeholder consultations and integrate comments from stakeholders to develop the final zonation map for the seven sites

- a. L. Gan Paree Fengan'du
- b. L. Gaadhoo (key habitats of turtle nesting beach, seagrass, mangrove, vegetation)
- c. L. Hithadhoo Kulhi
- d. L. Maabaidhoo Koaru
- e. Fushi Kandu (Marine)
- f. Hithadhoo Gaadhoo Kandu (Marine)
- g. L.Fushi Island with Vadonolhu Kandu Olhi (Sandbank with marine area)

2. Under take zonation and ground truth mapping survey including but not limited to drone mapping for four sites as per the Procedures identified in the Annex 1.

- L. Gan Paree Fengan'du
- L. Gaadhoo (key habitats of turtle nesting beach, seagrass, mangrove, vegetation)
- L. Hithadhoo Kulhi
- L. Maabaidhoo Koaru

3. Collect and collate raw and synthesized data collected through the survey, including representative photography and videography.

4. Produce detailed, geographically reference maps of the survey sites and submitted in original (including but not limited to shape files), pdf and photo format in dhivehi and English (Sample in Annex 2).

5. Provide data on the area of habitats covered by the protected areas in relation to the atoll area;

- Total Marine Area
- Total Terrestrial Area
- Coral reef cover
- Mangroves and wetland cover
- Total area of water body
- Vegetation cover



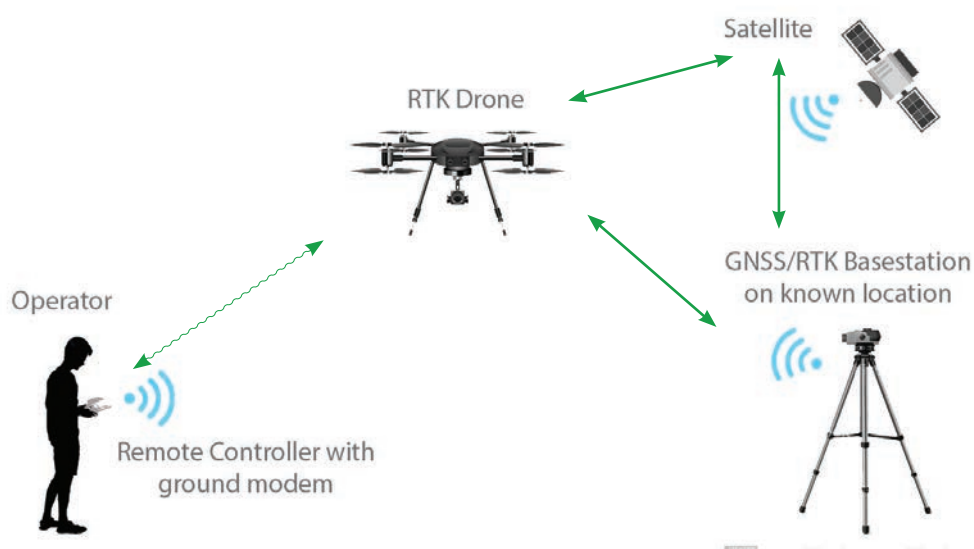
4 METHODOLOGY:

The assessment of zonation of Laamu Atoll proposed PAs were conducted by a team from EPA and ENDhERI project, in September 2021. The TOR for the assignment issued on 31st August (Annex 1) contains the details of assignment.

SURVEY TEAM:

Name	Designation	Organisation
Hussain Shufran	Assistant Director	EPA
Ali Ahmed Didi	IT Technical	EPA
Ahmed Nadheem	ENDhERI Project Coordinator/ Laamu	MoECCT
Ali Nizar	ENDhERI Project Communications Officer	MoECCT

Field assessment was conducted for a duration of 10 days, and drone mapping was carried out using Real-time kinematic drone. RTK is onboard drone hardware that allows a survey drone to communicate with a base station in real time to validate its location in space. Photogrammetry data is collected at survey-grade accuracy as given in the following diagram.



Aerial imagery of island was collected using the DJI Phantom 4 RTK with 1-inch 20 Mega Pixel CMOS sensor. The flight plans were created using Creating flight paths on the controller using the built-in app (DJI GS RTK app), at the height of 120 meters.

Even though from the Drone integrated GPS provides geo-referencing, it was essential in this project to take ground control points to make the map as accurate as possible. To increase geo-location accuracy during post-processing, five (5) ground control points (GCPs) randomly distributed were marked within and along the edges and in open areas using natural markers. Horizontal GPS locations of these markers were taken with Topcon GR-5 GPS and Base Station at a ± 10.0 mm or ± 1 cm accuracy using the RTK mode. The GCP's were taken before the mapping of the area. The Photogrammetry data collected are processed in GIS software to produced maps. Area calculations are done in GIS software.



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KEY DELIVERABLES:

The key deliverables of the assignment were:

- Geographically reference maps of the seven sites and submitted in original (including including but not limited to shape files), pdf and photo format in dhivehi and English (Sample in Annex 2):
 1. L. Gan Paree Fengan'du
 2. L. Gaadhoo (key habitats of turtle nesting beach, seagrass, mangrove, vegetation)
 3. L. Hithadhoo Kulhi
 4. L. Maabaidhoo Koaru
 5. Fushi Kandhu (Marine)
 6. Hithadhoo Gaadhoo Kandhu (Marine)
 7. L.Fushi Island with Vadonolhu Kandhu Olhi (Sandbank with marine area)
- Photos and videos of the four areas surveyed for ground truthing
- Figures of the area of habitats covered by the protected areas in ;
 1. Total Marine Area
 2. Total Terrestrial Area
 3. Coral reef covered
 4. Mangroves and wetland covered
 5. Total area of water body
 6. Vegetation cover

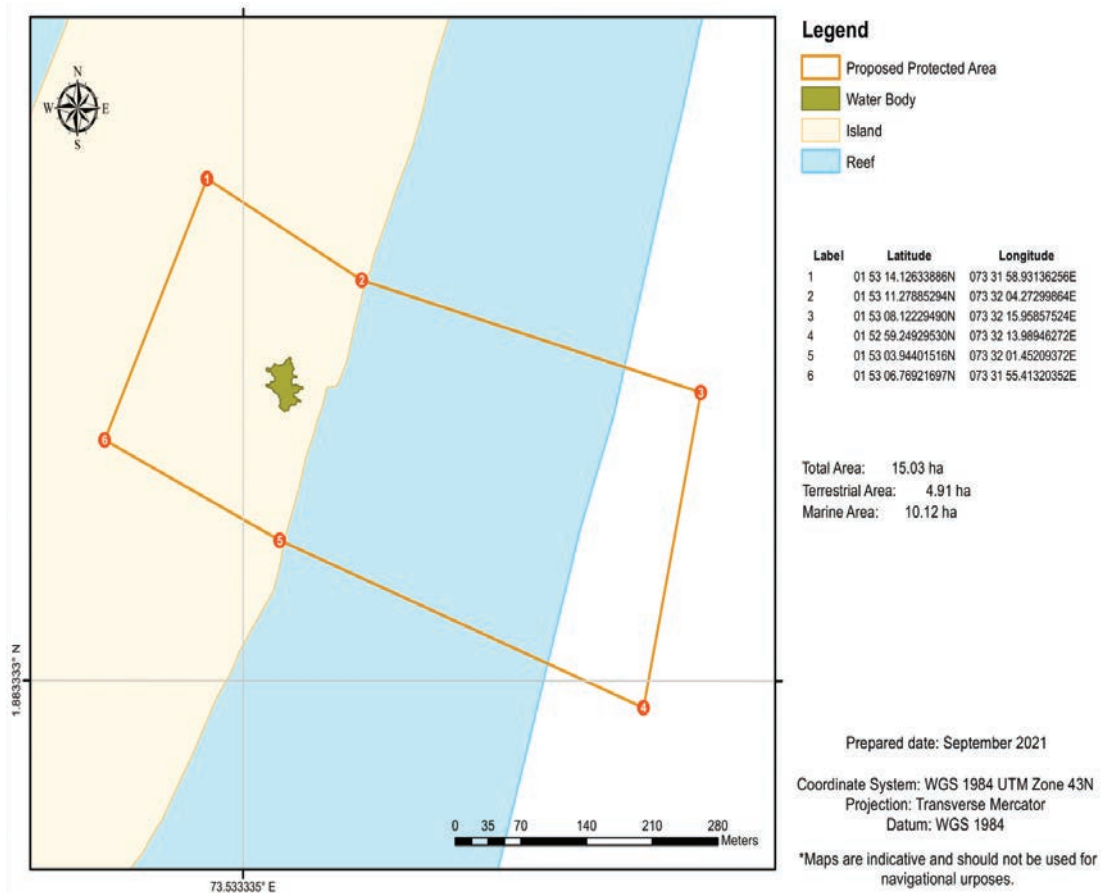


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ZONATION MAPS:

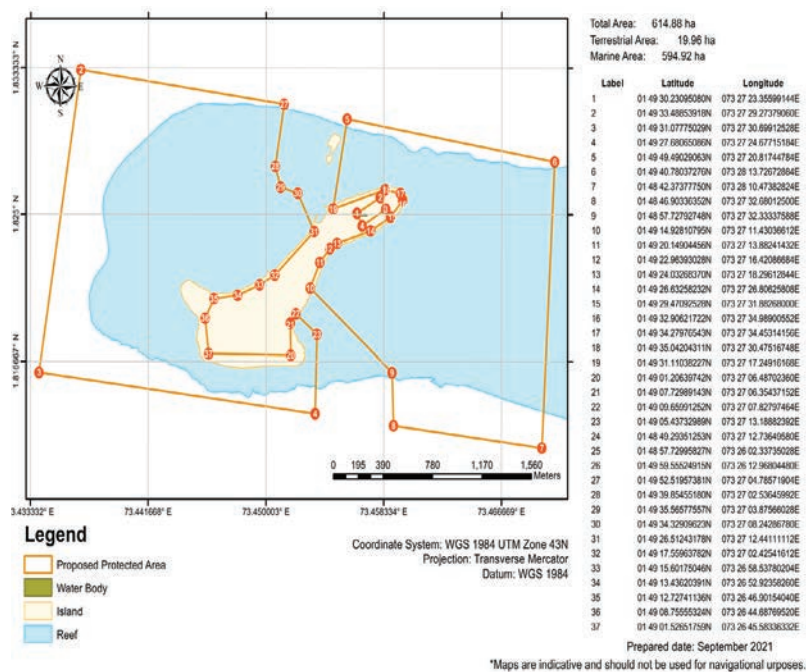
The zonation maps and brief description of the area is given below:

L. Gan Boda Fengan'du:



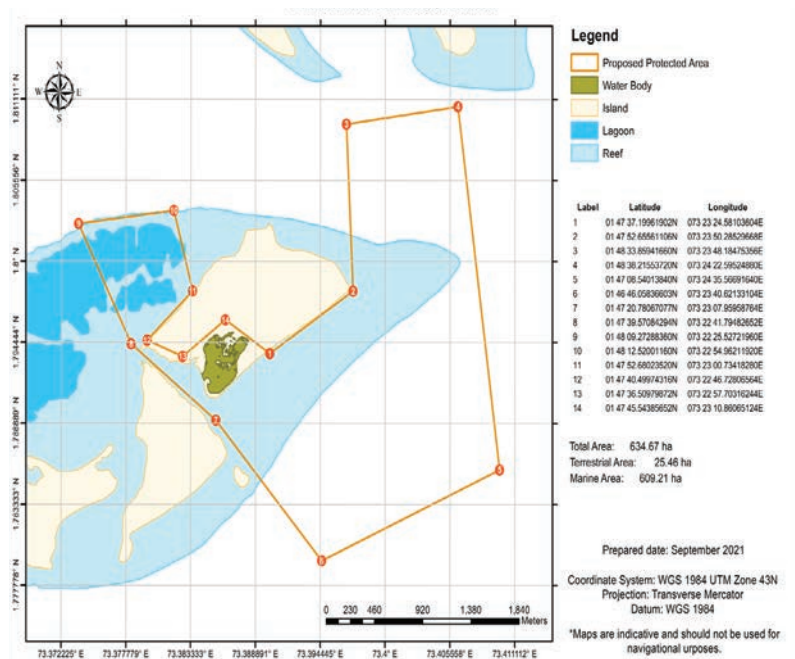
L. Gan Boda Fengan'du includes the water body, surrounding vegetation including the marine area on eastern side. A total area of 15.03 ha is included in PA boundary, with total terrestrial area of 4.91ha and marine area of 10.12ha.

L. Gaadhoo :



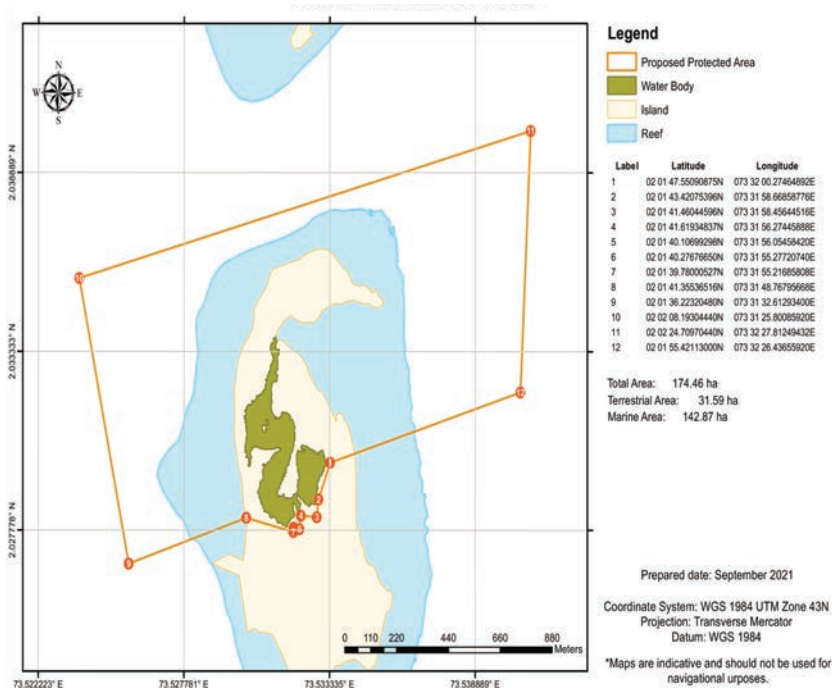
L. Gaadhoo PA boundary includes key habitats of turtle nesting beach, seagrass, mangrove, and part of terrestrial vegetation of the island. A total area of 614.88ha is included in PA boundary, with total terrestrial area of 19.96ha and marine area of 594.92ha.

L. Hithadhoo Kulhi:



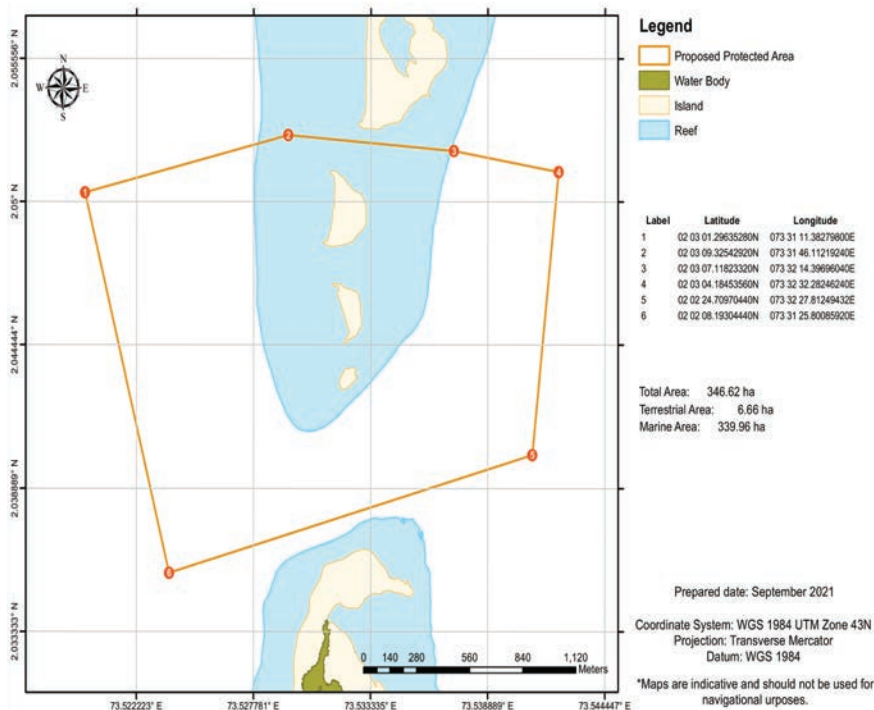
L. Hithadhoo Kulhi boundary includes mangrove, terrestrial vegetation, seagrass beds, surf zone and marine area including Manta Point. A total area of 634.67ha is included in PA boundary, with total terrestrial area of 25.46ha and marine area of 609.21ha.

L. Maabaidhoo Koaru:



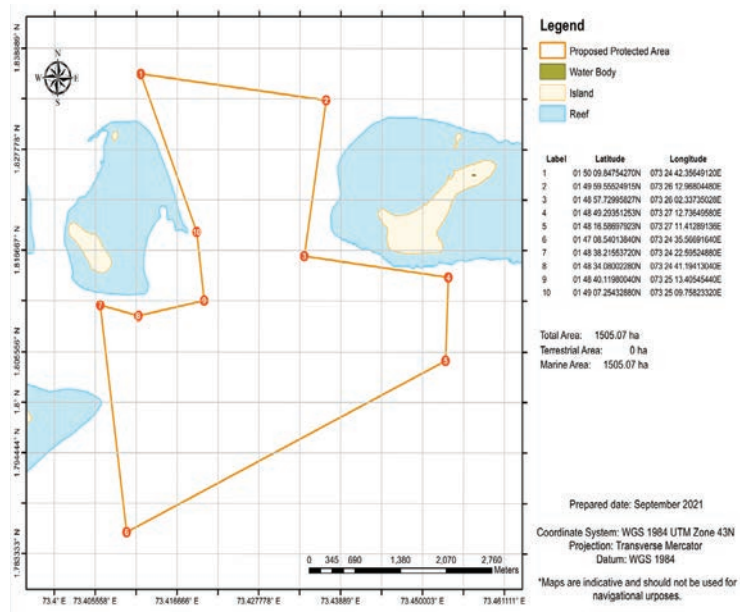
L. Maabaidhoo Koaru boundary includes wetland, terrestrial vegetation, seagrass beds, surf zone and marine area. A total area of 174.46ha is included in PA boundary, with total terrestrial area of 31.59ha and marine area of 142.87ha.

Fushi Kandu:



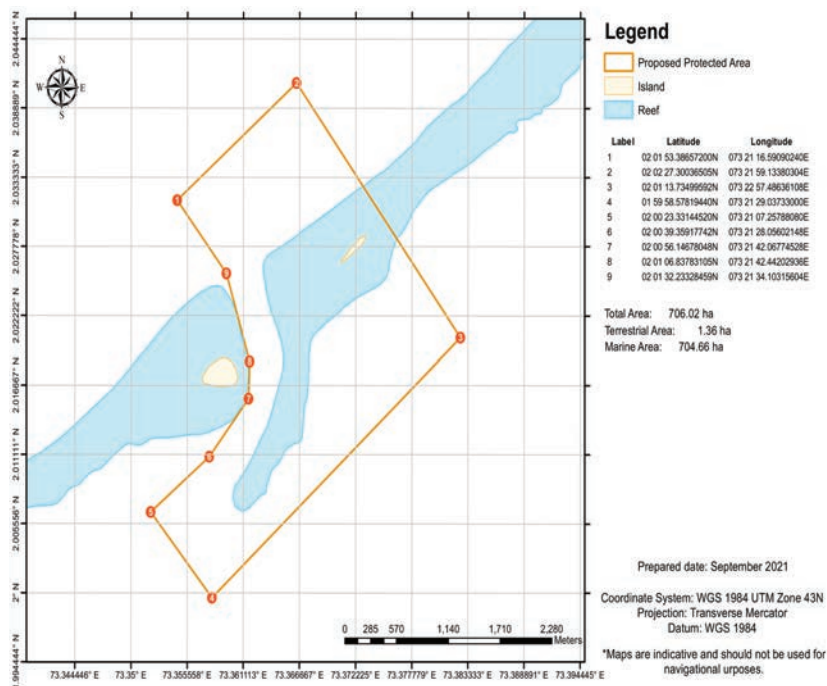
L. Fushi Kandu is a marine area and boundary includes, channel, grouper aggregation site, coral reef and 3 islands. A total area of 346.62ha is included in PA boundary, with total terrestrial area of 6.66ha and marine area of 339.96ha.

Hithadhoo Gaadhoo Kandu:



L. Hithadhoo Gaadhoo Kandu is area is the channel between Hithadhoo and Gaadhoo island. The area is a marine area and boundary includes, channel, manta aggregation site and coral reef. A total area of 1505.07ha is included in PA boundary.

L.Fushi Island with Vadonolhu Kandu Olhi:



L. Fushi Island with Vadonolhu Kandu Olhi area is a channel and adjacent reef. The area is a marine area and boundary includes island. A total area of 706.02ha, with a terrestrial area of 1.36ha.

Annex 1: TOR for Zonation Maps

Date: 31 August 2021

Terms of Reference: Zonation and mapping of proposed protected areas of Laamu Atoll

Background

The government of Maldives has pledged to bring 1 island, 1 reef and 1 mangrove under a protected area regime and has committed to establish better management regimes for these areas which is also reflected in the present Strategic Action Plan 2019-2023 and National Resiliency and Recovery Plan. In an effort to conserve key biodiversity habitats of Laamu Atoll for supporting supporting development for better management and decision making, Ministry of Environment, Climate Change and Technology has initiated a process of designating seven sites of Laamu Atoll as protected areas under the Environmental Protection and Preservation Act 4/93.

This project is funded and supported by the Enhancing National Development through Environmentally Resilient Islands (ENDhERI) project financed by Global Environment Facility (GEF) and assisted by United Nations Environment Program (UNEP) with the objective of enhancing reef protection, resilience and ecosystem recovery by reducing development impacts in a selected project site the Maldives, enabled for replication nationally through public awareness and integrating the values of marine biodiversity and other natural capital in national accounting.

This project aims to assist the government of the Maldives in its implementation of new environmental policies and transition towards national adoption of Green Growth atoll development that will sustain marine Natural Capital (NC) and strengthen the resilience and recovery of reef ecosystems. This will be informed by learning from atoll-wide integrated coastal zone management within a Managed Marine Area / Biosphere Reserve framework, and the application of innovative sustainability practices and standards in agriculture, fisheries, tourism and construction sectors as the basis for transforming the human ecological footprint in Laamu Atoll, and taking this up to national level through sector transformation, spatial planning and improved governance based on NC accounting. The intermediate objective of this transformation is to minimize the flows of pollutants from land-based activities into the adjacent marine environment, and reduce marine-based drivers of reef degradation including baitfish and reef fisheries. Overall, the project seeks to enhance reef ecosystem integrity and resilience through sustainable management, reducing development impacts and integrating NC accounting into national planning.

Members of the survey team

Name	Designation	Organisation
Hussain Sufran	Assistant Director	EPA
Ali Didi	IT Technical	EPA
Ahmed Nadheem	ENDhERI Project Coordinator/Laamu	MoECCT
Ali Nizar	ENDhERI Project Communications Officer	MoECCT

Scope of work

- Develop zonation maps for seven sites identifies in Laamu Atoll. The survey team is responsible for developing draft maps, participate in stakeholder consultations and integrate comments from stakeholders to develop the final zonation map for the seven sites

②. L. Gan Paree Fengan'du

- ☐. L. Gaadhoo (key habitats of turtle nesting beach, seagrass, mangrove, vegetation)
- ☐. L. Hithadhoo Kulhi
- ☐. L. Maabaidhoo Koaru
- ☐. Fushi Kandhu (Marine)
- ☐. Hithadhoo Gaadhoo Kandhu (Marine)
- ☐. L.Fushi Island with Vadonolhu Kandhu Olhi (Sandbank with marine area)
- Under take zonation and ground truth mapping survey including but not limited to drone mapping for four sites as per the Procedures identified in the Annex 1.
 - ☐. L. Gan Paree Fengan’du
 - ☐. L. Gaadhoo (key habitats of turtle nesting beach, seagrass, mangrove, vegetation)
 - ☐. L. Hithadhoo Kulhi
 - ☐. L. Maabaidhoo Koaru
- Collect and collate raw and synthesized data collected through the survey, including representative photography and videography.
- Produce detailed, Geographically reference maps of the survey sites and submitted in original (including but not limited to shape files), pdf and photo format in dhivehi and English (Sample in Annex 2).
- Provide data on the area of habitats covered by the protected areas in relation to the atoll area;
 - ☐. Total Marine Area
 - ☐. Total Terrestrial Area
 - ☐. Coral reef covers
 - ☐. Mangroves and wetland covered
 - ☐. Total area of water body
 - ☐. Vegetation covered

Key Deliverables

The survey teams are expected to deliver the following deliverables

- Geographically reference maps of the seven sites and submitted in original (including including but not limited to shape files), pdf and photo format in dhivehi and English (Sample in Annex 2):
 - ☐. L. Gan Paree Fengan’du
 - ☐. L. Gaadhoo (key habitats of turtle nesting beach, seagrass, mangrove, vegetation)
 - ☐. L. Hithadhoo Kulhi

- ☐. L. Maabaidhoo Koaru
- ☐. Fushi Kandhu (Marine)
- ☐. Hithadhoo Gaadhoo Kandhu (Marine)
- ☐. L.Fushi Island with Vadonolhu Kandhu Olhi (Sandbank with marine area)
- Photos and videos of the four areas surveyed for ground truthing
- Figures of the area of habitats covered by the protected areas in ;
 - ☐. Total Marine Area
 - ☐. Total Terrestrial Area
 - ☐. Coral reef covered
 - ☐. Mangroves and wetland covered
 - ☐. Total area of water body
 - ☐. Vegetation covered

The survey team should ensure that:

- Highest standards of confidentiality are maintained
- The data collected and maps are produced in a raw and processed and editable formats that can be used for future analysis.
- The process of data collection is participatory and transparent while protecting the rights of the individuals with all necessary permits attained.
- All works are completed in a timely manner in close collaboration with the Ministry of Environment, Climate Change and Technology
- The laws and regulations of the Maldives are complied with and safety and health is not compromised of anyone involved in the survey.

Collaboration, Guidance and Supervision:

- The Survey team will be guided by the Ministry of Environment, Climate Change and Technology
- The survey team will follow the guidance of the project coordinator from the Ministry towards delivery of the outputs of the task.

Duration of the assignment:

- The survey team is required to complete all the tasks of the project within 15 (fifteen) calendar dates.

9. Intellectual Property

The Ministry of Environment, Climate Change and Technology will have copyrights of all data, photos, videos and information collected for the purpose of this task. The Ministry of Environment, Climate Change and Technology will have the full rights to all products, drafts and final deliverables of the task. The survey team will not have any right to the use of any component of this task including the raw and synthesized data outside the scope of this task without prior written consent from the Ministry of Environment, Climate Change and Technology.

10. Additional information

Environment Department of the Ministry of Environment, Climate Change and Technology has overall responsibility of the management of the task. The survey team is expected to work closely with the Ministry during the course of the assignment.

The survey team will be working independently using their own space and resources, however, where necessary Ministry will facilitate acquiring necessary permissions.

The Ministry will provide Daily Subsistence Allowance (DSA), and will cover the cost of travel and accommodation for the team for the duration of travel for the purpose of completing this assignment.

ANNEX 1: Procedures for mapping of sites

The draft provided by the Ministry will be used for zonation surveys.

The zonation survey should aim to delineate the boundary of the protected area based on the:

- Draft or finalized land use plans
- Atoll development plans and island development plan of the inhabited islands
- Ongoing and planned developmental projects and EIA submitted to these projects if present.
- A member of the island council in inhabited islands will assist the team to identify the boundary coordinates for ground truthing
- AgroNat will assist the team to identify the boundary coordinates for ground truthing in Laamu Gaadhoo

If appropriate, incorporate heritage sites in the zonation as these are key sites that need protection for future generations.

A coastal vegetation belt of 20 m should be included surrounding the island of Laamu Gaadhoo for protection, in the boundary of protected areas

A vegetation of 15 m surrounding the wetland should be included in the boundary of protected areas.

ANNEX 2: Sample maps

