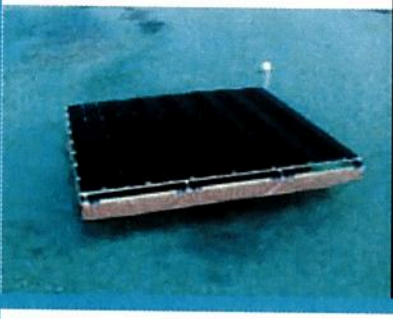
Swimsol GmbH

Environmental Management Plan
for
Clean Electricity for Dharavandhoo – a Floating Solar Project at Dharavandhoo, Baa Atoll



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Signature:

October 2015

Land and Marine Environmental Resource Group Pvt Ltd, Maldives

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Consultants Declaration

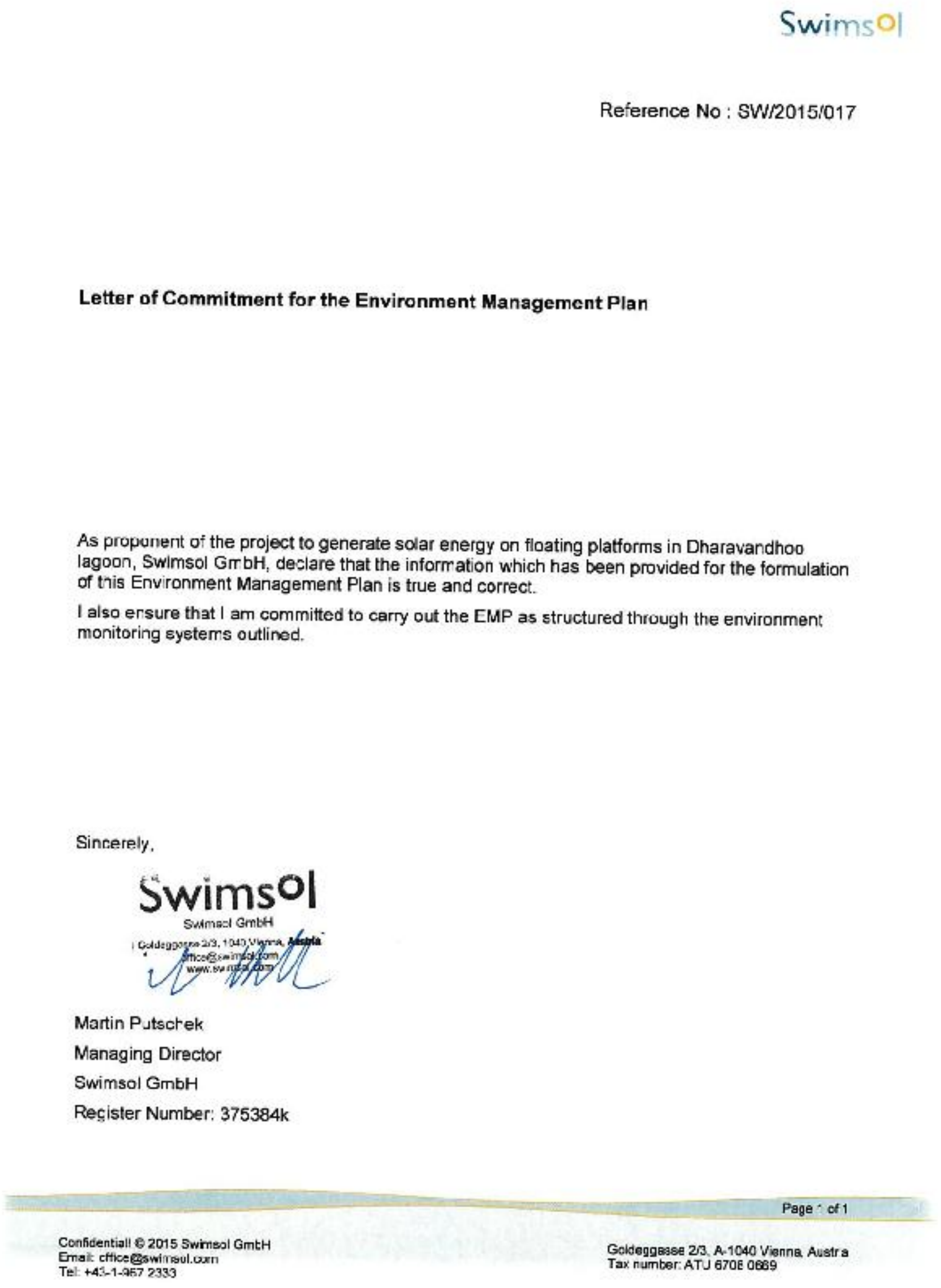
As the environmental consultant for this project, and preparation of EMP, I declare that the information and assessment of environmental components are true and correct.

Hussein Zahir

EIA consultant

EIA registration Number (04/12)

Proponents Declaration



Swimsol

Reference No : SW/2015/017

Letter of Commitment for the Environment Management Plan

As proponent of the project to generate solar energy on floating platforms in Dharavandhoo lagoon, Swimsol GmbH, declare that the information which has been provided for the formulation of this Environment Management Plan is true and correct.

I also ensure that I am committed to carry out the EMP as structured through the environment monitoring systems outlined.

Sincerely,

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1. Introduction

Maldives, like any other country in the world heavily depends on fossil fuels to meet the energy needs of the population. Given the circumstances such as risks of climate change impacts, expected decline of global fossil fuel stock and change of fuel prices, the Maldives aims to reduce the dependency on fossil fuel through exploration of alternative sources of energy such as renewable energy sources and become carbon neutral by the year 2020. Use of renewable energy as a means of becoming energy efficient is a central component of Maldives energy policy to reduce greenhouse gas emissions and energy cost and contribute to energy security and affordable energy.

The Maldives with its geographic location is ideal for solar energy. Due to the high radiation, solar energy is not only emission-free, but also more cost-effective than electricity produced with Diesel generator sets. Therefore, by exploring various options for capturing solar energy, the Maldives could reduce both CO2 emissions and foreign currency expenditure, which is well in line with the energy policy of the Maldives. However solar energy systems on land take up a lot of space. With the limited land area in Maldives suitable locations are scarce.

Hence to support the policy to reduce greenhouse gas emissions and energy cost and contribute to energy security and affordable energy in the Maldives with no pressure on land area, Swimsol aims to develop floating solar energy systems that could be installed on the lagoons.

Swimsol GmbH was established in 2012 by shareholders with 20 years of experience in solar energy systems to develop a marketable product. Their shareholders' combined installation base consists of over 500 conventional roof-top and ground-mounted solar PV systems totaling several dozens of MWs, mostly in Germany. In the Maldives, Swimsol GmbH is represented by Swimsol Maldives Pvt. Ltd.

Over the past five years Swimsol has been actively involved in research and development of a floating energy system for the usage inside atolls in the Maldives. They have pilot run two successful projects in two resorts, Four Seasons in Baa Atoll and Gili Lankanfushi in Male' Atoll. With the experience of two pilot projects, Swimsol, together with the Austrian Development Agency and the support of the Maldivian government aims to install a 96 kWp demonstration floating platform with a size of 30x30 meters on the lagoon of Baa Dharavandhoo. If mooring is taken into account, the underwater space requirement accounts for 65,000 sqft.

Although the project is not expected to cause any negative environmental impact, it was recommended by the Environmental Protection Agency to prepare an Environmental Management Plan (EMP) as stipulated in the Environmental Impact Assessment regulation to ensure environmental safety and sustainability.

In this regard this report identifies specific environmental impacts associated with the project, management options for those impacts and also identification of environmental monitoring with respect to reporting and environmental auditing.

2. Project description

2.1. Project Proponent

The project proponent of the proposed development project at Baa Dharavandhoo Lagoon is Swimsol GmbH, the operator of the facility.

2.2. The Project

The proposed project "Clean Electricity for Dharavandhoo – a Floating Solar Project" aims to provide solar energy to the locals of Dharavandhoo using floating panels installed on the lagoon area of the island (see Figure 3 for location). It involves installing 96 kW_p demonstration floating solar system with a size of 30x30 meters consisting of 4 floating PV platforms, each carrying solar panels with the capacity of 24 kW_p in total. Each of the 4 platforms has the size of 13x13 meters (see Figure 1 below for a similar example).

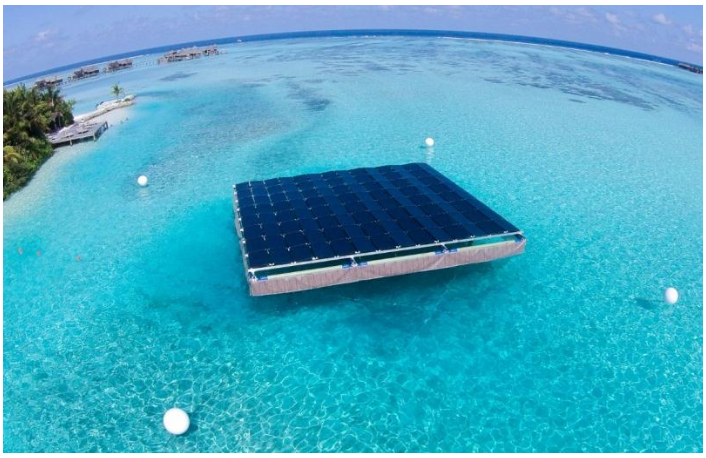


Figure 1 Solar floating platform at Gili Lankanfushi, installed in 2015 (the platform structure at Dharavandhoo would be similar)

The estimated cost of the project is USD 316,000. The construction of the floating PV platforms will be undertaken by experts of Swimsol. The total duration for the installation of the project is 3-4 months and the product is expected to run for 20 years, from October 2015 to October 2035.

It is expected that each Swimsol lagoon platform would save about 10,000 liters of diesel, or the equivalent of 28 tonnes of CO2 annually. The public of B. Dharavandhoo would benefit from this savings as the energy from this system will be fed to the island electricity grid system after the completion of phase 2 in January 2016.

Currently the island is housed with 3 gensets (250 kW, 125 kW, 100 kW) of which 250 kW genset running during the day time. The electricity is provided by Fenaka Corporation. According to them, the capacity of the gensets needs to be increased as the load is expected to increase significantly in the future. The Figure 2 below shows the total load of the island in March 2015 and the possible solar output from the proposed solar energy system. It can be seen that on a sunny day during the peak hours of sun exposure, the platforms can cater 40% of the total at that time period.

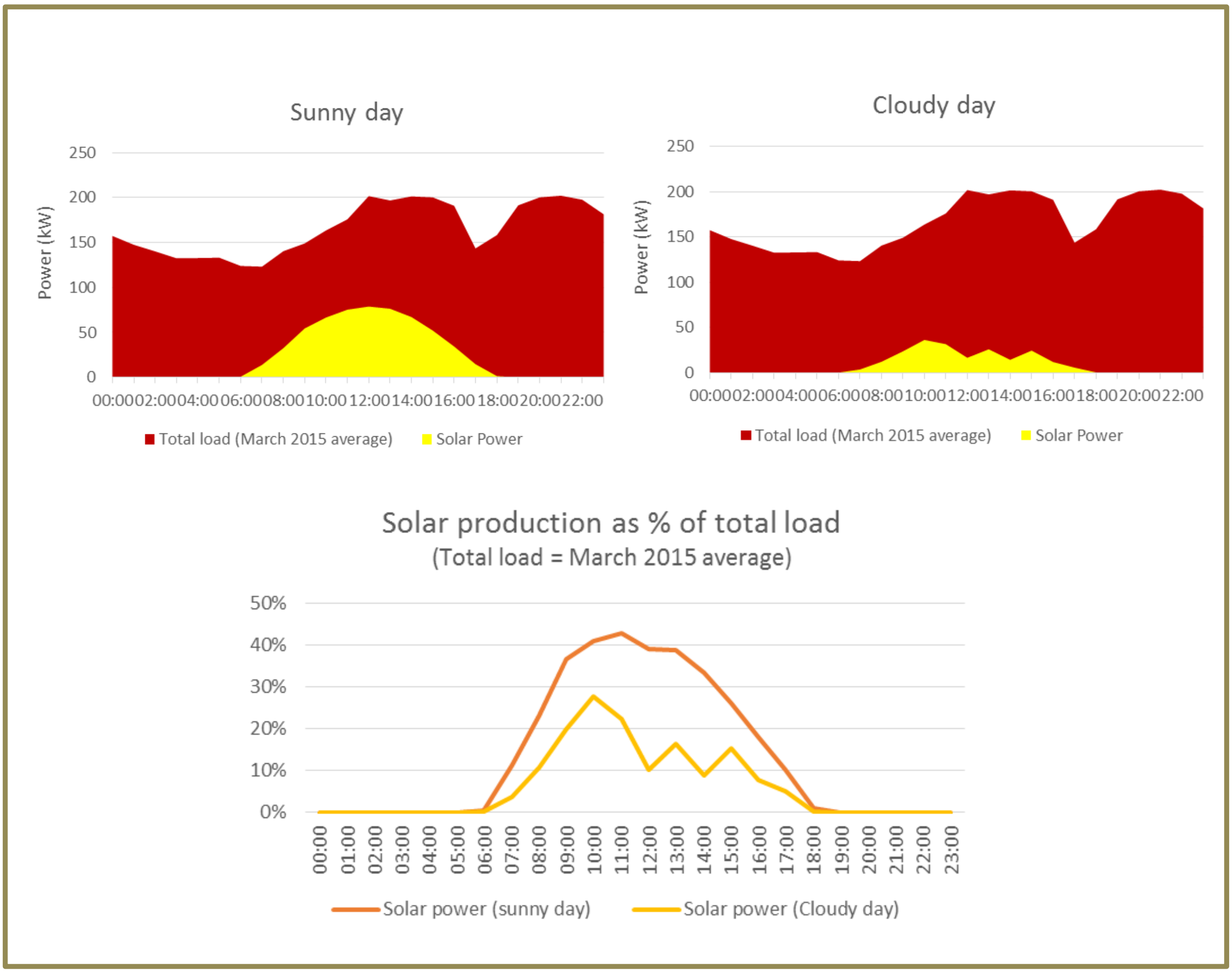


Figure 2 Average solar output within the month of March 2015 compared with the total load of the same month

2.3. Need for the Project

Maldives aiming to reduce its dependency on fossil fuel based electricity usage, opting for renewable energy such as solar energy is one of the best alternatives as high level of solar radiation to convert to solar power based electricity is abundant in the Maldives at its tropical setting. However solar energy systems requires a lot of space which are very few in the country as land based 100 kWp of solar power require an area of approximately 10,000 ft^2. Limited space in islands makes it difficult to choose a suitable location to install such a system. Hence innovative ways to use the available spaces such as the island lagoons need to be explored to maximize the use of solar energy available to Maldives.

2.4. Location and Extent of Site Boundaries

Dharavandhoo is located on the southeastern peripheral reef of Baa Atoll at geographic coordinates of N5° 09' 27" and E73° 07' 56". Neighboring inhabited islands are Maalhos & Dhonfanu. It is approximately 9kms away from Eydhafushi (atoll capital). It also houses a domestic airport which caters flights flying to the Hulhule and northern region of the Maldives (Figure 3).

Figure 3 Location of the island where project will be undertaken; Baa Dharanvandhoo

The proposed installation is to be located at the eastern side of the island (5°09’24N, 73°08’19E) on the burrow area which was used for the reclamation project that was done for the construction of the airport.

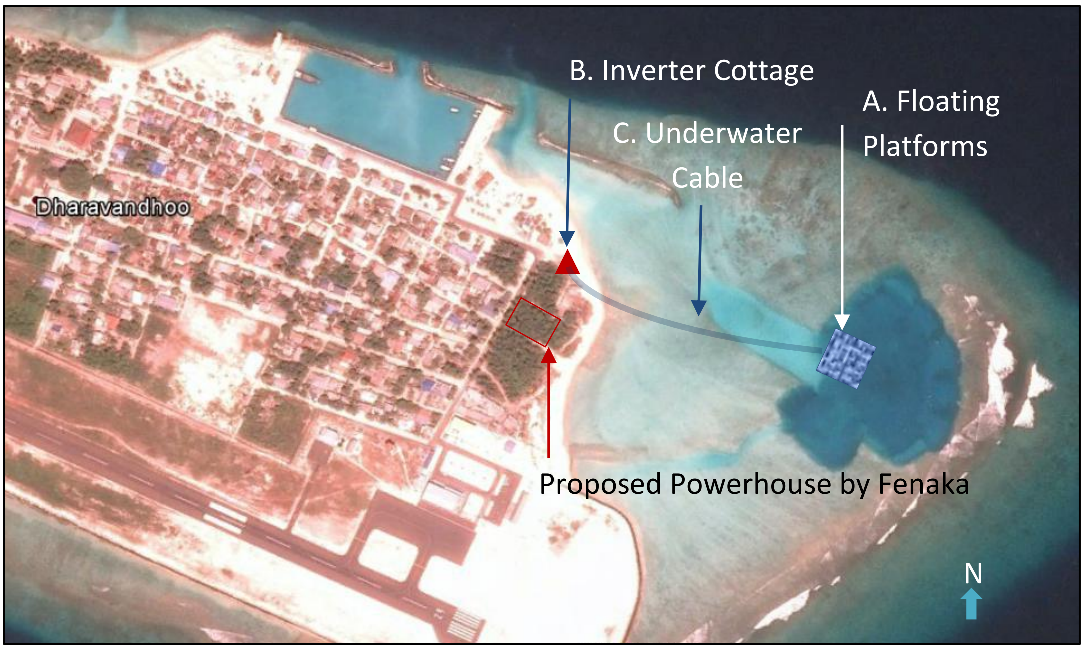


Figure 4 Proposed location of the platform; A: Floating Platform, B: Inverter Cottage, C: Underwater Cable

2.5. Construction Method, Materials & Equipment

The proposed project is composed of:

- Construction and installation of 4 floating PV platforms, each carrying solar panels with the capacity of 24 kWp in total. Each of the 4 sub-platforms has the size of 13x13 meters.
- Installation of the mooring system (see Appendix 2ii), with dedicated underwater screws
- Construction and installation of a small cottage of 3.5x1.5m on the island in the vicinity of new powerhouse. In this cottage the inverters of the solar project are installed

The following measurement devices will be used for the construction and installation of the platform:

- A sensor to measure the inclination of the platform
- An acceleration sensor
- A Raspberry Pi microcomputer with a 3G modem to upload measurement data

The measurement devices are encased in watertight boxes. The Figure 5 shows some of the measurement devices that will be used in this project. Figure 6 shows the test basin in Vienna which was used last year for testing small-scale models of the platform.

Figure 5 Measurement devices

Figure 6 Test basin in Vienna

The construction and installation of the floating solar panels in B. Dharavandhoo is estimated to take place in 2 phases which would take approximately 12 months including the preliminary works and EMP preparation. Schedule for implementation is shown in Table 1 below.

Table 1 Schedule for implementation of floating solar PVs

Project components	Months												Status
	1	2	3	4	5	6	7	8	9	10	11	12	
Preliminary work; stakeholder meetings & workshops	■	■	■										Completed
Technical preparation of the project			■	■	■	■	■	■					Completed
Procurement								■					Completed
EMP Report Preparation									■				Oct 2015
Installation of first phase, two platforms 46kW solar system									■				Oct 2015
Mooring and underwater constructions for the first two platforms										■			Nov 2015
Installation of second phase, two platforms and 46kW											■	■	Nov-Dec 2015
Grid connection of whole 96KW PV project												■	January 2016
Monitoring									■	■	■	■	During Construction, after construction for 1 year

2.6. Major Inputs and Outputs

2.6.1. Inputs

2.6.1.1. Mobilization and material unloading

All the necessary material and machinery is expected to be brought during the 8th month of the project, together with the installation team. Materials brought to site will be unloaded at the existing harbour facility on the island and transferred to the project site.

2.6.1.2. Workforce

Total workforce for the project is 10 workers which include 3 Technical and 7 installation assistants. Accommodation of the workforce will be at rented rooms at Dharavandhoo.

2.6.1.3. Floating construction and installation Methods

The floating construction is not a permanent structure and could generally be removed or transferred during the project lifetime. The construction includes very low impact, soft engineering as no heavy-machinery is needed to install the platforms.

The project will seek to produce solar energy through the floating platform for 20-30 years. During the runtime of the project no further construction or maintenance works are expected.

The project activities on the ecosystem are limited to low impact sand mooring through dedicated sand mooring screws from e.g. the company Sea Tech & Fun as shown in Figure 7 and Figure 8 (see Appendix 2 ii for the mooring plan).

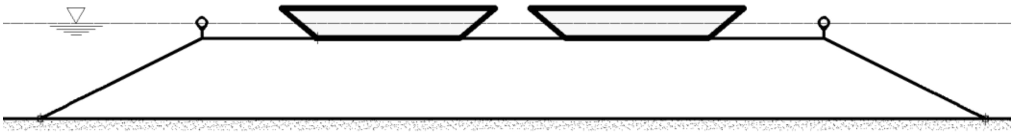


Figure 7 The mooring principle

Figure 8 Mooring Screws

Besides the mooring, a narrow and shallow trench will be dug at the lagoon surface manually using a water pump for the underwater cable connecting the panels to the island. At land, the cable will run through the existing PVC pipes installed under the road network. The cable from the cottage will be first connected to the existing distribution board. However, the connection will be changed to the new powerhouse once the place is complete and if necessary.

2.6.2. Outputs

2.6.2.1. The floating PV platforms

A total of 4 floating PV platforms, each carrying solar panels with the capacity of 24 kWp in total will be built and moored through dedicated sand mooring screws (see Appendix 2 ii).

The dimensions of the platform are approx. 13 x 13 meters and the height above the waterline is roughly 1.5 meters. The platform consists of Polystyrene floating bodies hulled with PE foil and aluminium beams and panel mounting systems as well as double-glass solar panels as shown in Figure 9. Devices to measure solar radiation and the movement of the platform are located on the platform in sealed boxes. The platform is moored to the seabed with ropes and screw anchors to withstand the maximum wind speeds and wave heights on site. Major components and important specifics of the platform are;

- Mass of the platform: approx. 4,800 kg
- Connections between individual beams are made with stainless steel screws, threaded rods and the corresponding nuts
- The mooring rope was purchased from the Austrian company Teufelberger. Type FSE Rio, diameter 16 mm, BRL: 45 kN, material polyester.
- The rope is connected to the mooring with 12 mm stainless steel shackles with a BRL of 65 kN.
- 4 pretension buoys (Majoni Fender) are used to keep the mooring ropes tight.
- 112 heavy duty solar panels featuring glass-glass technology made by European manufacturer Solitek are used. They were made seawater-resistant with a waterproof butyl edge sealant.
- The mounting system for solar panels is made from aluminium profiles and panel clamps as well as screws made from stainless steel.

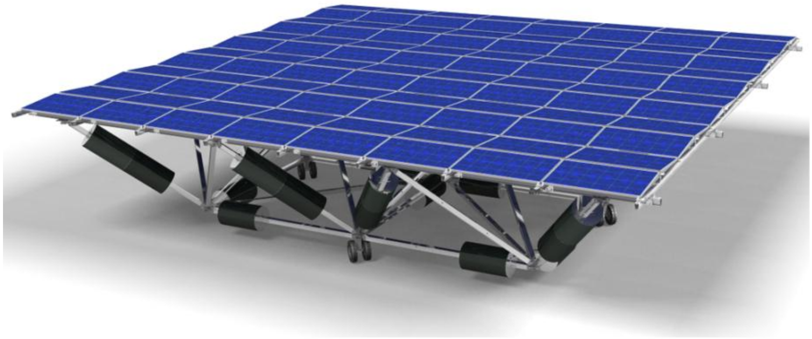


Figure 9 A schematic diagram of the floating PV platform

2.6.2.2. Inverter Cottage

A small cottage of 3.5x1.5m will be built on the island with 15cm bricks. In this cottage the inverters of the solar project are installed. The cottage will be built very close to the new location of the powerhouse.

2.6.2.3. Energy

The annual solar production of the 96 kWp solar system is expected to be approximately 155,000 kWh. The figure below shows solar energy production as percentage of the total load of the island. The total load of March 2015 was used to do the analysis.

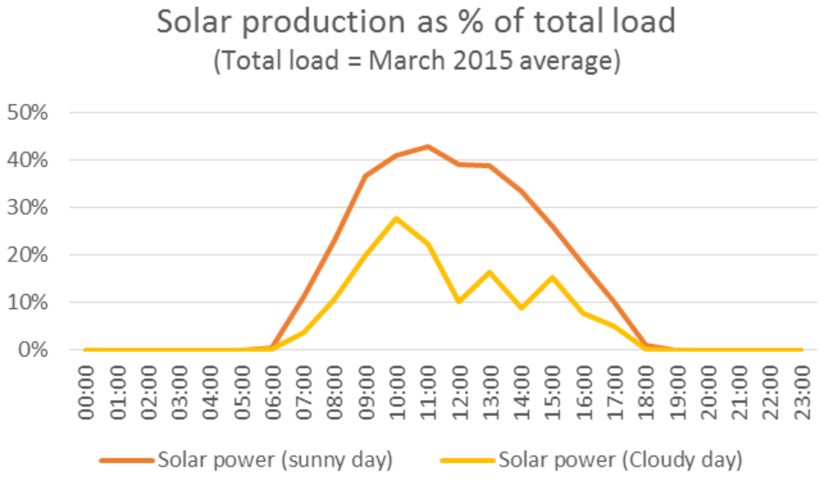


Figure 10 Solar Production as % of total load

2.7. Risks associated with the project

No major or significant risks are foreseen to be associated with this project (both during the construction and operation phase) as the project design and set up is seen to have minimal or negligible impact on the environment.

3. Methodology

Data collection and compilation of this report are based on:

- Consultation and discussion with the proponent with regard to design and work methodology that would be used to implement the proposed activities of the project,
- Examination of the existing environment to identify significant environmental components that are likely to be affected,
- Consultation with major stakeholders to exchange information on the project and to follow the EIA procedures required for the report, and
- Evaluation of available and relevant literature on environmental impacts associated with similar projects

4. Environmental condition at project sites

4.1. Location

The floating platform is to be located at the eastern side of the island on the existing burrow area which was used for the reclamation project that was done for the construction of the airport (Refer Site Plan, Appendix 2i). This area is a modified environment as it was dredged for the airport development project. It is also a sandy lagoon with a thick sediment sheet without hard bottom substrate. Hence no live corals were found at or near vicinity of the proposed area for installing the platform

4.2. Inverter Cottage

The inverter cottage will also be located at the eastern side of the island, at the beach area (Refer Site Plan, Appendix 2i). There was no significant vegetation at the location area except the shoreline vegetation. The cottage will be located at a cleared area hence there will be no removal of any vegetation.

5. Environmental Impacts

5.1. Impact Identification

Impacts on the environment from various activities of the floating solar project works (constructional impacts) and operation of the system (operational impacts) have been identified through interviews with the project management team, engineers and based on past experience in similar development projects.

Possible impacts arising from construction and operational stage are categorized in to reversible and permanent (irreversible) impacts. The impacts identified are also described according to their location, extent (magnitude) and characteristics. Reversible and irreversible impacts are further categorized in to intensity of impacts (negligible, minor, moderate and major) for identifying best possible remedial (mitigation measures) action to be taken. Below (Table 2) are the impact categories:

Table 2 Categorized scale of impact prediction

Impact category	**Description**	**Reversible/ irreversible**	**Cumulative impacts**
Negligible	The impact has no significant risk to environment either short term or long term	Reversible	No
Minor	The impact is short term and cause very limited risk to the environment	Reversible	No
Moderate	Impacts give rise to some concern, may cause long term environmental problems but are likely short term and acceptable	Reversible	May or may not
Major	Impact is long term, large scale environmental risk	Reversible and Irreversible	Yes, mitigation measures have to be addressed

The project area is limited to a construction of approximately 10,000 sqft platform at the lagoon; the required underwater space, inclusive mooring accounts for approximately 65,000 sqft; some cable laying works and construction of a small cottage inland for storage of inverters. An impact matrix summarizing environmental components that will be impacted are provided in

Table 3.

Table 3 Impact matrix for the floating solar project

Environment category	Impact categories	Extent of impact
Physical Environment	Water flow and circulation	No impact
	Seawater quality	No impact
	Sedimentation	Minor short termed impact
	Changes shoreline	No impact
Biological environment	Coral community	Minor impact during construction stage due to possible sedimentation plume
	Fish Community	No impact
	Protected areas	No impact (no protected area in the project boundary)
	Protected species	No impact (no protected species at site as habitat)
	Vegetation	No impact (no vegetation)
Socio economic environment	Health and Safety	Minor risk to workers and divers during construction stage and repair works during operational stage
	Waste disposal	No impact
	Fishery	No impact

5.2. Construction Impacts

5.2.1. Construction of platform and mooring works

The platforms will be installed on sandy soils, to ensure no coral is impacted from the shade of the platforms as it would block the sunlight which is essential for the corals to survive. The floating structures are similar to that of the seaplane landing platforms. Mooring of the platform will be through special sand mooring screws.

Therefore no impact is envisaged during this phase as the platform will be located at the existing area and will be anchored into the sand substrate.

5.2.2. Cabling and trench work

The floating platforms of solar panels will be connected to the island through an underwater cable. Cable deployment works includes both off shore and inland (shallow water) routes. Offshore cable deployment involves a narrow and shallow (approx.1 ft.) trench in the lagoon floor that will be dug manually. The surrounding reef area could be affected by potential sediment plume generated during the digging process. Also the water quality of the lagoon maybe affected due to this sediment plume. This is expected to be short term (during the work periods) and once the cable is buried and sediment (sand) displaced is covered over the cable the impact shall be rectified.

Furthermore, electromagnetic radiations caused by the underwater cable might affect large sharks which locate their prey on weak electromagnetic fields. However, they do not occur at the proposed locations.

Hence, given the insignificant magnitude and short time associated with this work, the impacts on the lagoon environment and the reef area nearby are envisaged to be minor to negligible.

5.2.3. Construction of Inverter Cottage

The cottage for the inverters will be built on already cleared land and no vegetation would be removed during this phase. Hence no impact is envisaged.

5.2.4. Waste Disposal

Also, no significant waste would be produced during the installations and all the materials used for the installation of system can be recycled. Any waste produced will be disposed through the protocols that are already being followed by the island.

5.3. Operational Impacts

Given the nature of the project, no negative impact is envisaged during the operational phase of the project as no leakage of any kind and/or significant change in the hydrodynamics is expected due to the platforms.

In contrary, the platforms may cause some positive impacts to the environment such as congregation of There under the platforms due to the 30x30 meters shadow area.

5.4. Socio-economic Impacts

It is expected that each Swimsol lagoon platform saves about 10,000 liters of diesel, or the equivalent of 28 tonnes of CO_2 annually.

This demonstration project is expected to be a good example of innovative ways of utilising renewable energy which is amply available in the Maldives. Hence it is anticipated that projects like this would increase the awareness of the public, especially the people of the island of Dharanvandhoo on environmental issues, importance of renewable energy and innovative ways to utilise the solar energy at island level.

As for the health and safety of the workers, minor risk to workers and divers during construction stage and repair works during operational stage is expected.

6. Relationship between EMP and project

The following management plan is based on the requirement of Environmental Protection Agency of Maldives as defined by the Environmental Impact Assessment regulation of Maldives (EIA regulation, 2012). According to the regulation an EMP is required for the projects that are not required to prepare an EIA report (not included in the schedule D, as EIA mandatory projects)

This management plan therefore describes and outlines the activities that would be carried out during construction and operation phase of the project activities that are likely to cause significant environmental impacts. The main objectives of the environmental management plan are to:

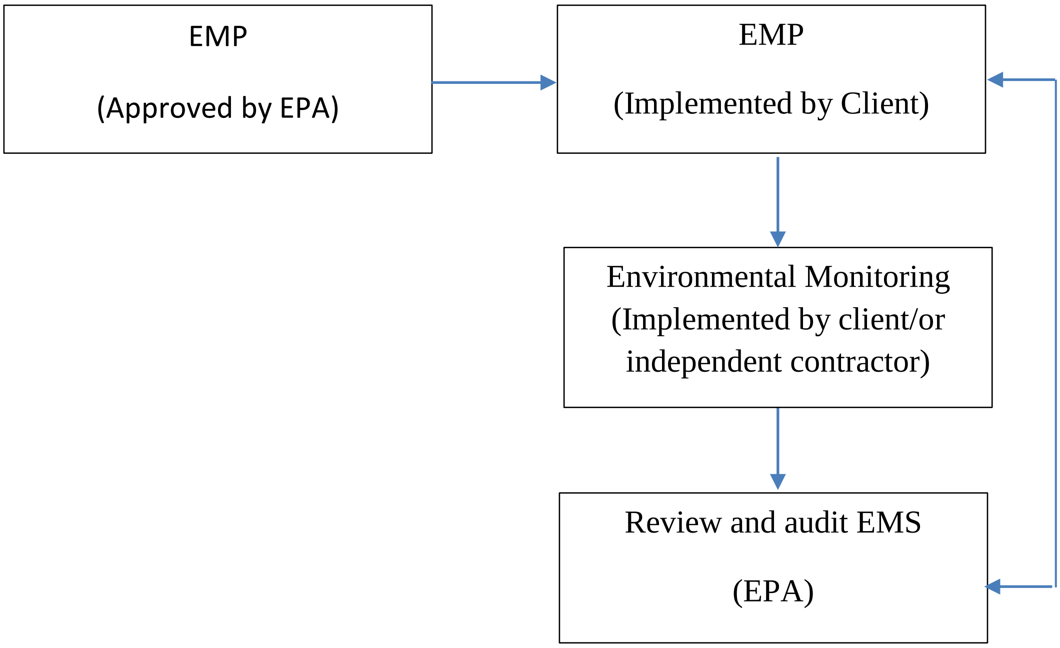
1. Develop a framework for likely impacts due to the proposed project to ensure that the performance through implementation of the project are managed by adhering to mitigation measures and performance measures and systems for monitoring, reporting and implementing corrective actions through outlined reporting mechanisms.
2. Provide evidence of compliance to legislation, policies, and guidelines through an Environmental Monitoring System to Maldives EPA.

7. Environmental Management Plan

Environmental management plan is based on the outline given in the EIA regulation of 2012 published by EPA.

Key components of the EMP include:

- Key performance indicator: measureable indicators for all the impact areas identified
- Project implementation and EMP: association between EMP and the proposed project
- Performance indicator monitoring: proposed methodology, frequency of performance indicators
- Auditing, reviews and compliance: proposed audit and review mechanism of monitoring of required performance indicators



The flow diagram below shows in brief the implementation process of the EMP.

7.1. Environmental Management system

The information from foregoing sections is assimilated here in a management context to identify procedures for controlling the occurrence and magnitude of potential adverse environmental impacts during the different phases of the development. It is important to note here that, for this particular project the potential environmental impacts is minor to negligible at both phases (construction and operation). Hence given the insignificant magnitude and short time associated with this work, the mitigation measures and monitoring variables proposed are limited to that scope.

7.2. Management responsibilities

Swimsol will be responsible for financing and carrying out the mitigation and monitoring measures. Swimsol shall delegate personnel to oversee the mitigation and monitoring stated in the Table 4 either by outsourcing to an environmental consultant or appointed environmental officer for the project. Main responsibility of the environmental officer/consultant will be to record and oversee that mitigation measures are implemented and verify the monitoring indicators. The environmental officer/consultant will also keep records of the mitigation measures, consultation meeting minutes, copies of permits and other parameters stated in the EMP.

In accordance to monitoring guideline of EPA, monitoring report shall be prepared and submitted to EPA after completion of the project. Monitoring for the operational stage of the project will be carried out yearly. As mentioned above, EMP monitoring will be done during the course of construction stage, the findings and monitoring data will be included in the first monitoring report (monitoring done after completion of construction works).

The environmental officer/consultant will be responsible for reporting environmental and social issues to project management team and inform management where corrective actions are needed (for unforeseen impacts and issues). Monitoring reports should be submitted to EPA.

Based on findings of the monitoring report, a Corrective Action Plan shall be formulated where necessary (unforeseen impacts, effectiveness of the mitigation measures) by EIA consultant contracted by Swimsol. EPA may also recommend additional corrective actions based on the findings of the report and recommendation of consultants.

7.3. Project monitoring and mitigation measures

The Table 4 provides project construction and operational stage mitigation measures as part of EMP. The effectiveness of the mitigation measures will be evaluated in the monitoring report prepared after completion of the construction works. Record keeping and logging of events will be the responsibility of Swimsol Environmental Coordinator or assigned Environmental Consultant.

As the project requires few mitigation measures during the construction phase and not much monitoring except the monitoring for the positive impacts (bird nesting and fish aggregation) both mitigation measures and monitoring variables are listed out in one table.

The following EMP also provides the time frame and the estimated costing where applicable.

Table 4 Environment Management Plan & Monitoring for construction and operational phase

ENVIRONMENT MANAGEMENT PLAN AND MONITORING FOR CONSTRUCTION PHASE								
Impacted area	**Impact agent/ action**	**Proposed Mitigation Measures**	**Monitoring indicator**	**Means of verification**	**Time Frame**	**Responsibility for monitoring**	**Cost Estimate (Rf)**	**Training needs**
Habitats, flora and fauna								
Coastal habitat – coral communities	Smothering of coral communities by dispersed sediments	1. Confine disturbance to as narrow a path as possible as per cable laying specification (lagoon area)	Cable laying specification followed, construction footprint not excessive	Diarized observation, photo cataloguing cable length during and after installation of articulate pipes	During Construction	Swimsol Environmental Coordinator or assigned Environmental Consultant	-	None
		2. Undertake trenching only within 2hrs of low tide (during cable burial at shoreline area).	Cable laying specification followed	Diarized observation, photo cataloguing burial area during and after construction	During Construction	Swimsol Environmental Coordinator or assigned Environmental Consultant	-	None
Coastal Habitat-coastal vegetation	Unplanned vegetation Clearance during construction of cottage due to a possible change of location or any other reason	1.Minimize vegetation clearance works at the cottage location	Construction carried out at the already cleared area	Visual inspection, photo catalogue during clearance and after construction	During Construction	Swimsol Environmental Coordinator or assigned Environmental Consultant	-	None
		2. Re-vegetate and rehabilitate the area if any area need to be cleared for construction	Only the construction area cleared	Visual inspection, photo catalogue during clearance and after construction	During Construction	Swimsol Environmental Coordinator or assigned Environmental Consultant	10,000	None
People and communities								
Waste Management	Aesthetics	Collect Inverter Cottage waste for disposal in landfill	Sites cleared of waste	Diarized observation	During Construction	Swimsol Environmental Coordinator or assigned Environmental Consultant	-	None
	Accumulation of inorganic waste in the environment	Thoroughly clear all sites (terrestrial and marine) of discarded cordage, plastic and other waste after construction works is completed for each day and final cleanup after completion of each site	Sites cleared of waste	Diarized observation	During Construction	Swimsol Environmental Coordinator or assigned Environmental Consultant	-	None

	Contamination or enrichment of the environment by organic waste and domestic effluent	Use of existing accommodation facilities at each project site, avoid setting up temporary accommodation and toilet facility (Since small work force is required need for temporary accommodation is eliminated)	Use of existing residential houses (rent basis)	Diarized observation	During Construction	Swimsol Environmental Coordinator or assigned Environmental Consultant	-	None
Conflicting infrastructure	Damage to buried services during trenching/laying.	1. Inform and obtain permit from island councils prior to trenching works	Request for permits and consultation carried out	Records of permits	Before Construction	Swimsol Environmental Coordinator	-	None
		2. inform and consult with local utility service providers prior to trenching works	Request for permits and consultation carried out	Records of permits	Before Construction	Swimsol Environmental Coordinator	-	None
ENVIRONMENT AND SOCIAL MANAGEMENT PLAN AND MONITORING FOR OPERATIONAL PHASE								
Impacted area	**Impact agent / action**	**Proposed Mitigation Measures**	**Monitoring indicator**	**Means of verification**		**Responsibility for monitoring**		**Training needs**
People and communities								
Waste Management	Accumulation of waste in the environment	Avoid disposal of hazardous waste at local disposal site, transport and dispose at Thilafushi or regional waste management centre (used batteries, chemical, waste oil...etc)	Waste management standards followed	Maintenance records	During Operation phase	Swimsol Management	-	None
Conflicting infrastructure	Displacement/impairment of future activities by other agencies	Remain open to discussion that would lead to accommodation of future development	Swimsol remain open to discussion with other infrastructure providers	Swimsol records	During Operation phase	Swimsol Management	-	None
Habitats, flora and fauna								
Bird Habitat	The platform could act as a possible bird nesting place	Considered as a positive impact, hence no mitigation measures	Take note of any bird visits to the lagoon before the project & after the project	Visual inspection, photo catalogue before and after construction	During Operation phase Bi annually	Swimsol Environmental Coordinator	-	None
Fish Habitat	Aggregation of fish under the platforms because of the shadow	Considered as a positive impact, hence no mitigation measures	Take note of any presence of fish in the lagoon before project & after the project	Visual inspection, photo catalogue before and after construction	During Operation phase Annually	Swimsol Environmental Coordinator	-	None

8. Reporting and Review

Monitoring reports need to be submitted to the Environmental Protection Agency as identified in the monitoring schedule

As per the EIA Regulations 2012, monitoring reports should include the following components:

- Project name
- Date
- Name of Consultant
- Environmental Aspects which were monitored (see monitoring schedule)
- Method used for monitoring
- Frequency of monitoring
- Summary results
- Corrective measures that may be taken where significant issues are identified

Monitoring Reports should be submitted as follows

- A monitoring report every 2 months during the construction; as the duration is expected to be 4 months, 1 report during construction and 1 report immediately after construction should be produced
- A monitoring report after 1 year of operation

8.1. Report Structure

The structure of the report shall be as follows

1. **Introduction:**
    - Audit Scope, Objectives and Criteria: discussion of the scope of the project (all environmental components and full development project), objectives of the audit and the criteria upon which the audit was based (EIA report/ decision note/ EIA regulations).
    - This section will also discuss documentation and records relating to the audit, training provided to meet monitoring needs.
    - Auditors and Auditees: this section will identify the personnel of the proponent, facility or consultant that performed the audit, as well as key contacts at the facility with a description of their responsibilities with respect to the audit.

2. **Project and site description:**
    - This section will discuss the facility and site, inclusive of descriptions of the various components, which have the potential to impact the environments, and environmental aspects that are being impacted due to the operation of the facility. Discussion of mitigation measures implemented to minimize the environmental impacts. Any changes to the operations or site since the last audit should be highlighted. Evaluation of the appropriateness of environmental aspects and their rating.
3. **Monitoring activities and results:**
    - Summary of monitoring programs being conducted at facility, internal audits and inspections, methodology used for the different monitoring activities and results obtained. Discussion of those, which fall out of optimal ranges. This section will also discuss challenges faced during monitoring inclusive of complaints and audit activities carried out
4. **Conclusions and Recommendations:**
    - Conclusions of the audit, with respect to status of conformity of the site/facility EMP with the requirements as well as the effectiveness of the EMP in meeting environmental objectives. Assessing and determining areas needing improvement in the organizational structure, staff expertise, practices, administrative and operational procedures, training, work instructions, process improvements, corrective actions and preventative measures for systems non-conformance.

9. Conclusion

The proposed project at Baa Dharavandhoo is expected to have minor to negligible impacts on some environmental components, both during the construction and operational phases of the project. This conclusion is based on the evaluation of various components of the proposed project, implementation methods discussed, findings of the existing environment and environmental components that are likely to be affected. The significant environmental component associated with the project is the marine environment.

Minor impact on terrestrial environment, during the construction phase of the project is expected to be on the adjacent reef area near the lagoon, due to possible sedimentation plume. However, this is expected to be short term (during the work periods) and once the cable is buried and sediment (sand) displaced is covered over the cable the impact shall be rectified. Mitigation measures as proposed in the EMP will be implemented to avoid or minimise the predicted impacts as much as possible.

Acknowledgements

The consultant acknowledges the contribution provided by the team members in this report for the valuable contribution to the report and at the field. The consultant also acknowledges the assistance provided by Swimsol in providing project description related information and data.

CVs of team members are given in Appendix 3.

Appendix 1 Letter from EPA

بسم الله الرحمن الرحيم

ދިވެހިން ދިވެހިކަމުގައި - މިނިވަންކަމުގައި އަބަދަށް
"Dhivehin" - Always Maldivian, Forever Independent

އެންވަޔަރަމަންޓަލް ޕްރޮޓެކްޝަން އެޖެންސީ
Environmental Protection Agency
EPA

ނަންބަރު: 203-EIARES/PRIV/2015/524

ޕޫލިރިކް ސޮލިއުޝަންސް،

ވެދުން ސަލާމަށްފަހު ދަންނަވަމެވެ.

- ދަރަވަންދޫގެ ޑްރެޖިންގ ސޯވަރ ޕްރޮޖެކްޓްގެ މަސައްކަތްކުރުމާއި ގުޅޭގޮތުން ހުށަހަޅުއްވާފައިވާ ސްކްރީނިންގ ފޯމުގެ ޑިސިޝަން ސްޓޭޓްމަންޓް މި ސިޓީއާއިއެކު ފޮނުވީމެވެ.

އިޙްތިރާމް ގަބޫލު ކުރައްވުން އެދެމެވެ.

20 ޛުލްޙިއްޖާ 1436
04 އޮކްޓޫބަރ 2015

[illegible]
[illegible]
ޑިރެކްޓަރ، އެންވަޔަރަމަންޓަލް އެސެސްމަންޓް

ޖ.އެލް.ބ.އެރް،
މާލެ، ދިވެހިރާއްޖެ

بسم الله الرحمن الرحيم

Environmental Protection Agency
އެންވަޔަރަންމަންޓަލް ޕްރޮޓެކްޝަން އެޖެންސީ

ނަންބަރު: 203-EIARES/PRIV/2015/524

ސްކްރީނިން ކޮމިޓީގެ ނިންމުން

މިއީ ބ. ދަރަވަންދޫގެ ފޯލިހަން ސޯލަރ ޕްރޮޖެކްޓުގައި ގޮތުން ސްކްރީނިން ކޮމިޓީގެ ނިންމުން އެންވަޔަރަމަންޓަލް ސްކްރީނިންގ ޓީ.އޯ.އާރ. އާއި ގުޅިގެން ދަންނަވަމެވެ.

☐ މި މަޝްރޫޢުގެ ސަބަބުން ތިމާވެއްޓަށް ނުރައްކާ ބޮޑު އަސަރުތައް ކުރާނެ ކަމަށް ފެނެއެވެ. ވީމާ، ތިމާވެއްޓަށް އަސަރު ކުރާނެ މިންވަރު ބަލައިލުމަށް އީއައިއޭ ހުށަހަޅަންވާނެއެވެ.

☐ މި މަޝްރޫޢުގެ މަސައްކަތްތަކަށް ތިމާވެށީގެ ފުރިހަމަ ދިރާސާއެއް ހުށަހަޅަންވާނެއެވެ.

☑ މި މަޝްރޫޢުގެ މަސައްކަތްތަކަށް ތިމާވެށީގެ މެނޭޖްމަންޓް ޕްލޭނެއް ހުށަހަޅަންވާނެއެވެ.

☐ މި މަޝްރޫޢުގެ ސަބަބުން ތިމާވެއްޓަށް ނުރައްކާ ބޮޑު އަސަރުތައް ކުރާނެ ކަމަށް ނުފެނެއެވެ. ވީމާ، މަޝްރޫޢުގެ މަސައްކަތް ކުރިއަށް ގެންދިއުން އެދޭ ހުއްދަ ދެވިދާނެކަމުގައި ދަންނަވަމެވެ.

☐ މި މަޝްރޫޢުގެ ސަބަބުން ތިމާވެއްޓަށް ކުރާނެ އަސަރުތައް ކޮންޓްރޯލްކޮށް މިނިމައިޒްކޮށް އަދި ފިޔަވަޅުތައް އަޅައިގެން މަސައްކަތް ކުރިއަށްގެންދެވޭނެ ދަންނަވަމެވެ.

ސްކްރީނިން ކުރި އިދާރާ: އެންވަޔަރަންމަންޓަލް ޕްރޮޓެކްޝަން އެޖެންސީ

ނަން: ޢަޒީމް އަޙްމަދު

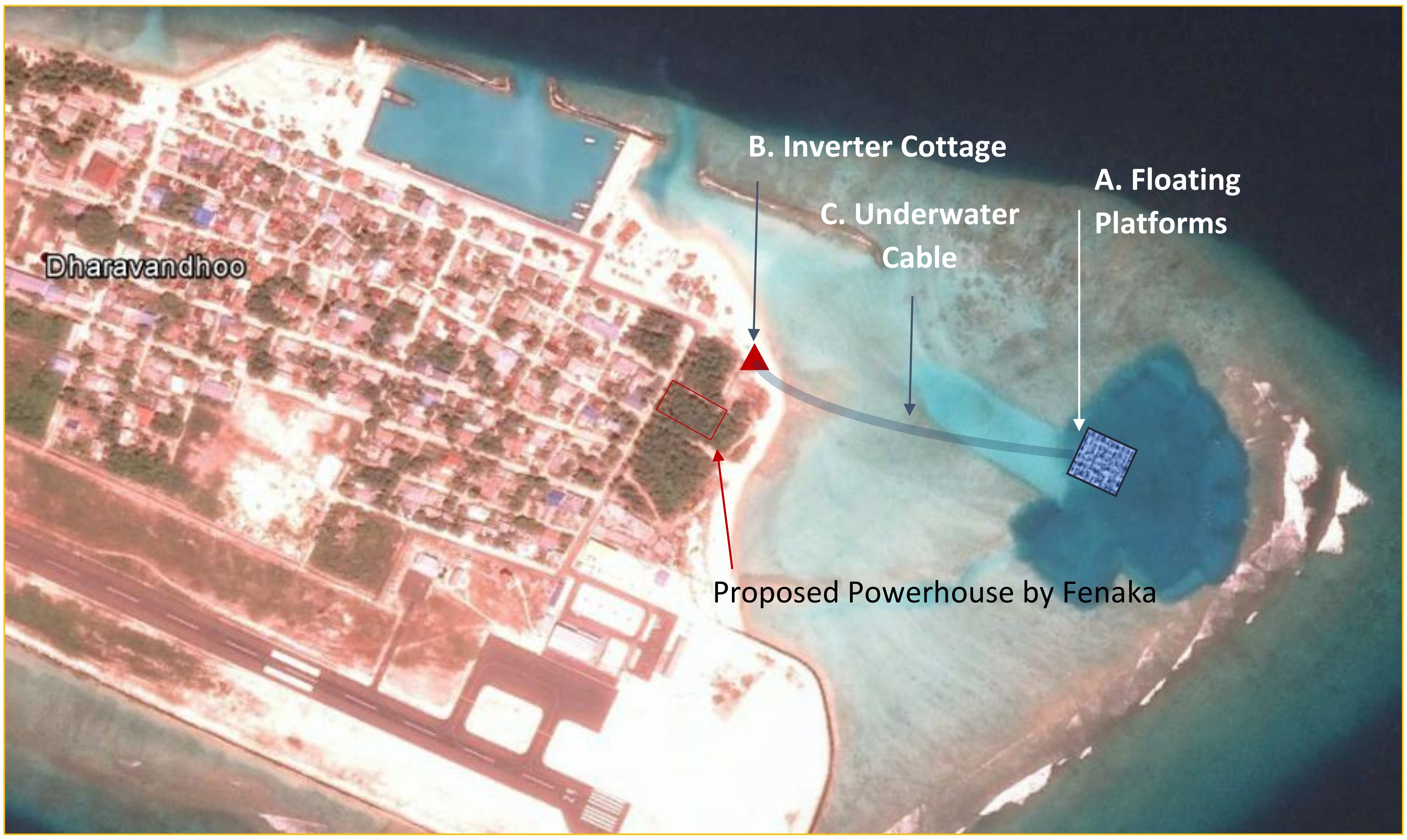
މަޤާމު: ޑިރެކްޓަރ، އެންވަޔަރަންމަންޓް އެސެސްމަންޓް

ސޮއި:

ތާރީޚް: 30/09/2015

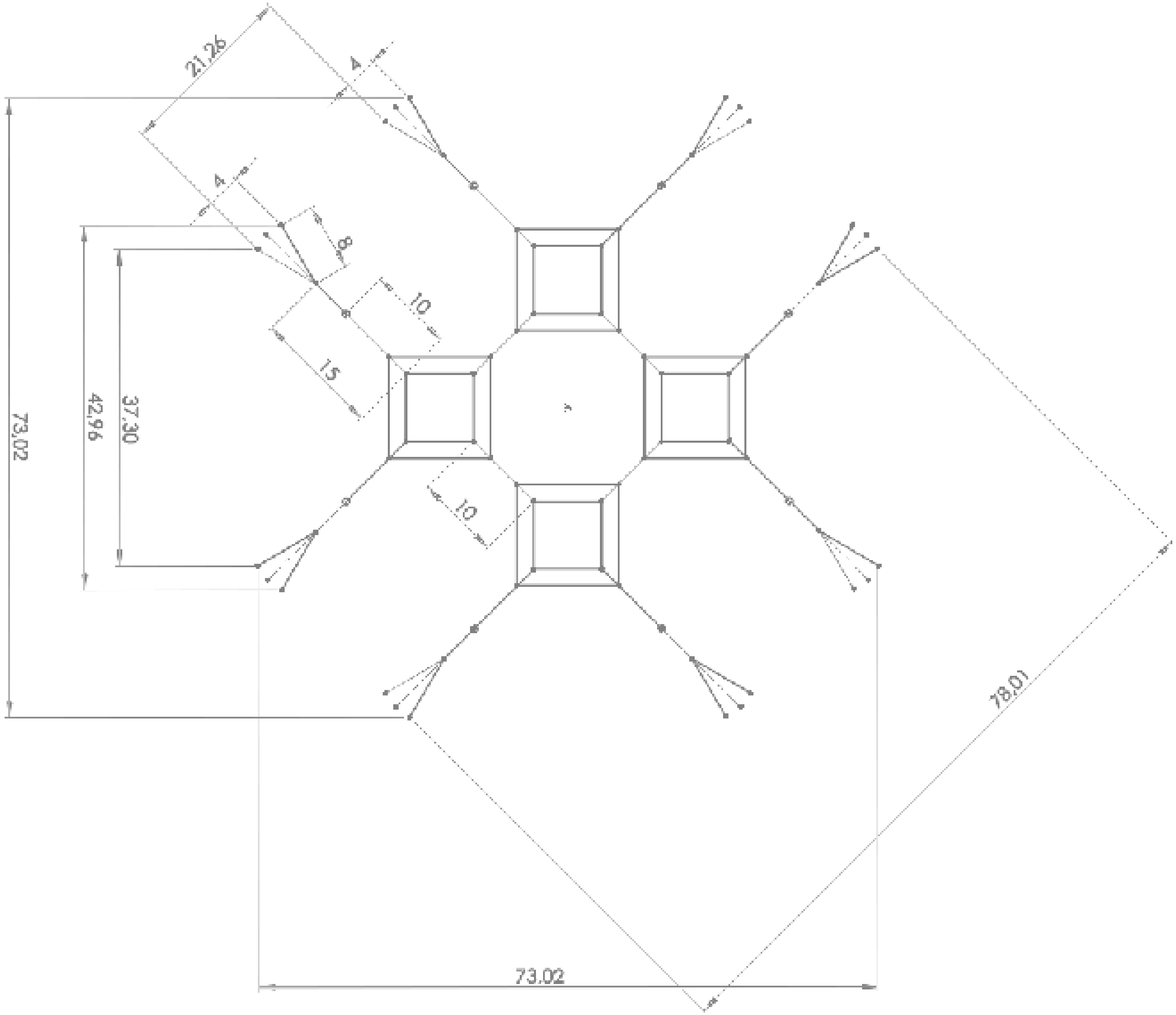
Appendix 2i Site plan

Location of the island where project will be undertaken; Baa Dharanvandhoo



Proposed location of the platform; A: Floating Platform, B: Inverter Cottage, C: Underwater Cable

Appendix 2ii Platform Mooring Plan



Appendix 3 CVs of the team members

بسم الله الرحمن الرحيم

CURRICULUM VITAE

1. **POSITION:** Environmental Specialist/EIA Consultant
2. **NAME OF FIRM:** LaMer Group
3. **NAME:** Hussain Zahir
4. **DATE OF BIRTH:** 10th February 1966
5. **NATIONALITY:** Maldives
6. **EDUCATION:**

Masters of Philosophy (MPhil) in Coral Reef Ecology
University of Newcastle upon Tyne. Newcastle Upon Tyne,
United Kingdom
2006

Marine Biology B.Sc. (Hon)
University of Newcastle Upon Tyne.
Newcastle Upon Tyne,
United Kingdom
1993-1996

7. **MEMBERSHIP OF PROFESSIONAL SOCIETIES:**
8. **OTHER TRAINING:**

1988. Marine Science Institute, University of Philippines
Certificate of completion of training course on Scleractinian Coral Taxonomy

1989. Chulalongkorn University. Bangkok. Thailand
Certificate of Completion of training Course on Coral Taxonomy, Ecology and Management

1998 Okinawa International Centre, Okinawa, Japan
Certificate of participation on training course on Conservation and Sustainable Management of Coral Reefs

1999 Korean Research and Development Institute, Seoul, South Korea
Certificate of Completion of the Training Course on marine coastal zone conservation and management

1990. Department of Marine Sciences. Chulalongkorn University. Bangkok. Thailand
Workshop on Taxonomy of Soft Bottom Invertebrates (ASEAN-Australian Coastal Living Resources Project)

1991. Mc Master University, Hamilton, Ontario. Canada.
Training on Boring Sponges of Coral reefs in Maldives

1996 Turtle Specialist Group, Convention on the Conservation of Migratory Species of Wild Animal (CMS) and government of India. Bhubaneshwar, India

Workshop and Strategic Planning Session for the Conservation of Sea Turtles of the Northern Indian Ocean

1999. United Nations Environment Program. Environment for South Asia and Pacific, organized by SACEP and Ministry of Home Affairs, Housing and Environment.

National Training for State of the Environment and Data Collection and Reporting

9. COUNTRIES OF WORK EXPERIENCE:

10. LANGUAGE AND DEGREE OF PROFICIENCY:

Dhivehi -Mother Tongue
English -Proficient

11. EMPLOYMENT RECORD:

Nov 2007- Present	Senior Reef Ecologist Marine Research centre, Ministry of Fisheries Agriculture and Marine Resources Male', Maldives.
Feb 2006- October 2007	Reef biologist Marine Research centre, Ministry of Fisheries Agriculture and Marine Resources Male', Maldives.
July 2001- January 2006	Senior Research Officer Marine Research centre, Ministry of Fisheries Agriculture and Marine Resources Male', Maldives.
June 2000 to Present	Marine Biologist/ Director (Part Time) Land and Marine Environmental Resource Group of Pte Ltd
July 1996 to July 2001	Research Officer Marine Research Centre , Ministry of Fisheries Agriculture and Marine Resources
1988 to 1992	Biological Aid Marine Research Centre , Ministry of Fisheries Agriculture and Marine Resources
1986 to 1988	Marine Research Centre , Ministry of Fisheries Agriculture and Marine Resources Trainee

12. DETAILED TASKS ASSIGNED:

WORK UNDERTAKEN THAT BEST ILLUSTRATES CAPABILITY TO HANDLE TASKS:

Marine Research Centre, Ministry of Agriculture and Marine Resources

National coordinator of Global Coral Reef Monitoring Network
Responsibilities: Including Implementation and management of the programme activities in the country through the GCRMN Regional Node for south Asian Region in Srilanka. Current programme of activities include, establishing and monitoring of coral reefs to assess the recovery processes after the 1998 Bleaching and to monitor the temporal changes to the reef system. Responsibilities also include coordination and implementation of socioeconomic monitoring at designated pilot sites to asses the livelihood and their dependence on coral reef resources. Coordinating the establishment national reef database to share information at national, regional, and global level is also part of the program of activities.

Coral Reef Degradation in the Indian Ocean (CORDIO) Programme
Responsibilities: include implementation and management of the identified projects/ Studies funded by CORDIO. Currently involved biophysical studies designed to understand the reef recovery processes after a severe disturbance in coral reefs

Catalogue of Common Coral Reef of Maldives, 1996
Year: 1996
Location: Maldives.

Task Undertaken
Independent Consultant

Initial Environmental Evaluation, Tsunami Emergency Assistance Project, Maldives
Year: 2006
Location: Ha. Filladhoo, HDH. Nolhivaranfaru, Sh. Maroshi, N. Maafaru, DH. Meedhoo, M. Kolhufushi and Th. Madifushi, Maldives
Client: ADB
Project features: Rehabilitation of damaged infrastructures (electricity)due to the tsunami of December 2004 in the Maldives financed by ADB under Tsunami Emergency Assistance project
Positions held: Domestic Environmental Specialist
Responsibilities: Initial Environmental Evaluation for the Repair and Reconstruction of Diesel powered generator housed in the above 7 island communities. Environmental issues specific of diesel power generation in the local and national context were addressed following ADB environmental guidelines.
I

Initial Environmental Evaluation, Tsunami Emergency Assistance Project, Maldives
Year: 2005
Location: Ugoofaaru, Manadhoo , Dhidhdhoo, Maldives
Client: ADB
Project features: Rehabilitation of damaged infrastructures (harbours)due to the tsunami of December 2004 in the Maldives financed by ADB under Tsunami Emergency Assistance project
Positions held: Domestic Environmental Specialist
Responsibilities: Initial Environmental Evaluation of the project sites; Ugoofaaru, Manadhoo and Dhidhdhoo for the tsunami

emergency assistance project: TA-0001 (MLD). Specific Task include rapid environmental assessment of the project sites, prepare environmental evaluations based on filed data and community Consultants, predict environmental impacts and propose an environmental monitoring plan for the project activities.

Marine Biodiversity assessment, Faafu atoll, Maldives,
Year: 2003
Location: Faafu atoll, Maldives
Client: ADB
Project features: Identification of potential biodiversity hotspots (sites/species) as part of identifying priority areas for an MCPA planning project funded by ADB. Project involves assessment of socioeconomic and biophysical assessment of the short listed sites identified for the project.
Positions held: Biodiversity Environmental Specialist
Responsibilities: Marine Biodiversity assessment Faafu atoll Maldives. ADB regional technical assistance for coastal and Marine resource management and poverty reduction in south Asia. (ADB RETA 5974). A project implemented by Ministry of Fisheries, Agriculture and Marine Resources. Assignment involves detail preparation of marine biodiversity and Coastal management issues with special reference to grouper fishery and resource management.

Environmental Impact Assessment Report for the Development of Fish Processing Plant at Ha. Huvahandhoo, Maldives,
Year: 2002
Location: Maldives
Client: Jausa Fishery Links
Project features: Construction of a tuna processing plant
Positions held: Marine Biologist
Responsibilities: The EIA report involves collection and assessment of baseline and secondary environmental data both at the marine and terrestrial environment of the project site. It also involved a risk assessment and evaluation report. An environmental management plan was also developed as part of the EIA.

Task Undertaken as an employee of Land and Marine Environmental Resource Group Pte Ltd

Replacement of wastewater collection, septic tanks and disposal systems in Ga.Villingili, Ga.Dhaandhoo, Gdh.Gahdhoo
Year: 2007-Ongoing
Location: Ga.Villingili, Ga.Dhaandhoo, Gdh.Gahdhoo
Client: American Red Cross
Project features: Design and construction of wastewater disposal systems in the specific islands
Positions held: EIA Specialist
Responsibilities: Environmental Impact Assessment research and analysis.
Preparation and submission of the Environmental Impact Assessment Report.

Environmental Impact Assessment for Reethi Rah Resort Redevelopment
Year: 2005
Location: Reethi Rah Resort
Client: Kersner International, Hotel Group
Resort development at Reethi Rah Resort
Positions held: Marine Biologist
Responsibilities: The EIA involves collection and assessment of baseline and secondary environmental data and marine and terrestrial environment of the project site. This is one of the largest reclamation project for resort development and assessment of impact of dredging and reclamation on the coastal marine habitats was a major component of this study

Environmental Impact Assessment Report for Villa Hakatha at Thilafushi, Male Atoll
Year: 2001
Location: Male Atoll
Client: Villa Hakatha,Maldives
Positions held: Project Biologist
Responsibilities: The EIA report involves collection and assessment of baseline and secondary environmental data both at the marine and terrestrial environment of the project site. It also involved a risk assessment evaluation report. An environmental management plan was also developed as part of this EIA.

Development at Baa. Landaagiraavaru, Maldives
Year: 2000
Location: Baa. Landaagiraavaru, Maldives
Client: Club mediterranee *Project features:*
Positions held: Project Biologist
Responsibilities: The EIA involved collection of Oceanographic data, Study of the beach environment, Vegetation, reef quality and reef water quality. The study examined the impacts of the island and mitigation measures where appropriate. The study also forms the baseline data for future monitoring of the environmental changes due to the resort development

Environmental state for the proposed channel dredging & associated Barrier Island at Sun Island Resort.
Year: 2000
Location: Sun Island Resort, Maldives
Client: Tekton Design Associates Pvt. Ltd
Positions held: Project Biologist
Responsibilities: The Study involved assessment of the potential environmental impact on the coastal shoreline of the island and on to the reef environment within close proximity of the proposed project site.

Tasks undertaken as an employee of Riyan Design and Management Pte Ltd

Environmental Statement for the Proposed Redevelopment of Reethi Rah Resort
Year: 2000
Location: Reethi Rah Resort
Client: Reethi Rah Resort
Positions held: Project Biologist
Responsibilities: This Study Involved assessment of the existing

status of the islands environment and identification of potential environmental impact areas related to the proposed redevelopment plans. Formulation of an environmental monitoring plan that would enable the client to record the environmental changes that may be related to anthropogenic activities or natural.

Environmental Statement for the Proposed Redevelopment of Reethi Rah Resort
Year: 2000
Location: Reethi Rah Resort
Client: Reethi Rah Resort
Positions held: Project Biologist
Responsibilities: This Study Involved assessment of the existing status of the islands environment and identification of potential environmental impact areas related to the proposed redevelopment plans. Formulation of an environmental monitoring plan that would enable the client to record the environmental changes that may be related to anthropogenic activities or natural.

Proposed Beach Nourishment at M. Medhufushi. An assessment of Environmental Design Parameters
Year: 2000
Location: M.Medhufushi
Client: Vaaly Brothers Pte.Ltd
Positions held: Project Biologist
Responsibilities: The study involved examination of the beach characteristic
Including the sediment properties, beach profiles. Identification of a borrow site by Comparing the borrow sediment characteristics of the borrow site and the native beach sand.

Environmental Evaluation of Small-bore Sewer System (SBS) in Lh. Hinnavaru and K. Gulhi
Year:1999
Location: Lh. Hinnavaru and K. Gulhi
Client: Maldives Water and Sanitation Authority
Project features: The Study Involved ground water/ Seawater analysis of sewage pollution; reef surveys hydro graphic /oceanographic surveys and survey of the slopes of the sewage lines.
Positions held: Project Environmental Analyst

Assessment of Oil Contamination in Male' Groundwater from Vehicle Garages and Petrol Stations.
Year:1999
Location: Male', Maldives
Client: Maldives Water and Sanitation Authority
Positions held: Project Environmental Analyst
Responsibilities: The study involved Ground water analysis of oil contamination and assessment of general working conditions and practices in the vehicle garages and petrol stations in male'.

Environmental Impact Statement for the Proposed Beach Protection Works at Nika Island Resort
Year:1999

Location: Male', Maldives
Client: Nika Island Resort
Positions held: Project Biologist
Responsibilities: The project involves assessment of physical environmental condition such as the wave, current sediment characteristics, bathymetry at the project site (Nika Island Resort). Assessment of the status of the reef at the project site and an evaluation of the possible impacts on the reef and the physical environment as a result of the proposed beach protection work.

Environmental Monitoring of F. Filitheyo Resort Development
Year:1999
Location: F.Filitheyo
Client: AAA Trading Company Pvt.Ltd
Positions held: Project Biologist

Environmental Monitoring of M. Medhufushi Resort Development
Year:1999
Location: M. Medhufushi, Maldives
Client: Vaally Brothers Pte Ltd
Position Held: Project biologist

Environmental Monitoring of Lh. Kanuhuraa, Maldives
Year:1999
Location: Lh. Kanuhuraa
Client: SIMDI Hotel Management Pte Ltd
Positions held: Project Biologist

Environmental Monitoring of R. Meedhupparu Resort Development
Year:1999
Location: R. Meedhupparu
Client: Cowrie Investment Pvt Ltd, Maldives
Positions held: Project Biologist
Responsibilities: The Monitoring programmes involved periodic measurements of the beach profiles around the islands, reef quality surveys, ground water/ seawater analysis and environmental auditing

Tasks Under Taken as a Freelance Consultant

Environmental impact Assessment for the F. Filitheyo Resort Development
Year:1998
Location: F.Filitheyo
Client: AAA & Trading Company, Maldives
Positions held: Project Biologist

Environmental Impact Assessment for Lh. Madhiriguraidhoo Resort Development
Year:1997
Location: Lh. Madhiriguraidhoo
Client: Guardian Agency Pte Ltd
Positions held: Marine Biologist

Environmental Impact Assessment for B. Fonimagoodhoo Resort Development
Year:1997
Location: B. Fonimagoodhoo, Maldives
Client: Thasmeen Ali, M. Sheeraazeege, Maldives
Positions held: Marine Biologist

Environmental Impact Assessment for M. Hakuraahuraa Resort Development
Year:1997
Location: M. Hakuraahuraa
Client: Fantasea Pte Ltd, Maldives
Project features:
Positions held: Marine Biologist
Responsibilities: The EIA studies Involved collection of oceanographic data studies of the beach environment, vegetation, reef quality and ground water / Seawater quality. These studies examined the impacts of the development on the island and mitigation measures where appropriate. The studies also form the baseline data for the future monitoring of the environmental changes due to the resort development

13. Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.

Date: 7 May 2008

[*Signature of staff member or authorized representative of the staff]* *Day/Month/Year*

Full name of staff member Hussain Zahir
Full name of authorized representative: .

CURRICULUM VITAE

1. **POSITION:** Geological Specialist

2. **NAME OF FIRM:** Riyan Pvt Ltd

3. NAME: Mohamed Aslam

4. **DATE OF BIRTH:** 6 October 1969

5. **NATIONALITY:** Maldivian

6. **EDUCATION:** University of Auckland, NewZealand,
Master of Science (Msc) in Geography ,2004

University of Wales, United Kingdom
Bachelor of Science (Hons) (Bsc) ,in Geological Oceanography, 1997

7. **MEMBERSHIP OF PROFESSIONAL GROUPS:**

A presiding member of International EC-safety cooperation organisation (IESCO)

Member, Climate Change Technical Team, Integrated Climate Change Strategy - Maldives, Ministry of Environment, Water and Energy (Presently).

Member, Technical Committee on Harbour Construction and Land Reclamation, Ministry of Planning and National Development (April 2001 – July 2003).

Member, Project Co-ordinating Committee, Fuahmulaku Harbour Project, Ministry of Construction and Public Works (April 2001 – July 2003).

Member, Technical Focal Group, Maldives Protected Area Systems Project, Ministry of Home Affairs Housing Environment (2000 – 2003)

8. **OTHER TRAINING:**

9. **COUNTRIES OF WORK EXPERIENCE:**

10. **LANGUAGE AND DEGREE OF PROFICIENCY:**
English – Excellent
Dhivehi - Excellent

11. **EMPLOYMENT RECORD:**

Director
Land & Marine Environmental Resource Group-Maldives
March 2012 to present

Minister of Housing & Environment
Ministry of Housing & Environment
July 2010 – February 2012

Minister of Housing, Transport & Environment
Ministry of Housing, Transport & Environment
November 2008 – July 2010

Land & Marine Environmental Resource Group-Maldives, (2006 to 2008)
Director
Founding Partner and Director of Lamer Group

Director
Male',Maldives (12/05-03/06)
Ministry of Construction and Public Infrastructure,
Coastal and Civil Engineering Section

Deputy Director
Male',Maldives (07/05-12/05)
Ministry of Construction and Public Infrastructure

Deputy Director
Male',Maldives (01/05-07/05)
Ministry of Construction and Public Works

Oceanographer
Male',Maldives (09/97-08/03)
Ministry of Construction and Public Works

Secretary
Male',Maldives (07/90-09/92)
Ministry of Public Works and Labour

Private
Male',Maldives (10/89-07/90)
National Security Services

12. DETAILED TASKS ASSIGNED:

WORK UNDERTAKEN THAT BEST ILLUSTRATES CAPABILITY TO HANDLE TASKS:

- Lead the climate change negotiation and mitigation level in COP 15, COP16 & COP 17 an head of delegation of Maldives

- Deputy chair of the climate change council, the national body who advised the president on policy matter relating to climate negotiation and Environmental conservation, protection in the Maldives

- Founding Member of Regional task force on renewable energy, an ADB body that was forced in 2010

Topographic and Hydrographic Surveys for JBIC, Japan
Location: Maldives,
Year: 2008,
Time Spent: 5months*,*
Position: Project Director

The Topographic and Hydrographic Surveys were carried out to prepare topographic maps and bathymetric maps for the Tsunami Reconstruction project in the Maldives, and to analyze the characteristics of the Tide of the project areas through the field observation and analysis of the records.
The Service consists of the following surveys.
Topographic and Bathymetric Surveys at Sh. Funadhoo Harbor

Tide Observation and Establishment of MSL at the harbor project sites
Topographic Survey of the sewerage project islands
Inventory Survey of Septic Tanks in the sewerage project islands

The Surveys were carried out at the following islands:

- *Ga Dhaandhoo (Tide)*
- *L Isdhu (Tide)*
- *L Fonadhoo (Tide)*
- *Th. Dhiyamigili (Tide)*
- *M Muli (Topography)*
- *K Mafushi (Tide)*
- *B Eydhafushi (Topography)*
- *Sh Funadhoo (Topography, Hydrographic, Tide)*

Topographic Surveys of Tsunami rehabilitation project, sewer system designing for American Red Cross
Location: Maldives,
Year: 2007,
Time Spent: 2months*,*
Position: Project Director

The Topographic Surveys were carried out to prepare topographic and as-built maps for the Tsunami Reconstruction project in the Maldives
The topographic Surveys were carried out at the following islands:

- *GDh Gadhoo*
- *Ga Villigili*
- *Ga Dhaandhoo*

Topographic Surveys of Tsunami rehabilitation project, sewer system designing for UNOPS
Location: Maldives,
Year: 2007,
Time Spent: 2months*,*
Position: Project Director

The Topographic Surveys were carried out to prepare topographic and as-built maps for the Tsunami Reconstruction project in the Maldives
The topographic Surveys were carried out at the following islands:

- *Dh Meedhoo*
- *F Nilandhoo,*
- *R Ungoofaaru*

Lh Madivary Airport Development Topographic and Bathymetric Surveys for IAS, Maldives
Location: Maldives,
Year: 2007,
Time Spent: 2months*,*
Position: Project Director/Surveyor

The Topographic and Bathyetric Surveys were carried out to prepare topographic maps and bathymetric maps for the Island for the design of the runway and harbour facilities of the airport

Fuahmulaku Harbour Project
Location: Maldives,
Year: 1999 - 2003,
Time Spent: 4 years,
Position(s): Environmental Analyst (1999 – 2001)
then Project Manager (2001 – 2003)

Responsibilities:
The project involved dredging of a 2000sqm harbour basin with a sheet piled quay wall of length 650m and a rubble mound breakwater of 540m. The environmental analyst assisted the design consultant (Niras/Portconsult, Denmark) for the project to understand the specific environmental conditions of the project site and also carried out the bathymetric surveys required for the physical modelling of the harbour design.

As the project manager, duties included managerial review of all project components and making timely decisions on all matters to be dealt by the client for the effective implementation of the project.

Hulhumale Land Reclamation and Coastal Structures Development Project
Location: Maldives, *Year:* 2001 - 2002, *Time Spent:* 1 year,
Position: Project Engineer

Responsibilities:
The project involved reclamation of a land area of approximately 2sqkm that required approximately 3million cum of dredged material. This fill material was dredged from the deeper lagoon of Hulhule Lagoon. The coastal protection works included construction of a revetment and a sheet pile quay wall. As the project engineer, duties included overall supervision of the quality of works carried out by the contractor (Dredging International, Belgium) and making assessment of technical issues in the implementation of the project.

Environmental/Technical Study for Dredging and Reclamation Works Under the Hulhumale Project
Location: Maldives, *Year:* April 2002- June 2002, *Time Spent:* 3 months,
Position: Counterpart Environmental Specialist
Responsibilities:

This was study conducted to assess the technical feasibility of the reclamation works under the Hulhumale' project and to assess the environmental impacts associated with the dredging and reclamation works. The counterpart environmental specialist was responsible for carrying out the environmental data collection program. Some of the specific environmental data collected by the counterpart environmental specialist included current measurements at the site and a detailed bathymetric survey of the site. Preliminary assessment of the current data and processing and plotting of bathymetric data were also performed by the counterpart environmental specialist.

List of Some Technical Studies and Papers

EIA Ha Berimadhoo Resort Development
Location: Maldives, *Year:* February – March 2008, *Time Spent:* 2

month,

Position: Consultant

EIA Ga Kondeymathilabadhoo Resort Development
Location: Maldives, *Year:* January –February 2008, *Time Spent:* 2 month,

Position: Consultant

EIA Ga Munandhua Resort Development
Location: Maldives, *Year:* January 2008, *Time Spent:* 1 month,

Position: Consultant

EIA for Coastal Protection Works at Gdh. Lonudhuhutta

Location: Maldives, *Year:* 2006-2008, *Time Spent:* 2 years,

Position: Leading Consultant for Coastal Monitoring for 2 years and for the design of the coastal protection works

EIA GDh Vattavareha Resort Development
Location: Maldives, *Year:* July 2006, *Time Spent:* 1 month,

Position: Consultant

Beach Replenishment Technical Study. WhiteSands Resort and Spa, South Ari Atoll, Maldives
Location: Maldives, *Year:* March 2006, *Time Spent:* 1 month,

Position: Leading Consultant

Geological effects of tsunami on mid-ocean atoll islands: The Maldives before and after the Sumatran tsunami.
Paul S. Kench, Roger F. McLean, Robert W. Brander, Scott L. Nichol, Scott G. Smithers, Murray R. Ford, Kevin E. Parnell and **Mohamed Aslam** (2006). Geology: Vol. 34, No. 3, pp. 177–180.

Shore Protection Technical Study for Dhonveli Beach & Spa Resort, Maldives
Location: Maldives, *Year:* February 2006, *Time Spent:* 1 month,
Position: Leading Consultant

Environmental Impact Assessment Report for the Proposed Remodelling of the Coastal Environment of FunIsland Resort.
Location: Maldives, *Year:* September 2005, *Time Spent:* 2 month,
Position: Consultant (Coastal Environmental Specialist)

Environmental Impact Assessments (EIA) Report, Domestic Maritime Transport Study (ADB TA 4394-MLD)
Location: Maldives, *Year:* March 2005, *Time Spent:* 5 ½ month,
Position: Consultant (Environmental Specialist)

Environmental Impact Assessment Report Redevelopment of Reethi Rah as a Premium Nature Resort
Location: Maldives, *Year:* May 2005, *Time Spent:* 1 ½ months,
Position: Consultant (Coastal Environmental Specialist)

Regional Technical Assistance for Coastal and Marine Resources Management and Poverty Reduction in South Asia (ADB RETA 5974)
Location: Maldives, *Year:* April 2003, *Time Spent:* 3 months,
Position: Consultant (Coastal Environmental Specialist to assess the coastal zone issues in Faaf atoll, Maldives and formulation of an Integrated Coastal Zone Management Strategy and An Action Plan.

Proposed Shore Protection works at Hakuraahuraa – An Assessment of Environmental Design Parameters
Location: Maldives, *Year:* Sep 2001, *Time Spent:* 4 months,

Position: Leading Consultant
The study involved examination of the beach characteristics, nearshore current and wave patterns and how they affect the beach of the island. Based on these examinations a shore protection structure suitable for the island was proposed.

Environmental Study on the Proposed Beach Fill Project at K. Hudhuveli – An Assessment of Beach Fill Design Parameters
Location: K. Hudhuveli, *Time Spent:* September 2000 (1 ½ months),
Position: Leading Consultant

The study involved examination of the beach characteristics including the sediment properties, beach profiles. Identification of a borrow site by comparing the borrow sediment characteristics of the borrow site and the native beach sand.

Environmental Impact Assessment Study for the Resort Development at Baa. Landaagiraavaru
Location: Maldives, *Year:* June 2000, *Time Spent:* 2 months,
Position: Consultant (Coastal Environmental Specialist)

The EIA study involved collection of oceanographic data, study of the beach environment, vegetation, reef quality and groundwater/seawater quality. The study examined the impacts of the development on the island and mitigation measures where appropriate. The EIA study also recorded the baseline data for future monitoring of the environmental changes due to the resort development.

Proposed Beach Nourishment at M. Medhufushi. An assessment of Environmental Design Parameters
Location: M. Medhufushi, *Time Spent*: April 2000,
Position: Leading Consultant

The study involved examination of the beach characteristics including the sediment properties, beach profiles. Identification of a borrow site by comparing the borrow sediment characteristics of the borrow site and the native beach sand.

Environmental Evaluation of Small Bore Sewer System (SBS) in Lh. Hinnavaru and K. Gulhi (A study carried out for Maldives Water and Sanitation Authority, Maldives).
Location: Maldives, *Year:* 1999, *Time Spent:* 3 months,
Position: Consultant

The study involved groundwater / seawater analysis for sewage pollution, reef surveys hydrographic / oceanographic surveys and survey of the slopes of the sewage lines.

Assessment of Oil Contamination in Male groundwater from vehicle garages and petrol stations. . (A study carried out for Maldives Water and Sanitation Authority, Maldives).
Location: Maldives, *Year:* 1999, *Time Spent:* 3 months,
Position: Consultant

The study involved groundwater analysis for oil contamination and assessment of general working conditions and practices in the Vehicle Garages and Petrol Stations in Male.

Environmental Impact Assessment for R. Meedhupparu Resort Development
Location: Maldives, *Year:* 1998, *Time Spent:* 2 ½ months,
Position: Consultant

Environmental Impact Assessment for F. Filitheyo Resort Development
Location: Maldives, *Year:* 1998, *Time Spent:* 2 ½ months,
Position: Consultant

Environmental Impact Assessment for Alif Maamigili Airstrip Development
Location: Maldives, *Year:* 1997, *Time Spent:* 3 ½ months,
Position: Consultant

Environmental Impact Assessment for Lh Madhiriguraidhoo Resort Development
Location: Maldives, *Year:* 1997, *Time Spent:* 2 ½ months,
Position: Consultant

11.Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.

[*Signature of staff member or authorized representative of the staff]*
Mohamed Aslam

Shahaama Abdul Sattar

Personal Information

Date of birth: 30 September 1980

Address: G. Helengeli Aage, Apt 2 B
Rahdhebai Magu
Male'
Republic of Maldives
Contact No: + 960 7904985 (m)
Email: shahaama@lamer.com.mv (LaMer Pvt Ltd)
shahaama.sattar@gmail.com

Work Address: Currently working independently

Education

Graduate and Postgraduate

Aug 2004 - Jun 2006 Master of Science in Fisheries Biology and Fisheries Management
University of Bergen
Department of Biology
Postbox 7800
N-5020 Bergen, Norway

Feb 1999 - Dec 2001 Bachelor of Science
The Flinders University of South Australia
GPO Box 2100
Adelaide 5001, South Australia

Secondary

Apr 1997 – Jul 1998 G.C.E A'Level (London)
Kolej Damansara Utama
Damansara Jaya
Selangor,
Malaysia

Jan 1994 – Dec 1996 G.C.E O'Level (London)
Aminiya School
Male',
Republic of Maldives

Work experience

Feb 2002 Volunteer work at Seal Bay, Kangaroo Island, South Australia.
Work involved helping researchers with catching seals and removing tracking devices from the seals.

Dec 2001 – Feb 2002 Work experience at the South Australian Aquatic Sciences Centre
Work involved dealing with sea urchins, mainly cleaning their tanks, doing dissections on sea urchins and helping researchers with different aspects of the research.

May 2008 Participated in the Biodiversity Valuation survey of Baa Atoll Maldives carried out by AEC project and IUCN

Employment Record

May 2011 - Present Consultant, Darwin Reef Fish Project
Marine Research Centre, Maldives / Marine Conservation Society, UK
- Consultant to the Darwin Reef Fish Project (4 year joint collaboration between MRC and MCS, UK), which assesses the various reef fisheries (grouper, aquarium and food fisheries) of the Maldives and aims to establish management plans for these fisheries. Provision of technical support and assistance to the project staff and MRC in implementing the project and formulation of the management plans.

June 2011 – Present LaMer Pvt Ltd
- Work part time in report writing for the various Environmental Impact Assessment projects conducted by the group.

July 2011 – Present BOBLME Sharks Working Group Coordinator, Bay of Bengal Large Marine Ecosystem Project
- Coordinator for the Sharks WG of BOBLME project, and work with the focal points in the member countries, to assist in the formulation and implementation of their National Plans of Action for Sharks.

June 2002 – May 2011 Fisheries Biologist (At time of resignation)
Marine Research Centre
Ministry of Fisheries and Agriculture
Male’, Republic of Maldives

Line of work at MRC included:

- Conduct field surveys to monitor the reef fishery and fish species behaviour
- Compilation and analyses of the reef fisheries data, in particular the grouper and food fishery data
- Write reports and regular reviews on the status of fisheries including recommendations for management.
- Focal point for the IUCN funded project on identification of reef fish spawning aggregations in the Maldives through fishermen interviews (2007)
- Secretariat – Indian Ocean Cetacean Symposium 2009
- Project Partner for Maldives for the Darwin Initiative Coral Reef Fish Project, Maldives
- MRC Focal point for the Atoll Ecosystem Conservation Programme, Ministry of Housing and Environment (2009 – 2011)

Workshops/Seminars Participated

15-21 March 2003 - Training Workshop on the Implementation of Multilateral Agreements in the Conservation of Biodiversity with special focus on Marine Biodiversity. Kushiro, Japan

14-16 November 2006 – Sixth William R. and Lenore Mote International Symposium – Life history in Fisheries Ecology and Management. Sarasota, Florida

03-05 March 2008 – Olhugiri and Dhigalihaa Protected Areas Management Planning Workshop. Eydhafushi, Maldives

11 March 2008 – Applying the Ecosystem Approach to managing Atoll Ecosystems in the Maldives. Hulhule Island Hotel, Maldives

24-26 March 2008 – Regional Consultation on Preparation of Management Plans for Shark Fisheries. Beruwela, Sri Lanka

17-19 June 2008 – Workshop on Assessment and Management of the Offshore Resources of South and Southeast Asia. Bangkok, Thailand

22-23 March 2009 – BOBP-IGO National Workshop on Monitoring, Control and Surveillance in Marine Fisheries. Male’, Maldives

18 – 20 July 2009 – Indian Ocean Cetacean Symposium 2009. Paradise Island Resort and Spa, Maldives.

09-11 August 2009 – Second Regional Consultation on Preparation of Management Plans for Shark Fisheries. Kulhudhuffushi, Maldives

24-25 February 2010 – BOBLME Project – National Inception Workshop, Male’, Maldives

2-3 June 2010 – BOBP-IGO Technical Advisory Committee – 5th Meeting, Male’, Maldives

13-14 September 2010 – BOBLME Fisheries Assessment Working Group – 1st Meeting, Bangkok, Thailand

14-16 December 2010 – EWS-WWF 2nd Marine Conservation Forum for the Gulf Region In partnership with the Pew Environment Group – Local Actions for Global Challenges, Abu Dhabi, United Arab Emirates

18-19 January 2011 – Bay of Bengal Large Marine Ecosystem Project – Workshop on the Status of Marine Managed Areas in the Bay of Bengal, Penang, Malaysia

5-7 July 2011 –Bay of Bengal Large Marine Ecosystem Project – First meeting of the BOBLME Sharks Working Group, Male’, Maldives

7-8 September 2011 – Workshop to formulate the Grouper Fisheries Management Plan, DRFP/MRC, Male’, Maldives

15-17 September 2011 – SEAFDEC Special Meeting on Sharks Information Collection in Southeast Asia, Bangkok, Thailand

Publications

Sattar, S. A., Amir, H. and Adam, M. S. (2011) Reef fish tagging programme – Baa Atoll Pilot project (in press)

Sattar, S. A., Andréfouët, S., Ahsan, M., Adam, M. S., Anderson, R. C. and Scott, L (2011) Status of the Coral Reef Fishery in an Atoll under tourism development: the case of Central Maldives (in press)

Saleem, M., Sattar, S. A. (2009) Study on post-tsunami restoration and conservation projects in Maldives, *Prepared for the International Union for Conservation of Nature*.

Tamelander, J., Sattar, S., Campbell, S., Hoon, V., Arthur, R., Patterson E. J.K., Satapoomin, U., Chandi, M., Rajasuriya, A. and Samoilys, M. (2009) Reef fish spawning aggregation in the Bay of Bengal: Awareness and Occurrence, *Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale, Florida, 7-11 July 2008,* Session 22

Sattar, S. A., Jørgensen, C., Fiksen, Ø. (2008) Fisheries Induced Evolution of Energy and Sex Allocation. *Bulletin of Marine Science*, 83(1): 235-250

Sattar, S. A. (2008) Review of the Reef fishery of the Maldives, Marine Research Centre, Male', Maldives. 62 pp

Sattar, S. A. and M. S. Adam (2005) Review of the Grouper fishery of the Maldives with additional notes on the Faafu Atoll fishery. Marine Research Centre, Male', Maldives. 54 pp

Referees

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Dr. Charles Anderson
anderson@dhivehinet.net.mv
charles.anderson11@btinternet.com

CURRICULUM VITAE

1. **PROPOSED POSITION:** Environmental Planner

2. **FIRM:** LaMer Pvt. Ltd

3. **NAME:** Aishath Abdulla

4. **DATE OF BIRTH:** 10th September 1986

5. **NATIONALITY:** Maldivian

6. **PERSONAL ADDRESS:**
H.Regalge,
MajeedheeMagu
Male' Rep. of Maldives

7. **EDUCATION:**
2012 M. Environment, Australia
2010 BA (Hons) in Urban and Regional Planning, Malaysia

8. **OTHER TRAINING:**

9. **LANGUAGE AND DEGREE OF PROFICIENCY:**
English – Fluent
Dhivehi – Mother tongue

10. **MEMBERSHIP OF PROFESSIONAL SOCIETIES:**

11. **COUNTRIES OF WORK EXPERIENCE:**
Maldives, Malaysia

12. **EMPLOYMENT RECORD:**

February 2013- Present	Senior Planner LAMER Group Pte Ltd Male' Maldives
November 2010 – January 2011	Planner/ Acting business development Manager Riyan Pte.Ltd Male' Maldives
May 2009 - July 2009	Trainee ANZ PLANNERS SDN. BHD Selangor Malaysia
August 2005 - October 2005	Surveyor Ministry of Fisheries and Agriculture Male' Maldives

December 2003	Surveyor Ministry of Planning and National Development Male’ Maldives
May 2003-August 2003	Volunteer UNICEF Male’ Maldives

13 DETAILED TASKS ASSIGNED:

WORK UNDERTAKEN THAT BEST ILLUSTRATES CAPABILITY TO HANDLE THE TASKS ASSIGNED:

Review and Update the Detailed Island Risk Assessment in the Maldives prepared for HDh. Kulhudhufushi and GDh. Thinadhoo
Year: 2013
Client: Ministry of Environment and Energy
Position Held: Social Planner/Project Coordinator
Duties Rendered: Review all relevant documents related to DIRAM study, study the social aspects impacting the risks of the islands and overall management of the project.

Preparation of Heritage Action Plan and Preliminary Inventory
Year: 2011
Client: Department of National Heritage
Position Held: Team Leader
Duties Rendered: Proposed action plan for the protection and safeguarding of national heritage. Prepared a preliminary inventory of the existing tangible and intangible heritage of Maldives

Preparation of Atoll and Island Development Plans for AA. Atoll
Year: 2011
Client: Secretariat of AA Atoll council
Position Held: Planner/ Project Manager
Duties: Manage and prepare the development plans

Reviewing the Third Tourism Master Plan 2005-2011
Year : 2011
Client: Ministry of Tourism Arts and Culture
Position Held: Planner/Project Coordinator
Duties Rendered: Provide input in planning perspective and also over all coordination of the project inclusive of conducting a workshop to present the findings

Integration of Climate Change Risk Resilience into Land Use Planning
Location: Maldives
Year: 2011

Client: Ministry of Housing and Environment
Position Held: Planner/Project Coordinator
Duties Rendered: Provide input in planning perspective and also over all coordination of the project inclusive of conducting a workshop to present the findings

Preparation of a detailed Layout Plan for Tourism Zone (Asseyri Project)
Year :2011
Client: Ministry of Tourism Arts and Culture
Position Held: Planner/Project Coordinator
Duties Rendered: Provide input in planning perspective through preparing the layout plan and also over all coordination of the project inclusive of conducting a workshop to present the findings

Appraisal of Hithadhoo Regional Hospital Development
Location: S. Hithadhoo, Maldives
Year :2010
Client:OPEC Fund for International Development (OFID)
Position Held: Socio Assessment Specialist/Project Coordinator
Duties Rendered: Overall Coordination of the project and carry out social Impact assessment study.

Mapping study of infrastructure and resources for Youth
Location:
Year :2010
Client:UNDP
Position Held: Assistant project coordinator
Duties Rendered: Assisting in overall coordination of the project

***Draf RancanganTempatan* DAERAH KUALA LANGAT (*Draft Local Plan* for Kuala Langat District)**
Location: Kuala Langat, Selangor, Malaysia
Year :2009
Client:JPBD (Town and country planning department, Selangor)
Position Held: Support consultant
Duties Rendered: Assisting in the planning process including the report writing, consultations, preparing layout plans and 3D sketch-up models

Reviewing the Master Plan
Location: Badra and Sweirra, Iraq
Year :2009
Client: City council, Badra and Sweirra
Position Held: Support consultant
Duties Rendered:providing consultancy on the master plan. Reviewing the EIA and preparing SIA for the master plan of Badra and Sweirra

HELIPAD Development; PRINCE COURT Hospital
Location: Ampang, Kuala Lumpur, Malaysia
Year :2009
Client:
Position Held: Support Consultant
Duties Rendered: Reviewing the guidelines for HELIPAD development, preparing proposal presentations for the development.

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes me, my qualifications, and my experience. I understand that any willful misstatement described herein may lead to my disqualification or dismissal, if engaged.

Aishath Abdulla

Aishath Abdulla Date: 10 December 2013

Address: LaMER Group Pvt Ltd
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Email: aishath.abdulla@lamer.com.mv