

# 1 Environmental and Social Screening Report: Installation of 2 MW Ground Mounted Solar PV in Kulhudhufushi

*The Screening Report must include a copy of the technical engineering design for the proposed intervention (where available), at least preliminary concept and description of the proposed project activity.*

## A. Description of Intervention

### Project Identification

Project title	Installation of 1.5 MW solar PV Installation in Kulhudhufushi
Project Proponent	Ministry of Environment

### Project Location

Location	<p><b>(Location Map and Site Photographs to be Annexed): Attached in Annex1</b></p> <p>Kulhudhufushi city is the most populous island north of Maldives. With a resident population of 9560. It is the most recent island to receive the city status. Located in the eastern side of Haa Dhaalu (Thiladhunmathi Dhekunuburi) Atoll on geographic coordinates of 6°37'0"North and 73°3'0"East. The land area of the island is 247 Hectares (ha). The length of the island is approximately 2.5 km and 0.89 km in width.</p> <p>The most significant natural feature of the island is existence of two wetland area. The larger one is in the northern end and small one in the south end of the island. Several true mangrove species are known to be found in this wetland area including, Black Mangrove (<i>Lumnitzera Racemos</i>), <i>Rhizophora apiculate</i> and small-leaved orange mangrove (<i>Brugeria cylindrical</i>). Most dense vegetation exists near the wetland area and eastern side of the island. The wetland area on the north of the island was reclaimed in 2018 and an airport was built in this location. It caused lot of controversies both nationally and internationally, as it is recognized as one of the most significant wetland areas in the Maldives.</p>
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Kulhudhufushi is seen as the northern most hub of Maldives, with many from HA, Hdh, Shaviyani atoll moving to the island to meet education and health needs. Being an economic hub, most people in Kulhudhufushi are involved in retail and wholesale business.

**Definition of Project Area**

*(The geographical extent of the project & areas affected during construction)*

For Kulhudhufushi both land and rooftops have been selected for solar PV installation. In terms of land the airport location has been selected for installation (Figure 1 and Annex 1 for full scale map).

1. Airport Location: An area of 16792 m<sup>2</sup> from two sections. The northern section 9766 m<sup>2</sup> and for southern section the area is 7026 m<sup>2</sup>.



**FIGURE 1 KULHUDHUHFUSHI AIRPORT LOCATIONS**

For buildings the details of the buildings, the area and the owner details are provided below (see below and Annex 1 for full scale site map).

**TABLE 1 ROOF SPACE AND OWNER DETAILS**

Building Name	Square Area (m <sup>2</sup> )	Owner
KPL Warehouse	1443	Kulhudhufushi Ports Limited
KPL Baggage Area	115	Kulhudhufushi Ports Limited
KPL Security Hut	29	Kulhudhufushi Ports Limited
Ferry Terminal	624.39	Kulhudhufushi Council
Fish Market	384.78	Kulhudhufushi Council

Majority of these buildings are located in the Port Area at the southern end of the island (Figure 2 and Annex-1 for full scale map). This includes the warehouse, baggage area and security hut. All these buildings are owned by Kulhudhufushi Ports Limited (KPL) a subsidiary company of Maldives Ports Limited (MPL).



**FIGURE 2 KULHUDHUHFUSHI PORT AREA BUILDINGS**

Of the remaining buildings the ferry terminal is located in the reclaimed land between southern harbour of Kulhudhufushi and Port to the south of the harbour (Figure 3). Construction of this Ferry terminal building was completed on 2020. An aerial image of the building is provided in Figure 4.



**FIGURE 3 LOCATION OF FERRY TERMINAL**



**FIGURE 4 AERIAL IMAGE OF FERRY TERMINAL BUILDING**

The fish market site is located in the reclaimed land as well between the northern harbour and the middle harbour of Kulhudhufushi (Figure 5). The construction of the fish market was completed on 2020 as well. Figure 6 provides the aerial image of the site.



FIGURE 5 LOCATION OF FISH MARKET



FIGURE 6 AERIAL IMAGE OF FISH MARKET

Adjacent land and features

In terms of adjacent land features, the airport area consists of airport infrastructure and the desalination plant of Fenaka (Figure 1). The desalination plant is 15 meters east of northern section. The control tower and fire building is around 40 meters from the southern section. The terminal building is located around 100 meters west of the southern section. In addition the site is located in the reclaimed land within the wetland area of the island, especially the northern section is immediately adjacent to the water body.



**FIGURE 7 AIRPORT PV LOCATION AND ADJACENT INFRASTRUCTURE**

As for remaining buildings, close to the port area as per the land plan (Annex 5) are a public beach area and some recreational parks.

In terms of ferry terminal, as per the land use plan in Annex 5, this area has been designated primarily for institutional and community use.

Close to fish market area as per the land use plan given in Annex 5 are water sports centre, a futsal court and a security hut. These sites are around 50 meters south east of the fish market building.

**Project Justification**

<p>Need for the project</p> <p><i>(What problem is the project going to solve)</i></p>	<p>This project is needed to achieve the objectives of the Strategic Action Plan (SAP) 2019 to 2023 (<a href="https://presidency.gov.mv/SAP/">https://presidency.gov.mv/SAP/</a>) of the government which has clear targets to achieve in terms of renewable energy. In this regard, the target of the government is to achieve 20 percent increase of renewable energy in National Energy mix by 2023 when compared to 2018 levels (Target 2.1). This project will facilitate to achieve this objective.</p> <p>As identified in the social survey of the project Annex 4 of the report, the project aims to resolve many of the issues that exist in the power generation system of the island (Kulhudhufushi) at present. Currently it is all diesel generated power in the island. By switching majority of daytime electricity generation to renewable energy the system becomes environmentally more sustainable. In addition, PV installation means less burden on existing generators, increasing efficiency of generators, hence less power disruptions are expected. Frequent, blackouts are one of the issues identified by the survey respondents.</p>
<p>Purpose of the project</p>	<p>As per the Strategic Action Plan (SAP) 2019 to 2023 (<a href="https://presidency.gov.mv/SAP/">https://presidency.gov.mv/SAP/</a>) of the government it is a target (Target 2.1) of the government is to achieve 20 percent increase of renewable energy in National</p>

<i>(what is going to be achieved by carrying out the project)</i>	<p>Energy mix by 2023 when compared to 2018 levels. To attain this target ministry aims to achieve 70% of peak load of electricity from renewable energy sources from all inhabited islands. This project facilitates to achieve this objective in Kulhudhufushi. This project when implemented will achieve 93% of peak load of electricity from renewable energy sources in Kulhudhufushi.</p> <p>The selection of islands are based on a policy decision. As this is utility scale project, for this project priority was given for larger islands with bigger population and hence more electricity demand. Outside the capital region Kulhudhufushi is the third most populous city in Maldives.</p>
<p>Alternatives considered <i>(different ways to meet the project need and achieve the project purpose)</i></p>	<p>While as alternatives the GoM can explore other sources of renewable energy like wind or floating solar, in terms of the currently trailed and developed technology and context in country, Solar PV on land is most viable in terms of environment condition of Maldives, available technology and costs. In terms of renewable energy costs, utility scale solar PV is at USD 0.068 per Kilowatt- hour (kWh), for onshore wind it was USD 0.053/kWh and for offshore wind ) USD 0.115/kWh <sup>1</sup>. Cost of Solar PV is progressively falling with 82% decline from 2010 to 2019, compared to this wind energy decline 40% within the same period. Even though inshore wind is cheaper at current rate, at an urban area like the proposed solar PV is more ideal considering the scenic impacts, electromagnetic interference and noise impacts.</p> <p>Global Horizontal Irradiance (GHI) is the total amount of shortwave radiation received from above by a horizontal surface. This value is of particular interest to photovoltaic installations and is used to determine potential of geographical areas for solar PV installation. Research suggests GHI values for Maldives are consistently high, with an average between 5.4.kWh/m<sup>2</sup> and 5.7 KWh/m<sup>2</sup>. The highest GHI is identified in the South of the archipelago, where average daily sums exceed 5.6 kWh/m<sup>2</sup> (yearly sum about 2050 kWh/m<sup>2</sup>) and more. The season of highest irradiation with daily sums above 6.2 kWh/km<sup>2</sup> lasts three months (from February to April). Second season of higher solar radiation, with daily sums from 5.3 to 5.6 kWh/m<sup>2</sup>, is found in a period from August to October <sup>2</sup>.</p> <p>Priority was given to attain land for the purpose of the project. However as Kulhudhufushi is an island with high demand for land, in addition to airport it was not possible to secure land spaces, hence as mentioned in project description some roof spaces are utilized. ■</p>

**. Project Description**

Proposed start date	April 2021
Proposed completion date	March 2022
Estimated total cost	Total cost will depend on the investor selected. However, approximately it will be around USD 1.8 million for construction

<sup>1</sup> source: <https://www.irena.org/publications/2020/Jun/Renewable-Power-Costs-in-2019>

<sup>2</sup> source: <https://www.esmap.org/node/3298>

<p>Present land ownership</p>	<p>Land is owned by regional airports. MOU is signed with regional airports to secure the land. The MOU is provided in Annex 6 of this screening report.</p> <p>For the roofs MOU has been signed with roof owners (Annex 6).</p> <p>The MOU guarantees the following key points:</p> <ul style="list-style-type: none"> <li>✓ Agreement between ME and the landowner securing the sites</li> <li>✓ Utilize any fees that is acquired through the sites via the investor for the benefit of the community</li> <li>✓ Resolution of issues that arise during project implementation through the Grievance Redress Mechanism (GRM) and disputes through the lease or license agreement</li> <li>✓ Ensuring that no cost will be incurred by the council for the purpose of project implementation.</li> </ul>
<p>Description of the project <i>(with supporting material such as maps, drawings etc attached as required)</i></p>	<p>The project involves installation 1.5MW of ground mounted Solar PV in Kulhudhufushi (Annex 1). The project will be implemented by an investor selected through a bidding process. Annex 1 shows the map of solar installation sites. Above section on adjacent land provides additional details regarding the overall area of installation.</p> <p>The general procedure involved in installation of ground mounted structure are described below:</p> <ol style="list-style-type: none"> <li>(1) Site clearance if any</li> <li>(2) Foundation works (pad footings or screw piling)</li> <li>(3) Erection of steel structure</li> <li>(4) PV installation including</li> <li>(5) Installation of inverters, meters and protective equipment</li> </ol> <p>As for rooftop installation the steps involve the following:</p> <ol style="list-style-type: none"> <li>(1) Installation of substructure</li> <li>(2) PV module installation</li> <li>(3) Installation of inverters, meters and protective equipment</li> </ol> <p>Once the panels are installed. The connection will occur to the grid of Kulhudhufushi. Which will involve underground burying of cables. An outdoor transformer will be placed at each location to step-up the voltage to deliver the renewable energy to the utility grid.</p> <p>For detailed description check Annex 2.</p>
<p>Project Management Team</p>	<p>The project management team from the Ministry of Environment side includes the following members:</p>



	<p>Maumoon Khalid: Project Manager</p> <p>Thaalooth Rasheedh: Financial Management Specialist</p> <p>Mohamed Hamdhaan Zuhair: Environmental and Social Safeguards Specialist</p> <p>Abdulla Afsal: Procurement Management Specialist</p> <p>Ifaad Waheed: Communications Specialist</p> <p>Akram Waheed: Senior Energy Specialist</p> <p>Nuzhath Ahmed: Project Coordinator</p> <p>Aminath Hanaan Mohamed: Monitoring and Evaluation Specialist</p>
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## **B. Site Description Questionnaire**

### **1. Site Setting and Land use/Ownership**

- a) Who is the owner/occupier of the site (refer to land registry/title deed)?

The land area of airport is owned by Regional Airports. Details of the building ownership is provided in Table 1 above. The MOUs signed with land/building owners are provided in Annex 7 of this screening report.

- b) What is the current land use of the site?

Refer “adjacent land and features” subheading above for details.

- c) When was the site first developed to the current land use?

- (1) Airport: Kulhudhufushi airport was officially inaugurated on 22<sup>nd</sup> September 2018
- (2) Kulhudhufushi Regional Port: Was officially inaugurated on 05<sup>th</sup> December 2005.
- (3) Kulhudhufushi Fish Market: Construction was completed in July 2020.
- (4) Kulhudhufushi Ferry Terminal: Construction was completed in July 2020.

- d) What is the historical land use of the site prior to the current development of the site?

All these are located in recently reclaimed land, hence this was lagoon space prior to reclamation.

- e) What is the current land use of the properties surrounding the vicinity of the site and adjacent to the site? (Request for land use plan with planned developments at the island/note land use during site vicinity walk around);

Described in detail for each site under “Adjacent land features” above.

### **2. Consultations with island council/local communities and civil society organization**

Minutes of the meeting undertaken with the council is provided in Annex 3. Outcomes of the online social survey that was undertaken in coordination with the council for the purpose of screening is attached to Annex 4.

For this environmental screening phase, consultation was undertaken with the council and an island wide survey was undertaken online by coordinating with the Kulhudhufushi council. At the time of the survey only the airport location was finalized hence, views of the public was not attained on the additional buildings that are proposed for PV installation. The buildings were identified later on once the need for additional space was identified following technical assessments. Public views on these buildings, especially building users will be attained during the ESIA preparation stage. The details of these are provided in Annex 3 and 4 respectively.

A total of 164 responses were received from Kulhudhufushi for the survey. This represents around 1.7% of the resident population. Despite the efforts to involve more women by the council by distributing the survey to women specific social media groups, majority of the respondents were men with 78.70% of the respondents. Once the covid restrictions are eased, during future assessments and engagements targeted consultations with women will be undertaken as specified in stakeholder engagement plan for the project. Majority of the respondents are youth of the island with 18 to 45 years being the dominant age group. In terms of employment the majority of those who are surveyed are employed (84.1%).

Based on the survey results, overall it can be seen that the public of Kulhudhufushi are very keen and positive regarding the project. With 95.1% of the surveyed public suggesting that Solar PV installation is beneficial. The text analysis done identified inherent environmental benefits of Solar installation and expectation for reduction in cost of electricity as the main benefits.

In terms of location, 75% of the survey respondents are happy with the location. Issues raised by those who were concerned, include impacts on aviation safety, impacts on wetlands, preference of some to move all the panels to the northern side of the runway, preference of some to install panels on homes and usability of space underneath the panels. All these have been responded and addressed in the survey report. The key mitigation measures to address these concerns include the following:

- (1) Aviation safety: Glare assessment has been completed. The panels will be angled as per the restrictions identified through assessment
- (2) Impacts on wetland: No vegetation will be removed from the wetland area. The construction workforce will be briefed on the sensitive nature of the area. Relevant boards will be installed at the site providing guidance.
- (3) Move all the wetlands to northern area: this will require removal of vegetation, as wetland area removal of vegetation is not favourable.
- (4) Home installation: home installation can occur through the net metering system.

***Additional information required from island council:***

**1) *Current and projected population;***

The resident population for Kulhudhufushi City Predicted for 2020 (based on Maldives Population Prediction 2014 to 2054)

Total: 9560

Male: 4711

Female: 4849

**2) *Number of households (and Empty houses);***

As per the latest census of 2014 the number of households includes the following:

8282 households (note: the number of empty houses information is not available in the census data) .

**3) *Planned development activities; (please see section above and attached Land use plan in Annex 5)***

4) ***Present employment by industry;*** As per household income and expenditure survey of 2016 which has data for Haa Dhaal atoll as a whole the distribution is as follows:

Agriculture: 10%

Other Industry: 28%

Service: 61%

5) ***Income distribution;***

Based on household income and expenditure survey of 2016 for Haa Dhaalu atoll Labour Force Participation rate is 56.1 % and as per the survey on average women earn MVR74.89 per hour while men earn on average MVR99.26 per hour

6) ***Public health status.***

A tertiary hospital is located in Kulhudhufushi which caters for the health needs of the whole atoll. The hospital have the following departments:

- ✓ Pediatrics
- ✓ General Medicine
- ✓ Internal Medicine
- ✓ Dentistry
- ✓ Anesthesiology
- ✓ Obstetrics and Gynecology
- ✓ ENT
- ✓ Surgery
- ✓ Cadiac centre
- ✓ Radiology
- ✓ Internal Medicine
- ✓ Speech Therapy
- ✓ Ophthalmology
- ✓ Neurology
- ✓ Psychiatry
- ✓ Dermatology

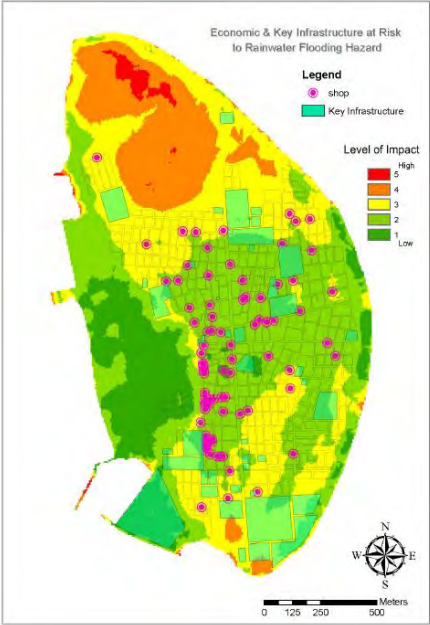
**C. Screening for Potential Environmental Impacts in relation to the proposed project intervention**

	Screening question	Yes	No	Significance of the effect  (Low, moderate, high)	Remarks
<b>Section A: General</b>					
1	Will construction and operation of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in water bodies, etc)	Yes		Low	<p>No significant change is expected as for land use, as the PV panels are planned to be installed in locations where planned and existing land use are complemented or are installed in locations where land cannot be used for any other purpose.</p> <p>In this regard the location is in airport boundary and cannot be used for any other purpose due to height restrictions, the panels will be installed close to ground level in line with the Obstacle limitation Surface (OLS) map provided by Maldives Civil Aviation Authority.</p> <p>The rest of the areas selected are roof spaces, hence no land use change is anticipated for these locations, as PV installation compliments existing land use.</p>
2	Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?	Yes		Moderate	<p>In terms of storage will include the storage of panels, concrete, aggregates, cables and wiring, steel members, water proofing agents, any other treatment chemical approved by civil engineer and small quantities of used oil and fuel for batching plant may be stored temporarily.</p> <p>Risks may include the following:</p> <ul style="list-style-type: none"> <li>➤ Risk of spills from fuels, chemicals, waste oil and other hazardous materials used during construction phase.</li> <li>➤ Health risks associated with storage, handling and transport of Solar PV.</li> </ul>

					<ul style="list-style-type: none"> <li>➤ Health and safety risks associated with construction work</li> <li>➤ Glare risks during operation phase to aircrafts that use the airport and also the air traffic control tower.</li> <li>➤ Risks to aircraft and airport operations while working in the airport.</li> <li>➤ Risk to building owners while installation is undertaken on the rooftops.</li> </ul>
3	Will the Project produce solid wastes during construction or operation?	<b>Yes</b>		<b>Moderate</b>	<p>Waste generated during construction phase can be categorized as construction waste and general waste.</p> <p>Construction waste will involve packaging, excess soil from earth works, used oil from vehicles and batching plant and any leftover material from cutting material (eg: cut wires, pieces of steel etc). Any construction waste can be first checked whether it can be reused within the island. Whether the island community needs it can be checked through the council. Any remaining waste can be transferred to Regional Waste Management Facility at Thilafushi.</p> <p>General Waste will involve food waste and other general day to day waste from the workers. This waste will be managed through the Island Waste management stream.</p> <p>As for operational phase Solar Panels once the lifetime is up will be a significant waste. The investor may want to replace some panels during operational phase to increase efficiency. In general the life of a Solar panel is expected to be around 25 to 30 years.</p>
4	Will the Project release pollutants or any hazardous,	<b>Yes</b>		<b>Low</b>	Overall, as it is a renewable energy project the project will facilitate to

	toxic or noxious substances to air?			<p>improve air quality, as emissions from diesel powerhouses will be reduced.</p> <p>However, some negative emissions can occur from vehicles used in the project during both construction and operational phase.</p> <p>In addition, dust will become an issue, especially during concrete mixing works, if pad footings are to be used for construction of land structures. When crystalline silica particles from concrete are inhaled for a prolonged period it can cause diseases like Silicosis, Lung Cancer, Chronic obstruction pulmonary disease and kidney diseases.</p> <p>As all construction materials need to be imported, this again increases the carbon footprint of the project.</p> <p>As Maldives, at present, does not have a hazardous or E-waste management facility, once the lifetime of the panels are up it needs to be transferred to a facility in another country. This transfer will increase the carbon footprint of the overall project. However, there is a chance that such a facility will be there before the 20 to 30 year lifetime of the installed panels are up.</p>
5	Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?	<b>Yes</b>	<b>Low</b>	<p>For construction phase for land structures, if pad footings are used noise will be generated, especially during concrete mixing.</p> <p>However, significant noise is not anticipated other than this at the construction site, as pad footings are considered at this stage as the preferred foundation method. However, if piling method is decided following detailed design, depending on method, it will lead to significantly more noise impacts. Even if piling, screw piling method</p>

					<p>needs to be considered first if practical as it leads to significantly less noise.</p> <p>As for rooftop installation, some minimal noise maybe generated during installation period. However, rooftop installations are not expected to take significant time. All work activities need to be undertaken at a time agreed with the roof owners.</p> <p>As for ground mounted structure at the airport, at a conceptual level pad footings are considered as the preferred foundation method (see Annex 1 project description). Hence vibration impacts are unlikely to occur if this method is adopted. However if piling is undertaken vibrations can occur. If piling is considered during detailed design stage, screw piling needs to be preferred where practical as it causes considerably less vibration. Moreover, feasibility and ground condition needs to be considered if piling is to be undertaken.</p> <p>Moreover, as mentioned previously as the ground mounted structure is constructed in an airport all requirements of the airport operator and aviation security command needs to be met.</p> <p>As for operational phase, glare will be the main issue of concern at the airport site.</p>
6	<p>Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater or coastal waters?</p>	<b>Yes</b>		<b>Low</b>	<p>Contamination during construction phase is likely from leakages that may arise from any chemicals, or hazardous waste that is stored (this primarily include water proofing agents, any other approved admixtures used for concreting and used oil).</p>
7	<p>Will the project cause localized flooding and poor drainage during construction?</p> <p>Is the project area located in a flooding location?</p>	<b>Yes</b>		<b>Moderate</b>	<p>Localized flooding can only become an issue during ground installation and cable laying works.</p> <p>If not properly leveled following construction of panels and cable laying can lead to localized water accumulation.</p>

					<p>In terms of project being located in a flooding area, this will be mainly a concern for ground mounted installation at the airport, as rest are planned to be installed on rooftops.</p> <p>As airport was built in reclaimed wetland, this area is located in one of the most flood prone areas of the island. However, following reclamation not much impact is anticipated for the southern section. However since the Northern section is close to the waterbody some impacts can occur.</p> <p>Given below is a flood map of Kulhudhufushi that was done prior to airport construction (source: <a href="https://www.environment.gov.mv/v2/en/download/4616">https://www.environment.gov.mv/v2/en/download/4616</a>)</p> 
8	Will there be any risks and vulnerabilities to public safety due to physical hazards during construction or operation of the Project?	Yes	<b>High to Moderate</b>		<p>Some of the risks the public may be exposed during the construction phase include the following:</p> <ul style="list-style-type: none"> <li>➤ Falling to open pits</li> <li>➤ Open pits at project site left for a long time can lead to mosquito breeding</li> <li>➤ Electrocution due to open wiring</li> </ul>



					<ul style="list-style-type: none"> <li>➤ Falling objects as the project involves working at heights.</li> <li>➤ Damage to roof when undertaking PV installation on rooftops.</li> <li>➤ Unattended equipment left in site without proper supervision leading to public use accidents and hazards.</li> <li>➤ Chemicals (this primarily include water proofing agents, any other approved admixtures used for concreting and used oil) at site left unattended can expose the public to health hazards.</li> <li>➤ Exposure to dust from concrete mixing (if pad footing method is used).</li> </ul> <p>During operational phase the main risks to the public can be identified as follows:</p> <ul style="list-style-type: none"> <li>➤ Risk of damage to the structure due to lack of maintenance can lead to compromising the structure, which in turn can become a public health hazard. Especially since the site is close to sea special attention should be paid to maintenance issues related to rusting.</li> <li>➤ The transformer if not enclosed can lead to electrocution risk to public.</li> <li>➤ Risk of damage to roofs during maintenance works undertaken for installation of roof panels.</li> <li>➤ Glare impacts from the airport site to aviation if the appropriate angles are not maintained.</li> <li>➤ Potential risk of fire due to faults in electronic equipment.</li> <li>➤ Potential risk of lightning</li> </ul> <p>During this screening stage the perceived risk increased attraction of birds to PV panels were investigated, especially since the installation is made at an airport site. There is very literature on this, however a study undertaken by DeVault <i>et al.</i></p>
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					(2014) in US airports with PV installation suggest that PV arrays will not likely increase risk of damage by bird strike at most locations.
9	Are there any transport routes on or around the location which are susceptible to congestion or which cause environmental problems, which could be affected by the project?	<b>Yes</b>		<b>Low</b>	<p>Transport route impacts are described for each site below:</p> <p>(1) Airport: Works will be undertaken in the airport boundary hence significant road closures are not expected. Road closures during cable laying works are also not anticipated as the route is very small (see Annex 1).</p> <p>(2) Kulhudhufushi Port Limited roofs: Again works will be undertaken within the port boundary, hence significant impacts are not anticipated. However, during cable laying some road crossings may occur which can lead to road closures (note route of cable not finalized for this site yet).</p> <p>(3) Ferry Terminal and Fish market roofs: As works will be undertaken on the roof for Solar PV installation road closures are not anticipated or disruption to transport not anticipated. However, during cable laying works if road crossings are involved road closures can occur (note route of cable not finalized for this site yet).</p>
10	Are there any routes or facilities on or around the location which are used by the public for access to recreation or other facilities, which could be affected by the project?	<b>Yes</b>		<b>Moderate</b>	Some of the roofs that were identified are common public access areas. This includes the ferry terminal and fish market. It is essential that appropriate safety measures are undertaken while working in these locations to ensure that the public that use these facilities are not impacted.

					<p>The airport and port location installations are likely to have minimal impacts on the public as it will occur within the boundary of these two sites.</p> <p>The cable laying involved for interconnection can lead to some temporary disruptions of activities undertaken by the community. However, works will be planned such that disruptions are minimal.</p>
11	Are there any areas or features of high landscape or scenic value on or around the location which could be affected by the project?	<b>Yes</b>		<b>Low</b>	<p>Scenic value is likely to be impacted only on the airport site, as in all other sites rooftops are used for PV installation.</p> <p>The airport site as mentioned previously is located within a wetland area. However as mentioned previously the area has already been reclaimed so the scenic value has already been disrupted. The project will be undertaken within the footprint of the reclaimed land, hence additional scenic disruptions are not anticipated.</p>
12	Are there any other areas on or around the location which are important or sensitive for reasons of their ecology e.g. wetlands, watercourses or other water bodies, mountains, forests which could be affected by the project?	<b>Yes</b>		<b>Moderate</b>	<p>The airport is located within a wetland area. Sandwiched between two ponds of the wetland (see site map in Annex 1). Several true mangrove species are known to be found in this wetland area including, Black Mangrove (<i>Lumnitzera Racemos</i>), <i>Rhizophora apiculate</i> and small-leafed orange mangrove (<i>Brugeria cylindrical</i>).</p> <p>In terms of fauna, bird species such as Maldivian pond heron, Cattle Egret and eastern grey heron are found to frequent the area.</p> <p>The wetland also have keystone species, such as crabs and hermit crabs. Moreover introduced fish species like Tilapia and milk fish could be found in the ponds.</p>
13	Is the location within or adjacent to the coastal zone? If so, what is the distance to the coast?	<b>Yes</b>		<b>Low</b>	<p>In terms of proximity to the coastal zone for each site is described below:</p>

					<p>(1) Airport Location: northern section is 120 meters from the coastal zone</p> <p>(2) Kulhudhufushi Port Limited: The closest building selected is the guardhouse which is right adjacent to the harbour basin.</p> <p>(3) Fish Market: Fish market building is right adjacent to quaywall harbour.</p> <p>(4) Ferry Terminal: Ferry terminal is right adjacent to quaywall harbour.</p> <p>Considering the distances and since rest of the buildings are close to the harbour no major impacts are envisioned.</p>
14	Are there any areas on or around the location which are used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, migration, which could be affected by the project?	<b>Yes</b>		<b>Moderate</b>	<p>See question 12</p> <p>Impacts on migratory birds (if any) that use the water bodies of the wetland needs to be investigated during EIA preparation phase. Based on a quick literature review major impacts in this regard are not envisioned.</p>
15	Are there mangrove, coral reef, sea grass bed, turtle beach habitats etc within close proximity?	<b>Yes</b>		<b>Low</b>	See question 12
16	Is the project located in a previously undeveloped area where there will be loss of green-field land		<b>No</b>	<b>N/A</b>	No vegetation is expected to be removed from any of the locations.
17	Will the project cause the removal of trees in the locality?		<b>No</b>	<b>N/A</b>	No vegetation is expected to be removed from any of the locations.
18	Can any of the identified historic or culturally importance sites on or around the location be affected by the project?		<b>No</b>	<b>N/A</b>	No known culturally or historically sensitive sites within close proximity of all the three sites.
19	Are there existing land uses on or around the location e.g. homes, gardens, other private	<b>Yes</b>		<b>Moderate</b>	“Adjacent landuse” is described above. However since the ground mounted solar PV location is within airport boundary

	property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining or quarrying which could be affected by the project?				and since the remaining are on the rooftop disruptions are likely to be minimal. During rooftop installation some minor disruptions may occur especially in public use buildings like ferry terminal, and fish market..
20	Are there any areas on or around the location which are densely populated or built-up, which could be affected by the project?		<b>No</b>	<b>N/A</b>	None of the proposed areas are densely populated. Its either within boundary of port, airport or within recently reclaimed land.
21	Are there any areas on or around the location which are occupied by sensitive land uses e.g. hospitals, schools, places of worship, community facilities, which could be affected by the project	<b>Yes</b>		<b>Low</b>	As identified previously Kulhudhufushi Regional Hospital is located 50 meters south of the local market location.  Since the works undertaken will be on the roofs and during day time any disturbances to the hospital is likely to be negligible.
22	Are there any Defence Installations / Airport Routes	<b>Yes</b>		<b>Moderate</b>	See section A questions 5 & 8.
23	Are there any areas on or around the location which contain important, high quality or scarce resources e.g. groundwater, surface waters, forestry, agriculture, fisheries, tourism, minerals, which could be affected by the project?		<b>No</b>	<b>N/A</b>	No Known such sites found closeby to any of these locations.
24	Are there any areas on or around the location which are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, which could be affected by the project?		<b>No</b>	<b>N/A</b>	No known such locations closeby to any of these sites.

25	Will the project involve treatment of Solid Waste, if so indicate the amounts, nature of waste and briefly describe proposed waste management technologies to be implemented on site.		<b>No</b>	<b>N/A</b>	Does not involve treatment of Solid waste, construction waste will be required to be transferred to regional waste management facility at Thilafushi, any domestic general waste generated by the construction work force will be managed through the island waste stream to be managed at island waste management centre.
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**Section B: Specific Screening Questions on Floating Solar**

3	Water body identified for floating solar is lagoon, coastal water way, harbor/jetty area or other, please provide details in the comments of the site			<b>N/A</b>	
4	Is the identified water body is used for water supply?			<b>N/A</b>	
5	Is the identified water body used for fishing activities?			<b>N/A</b>	
6	Is the identified water body used for any other human activity, such as recreation, docking of boats etc?			<b>N/A</b>	
7	Will the project activity restrict access to the water body or lead to safety concerns?			<b>N/A</b>	
8	Will the establishment of the Solar PV lead to aesthetic issues on site.			<b>N/A</b>	

**Section C: Social Impact Screening**

1	Will the project create significant/ limited/ no social impacts? If so please provide details of what they will be.	<b>Yes</b>		<b>Moderate</b>	Based on the survey results (Annex 4), overall it can be seen that the public of Kulhudhufsuhi are very keen and positive regarding the project. With 95.1% of the surveyed public suggesting that Solar PV installation is beneficial. The text analysis done identified inherent environmental benefits of Solar installation and expectation for reduction in cost of electricity as the main benefits.  In terms of location, 75% of the survey respondents are happy with the location. Issues raised by those who were concerned, include impacts on aviation safety, impacts on wetlands, preference of some to move all the panels to the
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					<p>northern side of the runway, preference of some to install panels on homes and usability of space underneath the panels. All these have been responded and addressed in the survey report. Similarly, in terms of impacts, issues raised regarding damage to buildings, livelihood, labour force, traffic, vegetation and groundwater can be adequately addressed.</p> <p>In terms of social impacts, the project can be seen as mostly beneficial. The key benefits can be summarized below:</p> <ul style="list-style-type: none"> <li>✓ As rate is much cheaper than diesel, the government can make savings in terms of huge subsidy paid to provide electricity through diesel. This savings can be used by the government for beneficial projects.</li> <li>✓ The lease/license fee received by the council is conditioned to be utilized for social beneficial project of the community.</li> <li>✓ Jobs creation within the local community. As through project agreements the investor is required to prioritize locals. With enough PV projects implemented nationally, there is likelihood of reduction of electricity prices nationally. Price of electricity in Maldives is set nationally.</li> </ul> <p>The potential negative impacts are mostly related to construction phase. These impacts are already covered in section A question 8.</p>
2	Land acquisition resulting in loss of income from agricultural land, plantation or other existing land-use.		<b>No</b>	<b>N/A</b>	Only government owned land and buildings will be utilized for the purpose of the project.
3	Land acquisition resulting in relocation of households.		<b>No</b>	<b>N/A</b>	see above


4	Cause any reduction of access to traditional and river dependent communities (to river and areas where they earn for their primary or substantial livelihood).		<b>No</b>	<b>N/A</b>	
5	Cause any displacement or adverse impact on tribal settlement(s).		<b>No</b>	<b>N/A</b>	See question 2
6	Lead to any specific gender issues.	<b>Yes</b>		<b>Low</b>	<p>Like any project there can be gender based violence associated with staff of the construction workforce. However considering the scale and timeframe of work and scarcity of such incidents in other such construction projects in the sector the significance can be determined as low.</p> <p>As for operational phase, to address the gender gap in the energy sector a Gender Action Plan (GAP) was developed for the project. The plan acknowledges and identifies the importance of training women through activities undertaken in the project.</p> <p>The gender response for the survey in kulhudhufushi resulted in more responses from Males. Furthermore gender focused consultations will be undertaken during ESIA/ESMP preparation stage.</p>
7	Will the project create significant / limited / no Social impacts during the construction stage?	<b>Yes</b>		<b>Moderate</b>	Risks already covered in section A question 8 and section C question 1.
<b>Section D: Impacts of Construction</b>					
1	Will the project lead to flooding of adjacent areas		<b>No</b>	<b>N/A</b>	No, further details have been provided in section A question 7
2	Will it involve the improper storage and handling of substances leading to contamination of soil and water	<b>Yes</b>		<b>Low</b>	Further details have been provided in section A question 6



3	Will the activity lead to elevated noise and dust emission?	<b>Yes</b>		<b>Low</b>	<p>Considering the scale of works will be very limited and only minor nuisance to the public. Noise generated will be mostly due to operation of installation machinery and from batching plant.</p> <p>Dust will mostly be generated during concrete mixing process.</p>
4	Will project activities lead to disruption to traffic movements	<b>Yes</b>		<b>Low</b>	As identified previously during cable laying works some roads may have to closed temporarily for a short period of time and traffic may need to be redirected.
5	Will project activities lead to damage to existing infrastructure, public utilities, amenities etc.	<b>Yes</b>		<b>High to Moderate</b>	<p>As the project involves digging and certain amount of cable laying, during construction phase possibility of chance damage is there. This may include damage to sewer pipes, telephone cables, cable TV lines and water pipes. In such a scenario temporary disruption of these services may occur to certain households. Thus, it is important to attain prior knowledge of existing cables and service pipe locations of the island. Pathway of such cables are often not known making this process difficult and risky</p> <p>Moreover as work is undertaken is some buildings damage to roofing of such buildings may occur during construction phase. Such issues are addressed in the roof lease agreement.</p>
6	Possible conflicts with and/or disruption to local community	<b>Yes</b>		<b>Low to Moderate</b>	<p>The following issues may arise:</p> <ul style="list-style-type: none"> <li>As highlighted accidental damages to cables and utility lines may occur. This may lead to disruption of service to public.</li> </ul>

					<ul style="list-style-type: none"> <li>• Accidental damage to roof during panel installation on the buildings.</li> <li>• Disruption to operation of ferry terminal and fish market if panel installations are not appropriately timed and planned.</li> <li>• Conflicts may occur if any human health impacts occur to the public due to negligence of construction work force.</li> <li>• Moreover, especially if foreign work force is involved conflicts may occur with local community.</li> <li>• The Labour Management Procedures developed for the project needs to be followed to address these issues (link: <a href="https://www.environment.gov.mv/v2/en/download/10026">https://www.environment.gov.mv/v2/en/download/10026</a>).</li> </ul>
7	Are there adequate facilities for storage of construction goods & materials	Yes		Low	Kulhudhufushi city have ample reclaimed land which is underutilized at the moment. These areas can be used for temporary site setup during construction phase. The investor will have to confirm the site for temporary storage and work setup from the council prior to mobilization. An alternative will be to use existing warehouse spaces for this purpose.
8	Will need to establish facilities for storage of any hazardous material	Yes		Low	Possibly the contractor may have chemicals such as water proofing agents, concrete admixtures, waste oil that needs storing.
9	Facilities for long term housing for operational workers		No	N/A	<p>For a facility like this not much operational staff is required. The investor will be encouraged to employ local staff within the island for the project, or the investor staff maybe based in capital Male' and may visit these sites for routine inspections.</p> <p>Investors will be encouraged to train and involve local community during operational phase of the project as per the contracting arrangements. Therefore it is</p>

					unlikely that there will be a need for long term housing of operational workers on site.
10	Will the construction works (Permanent & Temporary) lead to alterations of the site	Yes		Moderate	<p>The works will involve installation of permanent ground mounted PV panels and roof panels. Thus alterations will occur to these sites. However these can be seen as primarily positive, as the ground mounted PV are installed in a location which cannot be used for any other purpose and relatively new roof structures are used for roof installations. Some studies indicate that installation of PV panels help to prolong the life of the roof as it reduces harsh elements (sunlight, wind, rain) from directly encountering the roofs.</p> <p>Moreover, temporary digging is involved during construction phase.</p>
11	Are facilities for construction workers (temporary labour camp, drinking water, waste disposal, etc.) required during implementation	Yes		Moderate	<p>As suggested above reclaimed land of the island maybe used as temporary location for worker facilities in addition to storage, an alternative will be to rent a property by the investor.</p> <p>For labour camps some environmental and social risks that are involved can be summarized as below:</p> <ul style="list-style-type: none"> <li>➤ Lack of sanitation and clean drinking water at the project site.</li> <li>➤ Over congestion of work force in a small space can lead to disease and other such outbreaks. Often foreign labour in Maldives are housed by contractors in unhygienic and inhumane conditions.</li> <li>➤ Lack of access to shower facilities.</li> <li>➤ Food being served in unhygienic conditions.</li> <li>➤ Lack of availability of adequate meals.</li> <li>➤ Lack of clearly demarked designated areas for waste disposal can lead to unhygienic living/working environment which can lead to disease etc.</li> </ul>

					<ul style="list-style-type: none"> <li>➤ Areas in living and working quarters where water can collect can lead to mosquito breeding which in turn can lead to outbreak of mosquito borne diseases within the work force.</li> <li>➤ Pest infestation in the work space and living quarters can lead to unhygienic working/living conditions and can lead to serious disease outbreaks.</li> <li>➤ If foreign labour is involved social conflicts with the community due to differences in culture.</li> <li>➤ If project undertaken during Covid 19 situation. Chance of transmission of Covid from the workforce to the community.</li> </ul>
12	Are facilities for disposal of solid waste available on the Island- please specify the forms in the comments	<b>Yes</b>		<b>Moderate</b>	<p>The island waste management centre of Kulhudhufushi is located on the southern end of the island (see below).</p>  <p>As identified previously all the domestic waste produced by the workers will be managed through the island waste management stream, while construction waste will need to be transferred to regional waste management facility in Thilafushi.</p>
<b>Section E: Cumulative Impacts</b>					
1	Cumulative effects due to proximity to other existing or planned projects with similar impacts	<b>Yes</b>		<b>Moderate</b>	<p>Kulhudhufushi being a rapidly developing island which achieved city status recently, many new developments are underway, especially in the reclaimed land of the island where most of rooftop PV installations are to be undertaken.</p>

					Hence cumulative impacts from construction workforce can occur. Hence it is important that a grievance redress mechanism specific to the project is implemented and the locations where project workforce is housed, store materials and construction activities are undertaken are properly delineated.
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### 8. Project operating requirements

		Yes	No
24	Does the project belong to a prescribed category of the Environmental Protection Authority for EIA		No, But screening will be undertaken in parallel to this World Bank screening
25	Does the project need to obtain clearances from agencies such as the EPA, Island Council, Atoll Council etc :	<p>Yes. The following approval have already been attained (see Annex 7 and 8):</p> <ol style="list-style-type: none"> <li>1. MOU signed with council confirming the roofs of fish market, local market and ferry terminal.</li> <li>2. MOU signed with regional airports confirming the location of PV installation in airport.</li> <li>3. MOU signed with STO confirming STO Warehouse location</li> <li>4. MOU signed with Kulhudhufushi Ports Limited confirming the buildings at the port site.</li> </ol> <p>In addition screening document will be submitted to EPA for a screening decision.</p> <p>As per the ESMF of the project following screening the investor will undertake the required assessments.</p>	

### 9. Conclusion and Screening Decision

#### Summary of environmental effects:

Assuming that all mitigation measures are implemented as proposed, the following effects can be predicted

	N/S - Effect not significant, or can be rendered insignificant with mitigation
✓	SP - Significant positive effect
	SN - Significant negative effect
	U - Outcome unknown or cannot be predicted, even with mitigation

**10. Screening Decision Recommendation (check one):**

	<p>All potentially adverse effects can be classified as general construction related impacts and are mitigatable with known technology and operational impacts are minimal. Public concern does not warrant further assessment.</p> <p>Therefore, standalone Environmental and Social Assessment not required, an Environmental and Social Management Plan would be required prior to the project proceeding.</p> <p><b>An indicative mitigation plan to the identified risks are provided in Annex 9</b></p>
✓	<p>Potential adverse impacts are significant, hence, a standalone Environmental and Social Impact Assessment, including an Environmental and Social Management Plan is needed before the project can proceed</p>
	<p>Potential adverse impacts are significant, hence project cannot be justified</p>

**11. Details of Persons Responsible for the Environmental Screening**

**Screening report completed by:**

**Name and Designation:** Mohamed Hamdhaan Zuhair (Environmental and Social Safeguards Specialist, Ministry of Environment)

**Date:** 07<sup>th</sup> October 2020



**Signature:**

**Screening report reviewed by:**

**Name and Designation: Maumoon Khalid, Project Manager**

**Date:** 07<sup>th</sup> October 2020

**Signature**



**Approved by: (Approved by the World Bank through email)**

**Name and Designation:**

**Date:**

**Signature:**

## Reference

DeVault, T. L. et al. Bird use of solar photovoltaic installations at US airports: implications for aviation safety. *Landsc. Urban Plan.* 122, 122–128 (2014).

## 2 Annex 1: Location Map













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### 3 Annex 2 Project Description

#### 3.1 Accelerating Sustainable Private Investment in Renewable Energy (ASPIRE)

The Government of Maldives, since 2009, has embarked on a policy to achieve low carbon development and reduce dependence on fossil fuel. One of the approaches to achieve these targets is through scaling-up of renewable energy resources, particularly solar and wind energy.

The Maldives being one of the pilot countries of the Scaling-Up Renewable Energy Program in Low Income Countries (SREP), an Implementation Plan (IP) was submitted to the Climate Investment Fund (CIF) on October 2012. This SREP-IP, which was endorsed in November 2012 sub-committee, aims to “develop renewable energies on a large scale, to effectively contribute to poverty reduction and sustainable development”.

Thus, a program called Accelerating Sustainable Private Investment in Renewable Energy (ASPIRE) has been conceptualized within the boundaries of the SREP and policies of the government. This program aims to encourage involvement of private parties in the renewable energy sector of the Maldives. The program will combine technical assistance with private sector investment, to scale-up the deployment of PV based generation on the islands.

The aim of ASPIRE project is to encourage and facilitate private investments in the RE sector by addressing the barriers, namely:

- Associated high risk of investing in RE sector such as high capital investments with repatriation of profits.
- Limited local familiarity with the technology
- Little private sector exposure to the institutions in the sector
- Lack of fully evolved regulatory framework in the sector
- Domestic capital has little experience and/or appetite for investing in this sector
- Small scale of power distribution and dispersed investment projects make it difficult to attract private sector and to reach economies of scale.

This is the third subproject implemented under ASPIRE operations following successful 1.5 MW and 5 MW bid awarding.

#### 3.2 General Description of the project

The project involves installation 2 MW of ground mounted solar PV in Kulhudhufushi city.

For Kulhudhufushi both land and rooftops have been selected for solar PV installation. In terms of land the airport location has been selected for installation (see Annex 1 for map).

1. Airport Location: An area of 16792 m<sup>2</sup> from two sections. The northern section 9766 m<sup>2</sup> and for southern section the area is 7026 m<sup>2</sup>.

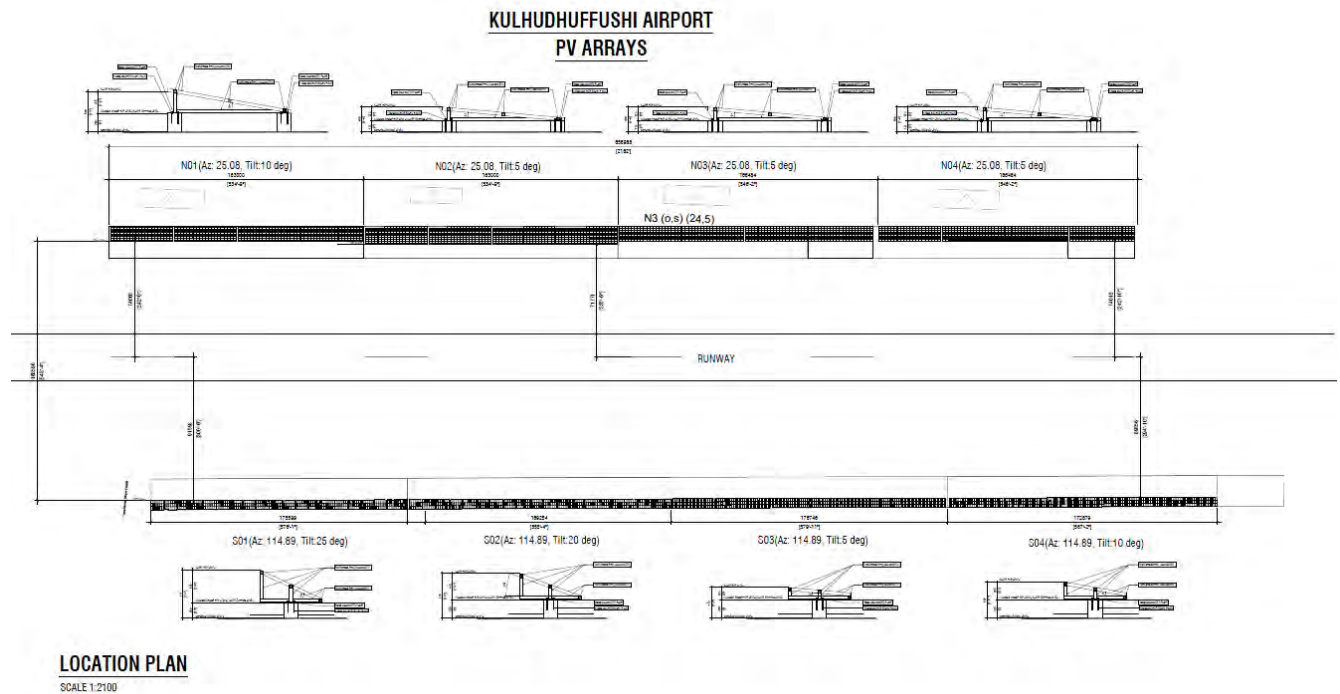
For buildings the details of the buildings, the area and the owner details are provided below (see Annex 1 for site map).

TABLE 2 ROOF SPACE AND OWNER DETAILS

Building Name	Square Area (m <sup>2</sup> )	Owner
KPL Warehouse	1443	Kulhudhufushi Ports Limited
KPL Baggage Area	115	Kulhudhufushi Ports Limited
KPL Security Hut	29	Kulhudhufushi Ports Limited
Ferry Terminal	624.39	Kulhudhufushi Council

Building Name	Square Area (m <sup>2</sup> )	Owner
Fish Market	384.78	Kulhudhufushi Council

### 3.3 General Method Statement for construction (Ground Mounted PV)



#### 3.3.1 General

This statement will focus on describing the general process of planning, organizing and implementation of ground mounted structures for solar PV. The method described here is for pad footing, however following detailed design by the investor another method maybe used.

#### 3.3.2 Purpose

Plan, design and build the project parameters as per schedule and delivering a successful outcome. This methodology will briefly explain on how the design stage and construction stage would be carried out. Anticipated difficulties and limits can be identified and tackled in due time giving way to progressive work.

#### 3.3.3 Scope

Scope of works associated with this project are

- 1- Site Preparation
- 2- Foundation works
- 3- Erection of steel structure
- 4- Installation of solar panels

### 3.3.4 Site Preparation

Upon site handover, all setting out points, benchmarks, site rails, pegs and other survey points shall be clearly marked and protected from damage or disturbance during the execution of the works. Benchmarks and levels shall be verified by the Contractor and approved by the client. The Contractor will also check the site surveys for dimensional and level accuracy and reporting any discrepancies before building work commences. Working areas shall be cleared from any vegetation or trees or any property of island council. Only necessary trees need to be removed, smaller trees and shrubs should be relocated to another location. For every tree removed, two trees need to be planted at a location identified by the client upon consultation with the island council. Strictly following client instructions for clearance. Special attention given to services running underground.

### 3.3.5 Foundation

#### 3.3.5.1 Excavation works and Backfilling

Once the site footing has been marked and approved by the client, excavation work is to commence. Initially, the water table level of the island shall be identified, and if dewatering is to be carried out, it shall be done following EPA guidelines and the island council's regulations and instructions. Special consideration to be taken not to excavate below the required depth and not disturb the soil below or surrounding the foundation footings. Excavation shall be done while supporting the excavated areas by an approved shoring procedure.

Before backfilling is done to the excavated area, all concrete surface shall be applied with approved bituminous waterproofing as per clients approval. Backfilling shall be done in layers of 150mm and to be compacted between layers.

#### 3.3.5.2 Lean concrete

Upon completion of excavation works to foundation depth, the surface shall be leveled and compacted to receive lean concrete. Mix ratio for lean concrete shall be in the proportion 1:2:6 (cement: fine aggregate: coarse aggregate) by dry volume. Lean concrete shall be mixed with concrete mixer and completed without breaks in between for a single footing. An approved Damp-proofing membrane to be applied to the top of lean concrete.

#### 3.3.5.3 Formworks

Formwork shall be performed to obtain accurate concrete following the design drawings. Formworks are to comply with an approved standard. Formwork shall be firmed and secured to bear the force of concreting and tightened to avoid cement paste seeping.

Sheathing for formwork shall be waterproof film-coated plywood of not less than 12 mm thick. Joint of sheathing shall be butt joint and firmly assembled.

The minimum period for keeping the forms in position and for watering after laying the concrete shall be 24hrs for the pad footings and column stumps.

Forms shall be removed in such a manner as to ensure the complete safety of the structure so that there is no shock or vibration as would damage the reinforced concrete.

#### 3.3.5.4 Placing of Reinforcement

All reinforcement shall be inspected by the client and approved before concrete is placed in the forms. Reinforcement intended for contact when passing each other shall be securely tied together with binding wire. The binders shall tightly embrace the longitudinal reinforcement to which they shall be securely bound. Binding wire shall be turned in from the formwork and shall not project beyond reinforcing bars.

The cutting, bending and fixing of the reinforcement to follow an approved standard. They shall be cleaned before use so that it is free from rust, oil, dirt or other coatings that reduce bond.

General specifications shall comply with the requirement of an approved standard and follow the specification of the design drawings.

Nominal reinforcement cover shall be minimum 50mm and maximum 75mm.

#### 3.3.5.5 Concrete

Before placing of concrete, all the areas where concrete is to be deposited shall be cleaned, and sheathing shall be sprinkled with water. Subsequently, water accumulated in the form shall be removed.

The concrete mix shall be done by batching plants and delivered to site through transit mixer trucks or mixed on-site with approval of the client.

Maximum free fall of concrete to be maintained below 1.5 meters, from mixer truck to foundation footings.

Once placed, concrete shall be compacted using vibrators with adequately sized pokers. Spare Vibrators shall be made ready at the site for contingencies. Concrete compaction shall be done until the mortar fills the spaces between the coarse aggregates and begins to cream up to form an even surface when this condition is achieved, vibration shall be stopped at compaction area and continued to the next pouring area. The vibrator shall not be operated on the same spot for more than 30 seconds at the same spot.

The maximum time interval between placements of continuous concreting shall not be more than 0.5 hours. However, when special measures are taken, this time limit may be changed according to the instruction or approval of the client. The time limit from start of mixing to completion of placing of a batch, as a rule, shall be 30 minutes. All joints for columns and beams shall be kept rough.

Concrete mix ratio for reinforced concrete shall be as per grades specified in the drawings.

After the concrete has been placed, the concrete surface shall be kept moist by spraying with water for curing for at least 4 days for pad footing and 7 days for column stumps.

#### 3.3.5.6 Testing

##### **Slump test**

Upon delivery of concrete by transit mixture truck, before placement slump test will be done to ensure w/c ratio and consistency of concrete.

The slump cone is filled to a quarter depths and tamped 25 times. Filling and tamping are repeated three more times until the cone is full and the top smoothed off. The cone is removed, and the slump measured, for consistent mixes the slump should remain the same for all samples tested



### Cube test

150 x150 x150mm concrete cubes will be taken from different concrete batches and tested for compressive strength. Cubes shall be taken from different mix batches. Each mould will be filled in three equal layers; 35 strokes with a tamping bar will tamp each layer. The samples will be covered with a damp sock and left for 24hrs before removing the mould. Samples will be wet cured for 7days and 28 days for testing, respectively.

### 3.3.6 Bolted connections

If the superstructure connection with substructure requires bolted connections, it is extremely important that anchor bolts be placed accurately in accordance with the anchor bolt setting plan. All anchor bolts will be held in place with a template or similar means, so they will remain plumb and in the correct location during placing of the concrete.

### 3.3.7 Erection

Erection will shall be done by completing bay by bay. The proper completion and plumbing of this first bay is extremely important. Although several methods are used to erect rigid frames, the best practice is to erect the columns first, tie them together with the girts and tighten the anchor bolts.

After the columns have been erected, the rafter/tie beams is hoisted into place and connected to the columns. The flange brace will be bolted to the rafter prior to raising in order to save time. The hoisting equipment should never be released from the rafter/tie beams until the frame is adequately braced, so it cannot buckle or tip.

### 3.3.8 Lifting cables and spreader bars

In all instances the length of the lifting cables should be such that the angle between the rafter and the lifting cables is no less than 45 degrees .To reduce the severe compression stresses at the ridge of the rafters that are created by the angle of lifting cables, a spreader bar is recommended, which allows the lifting cables to be parallel to each other (Figure 1).

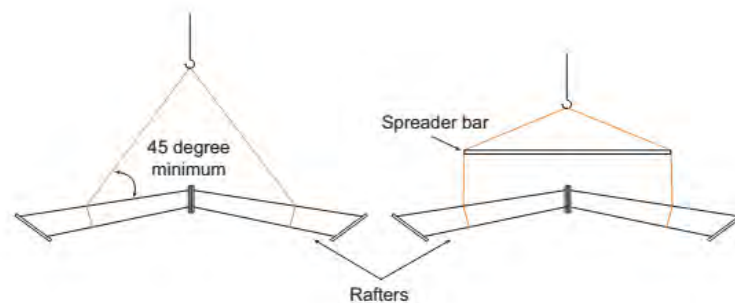


Figure 5. Hoisting cables.

### 3.3.9 Completing and Plumbing the first bay

After the first intermediate or interior frames have been set, all purlins, rafters and girts shall be installed in the braced bay and the entire bay plumbed, aligned and braced before proceeding further. If the structure is designed without cable bracing, temporary bracing shall be provided (Figure 2). When this bay is properly and accurately plumbed and braced, the remaining members, to a large degree, will automatically plumb and align when installed. Only a final check of the building plumb remains, and few adjustments, if any, will be necessary.

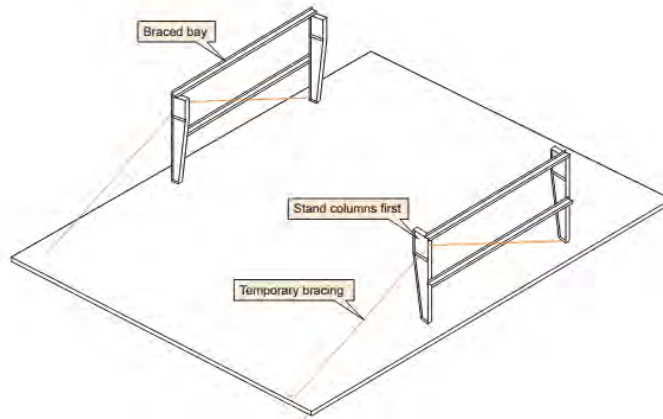


Figure 6. Bay erection and temporary bracing.

### 3.3.10 Precautions when erecting frames

- 1- Rigid frames, especially free ends or cantilevered sections should never be left “for the day” in an unsupported, unbraced or unguyed condition .Such practice has resulted in the total loss of considerable amounts of erected steel because of wind.
- 2- Additional care required in the erection of lighter sections. They are much more apt to buckle during erection, and consequently require greater care in rigging and handling.
- 3- Hoist cable capacity to be verified before hoisting to ensure the cable has the required tension capacity to carry the steel sections.

### 3.3.11 Installation of Panels

Panel installation shall only start after completing the steel structure with bracing and purlins. All connections shall be tested and approved before panel installation.

## 3.4 General Method Statement for construction (Rooftop Solar PV)

Given below is a general method statement for PV panel installation:

### 3.4.1 Installation of Mounting Structure

- PV modules will be mounted on substructure in portrait orientation (bottom side of the module facing towards lower edge of the roof) using mounting clamps.
- Substructure crossbars will be made of aluminium and will have a height of ~60 mm in order to allow ventilation of PV modules (see figure 1).
- Mounting clamps (see figure 2 and 3) will be made of aluminium and will have a height matching requirements due to module frame dimensions.
- Substructure crossbars will be mounted on raised bead of tin roofs using rubber buffers and sealing rivets in order to prevent corrosion of existing tin roofs and water seepage (see figures 1, 4 and 5).
- Each substructure crossbar will be mounted on two raised bead of the tin roofs only. This will avoid damages to tin roofs or substructure due to different expansion coefficients of steel plate tin roof and

aluminium substructure crossbars. Resulting length of substructure crossbars is ~460 mm each, which equals distance between two raised beads plus 50 mm on each end as additional mounting space (see figure 6).

- All cables will be attached to substructure crossbars cable ties in order to prevent sags into deep corrugation spaces as well as contact with tin roof sheets in general. Wherever potentially exposed to sunlight/UV radiation, cables will be guided and covered using cable ducts or protective and UV resistant pipes.

#### 3.4.2 Rooftop PV Installation Procedure for each building

- Set-up of stair tower and skip hoist for roof access
- Set-up of anti-fall guard
- Preparation of report of previous/existing roof damages (incl. photo documentation)
- Measuring of positions for substructure installation
- Installation of substructure
- Installation of cable ducts (roof to inverters)
- Installation of DC cables (roof to inverters) incl. mounting of cable connectors
- Installation of monitoring cables (inverter to inverter via roof)
- Installation of grounding cables (roof to ground, inverters, to ground) and ground rod
- Installation of PV modules (mounting, installation of DC connections)
- Installation of inverters (mounting, DC connection)
- Installation of protective equipment (for inverters etc.)
- Installation of metering equipment (mounting, inverter connection, grid connection)
- Preparation of measuring reports/test records for each PV unit as well as for the whole plant
- Installation of monitoring units (mounting, cable connections, initial operation)
- Initial operation of PV unit
- Final inspection and acceptance of PV units

### 3.5 Health and Safety

An independent scaffolding shall be erected to each external faces of the structure. Anyone working on or visiting the site will be required to wear safety helmets and operatives will use other protective clothing (PPE) depending on the type and location of work. The safety supervisor shall attend regular meetings with the planning supervisor and cooperate with site regulations to maintain the client's good safety record. The contractor should comply with the Health and Safety Regulation (2019/R-126) and should comply with the Labour Management Procedure developed for the project.

Care should always be taken when working with panels. Use safety lines and nets when necessary.

Storage and handling of panels shall be supervised at all times and panels shall never be used to walk on or as a platform.

Precautions shall be taken to secure structure during assembly. Temporary bracing may be required to stabilize the structure during erection. The structure shall never be left unbraced at any point during the erection process.

### 3.5.1.1 Schedule of Implementation

The construction phase of the project is expected to take around 08 to 10 months. The investor will operate the facility 15 years and will handover to Fenaka. Maintenance of the panels will be undertaken by the investor during this 15 year period and afterwards by Fenaka.

## 3.6 General Method Statement Cable Laying and Transformer Installation

This subcomponent involves connecting the panels to the existing grid of Kulhudhufushi. The diagram below provides the preliminary cable routes.



FIGURE 8 INTERCONNECTION DETAILS FOR AIRPORT SITE



FIGURE 9 INTERCONNECTION DETAILS FERRY TERMINAL AND PORT AREA

The following procedure will be followed by investor/contractor when laying the cables:

- Before trenching, the Contractor will obtain information on already existing power cables, communication cables, cable TV cables and sewerage and water mains will be gathered and the route of such cables and pipes identified on the land use plan.
- The Contractor will safeguard the existing infrastructure of various service providers, during trenching. Claims and liabilities arising from such damages will be the responsibility of the Contractor. The Contractor will also be responsible for making good any damage caused by him to public property. Work will be carried out in a manner which will ensure the safety of both the public and the workers.
- Both sides of the trench will be either sloped or protected by other means in accordance with the soil conditions encountered and the safety regulations to be observed.
- Cable lying in open trench for more than two weeks shall be protected against the radiation of the sun.
- Open trenches will be properly secured by red warning tapes on both sides along the trench. Flashing orange colour lights clearly visible from a reasonable distance will be placed around the open trench, at night.
- Cable trench will be cleaned from dirt etc. before closing.
- Trenches will be closed as soon as possible to avoid excessive ingress of dirt, damage and inconvenience to the pedestrians and traffic.

Detailed step by step procedure for cable burying and backfilling is described below:

- First, the trench will be excavated to a depth of 1 m.
- Then the trench will be filled with 100mm thick layer of clean or screened sand. The power cables will be laid on this layer.
- The trench will then be filled with a thick layer of clean or screened sand covering the power cables.
- A yellow plastic warning tape shall then be laid on this layer for the entire length of the cable route, followed by a soft layer of sand carefully rammed. The yellow plastic warning tape will have printed in black the following message;

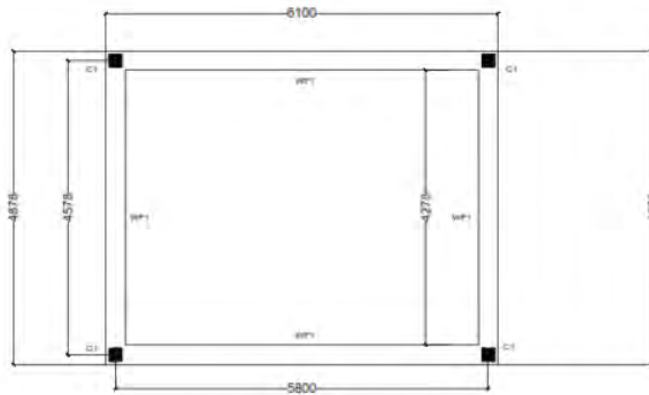
CAUTION CAUTION CAUTION

ELECTRIC CABLE BELOW

- The printing will be repeated at intervals not exceeding 500mm and shall be of adequate font size as per relevant standards. The tape will be made up of polyethylene for durability and shall have a width of at least 150mm.
- The filtered sand will be free from roots, debris, trash and other organic matter.
- In places where LV and MV cables share the same trench, the depth of the trench will be increased to 1100mm. Then after making a bed of 100mm thick layer of clean or screened sand (similar to LV cables), the MV cables will be laid first. The trench will then be filled with 200mm thick layer of clean or screened sand covering the MV power cables. The LV cables shall be laid on this layer and continued as described above.
- Only excavated material for trenching will be used for backfilling. If additional material required imported sand will be used, no sand will be dredged or mined for the purpose of this project.
- The trench will be filled and levelled by the contractor to the existing level prior to trenching.

### 3.6.1 Transformers

A transformer will be placed in each of the PV installation sites. The outdoor transformer will be placed on a concrete slab of 5 meters by 4 meters. The transformer will be fully enclosed. Foundation details of the transformer slab is provided below.



Foundation Details



FIGURE 10 TRANSFORMER ON CONCRETE SLAB

The transformer will be placed on a concrete slab. The following will be the basic method followed for construction of slab:

1. Clear and Level the required area
2. Add around ¾ inch gravel layer

<b>Subject:</b>	<b>Public Consultation regarding ARISE and solar PV installation locations</b>
<b>Date:</b>	July 12, 2020
<b>Location:</b>	Online
<b>Start Time:</b>	13:00
<b>End Time</b>	14:00
<b>Participants</b>	Kulhudhuffushi City Council and PMU

3. Install achor barriers and rebar
  4. Pour concrete, set wall or container anchors
  5. Level the concrete
- The transformer will not be accessible to the public.
  - Appropriate warning signs will be displayed outside of the transformer hut.

## 4 Annex 3: Council meeting Minutes

AGENDA ITEMS
<ul style="list-style-type: none"> <li>• Survey to be disseminated to public</li> <li>• Queries on the project</li> </ul>
DISCUSSION POINTS
<ul style="list-style-type: none"> <li>• A brief introduction was given on the purpose of the survey and Ministry of Environment (ME) requested Council to share the survey on the Councils' Facebook page and other online community groups of the island. ME requested to use any other platforms that would increase the reach of the</li> </ul>

survey to its maximum. Council stated that they can undertake physical survey and considered it a very effective method. ME informed that the target of the survey is to reach 10% of the population.

- The site selected for Solar PV installation was shared with Council and the council responded with approval for the site. ME informed of the other components of the project inclusive of grid upgrading and BESS installation.
- Further ME requested to coordinate with the Women Development Committees of the island to increase the reach of the survey to women as typically the number of females responding to survey deemed less. ME suggested to coordinate with schools in order to increase the response for the survey and the council agreed to the method.
- ME proposed the new swimming area that is being developed as a potential solar PV installation site that will provide shading as well. Council stated that the design stage is almost finished however experiencing certain delays due to Covid-19. Council supported the suggestion and agreed to check the possibility of incorporating the solar PV installation during the design stage. ME mentioned that it could serve as an attraction site as well. Council to provide a decision on the matter.
- ME requested to appoint a focal point regarding the survey and the Council president to share details through email after meeting.
- Council inquired regarding the starting date of the project. ME informed that the Prequalification (PQ) has been published and the bidding process is expected to finish mid-2021. ME further informed of the pipeline phases including grid upgrading and BESS installation and stated that the project is still in the formulation stage and formal approval and signing is expected to be completed by the end of this year.

#### OUTCOMES

- Council to share the survey on Council Facebook page and online community groups and coordinate with schools
- Council to share the focal point for the survey.
- Council to provide a response regarding solar PV installation in the newly developing swimming area.

#### Attendees Information List:

#	Institution	Name	Designation	Email
1	Kulhudhuffushi City Council	Abdul Latheef	President	
2	Ministry of Environment	Hamdhaan Zuhair	ESS Specialist	hamdhaan.zuhair@environment.gov.mv
3	Ministry of Environment	Nuzhath Ahmed	Project Coordinator	<a href="mailto:nuzhath.ahmed@environment.gov.mv">nuzhath.ahmed@environment.gov.mv</a>
4	Ministry of Environment	Ifaadh Waheed	Communications Officer	<a href="mailto:ifaadh.waheed@environment.gov.mv">ifaadh.waheed@environment.gov.mv</a>
5	Ministry of Environment	Aminath Hanaan Mohamed	Monitoring and Evaluation Officer	<a href="mailto:aminath.hanaan@environment.gov.mv">aminath.hanaan@environment.gov.mv</a>





## 5 Annex 5: Social Survey Report

### 5.1 Introduction and Background

#### 5.1.1 Objectives

This report is prepared to outline the outcomes of the social survey that was undertaken for the interventions planned for HDh. Kulhudhufushi under Accelerating Renewable Energy Integration and Sustainable Energy (ARISE) project funded by the World Bank and other development partners. The key activities planned for Kulhudhufushi are as follows:

1. Solar PV installation for 02 MW PV
2. Battery Energy Storage System (BESS) Installation of 04 MWH
3. Grid Upgradation

Solar installation will be undertaken by an investor selected through competitive bidding. While BESS installation and grid upgradation will be undertaken through an EPC contractor selected by Project Management Unit (PMU). As per the ESMF the required social and environmental assessments following screening for Solar PV installation will be undertaken by the investor. While for BESS and grid upgradation these assessments will be undertaken by PMU.

The survey was undertaken to fulfill the requirements under the 6.2.2 of the Environment and Social Management Framework (ESMF) prepared for the project and section 5.1 of the Stakeholder Engagement Plan (SEP) developed for the project.

#### 5.1.2 Island Characteristics

Kulhudhufushi city is the most populous island north of Maldives. With a resident population of 9560. It is the most recent island to receive the city status. Located in the eastern side of Haa Dhaalu (Thiladhunmathi Dhekunuburi) Atoll on geographic coordinates of 6°37'0"North and 73°3'0"East. The land area of the island is 247 Hectares (ha). The length of the island is approximately 2.5 km and 0.89 km in width.

The most significant natural feature of the island is existence of two wetland area. The larger one is in the northern end and small one in the south end of the island. Several true mangrove species are known to be found in this wetland area including, Black Mangrove (*Lumnitzera Racemos*), *Rhizophora apiculate* and small-leafed orange mangrove (*Brugeria cylindrical*). Most dense vegetation exists near the wetland area and eastern side of the island. The wetland area on the north of the island was reclaimed in 2018 and an airport was built in this location. It caused lot of controversies both nationally and internationally.

Kulhudhufushi is seen as the northern most hub of Maldives, with many from HA, Hdh, Shaviyani atoll moving to the island to meet education and health needs. Being an economic hub, most people in Kulhudhufushi are involved in retail and wholesale business.

### 5.2 Methodology

#### 5.2.1 Data Collection

A conference call was held with the island council on 12<sup>th</sup> July 2020. In the meeting the council was requested to circulate the survey through social media groups. Importance of getting a balanced view from both genders was highlighted and the council was requested to make extra effort to attain views of women. The council highlighted that full support will be provided by the council for the survey and highlighted that adequate response can be attained from the public. The minutes of the meeting is attached to Annex-1 of the report.

The council distributed the survey to public viber groups. The survey was publicized through the council official facebook page and the facebook page of the ministry as well.

Several news articles were also published promoting the survey. In this regard, articles regarding the social surveys undertaken under the project were published through the following local online news platforms:

Media Report about Community Survey on 6 islands – [avas.mv](https://avas.mv)

<https://avas.mv/85484>

Media Report about Community Survey on 6 islands – Public Service Media

<https://psmnews.mv/71144>

Media Report about Community Survey on 6 islands – [iru.mv](https://iru.mv)

<https://iru.mv/171026>

### 5.2.2 Analysis

Microsoft excel was used to analyse the data and develop the graphs for all the quantitative data collected through the survey.

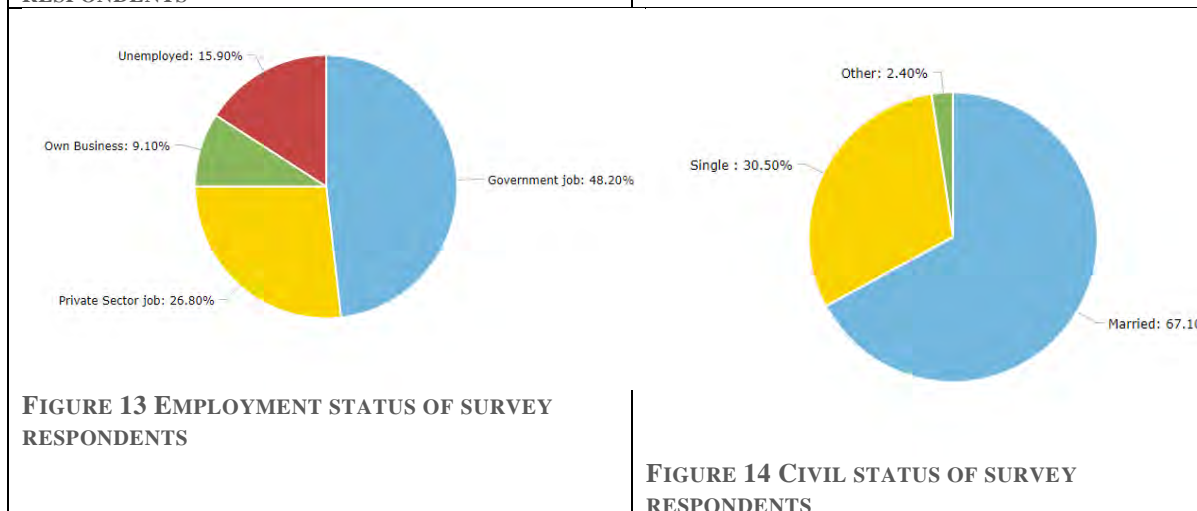
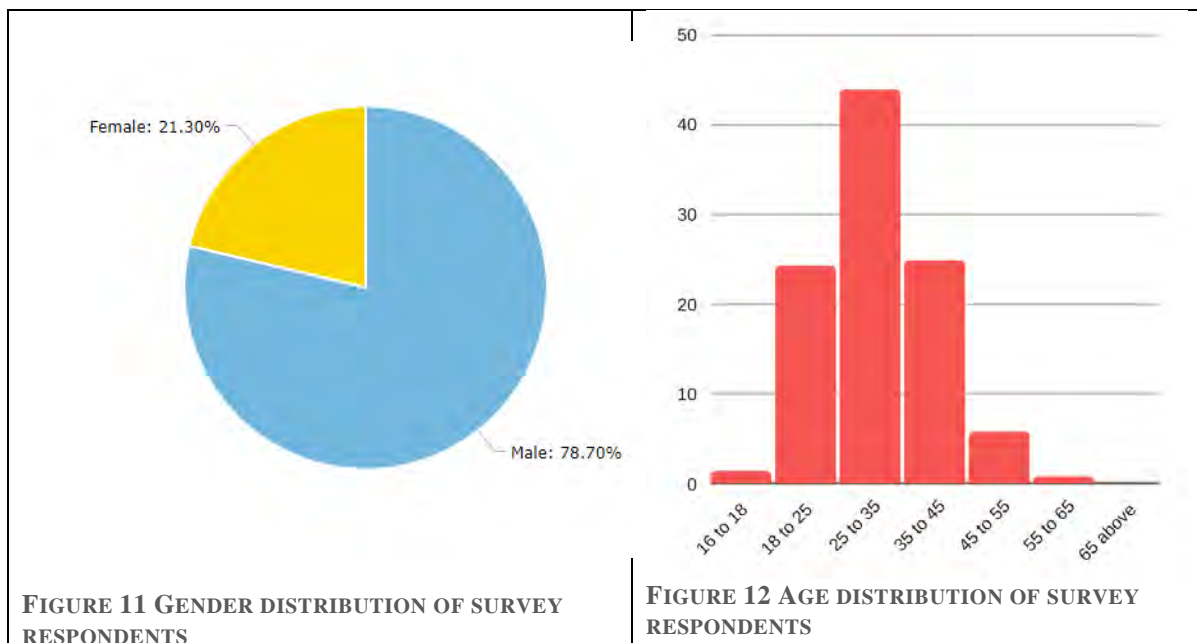
Cost of electricity per person was calculated by dividing the average bill information provided by the respondents by the number of persons in the household.

As for text analysis, on aspects in which there was significant text input from the public, word cloud analysis was done using monkeylearn online tool (<https://monkeylearn.com/word-cloud/>) to determine significant words and phrases used to determine public sentiment regarding the issue explored.

For rest where there is no significant data the few concerns that were raised were just collated for analysis.

## 5.3 Results and Discussion

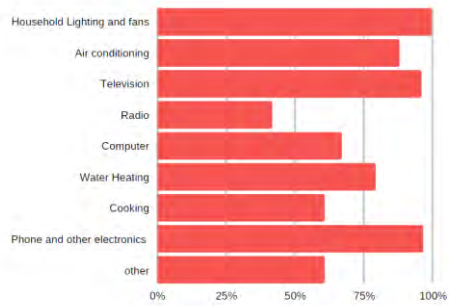
### 5.3.1 General characteristics



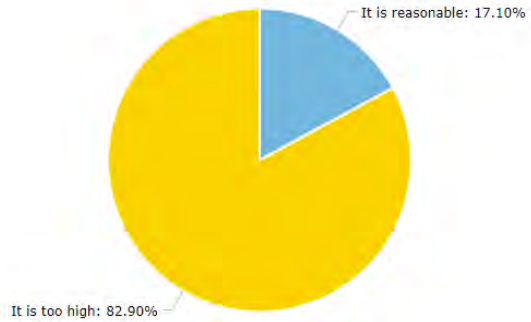
A total of 164 responses were received from Kulhudhufushi for the survey. This represents around 1.7% of the resident population. Despite the efforts to involve more women by the council by distributing the survey to women specific social media groups, majority of the respondents were men with 78.70% of the respondents (Figure 1). Once the Covid restrictions are eased, during future assessments and engagements targeted consultations with women will be undertaken as specified in stakeholder engagement plan for the project.

Majority of the respondents are youth of the island with 18 to 45 years being the dominant age group (Figure 2). 67.1 % of those who are surveyed are married figure 4. In terms of employment the majority of those who are surveyed are employed (84.1%). In terms of sector of employment, the majority of the respondents were government sector employees, with 48.2% of survey respondents (Figure 3).

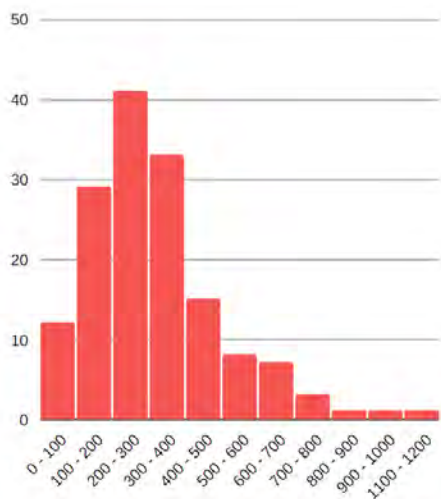
### 5.3.2 Electricity usage and reliability



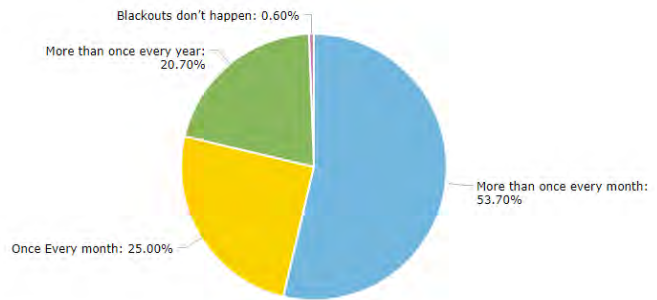
**FIGURE 15 HOUSEHOLD USAGE OF ELECTRICITY**



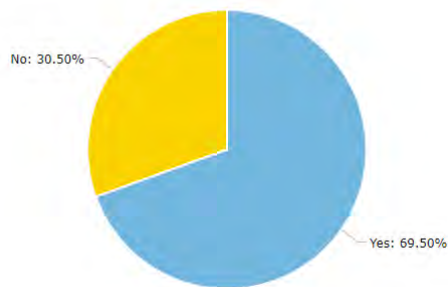
**FIGURE 16 VIEW ON PRICE OF ELECTRICITY**



**FIGURE 17 COST OF ELECTRICITY PER UNIT HEAD**



**FIGURE 18 FREQUENCY OF BLACKOUTS**

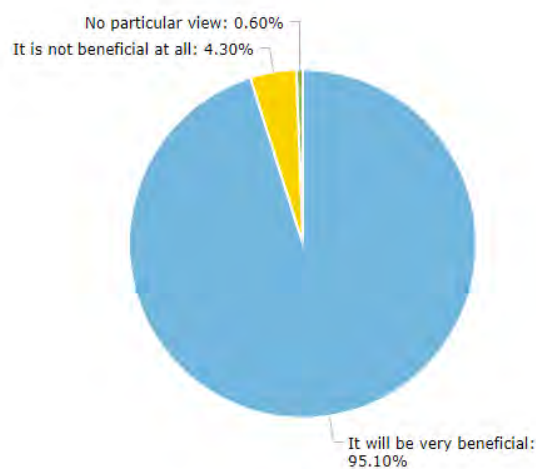


**FIGURE 19 DAMAGE TO ELECTRICAL APPLIANCES DUE TO BLACKOUTS**

This section presents the results from questions 6 to 11 (Annex 1) of the survey. As seen on Figure 5 household lighting, fans, air conditioning, television, water heating and charging electronic devices are the main aspects to which electricity is used in the households of Kulhudhufushi. More than 70% of survey respondents use electricity for these purposes (Figure 5). In addition, more than 50% of the respondents use electricity for cooking and computer operations (Figure 5). 82.90% of the respondents believe that the existing price of electricity is too high (Figure 6). On average per head MVR 100 to MVR 400 is spent on electricity on a monthly basis (Figure 7). In terms of blackouts 53.70% of the survey respondents suggested that electricity goes more than once every month (Figure 8). 69.50% of survey respondents suggested that electrical appliances have been damaged due to blackouts. Multiple project interventions planned, through grid upgradation, BESS system and solar PV installation will likely reduce these negative impacts related to blackouts that the surveyed community perceived to be experiences.

## 5.4 Perception on the Project

This section presents the results from 12 to 20 of the survey. This section identifies public perception on the proposed project interventions.



**FIGURE 20 BENEFITS OF SOLAR PV**

95.10% of those who were surveyed identified that the Solar PV installation undertaken through the project will be very beneficial (Figure 10). Only 4.30% of the respondents believe that the project will not be beneficial.

Based on the text analysis that was undertaken the primary benefit that the public identified as a result of PV installation is potential bill reductions and the inherent environmental benefits associated with Solar PV (Figure 11). As the word cloud analysis suggests that predominantly phrases like, “electricity bill”, “cost of electricity”, “environment” and “environmental” were the phrases used by the majority of the survey respondents (Figure 11). In addition many respondents also highlighted that the project will reduce dependency on fossil fuels for power generation (Figure 11). This also in turn leads to environmental and cost benefits. Hence, the two key reasons that the public supports this project can be summarized as below:

1. Inherent environmental benefits of the project
2. Expectation that a good change will occur to cost of electricity

As electricity is provided by a huge fuel subsidy the aim of the government is to reduce this subsidy through projects like this with the long-term aim of reducing the price of electricity. An immediate change in price in electricity may not occur as a result of the project, thus through the various communications undertaken through the project this needs to be clearly highlighted. Moreover, education awareness programs can be undertaken to show the environmental benefits that occur as a result of the project.



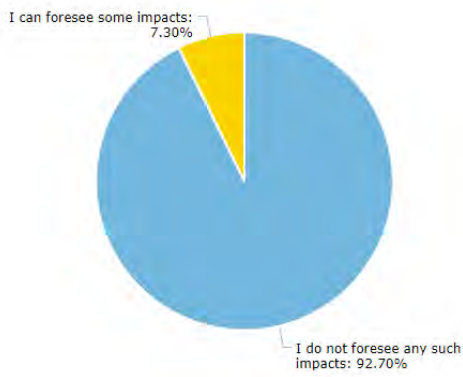




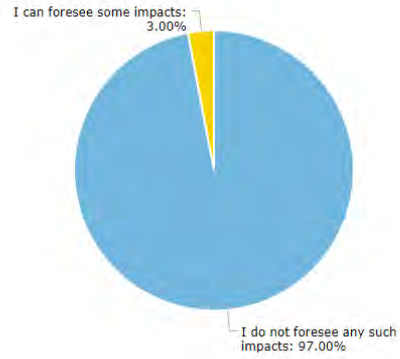
Issue Raised	Response to the concern
<b>Safety concern due to location being in the airport</b>	The panels will be angled such that glare will not become an issue. Glare assessment will be done and approval from Maldives Civil Aviation Authority attained.
<b>Concerns that it might damage the remaining part of the Kulhiduhfushi wetland</b>	All project activities will be undertaken within the already reclaimed land of Kulhiduhfushi. Workers will be instructed on strict working measures to ensure that no damage occurs to the wetland.
<b>No future land for airport expansion</b>	The location was given by regional airports taking into consideration any airport expansion plans that may exist
<b>Prefer all panels being installed in northern side of the runway</b>	The project did not consider further installments in northern side as it will require vegetation removal. It was not found favorable from an environmental perspective to remove vegetation from a wetland area.
<b>Would be better if underneath the panels could be used by the public</b>	As airport boundary public cannot use the area. Plus need to ensure that height restrictions of the airport are adhered.
<b>Want some in our homes too</b>	This is a utility scale project hence government land and buildings are used, home installations through the net metering system is promoted by the government

## 5.5 Perception on Environment and Social Impacts

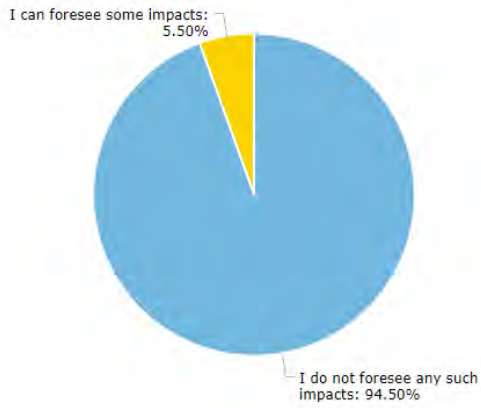
This section looks into the perception of the public in relation to potential environmental and social impacts related to the project. It relates to question number 20 and 36 of the survey. Figures below present the outcomes of the survey.



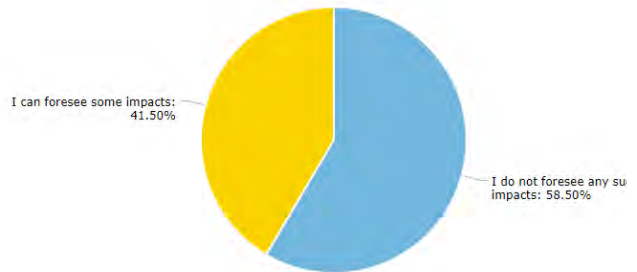
**FIGURE 25 POTENTIAL IMPACTS ON PUBLIC AND PRIVATE PROPERTY AS A RESULT OF THE PROJECT**



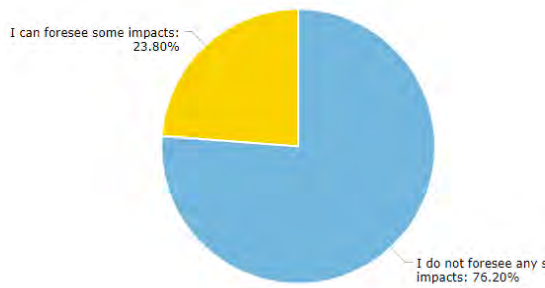
**FIGURE 26 POTENTIAL IMPACTS ON THE LIVELIHOOD AS A RESULT OF THE PROJECT**



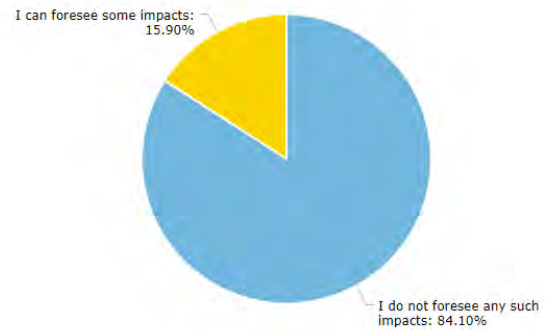
**FIGURE 27 POTENTIAL IMPACTS ON SAFETY**



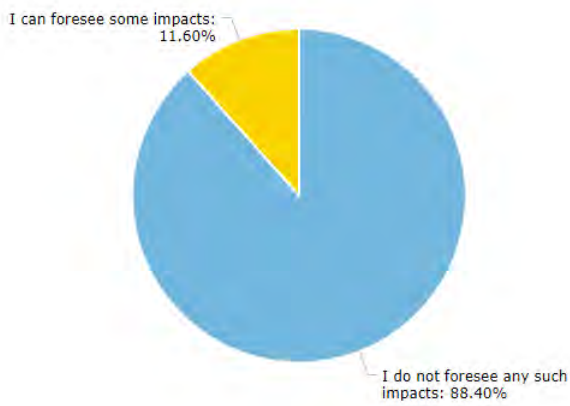
**FIGURE 28 POTENTIAL IMPACTS RELATED TO LABOUR FORCE**



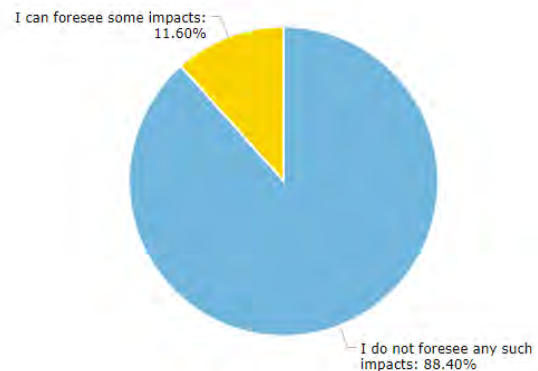
**FIGURE 29 POTENTIAL IMPACTS RELATED TO VIBRATION, NOISE AND DUST**



**FIGURE 30 POTENTIAL IMPACTS ON TRAFFIC**



**FIGURE 31 POTENTIAL IMPACTS ON VEGETATION**



**FIGURE 32 POTENTIAL IMPACTS ON GROUNDWATER**

As can be seen from the graphs the public do not foresee significant major negative impacts to arise as a result of this project. Of the few that raised concerns the table below summarizes the issues raised by the survey respondents for each of the impacts surveyed.

Aspect	Raised Issue or Concern
<b>Impacts on property</b>	<ul style="list-style-type: none"> <li>➤ One respondent highlighted that in previous projects due to digging walls of some houses has been damaged.</li> </ul>
<b>Impacts on livelihood</b>	<ul style="list-style-type: none"> <li>➤ Two respondents highlighted regarding loss of existing jobs in the sector</li> <li>➤ One respondent highlighted salary of Feneka staff has already been reduced due to this further reduction may occur</li> <li>➤ One respondent highlighted increase in electricity prices due to the project</li> </ul>
<b>Impacts on Safety</b>	<ul style="list-style-type: none"> <li>➤ Two respondents highlighted the concern regarding glare risks to aircrafts</li> <li>➤ One respondent highlighted that as a previously wetland area, the area might be unstable and the concrete footings may fall when it rains.</li> </ul>

<p><b>Impacts of labour Force</b></p>	<ul style="list-style-type: none"> <li>➤ Eighteen respondents raised the importance of using local labor for project activities rather than foreign labor</li> <li>➤ Conflicts of foreign labor with local community were raised by twenty six respondents. Many of whom also identified that many contractors leave the work force behind in the island following completion of works</li> <li>➤ Lack of pay and appropriate accommodation for labor force creating issues were raised by twelve respondents</li> <li>➤ Two respondents highlighted a concern of undocumented labor being utilized for construction</li> <li>➤ Three respondents highlighted Covid 19 being spread by outside workforce</li> <li>➤ One respondent highlighted the concern that a labor force not being aware of the environmental significance of the area, leading to damages during construction phase.</li> </ul>
<p><b>Impacts on noise, vibration and dust</b></p>	<ul style="list-style-type: none"> <li>➤ Four respondents highlighted concerns of these impacts in the airport area. The issue of cracks on the runway was highlighted by two of these respondents, it was highlighted that the airport was built on reclaimed land so cracks can easily happen.</li> <li>➤ One respondent highlighted impacts of dust during cabling works</li> <li>➤ Five respondents highlighted the impact of vibration. In this regard, the issue of damage to property due to vibration was highlighted by some of these respondents.</li> <li>➤ Three respondents highlighted that noise will become an issue during construction phase.</li> </ul>
<p><b>Impacts on traffic</b></p>	<ul style="list-style-type: none"> <li>➤ Nine respondents highlighted that road closures during cabling works will have negative impacts such as increased routes and increased travel times.</li> <li>➤ One respondent highlighted that if roads are not levelled appropriately following road works can lead to impacts to road users.</li> <li>➤ Two respondents highlighted potential closures to roads leading to airport during works undertaken at the airport location leading to airport operation disruptions.</li> </ul>
<p><b>Impacts on vegetation</b></p>	<ul style="list-style-type: none"> <li>➤ Fourteen respondents suggested that some vegetation might have to be removed, if so, will lead to negative impacts, especially considering the project area.</li> <li>➤ Two respondents highlighted potential impacts of removal of mangrove protected vegetation.</li> </ul>
<p><b>Impacts on groundwater</b></p>	<ul style="list-style-type: none"> <li>➤ One respondent highlighted if the structures disrupts the flow of water from runway to</li> </ul>

	<p>the “kulhi” it will prevent recharge of groundwater.</p> <ul style="list-style-type: none"> <li>➤ Four respondents highlighted dewatering impacts. Of these two highlighted that if water is released into ocean during dewatering process (if required) it will lead to negative impacts on the water table.</li> <li>➤ Two respondent highlighted pollution of groundwater from construction material</li> <li>➤ Two respondents highlighted pollution of Kulhi as a result of the construction work force, as works undertake near the remaining two Kulhi.</li> </ul>
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When preparing the required environmental and social assessments for various components of the project these aspects need to be investigated and appropriate mitigation measures identified. Some preliminary mitigation measures are identified in the table below:

Impacts	Responses and Mitigation Measres
<b>Damage to buildings and structures due to construction works</b>	<ul style="list-style-type: none"> <li>➤ If piling is undertaken will be undertaken with appropriate safeguards.</li> <li>➤ Excavation close to buildings and structures will be undertaken with appropriate shoring to minimize damage to foundation.</li> <li>➤ Digging close to the foundation of households will be avoided as much as possible.</li> </ul>
<b>Loss of job and revenue as a result of the project</b>	<ul style="list-style-type: none"> <li>➤ Loss any existing jobs or revenues as a result of the project will not occur.</li> </ul>
<b>Increase in electricity prices</b>	<ul style="list-style-type: none"> <li>➤ The project if at all will lead to reduction in electricity prices.</li> </ul>
<b>Involvement of locals in the labour force</b>	<ul style="list-style-type: none"> <li>➤ Local staff of Fenaka will be involved in operation and maintenance of Battery Energy Storage System (BESS)</li> <li>➤ Exposure visits and awareness campaigns undertaken for locals.</li> <li>➤ Locals staff from Fenaka will be involved in Environmental and Social inspection during construction and operation phase.</li> <li>➤ Investors that install solar PV will be encouraged to utilize local staff during operation and maintenance phase</li> </ul>
<b>Conflicts with local community</b>	<ul style="list-style-type: none"> <li>➤ The workers will need to be briefed on local customs and traditions using the language of the construction work force.</li> </ul>
<b>Labor force impacts on the wetland</b>	<ul style="list-style-type: none"> <li>➤ The labor force will be briefed on the environmental sensitive nature of the work environment.</li> <li>➤ Boards will be placed in construction zone clearly marking Don'ts.</li> </ul>
<b>Lack of pay, inadequate accommodation and ill treatment of labor force</b>	<ul style="list-style-type: none"> <li>➤ A Grievance Redress Mechanism will need to be implemented by investor for the labor force.</li> </ul>

<b>Undocumented workers working in the project</b>	<ul style="list-style-type: none"> <li>➤ Prior to mobilizing any staff to the project location, a valid work permit will need to be submitted.</li> </ul>
<b>Construction workforce left in the island following demobilization</b>	<ul style="list-style-type: none"> <li>➤ The contractor will be required to submit mobilization and demobilization records, all staff mobilized for the purpose of the project should demobilize.</li> </ul>
<b>Traffic impacts</b>	<ul style="list-style-type: none"> <li>➤ Where the road needs to be closed the following mitigation measures will be observed: <ul style="list-style-type: none"> <li>✓ Road closures will be coordinated with police and the council.</li> <li>✓ Appropriate safety signs will be installed.</li> <li>✓ Aim to finish construction works as per the schedule.</li> </ul> </li> <li>➤ All roads will need to be levelled and resurfaced to preexisting levels.</li> <li>➤ Any works close to the airport will be coordinated with airport operator.</li> </ul>
<b>Vegetation impacts</b>	<ul style="list-style-type: none"> <li>➤ Based on the location of solar PV and cabling works vegetation is not anticipated to be removed for the purpose of the project. If at all any vegetation is removed for example for BESS location (which is not confirmed at the time of the survey), option to relocate should be considered first, if not feasible then only any vegetation needs to be felled, for any palm or tree removed, two palms or trees need to be planted in Kulhudhufushi.</li> <li>➤ No protected trees or mangrove vegetation should be removed for the purpose of the project.</li> </ul>
<b>Groundwater contamination (dewatering and pollution related impacts)</b>	<ul style="list-style-type: none"> <li>➤ If dewatering is required dewatering permit needs to be attained and works need to be completed within the shortest possible time.</li> <li>➤ The option to recharge island groundwater should be considered first prior to discharging to sea.</li> <li>➤ No chemicals or fuels, waste oil or any hazardous material should be stored near the Kulhi.</li> <li>➤ Any chemicals, fuels, waste oil and hazardous waste should be handled and transported carefully. All such chemicals and wastes should be stored and transported in sealed containers. Such chemicals and wastes should be stored in concrete hard surfaces to prevent impacts through any leakages.</li> </ul>

	<ul style="list-style-type: none"> <li>➤ Stored containers should be regularly inspected to identify any leakages.</li> <li>➤ The storage for any hazardous material and any refueling activities should be undertaken outside the 20m Environmental Protection Zone of the island.</li> <li>➤ All vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground.</li> </ul>
--	---

## 5.6 Conclusion

Based on the survey results, overall it can be seen that the public of Kulhudhufsuhi are very keen and positive regarding the project. With 95.1% of the surveyed public suggesting that Solar PV installation is beneficial and 85.43% of survey respondents suggesting that grid upgradation will be beneficial. The text analysis done identified inherent environmental benefits of Solar installation and expectation for reduction in cost of electricity as the main benefits. As for grid upgradation the main benefits identified by the public was associated with resolution of frequent blackouts, voltage drop issues and other issues associated with providing reliable electricity.

In terms of location, 75% of the survey respondents are happy with the location. Issues raised by those who were concerned, include impacts on aviation safety, impacts on wetlands, preference of some to move all the panels to the northern side of the runway, preference of some to install panels on homes and usability of space underneath the panels. All these have been responded and addressed in this survey report. Similarly, in terms of impacts, issues raised regarding damage to buildings, livelihood, labour force, traffic, vegetation and groundwater can be adequately addressed through the proposed mitigation measures.

## 5.7 Translated google form

### Introduction and Background

This Google form is to attain public views regarding the Solar PV Installation, Grid Upgradation and Battery Installation at (island name) through Accelerating Renewable Energy Integration and Sustainable Energy (ARISE) Project. ARISE project is funded by World Bank and implemented by Ministry of Environment.

Disclaimer: The views and information provided in this survey will be kept confidential. Only compiled information will be used for data analysis.

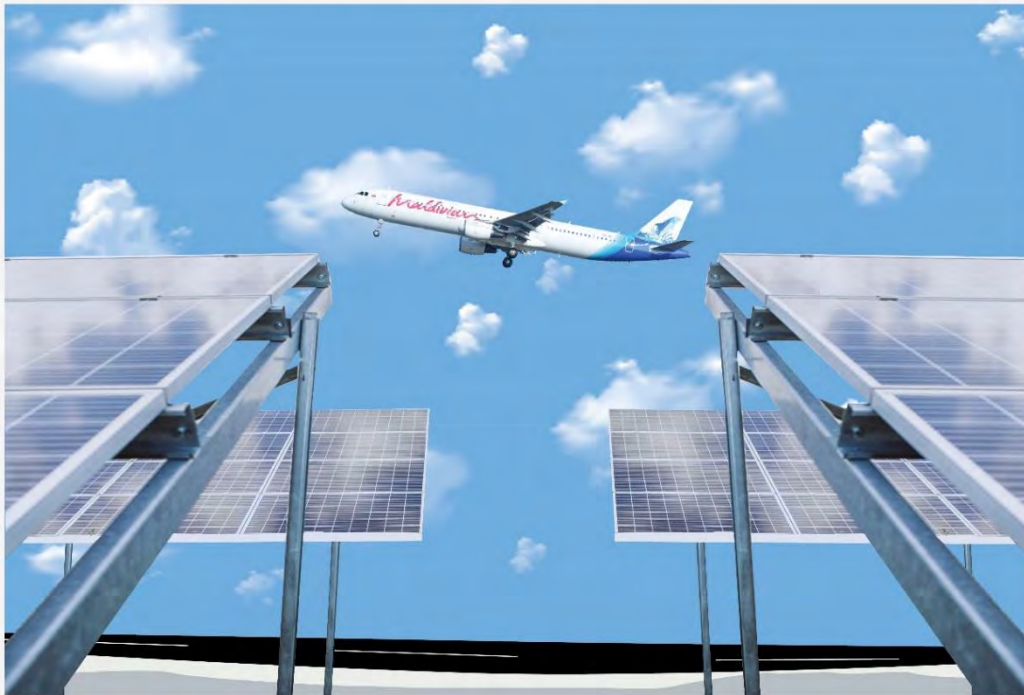
### Location of Solar PV Installation at (Kulhudhufushi)

#### Kulhudhufushi Airport



### 3D Visual of the location at which solar PV is installed (Kulhudhufushi)





Brief description of the construction activities that will be undertaken under each of the activities planned:

1. Solar PV Installation: Solar panel will be installed on ground mounted structures; the footing will be made of concrete. The work area will be closed off and proper demarcations will be placed during the construction phase. Construction is likely to take around 06 months.
2. Grid Upgradation: Grid Upgradation will involve cable laying on roads as the main component. Moreover, transformers will also need to be placed in certain location. Roads may need to be closed through council approval for a period of time, only roads where works are undertaken will be closed and appropriate traffic management will be undertaken by talking to police and council. Transformers will be placed in locations that are fenced out and protected with relevant safety signs so as to protect the public. It is not envisioned that private property will need to be used for this purpose. This work is likely to take a maximum of three months.
3. Battery Energy Storage System: This system will be most ideally placed within the powerhouse footprint, even if outside (depending on space) it will be placed in a designated location which will be enclosed with proper safety signage. Installation is likely to be completed within a month.

#### **Part 1: General Information**

1. Gender
  - (a) Male
  - (b) Female
  
2. Age
  - (a) 18 and 25 years
  - (b) 25 to 35 years
  - (c) 35 to 45 years
  - (d) 45 to 55 years
  - (e) Above 55

- 3. Marital Status
  - (a) Married
  - (b) Single
  - (c) Divorced
- 4. Number of Children

.....

- 5. Employment Status
  - (a) Government job
  - (b) Private Sector job
  - (c) Own Business
  - (d) Unemployed

- 6. Number of persons in the household

.....

**Part 2: Electricity Usage and Reliability**

- 7. Electricity is used in your household to which of the following activities (please choose all activities to which you use the electricity)
  - (a) Household Lighting and fans
  - (b) Air conditioning
  - (c) Television
  - (d) Computer
  - (e) Radio
  - (f) Water Heating
  - (g) Cooking
  - (h) Homebased livelihood activities

- 8. Average monthly expenditure spent on electricity at household

.....

- 9. What is your view on the electricity expenditure per month?
  - (a) It is reasonable
  - (b) It is too high

- 10. Usually blackouts happen in the household

- (a) Once Every month
- (b) More than once every month
- (c) Once every year
- (d) More than once every year
- (e) Blackouts don't happen

- 11. Have any electrical appliances been negatively impacted as a result of blackouts

- (a) Yes
- (b) No

**Part 3: Perceptions on the Project**

12. What is your view on the solar PV installation in your island

- (a) It will be very beneficial
- (b) It is not beneficial at all
- (c) I have no particular view on this

13. If you answered that it is very beneficial in question 10, then please briefly identify the reason for this

.....

14. If you answered that it is not beneficial in question 10 please briefly identify the reason for this

.....

15. What is your view on the Grid Upgradation in your island

- (a) It will be very beneficial
- (b) It is not beneficial
- (c) I have no particular view on this

16. If you answered that it is very beneficial in question 15 the please briefly identify the reason for this

.....

17. If you answered that it is not beneficial in question 15 please briefly identify the reason for this

.....

18. What is your view on the location in which the PV panels are proposed to be installed

- (a) The location is ideal
- (b) The location is not ideal
- (c) I have no particular view on this

19. If you answered the location is not ideal in question16 briefly state the reason for this

.....  
.....

20. Do you foresee any property damages that may occur as a result of this project? negative s

- (a) I do not foresee any such impacts
- (b) I can foresee some impacts

21. If you answered I can foresee some impacts in question 20 could you briefly describe the impacts

.....  
.....  
.....

22. Do you foresee that the project may negatively impact your livelihood?

- (a) I do not foresee any such impacts

(b) I can foresee some impacts

23. If you answered I can foresee some impacts in question 22 could you briefly describe the impacts

.....  
.....  
.....

24. Do you foresee any negative safety issues that may arise as a result of this project?

(a) I do not foresee any such impacts

(b) I can foresee some impacts

25. If you answered I can foresee some impacts in question 24 could you briefly describe the impacts

.....  
.....  
.....

26. Do you foresee any negative impacts related to labor force that may occur as a result of the project?

(a) I do not foresee any such impacts

(b) I can foresee some impacts

27. If you answered I can foresee some impacts in question 26 could you briefly describe the impacts

.....  
.....  
.....

28. Do you foresee any negative impacts related to dust, noise or vibration that may occur as a result of the project?

(a) I do not foresee any such impacts

(b) I can foresee some impacts

29. If you answered I can foresee some impacts in question 28 could you briefly describe the impacts

.....  
.....  
.....

30. Do you foresee any negative traffic impacts that may occur as a result of the project?

(a) I do not foresee any such impacts

(b) I can foresee some impacts

31. If you answered I can foresee some impacts in question 30 could you briefly describe the impact

.....  
.....  
.....

32. Do you foresee any negative impacts on vegetation that may occur as a result of this project?

(a) I do not foresee any such impacts

(b) I can foresee some impacts

33. If you answered I can foresee some impacts in question 32 could you briefly describe the impact

.....  
.....  
.....

34. Could you foresee any negative impacts on ground water that may arise as a result of this project?

- (a) I do not foresee any such impacts
- (b) I can foresee some impacts

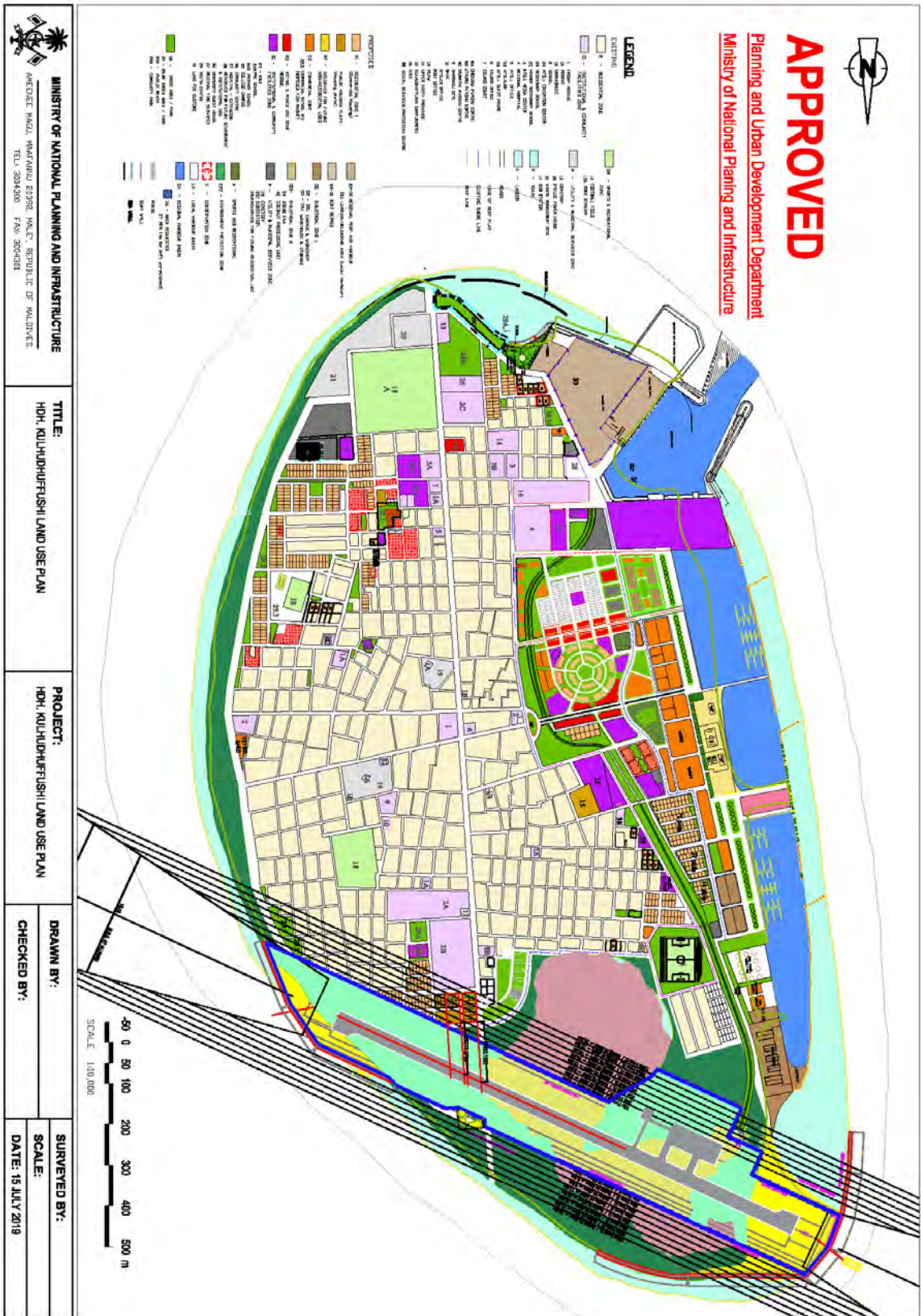
35. If you answered I can foresee some impacts in question 34 could you briefly describe the impact

.....  
.....  
.....

36. If you could foresee any other negative impacts as a result of this project please describe briefly below

.....  
.....  
.....

# 6 Annex 5: Landuse Plan of Kulhudhufushi



## 7 Annex 6: Translation of Approval by Civil Aviation

Maldives Civil Aviation Authority,

11<sup>th</sup> Floor, Velaanaage, Ameeru Ahmed Magu, Male', 20096, Maldives

Ref Number: 1/2020/438/E-201

To: Dr. Hussain Rasheed Hassan, Minister of Environment

With reference to your Ministry's letter number: 4/2020/201/ASPIRE-438, please note;

This Authority has no objection to constructing solar panels under the Accelerating Renewable Energy Integration and Sustainable Energy (ARISE) Project, in accordance with this Authority's regulations on obstacle limitation surfaces, outside 70 meters from the runway strips of the Airports at Kulhudhuffushi and Fuvahmulah.

Please note that the Panels shall be adjusted accordingly after construction, upon any report of an issue with operation of a flight due to reflectivity. Also, please share with us the assessment report on the impact of the panels to the operation of flights.

With Respect,

22 Zuhijja 1441

12 August 2020

Sincerely,

[Signature]

Fathimath Ramia,

Director, Air Navigation & Aerodromes

Ministry of Environment,

Male', Rep. of Maldives

Copy to: Regional Airports

This is a true and accurate translation of its Original. Translated by:

Hassan Shiyam Mohamed,

Legal Specialist

ASPIRE Project, Ministry of Environment.

31<sup>st</sup> August 2020



## 8 Annex 7: MOU with roof space owners

(ASPIRE/ASPIRE/2019/1)



### MEMORANDUM OF UNDERSTANDING

between

**MINISTRY OF ENVIRONMENT**

and

**REGIONAL AIRPORTS,  
Ministry of Transport and Civil Aviation.**

For commitment on mutual cooperation and support for the successful implementation of Accelerated Sustainable Private Investment in Renewable Energy (ASPIRE) Project

Dated: 1<sup>st</sup> August 2019





**THIS MEMORANDUM OF UNDERSTANDING** (the "MoU") is made on the 1<sup>st</sup> Day of August, 2019

**BETWEEN:**

**MINISTRY OF ENVIRONMENT** of the Government of Republic of Maldives, having its office at Green Building, Handhuvarce Hingun, Maafannu, Male', 20392 in the Republic of Maldives (hereinafter referred to as "ME").

**And:**

**REGIONAL AIRPORTS, MINISTRY OF TRANSPORT AND CIVIL AVIATION**, of the Government of Republic of Maldives, having its office at 11<sup>th</sup> Floor, Velanaage, Male' City, Republic of Maldives (hereinafter referred to as the "Site Owner").

(Collectively hereafter referred as "Parties")

**WHEREAS;**

- A. ME is desirous of executing a Memorandum of Understanding for commitment on mutual cooperation and support between Government Agencies, State Owned Enterprises and such other stakeholders necessary for the successful execution of Project(s) (as defined hereunder) carried out by or in connection with ME on behalf of the Government of Maldives (GoM), for the successful implementation of National Government Policies related to Energy; and
- B. GoM, represented by ME with the support of STRATEGIC CLIMATE FUND and the INTERNATIONAL DEVELOPMENT ASSOCIATION (IDA) has initiated a project in the Maldives titled Accelerating Sustainable Private Investment in Renewable Energy (herein referred to as "the Project" or ASPIRE), whereby private investors are invited to develop solar Photovoltaic (PV) systems on identified Site(s); and
- C. For the implementation of the Project, ME and the Site Owner has mutually identified Site(s) at the domestic airports under the jurisdiction of the Site Owner to develop solar PV system in accordance with Project Framework Documents (as defined hereunder);
- D. ME and Site Owner desire to execute this MoU for mutual support and cooperation in the successful implementation of the Project.

NOW THEREFORE, the Parties agree as follows;

1. Unless the context otherwise requires, in this MoU the following terms shall carry the meanings as set forth below;
  - 1.1 "Applicable Law" means any and all local policies, statutes, laws, regulations, ordinances, rules, rulings, judgements, orders, decrees, Authorizations, licenses or other governmental requirements or restrictions or any interpretation or administration of any of the forgoing, in effect at the time of entering into this MoU or shall come in to force in the future, in the jurisdiction of Republic of Maldives.
  - 1.2 "Authorizations" means permits, approvals or licenses required for the execution of the Project(s).



- 1.3 "Donor" means International Development Association of World Bank.
  - 1.4 "GoM" means Government of Maldives constituted under the Constitution of Maldives and shall include all the ministries, departments, authorities, agencies and persons thereto.
  - 1.5 "Government Agencies" means Ministry of Environment, Maldives Energy Authority, other government ministries, departments, State Owned Enterprises, statutory bodies and regulatory bodies with any jurisdiction over the implementation of the Project(s) and involved in the provision of Energy, and protection of the Environment under Applicable Law in the territory of the Republic of Maldives.
  - 1.6 "GRM" means the Grievance Redress Mechanism prepared as may be agreed between the Parties for the purpose of resolving social issues or grievances arising out of or in connection with the Project Framework Documents.
  - 1.7 "Investor(s)" means local and international private parties procured by GoM through ME or Ministry of Finance, to execute the Project.
  - 1.8 "ME" means Ministry of Environment and shall include the Maldives Energy Authority administered under ME and other departments, authorities, agencies, representatives and persons thereto.
  - 1.9 "Project" means ASPIRE, and any phase or sub-projects thereof.
  - 1.10 "Project Framework Documents" means all bid documents, letters of tender, Agreements, and all such other documents and communications related to the Project.
  - 1.11 "Site(s)" means the roof-top(s) and/or the terraces of the building(s) and such other public spaces mutually identified by the Parties in the domestic airports under the jurisdiction of Site Owner to be used for the purpose of Project. The locations, areas and dimensions are more fully described in the ANNEXURE I hereto.
  - 1.12 "Site Agreements" means any such legal agreements executed to provide a valid and binding leasehold interest in, or an easement, right-of-way, license, or other right in favor of the Investor to use the Site(s) in order to develop the Project.
2. Parties recognize that the successful implementation of the Project is a collective responsibility of GoM and the parties to the Project Framework Documents, and the Parties further acknowledge that ensuring the necessary Site(s) for Investor(s) is critical for the successful implementation of the Project, and to that end;
    - 2.1 Site Owner hereby undertakes to;
      - 2.1.1 enter in to Site Agreement(s) with the Investor(s) in order to obtain the Site(s) for the implementation of the Project, under the terms and conditions agreeable to the Parties; and
      - 2.1.2 utilize any fees acquired through the Site Agreement(s) for the benefit of the Fuvahmulah Island community, as maybe agreed between the Parties;
      - 2.1.3 provide necessary support in facilitating adequate resolution of issues or disputes arising out of or in connection with the Site Agreements and in the maintenance of Site(s), in accordance with the provisions of Project Framework Documents and GRM; and



- 2.1.4 fully comply with the provisions of the Site Agreement(s), and carry out such actions, without any undue delay, as maybe required by ME or any other party to the Project Framework Documents to enable such parties and GoM to comply with the Project Framework Documents in the performance of their obligations thereunder; and
- 2.1.5 fully cooperate with ME, the Investor(s) and such other parties to the Project Framework Documents where necessary, upon any reasonable request by such party in the performance of their obligations under the Project Framework Documents; and
- 2.1.6 not to carry out any communications, in writing or otherwise, which is related to or which shall have an adverse impact on the Project, with Donor, Investor(s), Government Agency, any other party to the Project Framework Documents, or any other third parties, unless such communications are made after consultation with and acquiring the consent of ME; and
- 2.1.7 keep ME informed of any and all communications related to, or which shall have an impact on the Project, exchanged between Site Owner and the Donor, Investor(s), Government Agency, any other party to the Project Framework Documents, or any other third parties; and
- 2.1.8 disclose to ME such other information related to the Project, without delay, upon any reasonable requests made by ME from time to time; and
- 2.1.9 carry out such actions on its part to enable the parties to the Project Framework Documents to obtain any and all Authorizations required for the execution of the Project under the said Documents.

2.2 ME hereby undertakes to;

- 2.2.1 provide necessary support in facilitating adequate resolution of issues or disputes arising out of or in connection with the Site Agreement(s) and in the maintenance of Site(s), in accordance with the provisions of Site Agreement(s), the GRM and other Project Framework Agreements; and
- 2.2.2 ensure that no costs arising out of or in connection with the Project shall be borne by the Site Owner, during the subsistence of the Site Agreement(s).

- 3 This MoU shall be effective from the date above mentioned and shall continue in full force unless terminated by either Party upon providing reasonable written notice to the effect or upon determination of the Site Agreement(s), as specified therein.
- 4 The Parties shall appoint a person(s) as a focal point in their organization for the implementation of this MoU and shall inform one another of such appointment.
- 5 All communications pursuant to this MoU, unless otherwise agreed, shall be exchanged in writing and delivered by person or via Government E-letter Management System (GEMS), email or legible facsimile transmission to the addresses set forth below, or to such other addresses, email or telefax numbers either Party duly inform in writing from time to time.



**For ME**

Name: Mr. Ajwad Musthafa  
Designation: Permanent Secretary  
Address: Green Building,  
Handhuvaree Hingun,  
Maafannu, Male', 20392, Republic of Maldives  
Email: ps.unit@environment.gov.mv  
Fax: +960 3018301

**For the Site Owner**

Name: Saamee Ageel  
Designation: Director General  
Address: Regional Airports,  
Ministry of Transport and Civil Aviation,  
11<sup>th</sup> Floor, Velanaage, Male', Republic of Maldives  
Email: saamee.ageel@airports.gov.mv  
Fax:

- 6 Any amendments to this MoU shall be in writing and as may be agreed between the Parties. The Parties may under mutual agreement include additional Site(s) to ANNEXURE I hereunder from time to time through an Addendum to this MoU. The Parties shall ensure that such amendment to this Agreement shall not adversely impact the implementation of the Project.
- 7 Any issues or disputes arising out of, relating to, or in connection with this MoU shall be resolved through amicable negotiations among executives or management of the Parties appointed by the Parties for the purpose.
- 8 Parties hereby agree that it is their intention that this MoU shall be executed and delivered in good faith between the Parties and to the best interests of GoM and that if, either Party believes that the other Party is operating in breach of this MoU, or to the detriment of the interests of GoM, the Parties will use their best efforts to agree on such action as may be necessary to amicably remedy such breach or actions.
- 9 The Parties agree that they will hold in confidence the provisions of this MoU, all information, documentation etc., which comes to their knowledge in the course of implementing this MoU (the "Confidential Information").
- 10 The Parties agree not to disclose any Confidential Information without the other Party's prior written consent provided that the Confidential Information may be disclosed to any governmental or regulatory authority requiring such disclosure under law.
- 11 The Parties agree not to publicize at any time, including making public announcements or press statements or issuing press releases of any kind or release any information related to or about this MoU without the other Party's prior written consent.



12 This MoU shall be governed by and construed in accordance with the laws of Republic of Maldives.

IN WITNESS THEREOF, the parties hereto, acting through their duly authorized representatives have caused this Memorandum of Understanding to be signed in MALE' CITY on the 1<sup>st</sup> day of August 2019.

**For and on behalf of ME**

Name: Dr. Hussain Rasheed Hassan

Designation: Minister of Environment

Date: August 1<sup>st</sup>, 2019

  
Signature & Seal 

**In the Presence of:**

Name: Hassan Shiyam Mohamed

ID Card Number: A093600

  
Signature

**For and on behalf of Site Owner**

Name: Saamee Ageel

Designation: Director General

Date: August 1<sup>st</sup>, 2019

  
Signature & Seal 

**In the Presence of:**

Name:

ID Card Number:

Signature

8/15/2020

KuldhuhufushiAirportrevised.png

## Kuldhuhufushi Airport



Note: height of the panels will be maintained within transitional slope and as per the approval of regional airports



# Fuvahmulah Airport



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**MEMORANDUM OF UNDERSTANDING**

between

**MINISTRY OF ENVIRONMENT**

and

**KULHUDHUFUSHI PORT LIMITED**

For commitment on mutual cooperation and support for the successful implementation of  
Accelerating Renewable Energy Integration and Sustainable Energy (ARISE) Project

REF NUMBER: (AGR) 438-ASPIRE/113/2020/1

**Dated: 5<sup>th</sup> October 2020**



**THIS MEMORANDUM OF UNDERSTANDING (the "MoU")** is made on 5<sup>th</sup> of October, 2020,

**BETWEEN:**

**MINISTRY OF ENVIRONMENT** of the Government of Republic of Maldives, having its office at Green Building, Handhuvaree Hiigun, Maafamu, Male', 20392 in the Republic of Maldives (hereinafter referred to as "**ME**").

**And:**

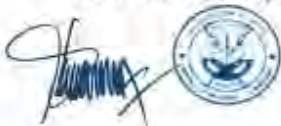
**KULHUDHUFUSHI PORT LIMITED**, having its office at Bandaara Magu, Kulhudhufushi, 02110, Republic of Maldives (hereinafter referred to as the "**Site Owner**").

(Collectively hereafter referred as "**Parties**")

**WHEREAS:**

- A. ME is desirous of executing a Memorandum of Understanding for commitment on mutual cooperation and support between Government Agencies, State Owned Enterprises and such other stakeholders necessary for the successful execution of Project(s) (as defined hereunder) carried out by or in connection with ME on behalf of the Government of Maldives (GoM), for the successful implementation of National Government Policies related to Energy; and
- B. GoM, represented by ME with the support of WORLD BANK has initiated a project in the Maldives titled Accelerating Renewable Energy Integration and Sustainable Energy (PI72788) (herein referred to as "the Project" or ARISE), whereby private investors are invited to develop solar Photovoltaic (PV) systems on identified Site(s), deploy Battery Energy Storage Systems (BESS), and grid modernization for Variable Renewable Energy (VRE) integration; and
- C. ME has further decided that the development of Solar PV systems in the City of Kulhudhufushi (hereinafter referred to as "Kulhudhufushi") initially planned under Accelerated Sustainable Investment in Renewable Energy (ASPIRE) Project implemented with the support of STRATEGIC CLIMATE FUND and the INTERNATIONAL DEVELOPMENT ASSOCIATION (IDA), shall be carried out under the ARISE Project, and
- D. Notwithstanding however, the preparatory works for the development of Solar PV systems, the deployment of BESS and grid modernization in Kulhudhufushi, has been in advanced stage under ASPIRE Project and therefore such preparatory works shall continue to be carried out under ASPIRE Project, and
- E. For the implementation of the Project, ME and the Site Owner has mutually identified the Site(s) owned or possessed by the Site Owner in Kulhudhufushi, to develop solar PV system in accordance with Project Framework Documents (as defined hereunder);
- F. ME and the Site Owner desire to execute this MoU for mutual support and cooperation in the successful implementation of the Project.

NOW THEREFORE, the Parties agree as follows;



1. Unless the context otherwise requires, in this MoU the following terms shall carry the meanings as set forth below;
- 1.1 "Applicable Law" means any and all local policies, statutes, laws, regulations, ordinances, rules, rulings, judgements, orders, decrees, Authorizations, licenses or other governmental requirements or restrictions or any interpretation or administration of any of the forgoing, in effect at the time of entering into this MoU or shall come in to force in the future, in the jurisdiction of Republic of Maldives.
  - 1.2 "Authorizations" means permits, approvals or licenses required for the execution of the Project(s).
  - 1.3 "Donor" means International Development Association of World Bank.
  - 1.4 "GoM" means Government of Maldives constituted under the Constitution of Maldives and shall include all the ministries, departments, authorities, agencies and persons thereto.
  - 1.5 "Government Agencies" means Ministry of Environment, Maldives Energy Authority, other government ministries, departments, State Owned Enterprises, statutory bodies and regulatory bodies with any jurisdiction over the implementation of the Project(s) and involved in the provision of Energy, and protection of the Environment under Applicable Law in the territory of the Republic of Maldives.
  - 1.6 "GRM" means the Grievance Redress Mechanism prepared as may be agreed between the Parties for the purpose of resolving social issues or grievances arising out of or in connection with the Project Framework Documents.
  - 1.7 "Investor(s)" means local and international private parties procured by GoM through ME or Ministry of Finance, to execute the Project.
  - 1.8 "ME" means Ministry of Environment and shall include the Maldives Energy Authority administered under ME and other departments, authorities, agencies, representatives and persons thereto.
  - 1.9 "Project" means ARISE, and any phase or sub-projects thereof.
  - 1.10 "Project Framework Documents" means all bid documents, letters of tender, Agreements, and all such other documents and communications related to the Project.
  - 1.11 "Site(s)" means the roof-top(s) and/or the terraces of the building(s) and such other public spaces mutually identified in Kulhudhuffushi Port Limited site to be used for the purpose of Project. The locations, areas and dimensions are more fully described in the ANNEXURE hereto.
  - 1.12 "Site Agreement(s)" means any such legal agreements executed to provide a valid and binding leasehold interest in, or an easement, right of way, license, or other right in favor of the Investor to use the Site(s) in order to develop the Project.
2. Parties recognize that the successful implementation of the Project is a collective responsibility of GoM and the parties to the Project Framework Documents, and the Parties further acknowledge that ensuring the necessary Site(s) for Investor(s) is critical for the successful implementation of the Project, and to that end;

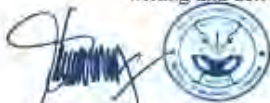
2.1 the Site Owner hereby undertakes to;



3



- 2.1.1 enter in to Site Agreement(s) with the Investor(s) in order to secure the Site(s) for the implementation of the Project, under the terms and conditions agreeable to the Parties; and
  - 2.1.2 utilize any fees acquired through the Site Agreement(s) for the benefit of the Kulhadhuffushi island community, as maybe agreed between the Parties;
  - 2.1.3 provide necessary support in facilitating adequate resolution of issues or disputes arising out of or in connection with the Site Agreement(s) and in the maintenance of Site(s), in accordance with the provisions of Project Framework Documents and GRM; and
  - 2.1.4 fully comply with the provisions of the Site Agreement(s), and carryout such actions, without any undue delay, as maybe required by ME or any other party to the Project Framework Documents to enable such parties and GoM to comply with the Project Framework Documents in the performance of their obligations thereunder; and
  - 2.1.5 fully cooperate with ME, the Investor(s) and such other parties to the Project Framework Documents where necessary, upon any reasonable request by such party in the performance of their obligations under the Project Framework Documents; and
  - 2.1.6 keep ME informed of any and all communications related to, or which shall have an impact on the Project, exchanged between the Site Owner and the Donor, Investor(s), Government Agency, any other party to the Project Framework Documents, or any other third parties; and
  - 2.1.7 disclose to ME such other information related to the Project, without delay, upon any reasonable requests made by ME from time to time; and
  - 2.1.8 carry out such actions on its part to enable the parties to the Project Framework Documents to obtain any and all Authorizations required for the execution of the Project under the said Documents.
- 2.2 ME hereby undertakes to:
- 2.2.1 provide necessary support in facilitating adequate resolution of issues or disputes arising out of or in connection with the Site Agreement(s) and in the maintenance of Site(s), in accordance with the provisions of the Site Agreement(s), the GRM and other Project Framework Agreements; and
  - 2.2.2 ensure that no costs arising out of or in connection with the Project shall be borne by the Site Owner, during the subsistence of the Site Agreement(s).
- 3 The Parties shall appoint a person(s) as a focal point in their organization for the implementation of this MoU and shall inform one another of such appointment.
- 4 All communications pursuant to this MoU, unless otherwise agreed, shall be exchanged in writing and delivered by person or via Government E-letter Management System (GEMS).




email or legible facsimile transmission to the addresses set forth below, or to such other addresses, email or telefax numbers either Party duly inform in writing from time to time

**For ME**

Name: Mr. Ajwad Musthafa  
Designation: Permanent Secretary  
Address: Green Building,  
Handhuvarree Hingui,  
Maafannu, Male', 20392, Republic of Maldives  
Email: ps.unit@environment.gov.mv  
Fax: +960 3018301

**For the Site Owner**

Name: Mr. Shahid Ali  
Designation: Managing Director  
Address: Kulhudhuffushi Port Limited, Kulhudhuffushi City  
Email: ceo@port.mv  
Fax: +960 6528558

- 5 Any amendments to this MoU shall be in writing and as may be agreed between the Parties. The Parties may under mutual agreement include additional Site(s) to the ANNEXURE I hereunder from time to time through an Addendum to this MoU. The Parties shall ensure that any amendment shall not adversely impact the implementation of the Project.
- 6 The Parties agree not to publicize at any time, including making public announcements or press statements or issuing press releases of any kind or release any information related to or about this MoU without the other Party's prior written consent.

IN WITNESS THEREOF, the parties hereto, acting through their duly authorized representatives have caused this Memorandum of Understanding to be signed on the dates below mentioned.

**For and on behalf of ME**

Name: Ajwad Musthafa  
Designation: Permanent Secretary  
Date: 5/10/2020

**In the Presence of:**

Name: Hassan Shiyam Mohamed  
ID Card Number: A093600



*Signature & Seal*

**For and on behalf of the Site Owner**

Name: Shahid Ali

Designation: Managing Director

Date: 05/10/2020

*Signature & Seal*



*Signature*

*Signature*

**In the Presence of:**

Name: Hassan Muzni Mohamed

ID Card Number: A054033

*Signature*

*Signature*



ANNEXURE

Selection of the Site(s) listed below are subject to the necessary technical assessments.




## 9 Annex 8: Grievance Redress Mechanism of the project

It is important to have an avenue for any affected persons to raise their concerns regarding the project and such issues addressed promptly. For this purpose, a grievance redress mechanism becomes integral part of stakeholder engagement process. The mechanism needs to take into special consideration vulnerable groups and how easy access to the grievance mechanism is ensured to such parties. A three-tier system is defined to ensure a fair process.

The GRM information will be given to the stakeholders during the project consultative meetings. Furthermore, the GRM will be displayed in council notice board, website and a notice board highlighting the process will be installed in each project site.

<b>Tiers of Grievance Mechanism</b>	<b>Nodal Person for Contact</b>	<b>Contacts, Communication and Other Facilitation by Project</b>	<b>Timeframe to address grievance</b>
<b>First Tier: Site level</b> Contractor (During Construction phase) Independent Power Producer (IPP) (for solar) / Electricity Service Provider (ESP) (for battery and grid) (During Operation Phase)	A person designated for the task need to be identified for the purpose by IPP and Electricity Service Provider.	<ul style="list-style-type: none"> <li>In the ESP or IPP or Contractor offices and the project site, there will be an Information Board providing details of the Grievance redress mechanism listing the names and contact telephones/emails.</li> <li>Grievances can be registered by contacting the designated person through phone/email or by submitting a letter of complaint or by filling a Tier-1 complaint form. The Tier-1 form must be available online</li> </ul>	14 working days

		<p>on the websites of the IPP or ESP or Contractor, Ministry of Environment (ME) and from the front office counters of the respective offices. (note PMU of ME should supply the form to respective parties).</p> <ul style="list-style-type: none"> <li>• For those who cannot properly write, a staff will assist in filling the complaint form and get it signed by the aggrieved party.</li> <li>• A formal receipt of the complaint will be provided to the aggrieved party.</li> <li>• The IPP/ESP/Contractor will screen the grievance to determine whether the grievance is related to ARISE project or not.</li> <li>• If it is related to the project, the aggrieved party will be informed in writing (copied to ME) how the case will be processed as per this grievance redress mechanism. This should occur within 03 working days of receiving the complaint. If the aggrieved party is unable to read (for whatever reason) the issued letter should be read to the person in presence of a witness and the witness should declare their witness to this event.</li> </ul>	
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		<ul style="list-style-type: none"><li>• Alternatively, if it is not related to the project, the aggrieved party will be informed that it is not related to the project in writing (copied to ME) and will inform how the case will be handled. This communication will occur within 03 working days of receiving the complaint. If the aggrieved party is unable to read (for whatever reason), the issued letter will be read to the person in presence of a witness and the witness should declare their witness to this event.</li><li>• Where the grievance is related to the project, the IPP/ESP/Contractor will come up with a solution either by (i) discussing internally; (ii) joint problem solving with the aggrieved parties, ME and Island Council or; (iii) a combination of both options.</li><li>• The IPP/ESP/Contractor will communicate the final decision in writing, in terms how the grievance was handled to the aggrieved party within 14 working days of receiving the complaint. If the aggrieved party</li></ul>	
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		<p>is unable to read (for whatever reason) the issued letter should be read to the person in presence of a witness and the witness should declare their witness to this event.</p> <ul style="list-style-type: none"> <li>• The aggrieved party must acknowledge the receipt of decision and submit their agreement or disagreement with the decision within 10 days.</li> <li>• If no acknowledgement is submitted from the aggrieved party then the decision will be considered as accepted.</li> <li>• If the grievance is not resolved to the satisfaction of the aggrieved party within 14 working days of submission of the grievance to tier 1 then the aggrieved party may notify local council in writing, of the intention to move to tier 2.</li> </ul>	
<p><b>Second Tier:</b> <b>Local Council</b> (Island or City Council or any other party which performs such a function)</p>	<p>Local Council will be the second point of contact. Designated contact persons should be established within the Council with a designated contact number.</p>	<ul style="list-style-type: none"> <li>• Where the aggrieved party is not happy with the outcome of the decision by the IPP/ESP/contractor or where the aggrieved party is of the view that the council is not capable of justly solving the issue or where the grievance is not resolved within 14 working</li> </ul>	<p>14 working days</p>

		<p>days the grievance can be upgraded to tier 2.</p> <ul style="list-style-type: none"> <li>• In the council office and the project site there will be an Information Board providing details of the Grievance redress mechanism listing the names and contact telephones/emails.</li> <li>• Grievances can be registered by contacting the local council directed contact person(s) or by submitting a letter of complaint addressed to the Mayor or Council president or by filling a Tier 2 Complaint Form. The Tier-2 form must be available online on the websites of the Island Council, Ministry of Environment (ME) and from the front office counters of the respective offices. (note PMU of ME should supply the form to respective parties).</li> <li>• For those who cannot properly write, a staff will assist in filling the complaint form and get it signed by the aggrieved party.</li> <li>• A formal receipt of the complaint will be provided to the aggrieved party.</li> <li>• The aggrieved party will submit a copy of the decision from tier 1 and the letter submitted</li> </ul>	
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		<p>raising their disagreement to decision where the reason for upgrading to tier 2 is the disagreement with the decision from tier 1.</p> <ul style="list-style-type: none"><li>• The aggrieved party will submit a copy of the grievance form submitted through tier 1 or the grievance letter submitted to council, where the reason for upgrading to tier 2 is due to lack of response from the IPP/ESP/Contractor.</li><li>• The council will screen the grievance to determine if the issues and concerns raised in the complaint falls within the mandate of the project.</li><li>• If it is related to the project, the council will inform the aggrieved party in writing (copied to ME) how the case will be processed as per this grievance redress mechanism. This should occur within 03 working days of receiving the complaint. If the aggrieved party is unable to read (for whatever reason) the issued letter will be read to the person in presence of a witness and the witness should declare their witness to this event.</li></ul>	
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		<ul style="list-style-type: none"><li>• Alternatively, if it is not related to the project, the council will inform the aggrieved party that it is not related to the project in writing (copied to ME) and will inform how the case will be handled. This communication will occur within 03 working days of receiving the complaint. If the aggrieved party is unable to read (for whatever reason), the issued letter will be read to the person in presence of a witness and the witness should declare their witness to this event.</li><li>• Where the grievance is related to the project, the council will come up with a solution either by (i) discussing within the council; (ii) joint problem solving with the aggrieved parties, ME, ESP and the contractor/IPP or; (iii) a combination of both options.</li><li>• The council will communicate the final decision in writing, in terms how the grievance was handled to the aggrieved party within 14 working days of receiving the complaint. If the aggrieved party is unable to read (for whatever reason) the</li></ul>	
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		<p>issued letter will be read to the person in presence of a witness and the witness should declare their witness to this event.</p> <ul style="list-style-type: none"> <li>• The aggrieved party must acknowledge the receipt of decision and submit their agreement or disagreement with the decision within 10 days.</li> <li>• If no acknowledgement is submitted from the aggrieved party then the decision will be considered as accepted.</li> <li>• If the grievance is not resolved to the satisfaction of the aggrieved party within 14 working days of submission of the grievance to tier 2 then the aggrieved party may notify ME, in writing, of the intention to move to tier 3.</li> </ul>	
<b>Third Tier:</b> Ministry of Environment and Energy	ME will forward the grievance to the Project Management Unit (PMU) of the Ministry. A dedicated number should be allocated to	<ul style="list-style-type: none"> <li>• Where the aggrieved party is not happy with the outcome of the decision by the council or where the aggrieved party is of the view that the council is not capable of justly solve the issue or where the grievance is not resolved within 14 working days the grievance can be upgraded to tier 3.</li> </ul>	14 Working Days

		<p>Grievances can be registered by contacting ME (directed to the contact person(s) or by submitting a letter of complaint addressed to the Minister of Environment or by filling a Tier 3 complaint form.</p> <ul style="list-style-type: none"> <li>• For those who cannot properly write, the ME staff will fill a complaint form and get it signed by the aggrieved party.</li> <li>• A formal receipt of the complaint will be provided to the aggrieved party.</li> <li>• The aggrieved party will submit a copy of the decision from the council and the letter submitted to council raising their disagreement to decision where the reason for upgrading tier 2 is the disagreement with the council decision.</li> <li>• The aggrieved party will submit a copy of the grievance form submitted to council or the grievance letter submitted to council, where the reason for upgrading to tier 2 is due to lack of response from the council.</li> <li>• Ministry will forward all the grievances related to the project to the Project Management Unit.</li> </ul>	
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		<ul style="list-style-type: none"><li>• PMU will screen the grievance to determine if it is related to the project.</li><li>• If it is related to the project PMU will inform the aggrieved party in writing how the case will be processed as per this grievance redress mechanism. This should occur within 03 working days of receiving the complaint. If the aggrieved party is unable to read (for whatever reason) the issued letter should be read to the person in presence of a witness and the witness should declare their witness to this event.</li><li>• Alternatively, if it is not related to the project, PMU will inform the aggrieved party that it is not related to the project in writing and should inform how the case will be handled. This communication should occur within 03 working days of receiving the complaint. If the aggrieved party is unable to read (for whatever reason) the issued letter should be read to the person in presence of a witness and the witness should declare their witness to this event.</li></ul>	
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		<ul style="list-style-type: none"> <li>• Where the grievance is related to the project, the PMU will come up with a solution either by (i) Discussing in the project steering committee; (ii) joint problem solving with the aggrieved parties, the council, Energy Service Provider and the contractor/IPP (iii) undertaking site visits and holding onsite discussions or; (iii) a combination of all these options.</li> <li>• The PMU will be responsible to ensure that there is no cost imposed on the aggrieved person, due to the grievance mechanism at the third tier.</li> <li>• ME will communicate the final decision in writing, in terms how the grievance was handled to the aggrieved party within 14 working days of receiving the complaint. If the aggrieved party is unable to read (for whatever reason) the issued letter should be read to the person in presence of a witness and the witness should declare their witness to this event.</li> <li>• The aggrieved party must acknowledge the receipt of</li> </ul>	
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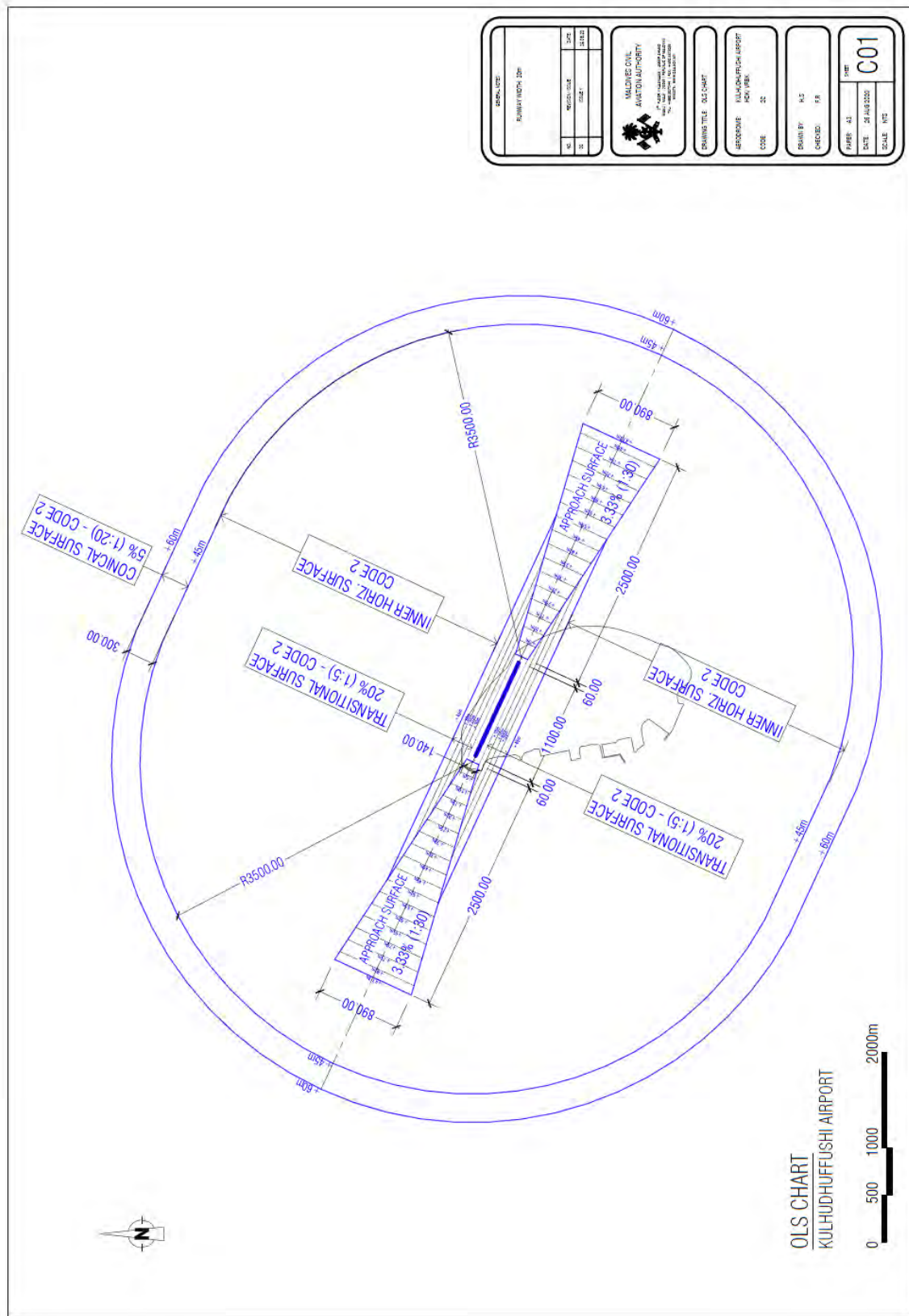
		<p>decision and submit their agreement or disagreement with the decision within 10 days.</p> <ul style="list-style-type: none"> <li>• If no acknowledgement is submitted from the aggrieved party then the decision will be considered as accepted.</li> </ul>	
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In addition to the system established through the project, legal mechanisms are available for any aggrieved party if they are to pursue that option. In such cases, established legal practice as per the laws of the country will be followed. Moreover, if any request for information is made through RTI, the set procedure established under the act will follow and the information officer identified by the Ministry will attend to it, if a request is made to ME.

At the project offices (ME, ESP, IPP and Island Council) the information on the focal points responsible for implementation of this GRM needs to be displayed in the notice board and also on social media platforms in the following format:

Description	Contact details
Company:	
To:	
Address:	
E-mail:	
Website:	
Telephone:	

# 10 Annex 9: Obstacle Limitation Surface Chart for Kulhudhufushi Airport



## 11 Annex 10: Indicative Mitigation Plan For the Identified Risks

Aspect	Indicative Mitigation Measures
Construction Site and Construction Workers	<ul style="list-style-type: none"> <li>• All provisions that are required under Health and Safety Regulation for Construction Industry (2019/R-156) should be strictly adhered.</li> <li>• All workers should be provided with Personal Protective Equipment (PPE) by the contractor/Investor. In this regard the following needs to be observed:</li> <li>• Hard hats should be used by all workers when undertaking construction and when undertaking inspections at height.               <ul style="list-style-type: none"> <li>✓ Enclosed safety shoes should be worn by all construction workers.</li> <li>✓ Safety harness should be used by all workers when climbing heights at project sites.</li> <li>✓ Electrical Protective gloves should be provided to workers when dealing with electrical components.</li> <li>✓ Chemical protective gloves should be provided to all workers when dealing with any chemicals.</li> <li>✓ Construction safety goggles should be worn by all construction workers.</li> <li>✓ Ear plugs should be worn by all construction workers working in environments with high noise (working above 75 decibels).</li> <li>✓ Masks should be worn when dealing with chemicals and when working in dusty environments.</li> </ul> </li> <li>• Safety nets should be used when working on rooftops.</li> <li>• All chemicals should be stored on hard surfaces and should be covered.</li> <li>• Portable drinking water should be available at the construction site during construction phase.</li> <li>• Adequate safety signs should be installed at the work site giving clear direction. These should be provided in addition to English, Dhivehi and in the language of the workforce.</li> <li>• Construction work site should be demarcated &amp; fenced, and warning signs should be displayed both in English and Dhivehi.</li> <li>• When construction is undertaken clearly demarcated bins for waste disposal needs to be placed and emptied daily.</li> <li>• Open pits should not be left for water to accumulate for a long time.</li> <li>• Any stockpiled sand needs to be covered to prevent sand particles from being airborne.               <ul style="list-style-type: none"> <li>• All vehicles and equipment used for the project needs to be used by well trained personnel.</li> </ul> </li> <li>• Any scaffolding used should be to British Standard (BS1139).</li> <li>• When working at night adequate lighting should be provided.</li> <li>• A designated toilet facility should be available within 10 minutes of the construction site.</li> <li>• Breaks should be given to the workforce during mealtimes.</li> </ul>

	<ul style="list-style-type: none"> <li>• Fire fighting equipment should be available at the construction site, at the workers accommodation and any storage areas used for the project.</li> <li>• The site needs to be cleaned daily following completion of days work.</li> <li>• The maximum working hours of all construction workers should be 48 hours per week as per the Employment Act of Maldives.</li> </ul>
Storage and use of hazardous chemicals	<ul style="list-style-type: none"> <li>• Any chemicals, fuels, waste oil and hazardous waste should be handled and transported carefully. All such chemicals and wastes should be stored and transported in sealed containers. Such chemicals and wastes should be stored in concrete hard surfaces to prevent impacts through any leakages.</li> <li>• Stored containers should be regularly inspected to identify any leakages.</li> <li>• The storage for any hazardous material and any refueling activities should be undertaken outside the 20m Environmental Protection Zone of the island.</li> <li>• Any hazardous material storage areas should have fire fighting equipment.</li> <li>• All vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground.</li> <li>• All activities should be undertaken in presence of an experienced supervisor.</li> <li>• Chemical protective gloves, goggles, masks and safety shoes need to be worn when handling any hazardous material.</li> </ul>
Transport, handling and Storage of Solar PV	<ul style="list-style-type: none"> <li>• Mechanical equipment (forklift) should be used when handling the containers with PV Panels during transport.</li> <li>• When moving packaged boxes to construction site, forklift should be used.</li> <li>• Transport should be coordinated with island council and Police.</li> <li>• If opening the box outside, please avoid rainy conditions. The rain will soften the box, may damage the modules and cause physical harm to the staff.</li> <li>• If the wind is too heavy avoid handling solar panels</li> <li>• The box should be placed horizontally to avoid tilting.</li> <li>• All staff involved in transport, storage and handling of Solar PV should wear gloves, safety shoes, safety goggles and hard hats.</li> <li>• Do not step on cartons containing PV modules</li> </ul>
Operation of Batching plant	<p><b>1. Maintenance of the general site operations</b></p> <ul style="list-style-type: none"> <li>• Maintain all the equipment including dust collection equipment to prevent any leaks.</li> <li>• Concrete batching operation needs to be undertaken away from residential locations to minimize dust and noise impacts.</li> <li>• Concrete batching operation should be undertaken away from the Protected Areas.</li> <li>• All concrete mixing operations should be undertaken during daytime to minimize noise impacts.</li> </ul>

	<ul style="list-style-type: none"> <li>• All staff involved in batch plant operation should wear, safety hats, dust masks, safety shoes, goggles and gloves.</li> <li>• Required safety signs should be installed at the batching plant site with warnings for dust and noise highlighted.</li> </ul> <p><b>2. Material handling and storage</b></p> <ul style="list-style-type: none"> <li>• Aggregates and sand required for concrete mixing should be handled and stored in an enclosed space. Enclosed storage bins or enclosed sealed bags.</li> <li>• As much as possible avoid using chemical concrete additives since they are more toxic. Instead, use sugar or wood based admixers.</li> <li>• Where chemical additives are approved to be used, need to store them in an enclosed space on a hard-impermeable surface.</li> </ul> <p><b>3. Mixer feed operations</b></p> <ul style="list-style-type: none"> <li>• Use the enclosed batch mixer feed as dust prevention and visible emissions.</li> <li>• Use the spray device to prevent dust emissions.</li> <li>• Conduct all the mixing operations from an enclosed space to help prevent emission of dust.</li> </ul> <p><b>4. Conveyors</b></p> <ul style="list-style-type: none"> <li>• To prevent dust emissions, the belt conveyors should be enclosed on both sides.</li> <li>• All conveyor transfer points should be enclosed by fitting the flexible seals to prevent dust.</li> <li>• The turning point of any conveyor should be provided with scrapers to prevent dust collection on the surface belt</li> </ul> <p><b>5. Mixing and loading operations</b></p> <ul style="list-style-type: none"> <li>• Loading concrete should be in such a way that minimizes dust emissions.</li> <li>• All the air borne dust emission generated by material loading and mixing operations should be vented to fabric filtering system.</li> <li>• The concrete mixers and other vehicles should be cleaned off after the loading and mixing operations to wash off the mud, dust deposited on the wheels and body.</li> </ul> <p><b>6. Fugitive dust</b></p> <ul style="list-style-type: none"> <li>• Use water sprays or dust suppression agents to reduce dust.</li> <li>• An air extraction and filtration system for collecting the generated dust should be installed.</li> </ul> <p><b>7. Waste concrete</b></p> <ul style="list-style-type: none"> <li>• Collect the waste concrete in suitable washout pits where it becomes gravel, sludge and sand which can later be reused.</li> </ul> <p><b>8. Waste water</b></p> <ul style="list-style-type: none"> <li>• Waste and contaminated water should be directed to onsite settling ponds and it can be reused later in for dust control, rinsing trucks exteriors.</li> </ul>
Vegetation Removal and levelling	<ul style="list-style-type: none"> <li>• Where trees and palms fall within the project footprint, option to relocate any trees and palms should be considered first.</li> </ul>

	<ul style="list-style-type: none"> <li>• If relocation is not feasible due to status of the tree/palm (for example palms that are too old and unlikely to survive elsewhere) or due to lack of available space to replant for every tree/palm removed two trees /palms need to be planted at a location identified by the city council.</li> <li>• No vegetation within the 20 m coastal zone should be removed for the purpose of the project.</li> <li>• No protected trees should be removed as part of the project.</li> <li>• Any construction area needs to be levelled to preexisting levels.</li> </ul>
Solid and construction waste during construction phase	<ul style="list-style-type: none"> <li>• For domestic waste produced by the staff clearly demarcated bins for waste disposal needs to be placed and emptied daily.</li> <li>• For construction solid waste should be cleared from work site every day and placed in a designated location.</li> </ul>
Solar Panel waste following lifetime	<ul style="list-style-type: none"> <li>• The panels should be either recycled or taken to a certified e-waste management facility. Preference should be given to recycling. Prior approval needs to be attained from Ministry prior to undertaking this activity.</li> </ul>
Emissions from vehicles	<ul style="list-style-type: none"> <li>• All vehicles used for the project should have an up to date road worthiness.</li> </ul>
Dust, Noise and Vibration	<ul style="list-style-type: none"> <li>• Restricting working hours from morning 06 to evening 06.</li> <li>• For rooftop installation informing the users of the buildings of the times when work will be undertaken and come up with prior understanding with the building owner and users.</li> <li>• Keeping construction equipment properly stored and secured at a location approved by the council</li> <li>• Materials that are stockpiled at the location for a long period of time should be covered to minimize impact of dust generation due to windy conditions.</li> <li>• Ensure that the construction site is wetted regularly to minimize impact of dust as a result of the project.</li> </ul>
Groundwater	<ul style="list-style-type: none"> <li>• All chemicals used should be stored on hard surfaces on enclosed spaces.</li> <li>• All chemicals should be handled using chemical protective gloves.</li> <li>• All storage containers need to be inspected regularly for any leaks.</li> <li>• Where dewatering is required, the dewatering permit should be attained as per the requirements of Dewatering Regulation (R-1697/2013).</li> <li>• Dewatering activities where required needs to be completed within the shortest possible time.</li> </ul>
Road closure and road safety	<ul style="list-style-type: none"> <li>• All closures need to be preannounced</li> <li>• All road closures need to be coordinated with the council and Police</li> <li>• Clear markings need to be placed on roads during road closure with indicative lights and warning signs.</li> <li>• Following backfilling and resurfacing where required, must ensure that preexisting levels are maintained.</li> </ul>

	<ul style="list-style-type: none"> <li>• The solar panels need to be placed at a height and angle such that glare doesn't become an issue for the vehicles.</li> </ul>
Impacts on recreational spaces close to installation site	<ul style="list-style-type: none"> <li>• The construction work should be limited to the footprint of the planned PV installation.</li> <li>• No equipment, vehicles should be left unattended.</li> <li>• Area in which construction work is undergoing should be closed off for public access.</li> <li>• Appropriate safety signs should be placed at the construction site in both English and Dhivehi.</li> </ul>
Damage to Utility lines and other cables	<ul style="list-style-type: none"> <li>• The investor/contractor should come into agreement with each and every service provider regarding how any damage is going to be fixed.</li> <li>• Identify the cable routes, utility lines prior to construction commencement and ensure that such areas are avoided.</li> <li>• Where chance damage occurs the investor needs to make arrangements to fix the damage within 24 hours of damage.</li> </ul>
Labour related impacts	<ul style="list-style-type: none"> <li>• If foreign labour is used the labour force needs to be briefed on the language, culture and customs of Maldives.</li> <li>• The labour force needs to be provided information on the rules and regulations pertaining to protected areas of Addu.</li> <li>• It is imperative that the comprehensive Labour Management Procedures (LMP) developed for the project is followed (link: <a href="https://www.environment.gov.mv/v2/en/download/10026">https://www.environment.gov.mv/v2/en/download/10026</a>)</li> <li>• Constant and reliable electricity supply should be available at project office and accommodation site.</li> <li>• Shower and toilet facilities should be available at temporary accommodation site.</li> <li>• Toilet and drainage should be connected to local sewer system, where not available septic tanks should be used for treatment prior to disposal.</li> <li>• A minimum ratio of 01 toilet/shower per 20 workers should be maintained. Separate facilities should be provided for men and women.</li> <li>• Individual bedding should be provided to all workers.</li> <li>• Storage space for individual belongings should be provided for all workers.</li> <li>• Male and Female workforce needs to be housed separately.</li> <li>• Designated locations for waste disposal with clearly marked bins needs be established. Bins need to be emptied daily.</li> <li>• Sufficient lighting and cooling systems need to be established.</li> <li>• Portable drinking water should be provided.</li> <li>• The site needs to be cleaned daily.</li> <li>• Monthly inspections to determine pest infestation of the site should be undertaken.</li> <li>• Meals if prepared from a local café or restaurant should be from a Maldives Food and Drug Authority certified facility.</li> <li>• If foreign labor is used, prior to mobilization the construction workers should be briefed in their language on customs of Maldives.</li> </ul>



	<ul style="list-style-type: none"><li>• If Covid19 restrictions are in place all guidelines issued by Health Protection Agency of Maldives need to be followed.</li><li>• If Covid19 restrictions are in place, investor/contract needs to attain advice Health Protection Agency of Maldives prior to mobilization and any guidance needs to be strictly followed.</li></ul>
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## 12 Annex 11: Risk Matrix

Construction phase						
Risks	Party at risk	Probability	Significance	Overall score Risk Score	Risk Level	Comments
Vegetation Clearance	Environment	1	3	4	Low	Considering the locations selected no significant vegetation is expected to be removed
Disruption of transport activities	Public	3	3	6	Low	Can occur during cable laying, however very minimal cable laying involved with proper coordination with authorities impacts are unlikely.
Falling to open pits	Public/Workforce	3	7	10	Moderate	Can be managed with proper mitigation measures/supervision
Mosquito breeding at open pits	Public	3	7	10	Moderate	Can be managed with proper mitigation measures/supervision

Electrocution due to open wiring	Public/Workforce	3	8	11	Moderate	Can be managed with proper mitigation measures/supervision
Falling objects as the project involves working at heights	Public/Workforce	3	8	11	Moderate	Can be managed with proper mitigation measures/supervision
Unattended equipment left in site without proper supervision leading to public use accidents and hazards.	Public	2	8	10	Moderate	Can be managed with proper mitigation measures/supervision
Chemicals (this primarily include water proofing agents, any other approved admixtures used for concreting and used oil) at site left unattended can expose the public to health hazards.	Public	2	8	9	Moderate	Can be managed with proper mitigation measures/supervision
Exposure to dust from concrete mixing.	Public/Workforce	5	8	13	Moderate	Can be managed with proper mitigation measures/supervision
Noise disturbance	Public/Environment	1	5	6	Low	Considering the construction methodology low
Vibration disturbance	Public/Environment	1	5	6	Low	Considering the construction methodology low

Damage to cables and utility lines	Other service providers	8	8	16	High	In most of the islands the exact location of cables are difficult to determine, hence the risk is high
Damage to public buildings during cable laying works	Public	3	3	6	Low	Based on the small scope highly unlikely
Risk of spills from fuels, chemicals, waste oil and other hazardous materials used during construction phase.	Environment/Public	4	8	12	Moderate	Can be managed with proper mitigation measures/supervision
Road accidents as a result of construction work	Public/workforce	4	8	12	Moderate	Can be managed with proper mitigation measures/supervision
Flooding Impact due to inadequate levelling	Environment/Public	2	6	8	Moderate	Can be managed with proper mitigation measures/supervision
Impacts on environmentally protected and sensitive areas	Environment	3	5	8	Moderate	Can be managed with proper mitigation measures/supervision
Impact on biodiversity (protected species, sensitive species etc)	Environment	3	5	8	Moderate	Can be managed with proper mitigation measures/supervision
Risk of Fire	Public/Worforce	3	8	11	Moderate	Can be managed with proper mitigation measures/supervision

Injury construction workforce due to improper use of equipment/machinery and work methodology	Workforce	4	8	12	Moderate	Can be managed with proper mitigation measures/supervision
Lack of Sanitation and clean drinking water at worker accomodation and project site(s)	Workforce	4	8	12	Moderate	Can be managed with proper mitigation measures/supervision
Overcongestion of workforce in small space	Workforce	6	7	13	Moderate	Can be managed with proper mitigation measures/supervision
Unhygienic food available for construction workfoce	Workforce	4	7	11	Moderate	Can be managed with proper mitigation measures/supervision
Lack of access to shower facility at worker accomodation	Workforce	2	8	10	Moderate	Can be managed with proper mitigation measures/supervision
Lack of adequate meals	Workfoce	2	8	10	Moderate	Can be managed with proper mitigation measures/supervision
Mosquito breeding at worker accomodation and project site (s)	Public/Workforce	8	7	15	High	Common issue in construction sites in Maldives hence the risk is high
Pest infestation at worker accomodation and project site (s)	Public/Workforce	8	7	15	High	Common issue in construction sites in Maldives hence the risk is high

Lack of clearly demarcated designated areas for waste disposal at the project site (s)	Environment/Public	5	8	13	Moderate	Can be managed with proper mitigation measures/supervision
Social conflicts with community	Public	1	5	6	Low	Even though there is a recent increase in such cases, was a whole considering the amount of projects undertaken such issues occur rarely
Covid 19 transmission through contractor workforce to the community	Public	3	8	11	Moderate	Can be managed by adhering to the guidelines by Health Protection Agency
Emissions from vehicles used in construction leading to air pollution	Environment/pollution	3	3	6	Low	From a global scale any emissions from the project will be minimal. Can be reduced negligible with proper mitigation and supervision
Gender based violence by the construction workforce	Public	1	5	6	Low	As a whole considering the amount of projects undertaken such issues occur rarely
Disturbance to operations of Airport	Public/Regional Airports	5	8	13	Moderate	Can be managed with proper mitigation measures/supervision

Disturbance to activities of fish market	Public/Council	5	7	12	Moderate	Can be managed with proper mitigation measures/supervision
Disturbance to activities of Port	Public/Kulhudhufushi Ports Limited	5	7	12	Moderate	Can be managed with proper mitigation measures/supervision
Disturbance to activities of Ferry Terminal	Public/Council	5	7	12	Moderate	Can be managed with proper mitigation measures/supervision

Operational phase						
Risks	Party at risk	Probability	Sginificance	Overall score Risk Score	Risk Level	Comments
Risk of damage to structure due to lack of maintenance leading public hazards	Public/Environment	3	3	6	Low	It is in the best interest of the developer to maintain the site, as the developer sells electricity to utility through PPA.
Transformer if not enclosed leading to electrocution to public	Public	3	3	6	Low	Through design/supervision will ensure that it is enclosed
Risk of fire due to faults in electrical equipments	Public/Workforce	3	3	6	Low	International standards are used to ensure quality of installation, hence unlikely
Lightening risk	Public	1	3	4	Low	
Improper disposal of hazardous waste	Public	1	3	4	Low	Conditioned in agreements, can be managed with proper supervision
Glare Impacts to Aircrafts	Public/Civil Aviation Authority/Airlines	1	5	6	Low	Considering a glare assessment is done the probability of this is unlikely as long as the restrictions mentioned in the assessment are enforced. Such projects successfully implemented in airports in other countries as well.



Scoring scheme for risks	
0 to 7	Low
7 to 14	Medium
14 to 20	High