



Ministry of Tourism and Environment  
Republic of Maldives

# Training on Tools & Methodologies for Tracking of Mitigation Actions

Consultancy Service for Tracking of Mitigation Actions

08<sup>th</sup> December 2025, Meeruma, Male'

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# Introduction



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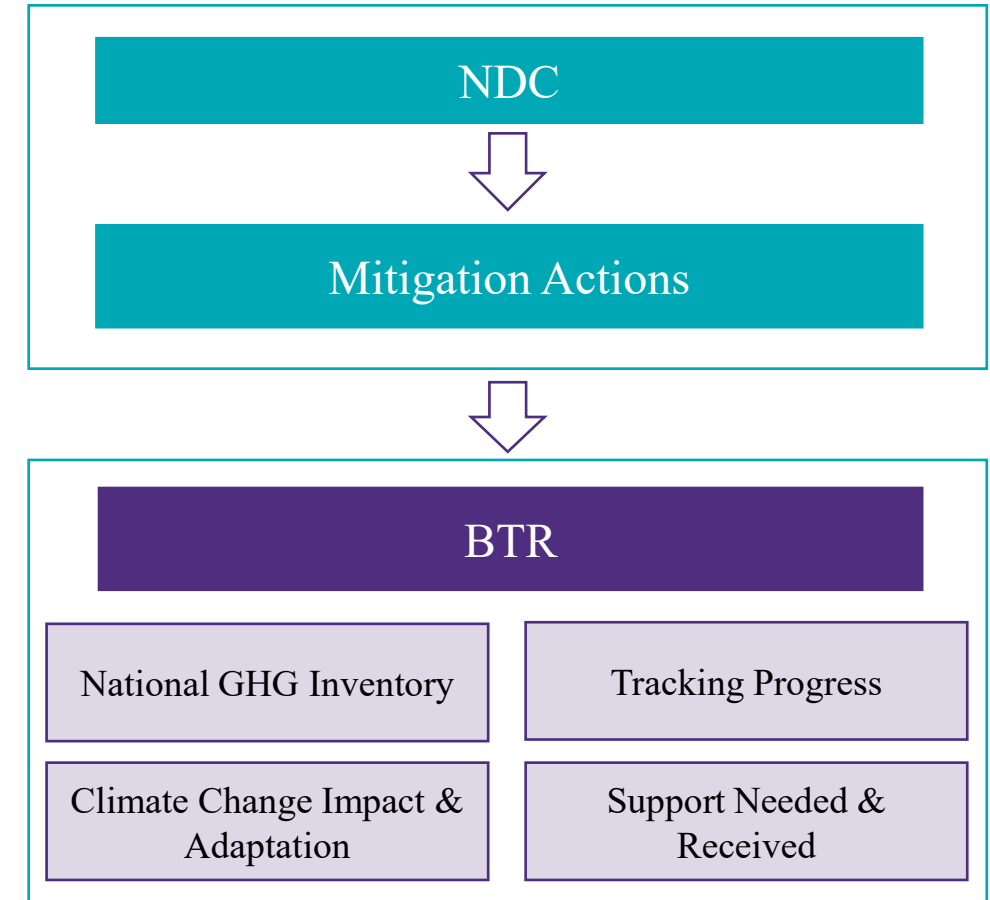
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# Introduction to UNFCCC

- **United Nations Framework Convention on Climate Change (UNFCCC)** is the foundational international treaty that provides the framework for global cooperation to limit GHG emissions and adapt to climate impacts
- **Enhanced Transparency Framework (ETF)** to build trust and promote effective implementation by ensuring transparency and accountability and it is linked to the two major pillars NDC and BTR
- ETF tracks progress on the implementation and achievement of Nationally Determined Contributions (NDCs)
- **Biennial Transparency Reports (BTRs)** are the main vehicle through which countries fulfill their ETF obligations



# Objective of the Training

## Objectives of the engagement:

- To develop **methodologies** for estimation of mitigation indicators to track the NDC implementation
- To develop **tool** to estimate the GHG emissions reduction from the mitigation actions
- To develop **guidelines** on reporting procedures of GHG estimations from mitigation measures
- To develop **integrated tool** for mitigation actions tracking and reporting

## Objectives of the training workshop:

- **Present reporting procedures** for the mitigation actions to track NDC implementation
- **Present final methodologies** for estimation of mitigation indicators to track the NDC implementation
- **Present finalized data capturing formats** for capturing data related to tracking mitigation actions
- **Practice exercise and Power BI dashboard** to be adopted for renewable energy, energy efficiency, waste, transport sectors





# Indicators for Tracking Mitigation Actions



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# Tracking Mitigation Actions (1/2)

## Types of projects

Renewable Energy

Energy Efficiency

Waste to Energy

Transport

## What need to be reported?

- **All projects aimed at reducing energy intensity, enhancing sustainability, and contributing to emission reductions**, in alignment with the mitigation measures outlined in the Maldives' Nationally Determined Contributions

## When and How to Report?

- **When** : During and after implementation of the mitigation measures/actions
- **How** : Use the sector-specific forms provided in this guideline for each mitigation action



# Tracking Mitigation Actions (2/2)

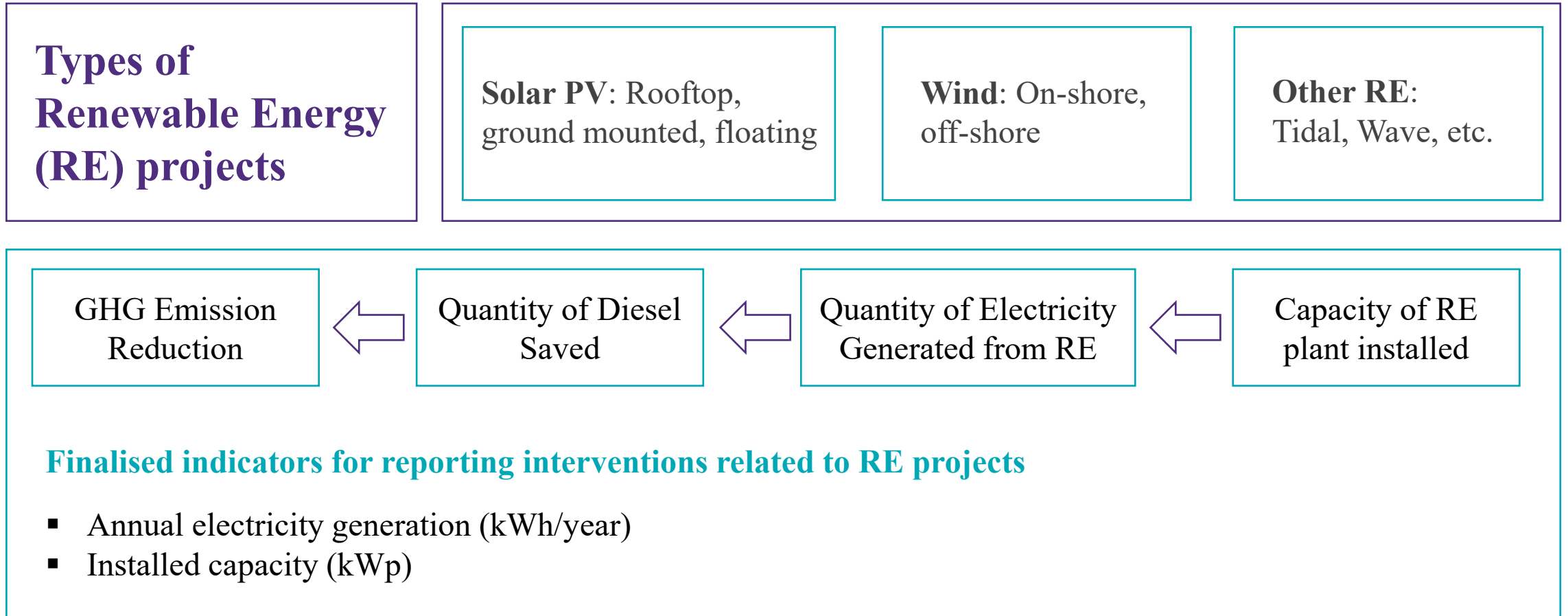
Stakeholder	Role
Implementing Entity	Report on data on mitigation actions (Half Yearly)
Ministry of Tourism and Environment	Determine which measure/actions to track, request data, estimate emissions, and compile national reporting

## After Data Submission?

- **What** : Submitted data need to be checked for the accuracy and completeness
- **Who** : Ministry of Tourism and Environment will carry out the review and assessment



# Indicators – Renewable Energy





# Indicators – Energy Efficiency

## Types of energy efficiency projects

Hakathari labelled  
Air Conditioner

Hakathari labelled  
Washing Machine

Hakathari labelled  
Refrigerators

GHG  
Emission  
Reduction



Quantity of  
Electricity Saved



Hakathari labelled  
(Rating of EE appliance)



Star rating or Efficiency  
appliance imported

## Finalised indicators for reporting interventions related to EE projects

- Number of imported appliances (per appliance type)
- Hakathari labelling status (labelled or unlabeled)
- Hakathari rating level (1 to 5 stars, if labelled)

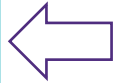
# Indicators – Transport

## Types of Transport projects

Import of the Electric vehicles (EV)

Import of the Hybrid Vehicles (HV)

GHG  
Emission  
Reduction



Quantity of Diesel / Petrol Saved  
and increased electricity  
consumption (EV)



Category of vehicles imported (HV/EV)

## Finalised indicators for reporting interventions related to Transport projects

- Number of Electric Vehicles (EVs) imported (by vehicle category)
- Number of Hybrid Vehicles (HVs) imported (by vehicle category)

# Indicators – Waste-to-Energy

## Types of waste-to-energy projects

Waste to Energy Plant  
(Waste used in waste to energy plant)

GHG Emission  
Reduction

Quantity of Waste Processed in Waste-to-energy plant  
(avoided from sending to landfills) – Avoided methane emissions

Quantity of Stack emissions based on type of WtE plant using IPCC guidelines

Quantity of Diesel  
Saved

Quantity of Electricity  
Generated from WtE

Capacity of WtE  
plant installed

### Finalised indicators for reporting interventions related to waste to energy projects

- Annual quantity of waste used in the WtE plant (tonne/year)



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# Summary of Finalized Indicator

Mitigation Projects to be reported	Renewable Energy Projects	Energy Efficiency Appliances imported	Waste used in Waste-to-energy	Transport - Electric and Hybrid Vehicles
Indicators	<ul style="list-style-type: none"> <li>Annual electricity generation (kWh/year)</li> <li>Installed capacity (kW)</li> </ul>	<ul style="list-style-type: none"> <li>Number of imported appliances (per appliance type)</li> <li>Hakathari labelling status (labelled or unlabeled)</li> <li>Hakathari rating level</li> </ul>	<ul style="list-style-type: none"> <li>Annual quantity of waste used in the WtE plant (tonne/year)</li> </ul>	<ul style="list-style-type: none"> <li>Number of EV imported (by vehicle category)</li> <li>Number of HVs imported (by vehicle category)</li> </ul>



# Methodologies for Estimating Mitigation Indicators



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# Renewable Energy

Methodology for tracking renewable energy mitigation actions

**Indicator:** Annual Electricity Generation from Renewable Energy Plant (kWh/year)

*Scenario 1: RE is replacing Grid electricity*

Step 1: Annual energy generation from RE project (kWh/year) is available

Step 2: Estimated of GHG reduction = RE energy generation (kWh/year)  $\times$  Grid emission factor

*Scenario 2: RE is replacing Diesel Generator electricity, but baseline diesel consumption is not monitored*

Step 1: Calculate the SEGR of the Diesel Generator or use 3.9 kWh/L

Step 2: Diesel saved due to renewable energy plant (L) = Annual Electricity Generation from Renewable Energy Plant / SEGR

Step 3: Estimated GHG reduction = Diesel saved (L)  $\times$  IPCC Default factor for diesel



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# Renewable Energy

Methodology for tracking renewable energy mitigation actions

**Indicator:** Installed Capacity of Renewable Energy Plant (kWp)

*Scenario 1: RE is replacing Grid electricity*

Step 1: Check CUF for RE project (or use default CUF) and calculate annual electricity generation.

Annual electricity generation = RE Plant capacity (kW)  $\times$  8760 (hr./year)  $\times$  CUF

Step 2: Estimated GHG reduction = RE energy generation  $\times$  Grid emission factor

*Scenario 2: RE is replacing Diesel Generator electricity, but baseline diesel consumption is not monitored*

Step 1: Check CUF for RE project (or use default CUF) and calculate annual electricity generation. Annual

electricity generation = RE Plant capacity (kW)  $\times$  8760 (hr./year)  $\times$  CUF

Step 2: Calculate the SEGR of the Diesel Generator or use 3.9 kWh/L

Step 3: Diesel saved due to Renewable energy plant (L) = Annual Electricity Generation from Renewable Energy Project / SEGR

Step 4: Estimated GHG reduction = Diesel saved (L)  $\times$  IPCC Default diesel emission factor



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# Energy Efficiency

Methodology for tracking energy efficiency mitigation actions

**Indicator:** Appliance wise data for the sales respective Hakathari label rating of the appliance

**Step 1:** Annual energy saving from EE appliance (kWh/year) for each label = Baseline energy consumption – Energy consumption of the EE appliance

**Step 2:** Calculating the import of the appliance from the custom department (sales / year) for each label and each appliance category

**Step 3:** Estimated energy saving (kWh/year) = Annual Energy consumption calculated in Step 1 × Number of the import for the same EE appliance

*Scenario 1: EE leading to reduction in energy generation – Grid Electricity*

**Step 4:** Estimated GHG reduction = Energy saving per year due to Hakathari appliance's (Energy saving calculated in Step 3) × Grid emission factor



# Energy Efficiency

Methodology for tracking energy efficiency mitigation actions

**Indicator:** Appliance wise data for the sales respective Hakathari label rating of the appliance

**Step 1:** Annual energy saving from EE appliance (kWh/year) for each label = Baseline energy consumption – Energy consumption of the EE appliance

**Step 2:** Calculating the import of the appliance from the custom department (sales / year) for each label and each appliance category

**Step 3:** Estimated energy saving (kWh/year) = Annual Energy consumption calculated in Step 1 × Number of the import for the same EE appliance

*Scenario 2: EEP leading to reduction in energy generation – Diesel Generator Electricity*

**Step 4:** Calculate the SEGR of the Diesel Generator or use 3.9 kWh/L

**Step 5:** Diesel saved due to Renewable energy plant (L) = Energy saving per year due to Hakathari appliance's (Energy saving calculated in Step 3) / SEGR

**Step 6:** Estimated GHG reduction = Diesel saved (L) × IPCC Default diesel emission factor



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# Waste

Methodology for tracking energy energy mitigation actions

**Indicator:** Quantity of the waste used in the WtE plant

**Step 1:** Quantify the waste used in the WtE plant (tonne/year)

**Step 2:** GHG reduction due to avoided methane emissions from landfill (tonne CO<sub>2</sub>/year) (B) = Quantity of waste (tonne/ year) × Methane emission factor (tonne of methane per tonne of waste) × Conversion factor of methane to CO<sub>2</sub>

**Step 3:** GHG reduction generated from waste combustions (tonne CO<sub>2</sub>/year) (C)= Quantity of waste (tonne/ year) × Stack emission data taken form IPCC guidelines

**Step 4:** Energy generation from WtE plant (A) = Data taken from the energy meter installed at plant (reducing the auxiliary energy consumption by the WtE plant)

*Scenario 1: Reduction in energy generation – Grid Electricity*

**Step 5:** Use the grid emission factor for the Maldives (CO<sub>2</sub>/kWh)

**Step 6:** Estimated GHG reduction = Grid emission factor × Energy generation (A)+ GHG emissions avoided (B) – GHG emissions from stack / combustion of waste (C)





# Waste

Methodology for tracking energy energy mitigation actions

**Indicator:** Quantity of the waste used in the WtE plant

**Step 1:** Quantify the waste used in the WtE plant (tonne/year)

**Step 2:** GHG reduction due to avoided methane emissions from landfill (tonne CO<sub>2</sub>/year) (B) = Quantity of waste (tonne/ year) × Methane emission (tonne of methane per tonne of waste) × Conversion factor of methane to CO<sub>2</sub>

**Step 3:** GHG reduction generated from waste combustions (tonne CO<sub>2</sub>/year) (C)= Quantity of waste (tonne/ year) × Stack emission data taken form IPCC guidelines

**Step 4:** Energy generation from WtE plant (A) = Data taken from the energy meter installed at plant (reducing the auxiliary energy consumption by the WtE plant)

*Scenario 2: Reduction in energy generation – Diesel Generator Electricity*

**Step 5:** Calculate the SEGR of the Diesel Generator or use 3.9 kWh/L

**Step 6:** Diesel saved (L) due to Energy generation from WtE plant = Energy generation from WtE plant / SEGR

**Step 7:** Estimate GHG reduction = [Diesel saved (L) × IPCC Default diesel emission factor] (A) + GHG emissions avoided (B) – GHG emissions from stack/combustion of waste (C).



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# Transport

Methodology for tracking energy energy mitigation actions

**Indicator:** Number of the different type of the EV sold

**Step 1:** Capture the sales of the EV sold under each vehicle type

**Step 2:** Fuel consumption for each vehicle type (liters/year) = Annual distance travelled (km) × Fuel economy (l/km)

**Step 3:** Baseline GHG emissions (tonne of CO<sub>2</sub>) = Quantity of the fuel used × emission factor as per IPCC

**Step 4:** Additional annual electricity required for pure EV = Range of the EV / battery capacity (kWh) × Annual distance travelled (km) based upon the vehicle type

*Scenario 1: Fuel consumption reduction and increased grid electricity consumption*

**Step 5:** Estimated of GHG reduction = Baseline GHG emissions – Grid emission factor × Additional annual electricity required for pure EV



# Transport

Methodology for tracking energy energy mitigation actions

**Indicator:** Number of the different type of the EV sold

*Scenario 2: Fuel consumption reduction and increased electricity from DG*

**Step 5:** Calculate the SEGR of the Diesel Generator use 3.9 kWh/L

**Step 6:** Additional Diesel required (L) to generate electricity = Additional annual electricity required for pure EV / SEGR (Step 5)

**Step 7:** Estimated GHG reduction = Baselines GHG emission from ICE vehicle (calculated in step 3) – Additional diesel required (L) × IPCC Default emission factor for diesel

*Scenario 3: Fuel consumption reduction and electricity from dedicated RE*

**Step 5:** Emission from the RE electricity is considered zero

**Step 6:** Estimated GHG reduction = Baseline GHG emissions

# Transport

Methodology for tracking energy energy mitigation actions

**Indicator:** Number Hybrid Vehicles sold (based upon vehicle types)

**Step 1:** Capture the sales of the vehicles under each Vehicle Types

**Step 2:** Annual fuel consumption in baseline scenario (liters/year) = {Annual distance travelled (km) × Fuel economy (l/km)}

**Step 3:** Annual fuel required in mitigation scenario (liters/year) = {Annual distance travelled (km) × Fuel economy for new HV (l/km) }

**Step 4:** Annual fuel saving (units/year) = Annual fuel consumption in baseline scenario – Annual fuel required in mitigation scenario

**Step 5:** Calculate the baseline GHG emissions = Annual fuel Saving (units/year) × emission factor for the fuel (Gasoline / Diesel) as per IPCC



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A photograph of three people in a professional setting. A man with a beard and a blue checkered shirt is smiling and looking at a woman. The woman has long dark hair, is wearing a beige blazer over a white blouse, and is holding a tablet. She is also smiling and looking towards the right. A third person, a man in a blue shirt, is partially visible on the right side of the frame, gesturing with his hand. The background is a bright, out-of-focus indoor space with large windows.

# Overview of the finalized data capturing formats



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# Renewable Energy – Forms

**Name of Organization / Business / Agency**

**Type of Organization**

☐ Government ☐ SOE ☐ Private Business ☐ Resort

☐ Household ☐ Other: \_\_\_\_\_

**Focal Person Name**

**Email Address**

**Phone Number**

**Name of Organization / Business / Agency**

**Estimated / Actual Project Cost (USD)**

**Financing Source(s)**

☐ Self-funded ☐ Loan ☐ Grant/Donor ☐ Other

**Supporting Documents**

☐ Photo of the installation



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# Renewable Energy – Forms

## Installation Status

- ☐ Operational
- ☐ Under Installation
- ☐ Planned

## Expected or Actual Operational Date

Month  
Year

## What motivated or supported you to install this renewable energy system?

- ☐ Required by government regulation
- ☐ Part of a business or island development plan
- ☐ Company sustainability goal
- ☐ Received financial support (e.g., grant, donor, loan, tax benefit)
- ☐ Voluntary (cost saving or environmental benefits)
- ☐ Other: \_\_\_\_\_

## Type of Renewable Energy

- ☐ Solar
- ☐ Wind
- ☐ Tidal
- ☐ Other: \_\_\_\_\_

## Technology type

- Solar: ☐ Rooftop ☐ Ground-mounted ☐ Floating
- Wind: ☐ Small-scale ☐ Large-scale
- Tidal: ☐ Stream Generator ☐ Barrage System
- Other: \_\_\_\_\_



# Renewable Energy – Forms

Capacity Installed (kWp or MW)

Type of Premises

- ☐ Government
- ☐ Business
- ☐ Resort
- ☐ Household
- ☐ Other: \_\_\_\_\_

Connection Type

- ☐ Grid-tied
- ☐ Off-grid
- ☐ Hybrid

Is battery storage included / planned?

- ☐ Yes
- ☐ No

Battery Capacity (if applicable)

\_\_\_\_\_ kWh

Battery Type (if known)

- ☐ Lead-acid
- ☐ Lithium-ion
- ☐ Other: \_\_\_\_\_

Electricity Generated by the System (kWh/month)



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# Energy Efficiency – Forms

**Name of Importer**

**Focal Person Name**

**Email Address**

**Phone Number**

**Reporting Period**

**Year**



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# Energy Efficiency – Forms

## Air Conditioner (Applicable for units with cooling capacity up to 24,226 BTU/hr.)

Brand	Model Number	Cooling Capacity (BTU/hr.)	Hakathari labelled	Hakathari Rating (if labelled)	Quantity Imported
			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5	

## Refrigerators (Applicable for units with capacity from 110 liters to 650 liters)

Brand	Model Number	Volume (liters) Without freezer, With freezer, With freezer, With freezer, through- the door ice dispense	Hakathari labelled	Hakathari Rating (if labelled)	Quantity Imported
			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5	

## Washing Machine (Applicable for units with capacity up to 14 kg)

Brand	Model Number	Capacity (kg) Front load Top load	Hakathari labelled	Hakathari Rating (if labelled)	Quantity Imported
			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5	





# Waste – Forms

**Name of Organization**

**Focal Person Name**

**Email Address**

**Phone Number**

**Quantity of waste used in the waste to energy (WtE) plant - tonne per year**

\_\_\_\_\_ tonne per year

**Does electricity generated from Waste to Energy (WtE) is replacing grid electricity?**

☐ Yes

☐ No

**Date of Implementation (Month/Year)**



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# Transport – Reporting Forms

## Electric Vehicles (EVs)

Vehicles that are clearly classified as Electric in customs import codes.

Year of reporting

Vehicle Category

Number of Units Imported

Electric Motorcycles

Electric Passenger Cars

Electric Light Commercial Vehicles (LCVs)

Electric Heavy-Duty Vehicles

Electric Urban Buses



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# Transport – Forms

## Hybrid Vehicles (HVs)

Vehicles that are clearly classified as Hybrid in customs import codes

### Vehicle Category

### Number of Units Imported

Hybrid Motorcycles

Hybrid Passenger Cars

Hybrid Light Commercial Vehicles (LCVs)

Hybrid Heavy Duty Vehicles

Hybrid Urban Buses



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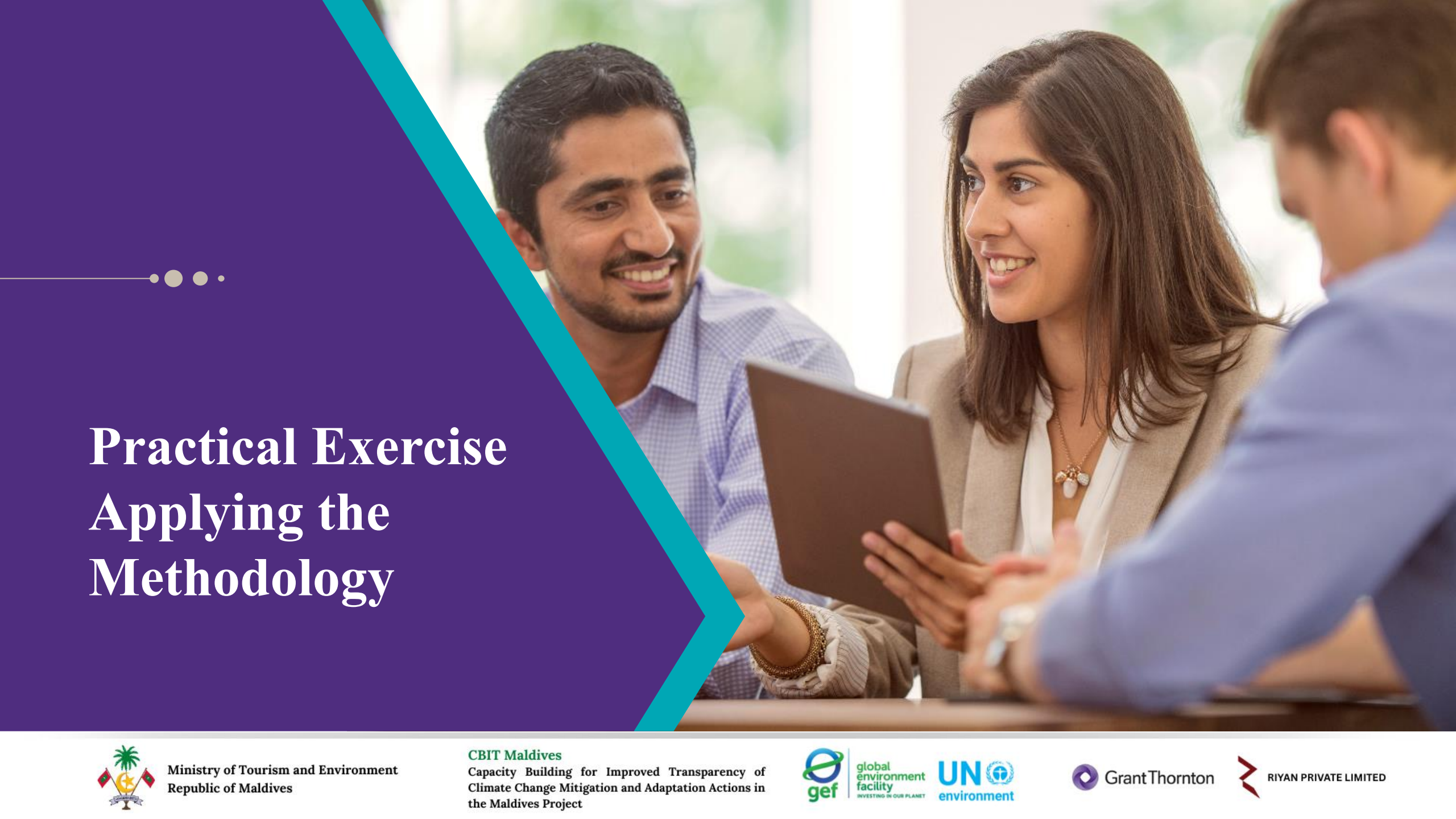
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# Practical Exercise Applying the Methodology



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# Breakout sessions – Task 1

## Group 1

The resort currently uses a diesel generator to produce electricity, with an average monthly fuel consumption of 7,200 liters. To reduce emissions and contribute to the Maldives' NDC commitments, the resort plans to transition to renewable energy and gradually phasing out air conditioners and refrigerators.

Additionally, the resort has been operating 10 electric vehicles (EVs) since 2024.

### Task:

What key parameters should be reported to monitor and track progress under these mitigation actions?

What different scenarios are applicable for evaluating these mitigation actions?

## Group 2

The ABC Building complex currently uses electricity as its primary energy source, with an average annual consumption of 65,000 kWh. To reduce emissions and contribute to the Maldives' NDC commitments, the building plans to transition to renewable energy by implementing a rooftop solar project.

The building has already replaced old air conditioners with Hakathari-labeled energy-efficient appliances.

### Task:

What key parameters should be reported to monitor and track progress under these mitigation actions?

What different scenarios are applicable for evaluating these mitigation actions?





# Breakout sessions – Task 2

## Group 1

The resort will implement a 25-kW solar installation in December 2026 and expand solar renewable energy generation by an additional 25 kW each year until 2029.

The resort plans to gradually phase out ten number air conditioners, replacing them with EE Hakathari-labeled units (18,000 Btu/hr., four-star), Eight number EE Hakathari-labeled refrigerators (220 liters, five-star, with freezer) starting January 2026.

The resort has been operating 10 electric vehicles (LCV) since 2024.

### Task:

Use the data to estimate the emission reduction during each year till 2030.

## Group 2

The building will implement a 10-kW rooftop solar project, which is expected to become operational in 2026.

The building phased out five number old air conditioners and replaced them with EE Hakathari-labeled units (21,000 Btu/hr., five-star) in August 2024.

The building replaced three old refrigerators with five EE Hakathari-labeled refrigerators (190 liters, five-star, without freezer) in April 2023.

### Task:

Use the data to estimate the emission reduction during each year till 2030.



# Assumptions

Description	Value	
Capacity Utilization Factor	18%	IRENA
Specific Energy Generation Ration	3.9 kWh/liter of Diesel	STELCO
Diesel Emissions	2.72 kg CO <sub>2</sub> / liter	IPCCC Conversions
Air conditioner (AC) (CSPF Baseline)	2.9 (Wh/Wh)	Ministry of Environment, Climate Change and Technology
Air conditioner (4 Star)	4 (Wh/Wh)	
Air conditioner (5 Star)	5.1 (Wh/Wh)	
Annual Operating hours for AC	4380 hours /year	
Refrigerator – without freezer (Baseline)	$(368 + 0.892 \times \text{Volume}) \times 0.551$ (kWh/year)	
Refrigerator – without freezer (5star)	$(368 + 0.892 \times V_{adj \text{ tot}}) \times 0.239$ (kWh/year)	
Refrigerator – with freezer (Baseline)	$(465 + 1.378 \times \text{Volume}) \times 0.553$ (kWh/year)	
Refrigerator – with freezer (5star)	$(465 + 1.378 \times \text{Volume}) \times 0.228$ (kWh/year)	
Distance travelled LCV	7300 km/year	
Fuel economy	0.125 liter of Diesel / km	
EV LCV	0.3 kWh/km	Manufacturer data
BTU to kW	3412 BTU /hr = 1 kWh	Conversion



# Thank You



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