



# Stakeholder Consultation Workshop on Energy Supply and Demand Study

Consultancy Services to Conduct Energy Supply and Demand Study 2018 – 2022

### **CBIT Maldives**

Capacity Building for Improved Transparency of Climate Change Mitigation and Adaptation Actions in the Maldives









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Capacity Strengthening for Improved Transparency of Climate Change Mitigation and Adaptation Actions in the Maldives Project







### Ministry of Climate Change, Environment and Energy

Capacity Strengthening for Improved Transparency of Climate Change Mitigation and Adaptation Actions in the Maldives Project (CBIT Maldives)





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December 2024

Consultant:

Sri Lanka Energy Managers Association (SLEMA)



in Association with Epoch Associates Pvt. Ltd.



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### **Executive Summary**

As part a consultancy project to conduct an energy demand and supply study for the Maldives from 2018-2022, a consultation workshop was held on 25<sup>th</sup> November 2024. The main objective of the workshop includes.

- 1. Obtain feedback from relevant stakeholders on the data sources, data collection methods, and assumptions used in the preparation of the draft report on Energy Supply and Demand Study,
- 2. Validate the key findings through feedback from participants, and
- 3. Introduce a mechanism for continuous publishing of energy data.

The workshop was held in the Auditorium of the Ministry of Climate Change, Environment and Energy (MCCEE). A total of 18 participants (7 female, 11 male) representing key stakeholders of the study along with MCCEE officials from relevant departments and officials from URA took part in the workshop providing valuable feedback on the findings of the study and the methodologies adopted.

The workshop was conducted by the consultants of the project, Sri Lanka Energy Managers Association (SLEMA) in association in Epoch Associates of Maldives (EPOCH), in the form of plenary session presentations. The consultants facilitated plenary discussions after each session to obtain feedback on the key findings of the study as well as the sources and methods used in data collection.

The workshop is part of the Deliverable "Capacity Building Report on Energy Statistics and Energy Balance" of the Consultancy Service to Conduct Energy Supply and Demand Study issued by CBIT Maldives Project.

#### 1. Introduction

The Capacity Building Initiative for Transparency (CBIT) project of Maldives is aimed to strengthening institutional capacity for tracking mitigation and adaptation actions and establishing climate finance tracking system in the Maldives. It aims to establish and enhance the Maldives' transparency system, in line with Enhanced Transparency Framework (ETF) of Paris Agreement funded by the Global Environmental Facility (GEF) with assistance from United Nations Environment Programme (UN Environment).

As part of the Maldives CBIT project, Sri Lanka Energy Managers Association (SLEMA) in association with Epoch Associates of Maldives (EPOCH), was awarded the consultancy contract to conduct a study on Energy Supply and Demand of the Maldives. The main objective of the assignment is to develop the energy balance for the period between 2018-2022 and establish a mechanism for continuous publishing of energy balances. As part of the assignment, the consultant developed a draft report "Energy Supply and Demand Study for Maldives for the year 2018-2022" across all sectors and a mechanism for Utility Regulatory Authority (URA) to verify the power production data and a mechanism for continuous publication of the energy balance.

The workshop was held on Monday, 25<sup>th</sup> November 2024 to present and validate the key findings and data collection methods of the draft report to key stakeholders and introduce the mechanism for continuous publishing of the energy balance for Maldives. This stakeholder consultation workshop is part of the capacity building component of this assignment with a second hands-on training workshop on energy statistics and energy balance expected to be held in December 2024.

The workshop began with opening remarks from Mr. Ajwad Musthafa, Permanent Secretary of MCCEE. Mr. Ajwad Musthafa welcomed the participants of the workshop and highlighted the importance of robust energy data in shaping evidence-based policies to meet the Maldives climate and energy commitments.

After the inauguration of the workshop, presentations were given by the consultants. The presentations were given in three separate sessions with the opening session providing an overview of the consultancy and energy data. The second session focused on the overall outlook, key findings and observations from all the sectors followed by a final session on continuous reporting of energy data and publication.

This workshop report is aimed to archive the main discussions and the presentations given during the workshop on the trends in energy supply and demand, the flow of energy data, and the methodologies adopted in compiling the energy balance. This report outlines as the following.

- **Objectives of the workshop:** the section includes the objectives of stakeholder consultation workshop.
- **Presentations:** this section describes the three presentations given during the workshop. These presentations were given to facilitate and engage the participants for the discussion on key findings and methods adopted by the consultant
- **Discussions:** this section captures the main discussions and recommendations made by the participants on key findings and methods adopted by the consultant for developing the draft energy supply and demand study and the continuous reporting mechanism suggested.

### 2. Objectives of the workshop

The objectives of the workshop are the following:

- Review the draft Energy Supply and Demand Study (2018–2022) and validate its key findings.
- Enhance understanding of energy data, balances, and methodologies.
- Discuss challenges in data collection and validation across supply and demand sectors.
- Introduce mechanisms for the continuous reporting of energy balances.
- Gather stakeholder feedback to refine the study and ensure alignment with national energy planning needs.

### 3. Presentations

#### 3.1 Overview of the Consultancy and Introduction to Energy Balance and Energy Data

This presentation was given by Dr. Amila Wickramasinghe, the Energy Statistician of the consultancy project and Mr. Harsha Wickramasinghe, the Team Leader and Energy Expert of the consultancy project. The main content of this presentation includes the following.

- The main objectives of the consultancy, key tasks undertaken and the approach and methodology adopted by the consultant in undertaking the tasks.
- Main properties of an energy balance, the energy balance matrix and it's components.
- Overview of an energy flow diagram or Sankey diagram.
- Graphical representation of an energy flow diagram and the considerations within a national context.
- The energy and data flow from supply end to the consumer or demand end.
- The 2020 Sankey diagram of Maldives.

The presentation slides have been attached in Annex 01, Annex 02 and Annex 03 of this workshop report.

### 3.2 Overall Outlook, Findings and Observations

This presentation was given by the entire team of consultants on different sectors that are compiled together to present an overall energy balance of an economy. Each sector was individually presented with the context, methodology, assumptions, validation and proposals for the future in data collection and validation.

The main content of this presentation includes the following.

 The overall energy balance of Maldives for 2022 including the primary energy supply and consumer categories.

- Electricity Sector Data collection methods, methodologies adopted for data collection, assumptions,
   validation and proposal for the future.
- Resort Sector Data collection methods, methodologies adopted for data collection, assumptions,
   validation and proposal for the future.
- Transport Sector Data collection methods, methodologies adopted for data collection, assumptions,
   validation and proposal for the future.
- Fisheries Sector Data collection methods, methodologies adopted for data collection, assumptions,
   validation and proposal for the future.
- Emissions Data collection methods, methodologies adopted for data collection, assumptions,
   validation and proposal for the future.

The presentation slides are attached to Annex 02 of this workshop report.

### 3.3 Continuous Reporting Mechanism for Supply and Demand Study

This presentation was given by Mr. Harsha Wickramasinghe, the Team Leader and Energy Expert of the consultancy project and Ms Jinesha Kodikara, consultant for SLEMA. The main content of this presentation includes the following.

- Overview of the current reporting and publication mechanism of energy data in the Maldives.
- Factors that influence the change in the current energy reporting mechanisms.
- The importance of an energy supply and demand study for climate reporting and NDC's.
- Challenges faced by the Maldives in reporting accurate energy data to the authorities.
- Mechanism and steps that needs to be taken sector wise to improve the accuracy of the data reported and maintain the continuous reporting of data.
- Propose a system (National Energy Statistical System) for standard statistical indicators for the Maldives in reporting data sector wise.
- Role of the key working group involved in data collection, validation and publication of an energy balance and propose a timeline for continuous publication of energy balances.

### 4. Main Discussions and Recommendations

The following Table 4-1 summarizes the main discussions and recommendations by the participants on the data collection methods, assumptions, methodologies and the proposed mechanism for continuous publishing of the energy balance.

Table 4-1: Main discussion and recommendations from the workshop

Sectors	Main Discussion	Recommendations
Energy Supply – Overall Outlook, Findings and Observations	<ul> <li>Dr Amila Wickramasinghe highlighted that even though STELCO and FENAKA are the two major electricity service providers in the country the consultants during their visit to some of the inhabited islands noticed that there are major industrial activities carried out by private parties using their own generators for electricity generation, which is a substantial energy used not captured.</li> <li>Participants highlighted that even in Male' region there is a significant power generation from external generators which is not captured in the STELCO data.</li> <li>Participants inquired about the aviation fuel types classified as AVTUR and AVGAS in the study since the only type of aviation fuel used in the country in JET A1 fuel. Consultants explained that some of the fuel supply data received included aviation gas data.</li> <li>A significant amount of solar energy installations has been occurring within the resorts that hasn't been captured. MCCEE highlighted that with the recent MoU signed with Maldives Bureau of Statistics (MBS), they are expecting to receive this data in the future.</li> </ul>	<ul> <li>Identify and capture the electricity generated and fuel consumed by the external generators other than the STELCO and FENAKA operated generators.</li> <li>Attending stakeholders to share the existing external generator data upon request</li> <li>The energy balance to follow the JET A1 fuel format for all the aviation fuel data collected from the data</li> </ul>
Transport – Overall Outlook, Findings and Observations	<ul> <li>A GHG Inventory Expert participating in the workshop highlighted that the formula used by the consultants to derive the fuel usage for sea transport might not be entirely accurate since the number of fishing vessels in operation has significantly decreased over the past decade compared to the most recent energy demand and supply study which was done in 2012.</li> <li>Participants recommended to request the fuel supply data to fisherman from FSM as they sell fuel to fisherman at a specific rate which will be recorded.</li> <li>Consultants stated that they have received data from FSM, but the data shared does not have a</li> </ul>	To make a request to FSM for the fuel data supplied to fishing vessels.

Emission – Overall	<ul> <li>specific category stating the fuel sold for fishing vessels.</li> <li>Mr Harsha Wickramasinghe stated that the fuel consumption data of land vehicles in operation was derived from the vehicle data of the 2010-2012 Supply and Demand Study for Maldives which maybe outdated. MCCEE informed that the vehicle data obtained from Ministry of Transport and Civil Aviation for the Biennial Transparency Report (BTR) will be shared with the consultant.</li> <li>Mr Harsha Wickramasinghe suggested that taking the odometer reading of the land vehicles is an accurate way of determining the fuel usage by land vehicles as there are vehicles that have been registered in the database but not used at all for land transport.</li> <li>MCCEE informed that they are working with the Transport Ministry to establish a mechanism where the odometer reading must be reported by the service garages that the vehicle is being taken to for annual road worthiness check.</li> <li>The GHG Inventory Expert stated that fishing is</li> </ul>	Consultant to review the
Outlook, Findings and Observations	under the other category as per the IPCC guidelines for national greenhouse gas inventories.	findings for final report.
Continuous Publishing	<ul> <li>Consultants proposed simplified data input methods to the energy balance of Maldives with Joules as a primary unit to be used in the future continuous publications.</li> <li>MCCEE highlighted that the reporting schedule proposed by the consultant is similar to the process carried out by the BTR team with the roles of the working group team slightly different than the terminologies used by the consultant in proposing the continuous publication process.</li> <li>Participants highlighted that the data collection stage to start in January might not be the most ideal since the data recorded and shared might not be the most accurate and suggested the data collection process to start in February instead.</li> <li>URA requested the stakeholders present amongst the participants to share the challenges they faced in providing the data for the study in the format developed by them and the consultants.</li> </ul>	

Annex 1: Presentation on Overview of the Consultancy and Introduction to Energy Balance and Energy Data





## Stakeholder Consultation on Energy Supply and Demand Study

Consultancy Service to Conduct Energy Supply and Demand Study

25th November 2024

### **CBIT Maldives**

**Capacity Building for Improved Transparency of Climate Change Mitigation and Adaptation Actions in the Maldives** 





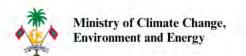


## Overview of the Consultancy

Amila Wickramasinghe PhD













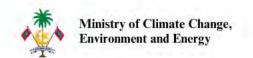


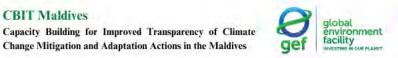
### **Objectives**

- Develop the energy balance of Maldives for the past 5 years (2018-2022)
- Establish a mechanism for the continuous publishing of the energy balance 2.













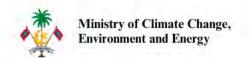
Change Mitigation and Adaptation Actions in the Maldives



### **Key Tasks Undertaken**

- Conduct Energy Supply and Demand Study for the Maldives for the years 2018 2022 and capacity building of relevant stakeholders on energy statistics and energy balance.
- 2. Review and improve the mechanism for the continuous publishing of Energy Supply and Demand report.
- Development of mechanism by which Utility Regulatory Authority (URA) can verify power production data.











### **Approach and Methodology**

Phase 1

• Study past efforts, present practices and issues faced by data providers, analysts and data users.

Phase 2

• Identification of root causes of issues which hinder smooth and continuous flow of data from action points to data repositories.

Phase 3

• Design of a seamless process of data capture, unhindered flow, validation, analysis and reporting

Phase 4

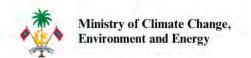
• Preparation of a roadmap to implement the new process in consultation with the key Maldivian energy sector stakeholders.

Phase 5

• Capacity building of Maldivian energy sector players to implement the new process.

Capacity Building for Improved Transparency of Climate Change Mitigation and Adaptation Actions in the Maldives









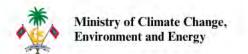


## Energy Data & Energy Balances: An Introduction

Harsh Wickramasinghe















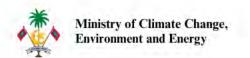
## **Energy and Economy**

- 1. Energy is an amplifier of economic output
  - a. It replaces labour
  - b. Grant access to resources otherwise inaccessible
  - c. Convert natural resources to usable goods and services
  - d. Add value

4

- No energy = No economy
  - a. Relevant to the present day civilisation
- Economic development = Supply of cheap, reliable energy in an environmentally sustainable manner
- 4. Hence the term 'energy economy nexus'







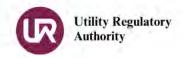


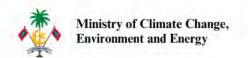




### A View From Afar...

- 1. A national economy has a heavy dependence on energy
- 2. It must be properly seen and understood
  - a. Where did it come from?
  - ь. Where did it go?
  - Most importantly, what did it do..? After going 'in to' the economy.??
- 3. A picture of the energy-economy interplay (a snapshot)
  - a. It is also a movie (several snapshots in a sequence)
- 4. A national energy balance provides all these and more
  - a. We have dubbed it the Maldivian Energy Balance (MEB)













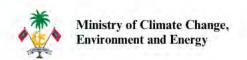
### Nature of an Energy Balance

- 1. It is a neat way to depict the energy-economy interplay
- 2. Constituted by some basic energy ingredients
  - a. Energy supply
  - ь. Energy demand
  - c. Energy waste
- 3. Also, some economic ingredients
  - a. Demography of the economy
  - ь. Economic profile of the country
  - c. Energy input to economy (interaction between energy and economy)

Capacity Building for Improved Transparency of Climate Change Mitigation and Adaptation Actions in the Maldives

d. Market prices of energy products and services





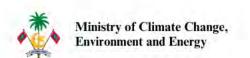






Firstly, the Energy Ingredients of the EB...













## Type of Energy Data

- 1. All types of energy sources
  - Coal, crude oil, finished petroleum products, renewable energy, LP gas, fuel wood, wood waste, residues...
    - i. How much came? From where? During which period? Stock position?
- 2. Types of transformation going on
  - a. Crude oil to oil products and gas products
    - i. How much fuel went in? How much electricity generated?
  - b. Coal or oil to electricity generation
    - i. How many tonnes of coal went in? How much electricity generated













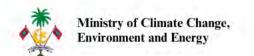
### **Types of Energy Data...**

- 1. Who is using the energy supplied?
  - a. Industrial concerns? Transport system? Buildings?
  - ь. Any fuel being used as a feedstock (non-energy use)?
  - c. What amount of energy is wasted and lost?



- 2. Snapshot is the key word here
  - A careful and methodical noting down of transacted volumes of energy commodities at each transaction point
  - b. Within a pre-set period (usually a calendar year)









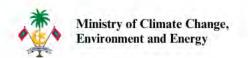




## **Energy Balance is a Complex Matrix**

- 1. A matrix of many rows and many columns for a complex industrialized, and integrated country
- 2. Columns represent groups of energy products that are available for use in the national territory
- 3. Rows represent energy flows from resources to final use
- 4. Rows and columns should contain homogeneous information a single unit of measurement.
  - a. Most countries manage with Joules and kWh







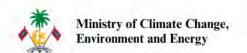




## The Complex Matric

Singapore 2012 (ktoe)	Coal	Peat	Oilshale and Oil Sands	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Geothermal	Solar, Wind, Others	Biofuels & Waste	Electricity	Heat	Heat Output from non- specified comb fuels	Total
Production	-			-	-	-	-			1.12	602.21	-			603.32
Imports	7.41			49,780.68	97,249.69	7,325.98	-			-	-	-	-		154,363.77
Exports	_			-300.90	-83,326.50	-	-			-	-	-			-83,627.40
International marine bunkers	-			-	-41,092.26	-	-			-	-	-			-41,092.26
International aviation bunkers	-			-	-6,849.58	-	-			-	-	-			-6,849.58
Stock changes	-			-	1,655.62	-	-			-	-	-	-		1,655.62
Total primary energy supply	7.41			49,479.78	-32,363.03	7,325.98	-			1.12	602.21	-			25,053.47
Transfers	-			6,844.20	-6,844.25	-	-			-	-	-	-		-0.05
Statistical differences	-			-0.00	-782.46	548.40	-			-	-	-	-		-234.06
Main activity producer electricity plants	_			-	-1,278.28	-6,397.53	-			-1.12	-602.21	3,887.11			-4,392.02
Autoproducer electricity plants	-			-	-341.38	-337.22	-			-	-	147.66			-530.93
Main activity producer CHP plants	-			-	-	-	-			-	-	-			-
Autoproducer CHP plants	-			-	-	-	-			-	-	-	-		-
Main activity producer heat plants	-			-	-	-	-			-	-	-	-		-
Autoproducer heat plants	-			-	-	-	-			-	-	-			-
Heat pumps	-			-	-	-	-			-	-	-			-
Electric boilers	-			-	-	-	-			-	-	-	-		-
Chemical heat for electricity production	-			-	-	-	-			-	-	-	-		-
Gas works	-			-	-	-	-			-	-	-	-		-
Oil refineries	-			-56,323.98	54,761.94	-	-			-	-	-			-1,562.03
Coal transformation	-			-	-	-	-			-	-	-			-
Liquefaction plants	-			-	-	-	-			-	-	-			-
Non-specified (transformation)	-			-	-	-	-			-	-	-			-
Energy industry own use	-			-	-2,089.67	-9.99	-			-	-	-161.42			-2,261.08
Losses	-			-	-	-	-			-	-	-64.76	-		-64.76
Final consumption	7.41			-	11,062.88	1,129.64	-			-	-	3,808.60			16,008.53
Industry	7.41			-	2,669.92	978.57	-					1,513.17			5,169.06
Iron and steel	-			-	-	-	-			-	-	-	-		-









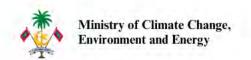




### More Properties of an Energy Balance

- 1. Compiled with respect to a clearly defined reference period (ideally a calendar year)
- 2. A separate row is reserved for statistical difference, calculated as the numerical difference between the total supply of a fuel, electricity or heat and the total use of it
- Supply of primary and secondary energy as well as external trade in energy products, stock changes, final energy consumption and non-energy use should be clearly separated to better reflect the structure and relationships between energy flows and to avoid double-counting.







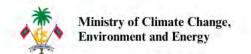




## **Top Block – Energy Input to the Country**

	Supply-Use \ Resources	Coal	Peat	Oil shale and oil sands	Crude oil	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Solar, Wind, Others	Biofuels and waste	Electricity	Heat	Heat output from non- specified combustible fuels	Total
1	Indegeneous Supply															
2	Imports															
3	Exports															
4	Bunkers															
5	Stock Change															
6	<b>Total Primary Energy Supply (TPES)</b>															









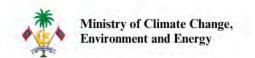




## **Total Primary Energy Supply (TPES)**

- 1. It is the most important indicator of the size of the energy industry of a country
  - Involves crude oil, finished oil products, natural gas, hydropower, coal, biomass, nuclear power and renewable energy in a developed country
  - ь. Limited to finished oil products (including LP gas) and solar electricity in the Maldives
- 2. In closely connected countries, cross border electricity and pipeline systems add severe complexities to energy balances
  - a. Involves concepts of 'net' imports after deducting exports.











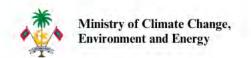


### **Energy Resources**

- In the case of fossil fuel deposits found in the country under consideration, various other aspects come into play
  - Proven resources + exploration activities
  - Annual production volumes by mine / well
  - Losses, torches and flares
  - Crude supplied to local refineries vs. crude exported
  - Monitoring of stock levels









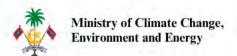




### **Middle Block - Transformations**

	Supply-Use \ Resources	Coal	Peat	Oil shale and oil sands	Crude oil	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Solar, Wind, Others	Biofuels and waste	Electricity	Heat	Heat output from non- specified combustible fuels	Total
7																
8	Statistical differences															
9	Electricity plants															
10	. , ,															
	CHP plants															
	Captive CHP plants															
	Heat plants															
14	Captive Heat plants															
	Heat pumps															
	Electric boilers															
	Chemical heat for electricity generation															
	Gas works															
19	Oil refineries															
20																
	Liquefaction plants															
	Non-specified (transformation)															
23	Energy industry own use															
24	Losses															
25	Final consumption															









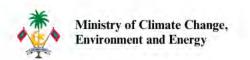


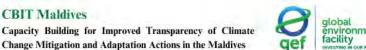


### **Transformations**

- Deals with energy conversion along the value chain
- Needs a considerable effort to report the operations of:
  - Power plants
  - Refineries
  - Gas processing plants
- Maldives case involve only the power plants
  - Type, installed capacity, available capacity, vintage
  - Annual generation vs. station use
  - Transmission losses











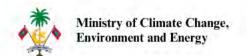




## **Bottom Block – Energy Demand from Sectors**

	Supply-Use \ Resources	Coal	Peat	Oil shale and oil sands	Crude oil	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Solar, Wind, Others	Biofuels and waste	Electricity	Heat	Heat output from non- specified combustible fuels	Total
26	Industry															
27	Iron and steel															
28	Chemical and petrochemical															
29	Non-ferrous metals															
30	Non-metallic minerals															
31	Transport equipment															
	Machinery															
33	Mining and quarrying															
34	Food, beverages and tobacco															
35	Paper, pulp and print															
36	Wood and wood products															
37	Construction															
38	Textiles and leather															
39	Non-specified (Industry)															





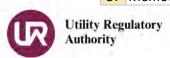


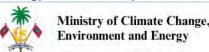




## **Bottom Block – Energy Demand from Sectors**

Supply-Use \ Resources	Coal	Peat	Oil shale and oil sands	Crude oil	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Solar, Wind, Others	Biofuels and waste	Electricity	Heat	Heat output from non- specified combustible fuels	Total
40 Transport															
41 Road															
42 Domestic aviation															
43 Rail															
44 Pipeline transport															
45 Domestic navigation															
46 Non-specified (transport)															
47 Other															
48 Residential															
49 Commercial and public services															
50 Agriculture/forestry															
51 Fishing															
52 Non-specified (other)															
53 Non-energy use															
54 Non-energy use industry/transformation	ion/ene	rgy													
55 Non-energy use in transport															
56 Non-energy use in other															
57 Memo: Non-energy use chemical/petr	ochemi	ical									_				











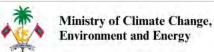
### **Additional Rows**



Capacity Building for Improved Transparency of Climate

Change Mitigation and Adaptation Actions in the Maldives

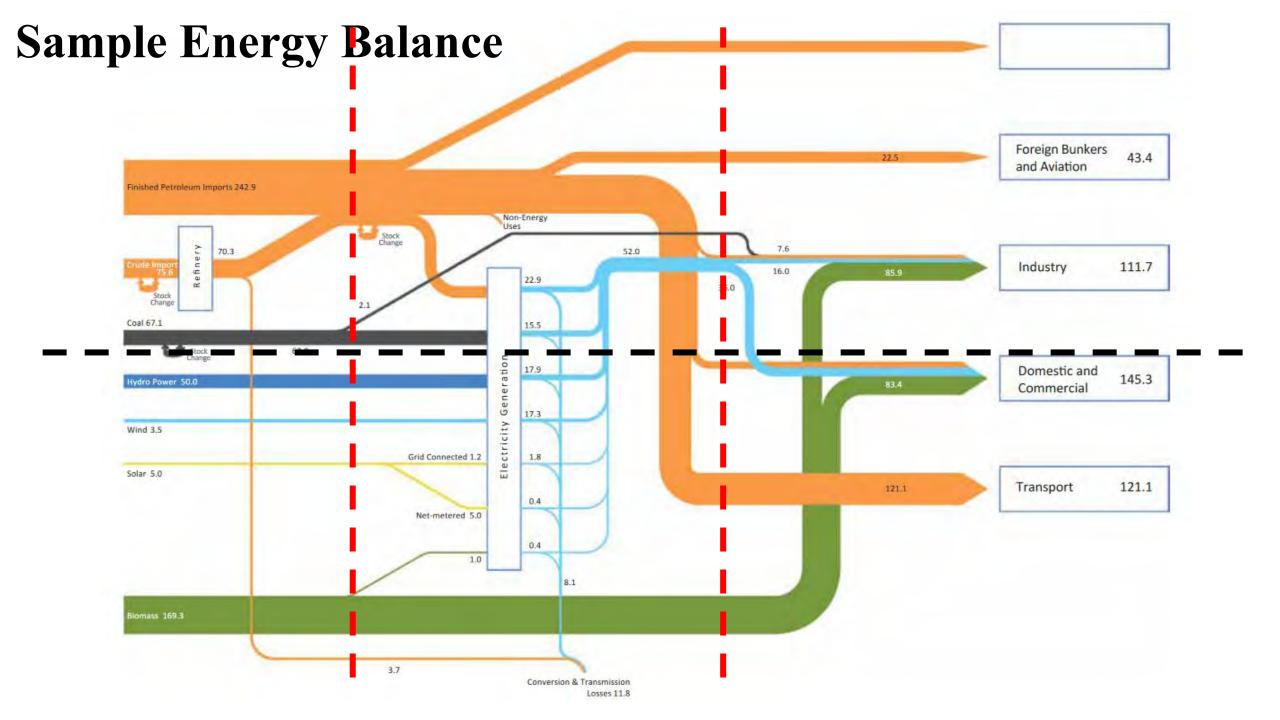




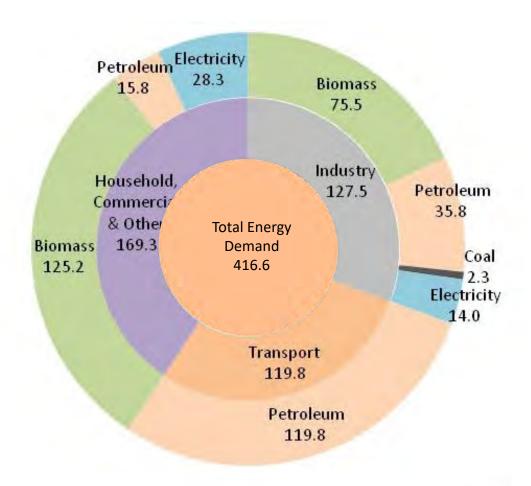




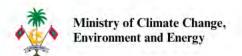




## **Energy Supply & Demand Profile**













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Change Mitigation and Adaptation Actions in the Maldives



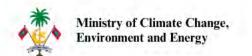
#### **Consideration of the National Context**

- Maldives, like many other countries in the region have simple economic profiles and simple energy systems
  - a. Operate in isolation from other countries
  - ь. Relatively limited number of energy products in use



- 2. Other complications could exist
  - a. Non-availability of an interconnected 'national' grid
  - ь. Many loading / unloading points
  - c. Existence of a large informal sectors (both energy and economic)



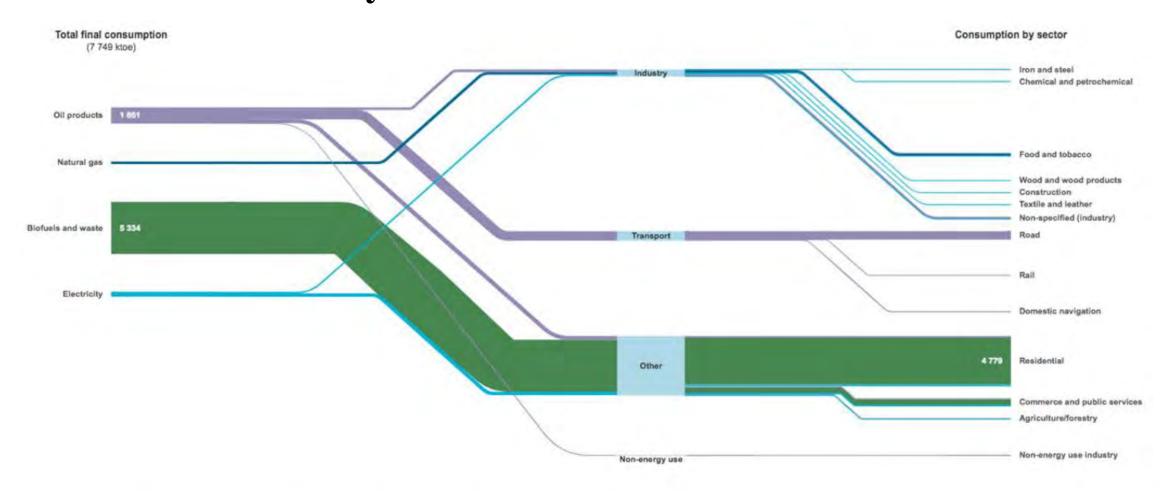






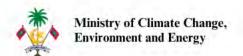


### A Similar Economy from Africa

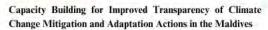


Source: International Energy Agency (IEA) from Energy Balance Flows © OECD/IEA [online]. [Accessed on September 10, 2017]. Available from: http://www.iea.org/Sanke













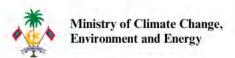


# **A Simpler Matrix**

	Supply-Use \ Resources	Oil products	Solar, Wind, Others	Biofuels and waste	Electricity	Total
1	Indegeneous Supply					
2	Imports					
3	Exports					
4	Bunkers					
5	Stock Change					
6	Total Primary Energy Supply (TPES)					
7	Transfers					
8	Statistical differences					
9	Electricity plants					
10	Captive Electricity plants					
22	Non-specified (transformation)					
23	Energy industry own use					
24	Losses					
25	Final consumption					
26	Industry					
34	Food, beverages and tobacco					
37	Construction					
38	Textiles and leather					
39	Non-specified (Industry)					

	Supply-Use \ Resources	Oil products	Solar, Wind, Others	Biofuels and waste	Electricity	Total
40	Transport					
41	Road					
42	Domestic aviation					
45	Domestic navigation					
46	Non-specified (transport)					
47	Other					
48	Residential					
49	Commercial and public services					
50	Agriculture/forestry					
51	Fishing					
52	Non-specified (other)					
53	Non-energy use					
54	Non-energy use industry/transformation	n/ene	rgy			
55	Non-energy use in transport					
56	Non-energy use in other					
	Memo: Non-energy use chemical/petro	chemi	cal			
58	Electricity output in GWh					
	Electricity Generation from Electricity p					
	Electricity Generation from Captive Elec	ctricity	plants			
	Plant Efficiencies					
69	Electricity plants					
70	Captive Electricity plants					







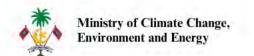






Secondly, the Economic Ingredients of the Energy Balance...









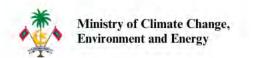




# **Demography and Characteristics**

- Population and number of dwellings in relevant administrative units (smaller the unit, better it is)
- 2. Mean temperatures (minimum and maximum in a given period daily / weekly / monthly)
- 3. Work patterns (open / close days), seasonal aspects such as crop cycles













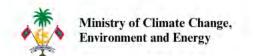
### **Economic profile of the country**

- Major constituents of the GDP at market prices and factor cost prices must be known (a long-term data set will be invaluable)
- 2. Economic output from different sectors
  - a. Fisheries and tourism to be in focus



ы. Ideally the sectors recognized in the smallest disaggregation









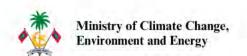


# Classifying an Entire Economy

### Main ISIC table with two-digit categorization

Section	Divisions	Description
Α	01-03	Agriculture, forestry and fishing
В	05-09	Mining and quarrying
С	10-33	Manufacturing
D	35	Electricity, gas, steam and air-conditioning supply
Е	36-39	Water supply; sewage, waste management and remediation activities
F	41-43	Construction
G	45-47	Wholesale and retail trade; repair of motor vehicles and motorcycles
Н	49-53	Transportation and storage
I	55-56	Accommodation and food service activities
J	58-63	Information and communication
K	64-66	Financial and insurance activities
L	68	Real estate activities
М	69-75	Professional, scientific and technical services
N	77-82	Administrative and support service activities
0	84	Public administration and defence; compulsory social security
Р	85	Education
Q	86-88	Human health and social work activities
R	90-93	Arts, entertainment and recreation
S	94-96	Other service activities
		Activities of households as employers; undifferentiated goods and services
Т	97-98	producing activities of households for own use
U	99	Activities of extranational organisations and bodies













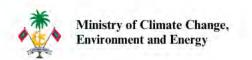
# **Energy Input to the Economy**

- Interaction between energy and economy, a fine depiction of how energy efficient a country is...
  - Energy intensity of economy (e.g. Joules which went into produce a million USD)



- 2. Per capita use of energy
  - a. kgOE per capita in a given year
  - ь. kWh per capita in a given year













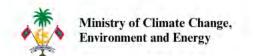
# Market Prices of Energy Products and Services

- 1. Carefully maintained records of energy prices during the period of interest
  - Every price revision of every fuel, electricity and energy supply must be recorded
  - ь. Average price for the period of interest calculated on weighted basis



- 2. It will be fruitful to record the international price movements too
  - A clear indication of taxation on energy and efficiency of the energy sector utilities can be elicited
  - ь. Not forgetting the subsidies on energy commodities











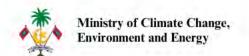


#### **Probable Sources of Data**

- Ministry of Climate Change, Environment and Energy
- Maldives Utility Regulatory Authority
- Maldives Bureau of Statistics
- Ministry of Tourism
- Ministry of Finance
- Maldives Monetary Authority
- Waste Management Corporation
- Ministry of Transport and Civil Aviation
- STELCO
- FENAKA

- Ministry of Fisheries and Ocean Resources
- Maldives Transport and Contracting Company
- State Trading Organisation
- Oil Importers and Gas Importers
- Renewable Energy Equipment Vendors
- Maldives Ports Limited
- Maldives Customs Services
- Maldives Airport Company Limited
- Maldives Industrial Fisheries Company
- Domestic Airlines











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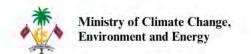
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# What Type of Data to be Collected?

- Electricity data
  - STELCO
  - FENAKA
  - Independent Power Producers
    - Generation
    - Use
    - Information about power plants
    - Information of small power producers
    - Fuel consumption in power plants

- Petroleum data
  - State Trading Organisation
  - Other Oil Companies
    - Imports
    - Exports
    - Uses
    - Pricing information
- Biomass data
  - Informal sector
  - Assumptions
    - Domestic / commercial
    - Industrial



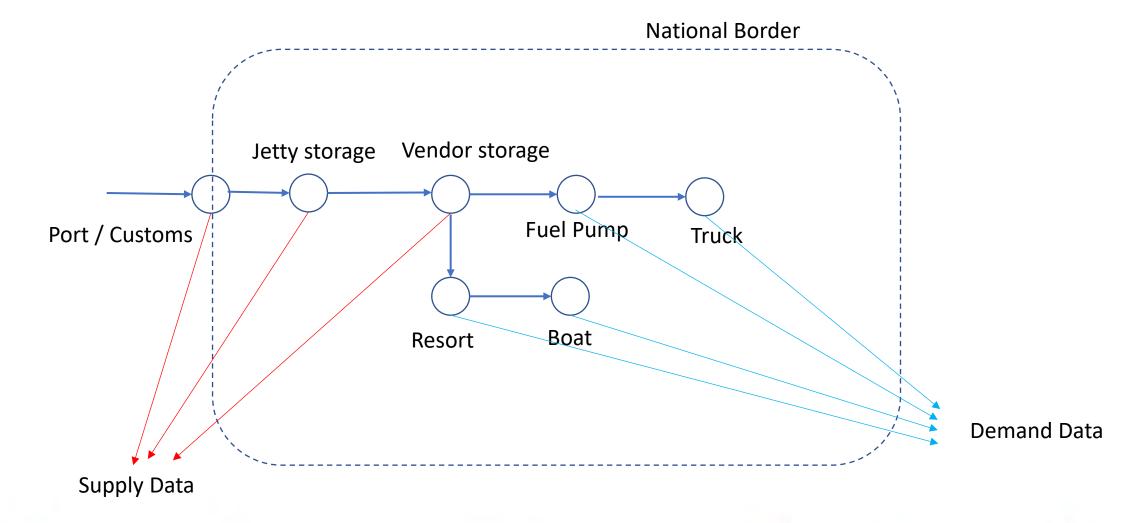




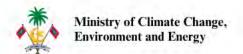




# **Energy Flow and Data Flow**









Change Mitigation and Adaptation Actions in the Maldives

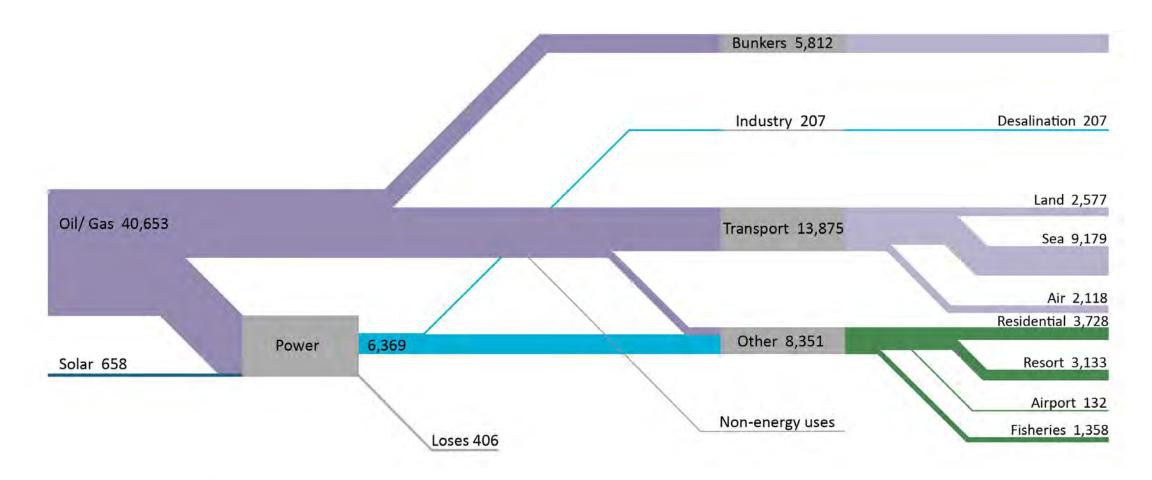




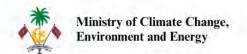


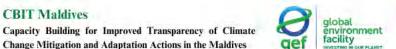
# **Energy Supply and Demand Study (2018-2022)**

All Quantities are in Terajoules (TJ)













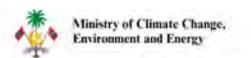
Annex 2: Presentation on Overall Outlook, Finding and Observation Across All Sectors

# Overall Outlook, Findings and Observations

Amila Wickramasinghe PhD
Sanath Kumara
Ruvinath Rathnasinghe
Harsha Wickramasinghe
Nimashi Fernando











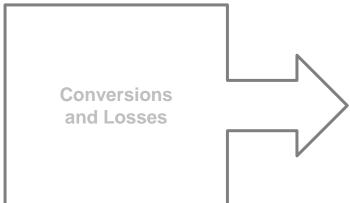


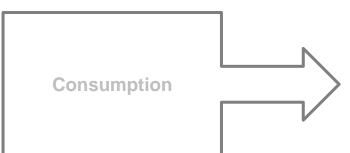
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# **Energy Balance**





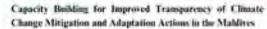


Maldives Energy Balance 203	20 (in Tera Jo	oules)					
	Renewables	Electricity	LPG/F. gas	Petrol	Jet A1	Diesel	Total
Supply							
Primary Energy	104						104
Imports			619	2,627	3,261	21,609	28,11
Direct Exports							
Foreign Bunkers & Aviation				(0)	(2,454)	(206)	(2,66
Stock Change							
Total Energy Supply	104		619	2,627	806	21,403	25,559
Energy Conversion							
Thermal Power Plants		3,044				(9,009)	
Solar PV	(95)	37					
Airport		102				(283)	
Desalination		182				(488)	
Resort diesel generation		1,110				(3,283)	
Resort solar							
Own Use							
Conversion Losses							
Losses in Transport and Distribu		(379)					(379
Consumption for Non Energy U							
Total Energy Conversion	(104)	4,096				(13,064)	
Energy Use							
Fishing industry						1,300	1,30
Desalination		182				·	18
Airport		102					10
Road Transport				1,839		551	2,39
Domestic navigation				788		6,694	7,48
Domestic Aviation					806	·	80
Resorts		1,110	282				1,39
Household, Commercial and Ot		2,703	337				3,04
Total Energy Use		4,096	619	2,627	806	8,545	16,692







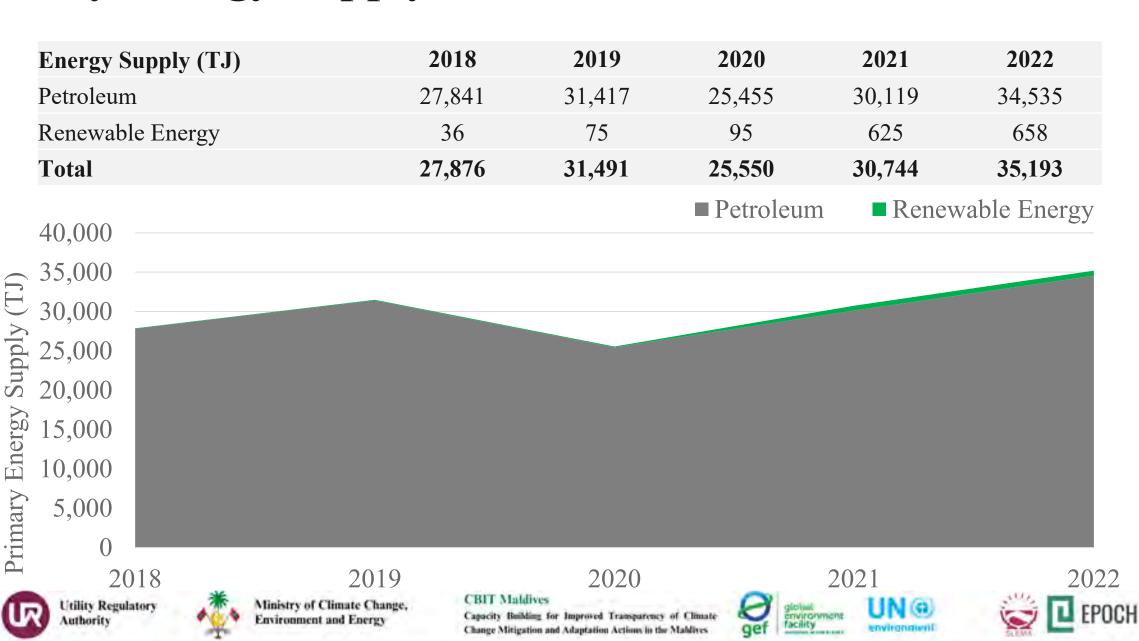






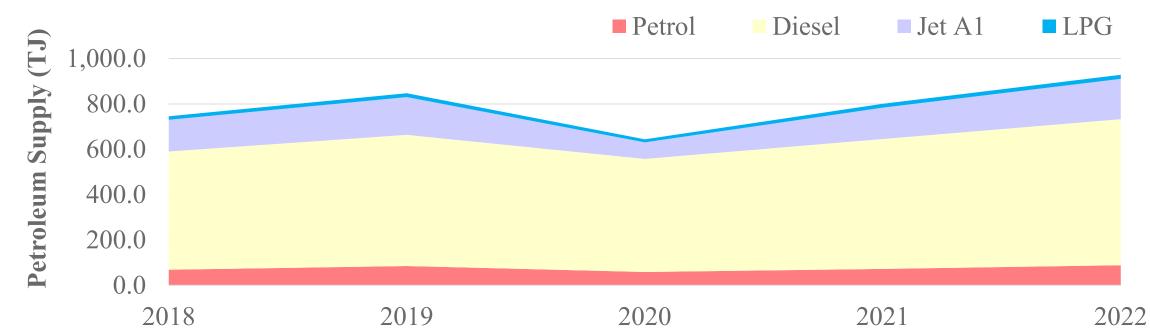


# **Primary Energy Supply in Maldives**

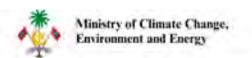


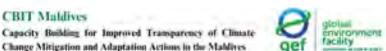
# **Supply of Petroleum Products**

Petroleum Supply (TJ)	2018	2019	2020	2021	2022
Petrol	68.6	84.7	58.6	72.5	88.6
Diesel	521.6	578.9	498.7	572.9	644.2
Jet A1	140.0	166.7	73.1	138.0	178.0
LPG	15.0	16.9	13.1	16.8	17.6









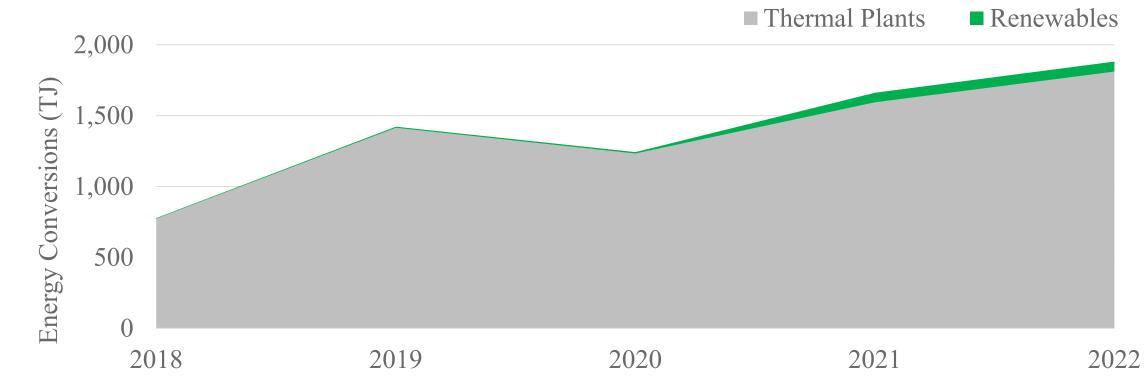




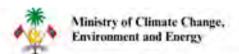


# **Conversions from Primary Energy to Secondary Energy**

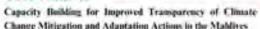
Petroleum Supply (TJ)	2018	2019	2020	2021	2022
Thermal Plants	773.8	1,414.5	1,232.4	1,594.1	1,810.2
Renewables	3.9	8.1	10.4	67.8	71.5
Total	777.7	1,422.6	1,242.8	1,661.9	1,881.7













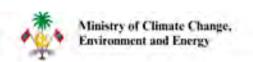




### **Energy Consumption Categories**

- Household, commercial and other
- Transport
- Resorts
- Agriculture (including fishing)
- Industry (including water desalination)





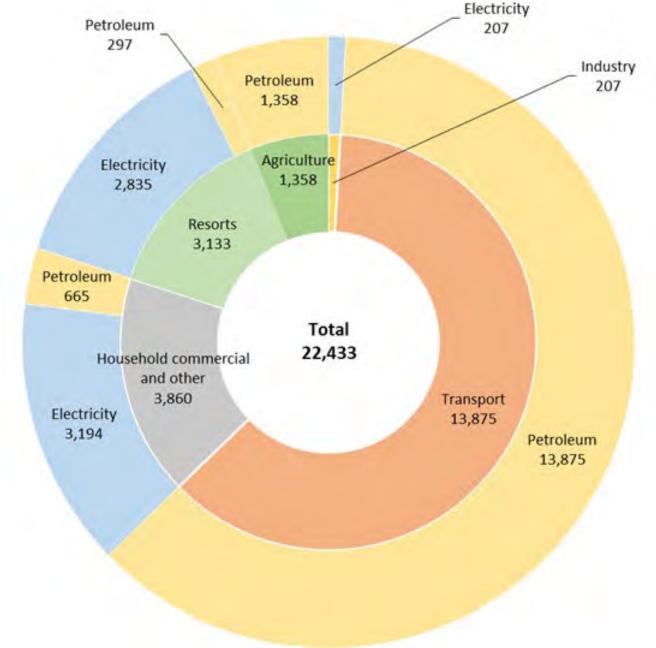




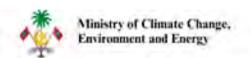


**Energy Consumption in 2022 (in TJ)** 

- Total energy consumption of Maldives in 2022 was 22,433 TJ.
- Energy consumed in the Transport Sector is sourced as liquid petroleum.
- 90% of resort energy consumption is sourced as electricity
- Total energy consumption in fishing industry, which is identified as the key agricultural activity, is sourced as petroleum fuels.
- 83% of energy consumption by households and businesses is in the form of electricity





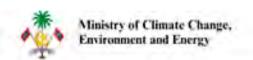




# **Transport Energy Use**

Land Transport (TJ)	2018	2019	2020	2021	2022
Diesel	321	597	561	563	563
Petrol	1,526	1,713	1,839	1,890	2,014
Total	1,847	2,310	2,400	2,453	2,577
Domestic Navigation (TJ)	2018	2019	2020	2021	2022
Diesel	12,670	8,305	6,694	6,587	7,723
Petrol	1,549	2,082	788	1,360	1,956
Total	14,219	10,387	7,482	7,947	9,679
Domestic Aviation (TJ)	2018	2019	2020	2021	2022
Jet A1	1,656	1,896	806	1,609	2,118



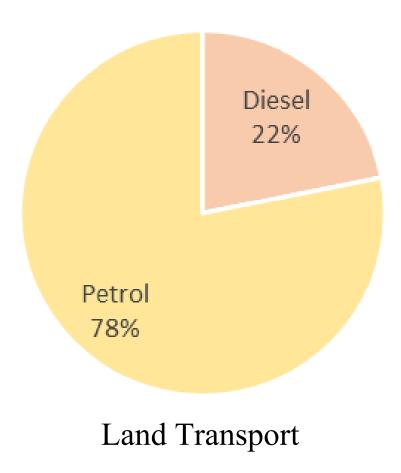








# **Transport Energy Use in 2022**



Petrol 21% Diesel 79%

Domestic Navigation





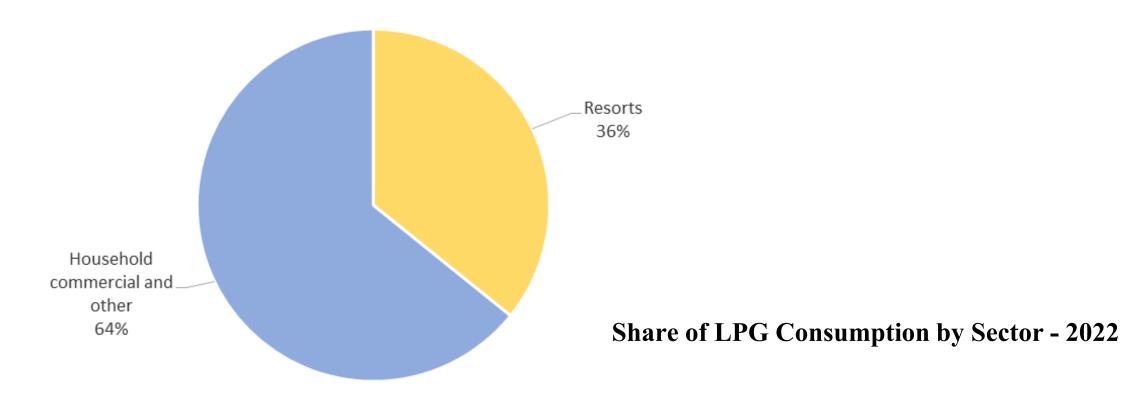




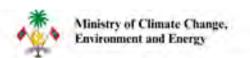


# Use of Liquefied Petroleum Gas (LPG)

LPG Consumption (kt)	2019	2020	2021	2022
Resorts	3.6	6.0	4.2	6.3
Households, Commercial and Other Users	13.3	7.1	12.6	11.3
Total	16.9	13.1	16.8	17.6





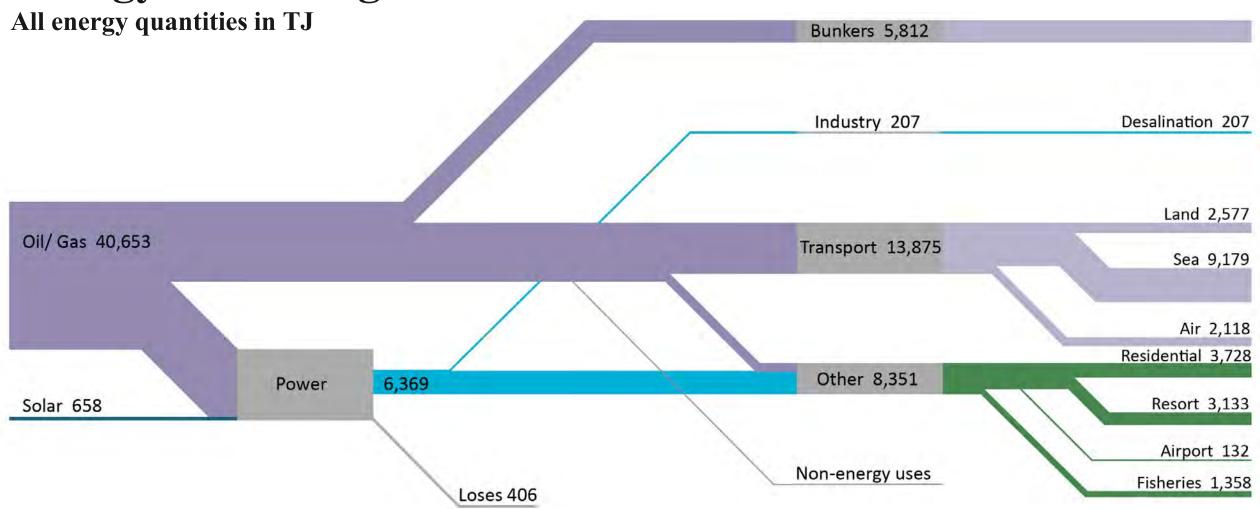




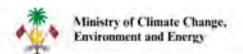




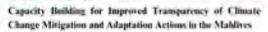
# **Energy Flow Diagram**















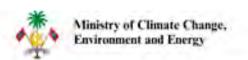


# **Energy Supply**

Amila Wickramasinghe PhD













# **Energy Supply Context**

- Primary energy supply to Maldives comprises two main forms
  - Imported petroleum
  - Indigenous renewable resources

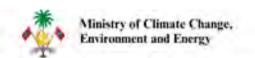
#### Petroleum

- In the absence of a refinery, petroleum supply is only in the form of finished products
- All imports are recorded by Maldives Customs Service (MCS)
- Bunkering operation is not included in the national energy balance

#### Renewable Energy

- Electricity generation by solar PV systems is the other main primary energy supply
- Solar water heating and drying, biomass cooking, any small-scale wind turbines in operation are not considered as their contribution is either insignificant or unquantifiable and not typically considered in national energy balance











# **Energy Supply Context**

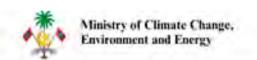
#### Secondary Energy Supply

- Apart from the petroleum use in the transport sector, primary energy supplied to the country is first converted to electricity, which is the most convenient secondary energy form, before being consumed by the end users
- Conversion of petroleum fuels to steam for consumption in industries, and resorts (for laundry and cooking) requirements is not widespread in Maldives. Even in the resorts, close to 90% of petroleum supply is for electricity production.

#### Electricity Supply

- All inhabited islands are supplied electricity by either STELCO or FENAKA by generating electricity using diesel or using solar PV systems.
- All resorts maintain own diesel generators and produce and use electricity within the resort.











# Methodology

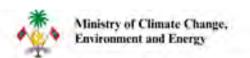
#### Petroleum

- Import data recorded by MCS is obtained for following finished products
  - Diesel
  - Petrol
  - Aviation Gasoline
  - Liquid Petroleum Gas (LPG)
- Petroleum import data are adjusted by the quantities used in the bunkering operation (if any) by removing such quantities from the total imports

#### Electricity

- Inhabited islands: use diesel and solar PV generation data from STELCO and FENAKA
- **Resort islands:** estimated based on occupancy levels of resorts reported by the statistical bureau and established electricity consumption rates of resorts











# **Assumptions**

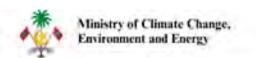
#### Petroleum

- All energy imports, even for the use of resorts are recorded at MCS
- Use of Kerosene as an energy source is negligible
- Aviation fuel types AVTUR, AVGAS, JETA1 are not separately recorded and therefore, all aviation fuel types are presented as aviation gasoline.

#### Electricity

- All diesel-based and renewable energy (solar PV) generation in inhabited islands are reported to STELCO or FENAKA, who in-turn, report the same to URA.
- No solar PV generation in resort islands, apart from the generation directly reported by several resorts to URA.
- Electricity consumption of resorts is proportional to occupancy level.











### Validation and Proposals for the Future

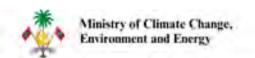
#### **Petroleum**

- Aggregate of fuel supplied by fuel suppliers operational in Maldive (STO/FSM, Hawks, Villa Gas, Maldives Gas etc.) shall tally with the fuel import data recorded by MCS.
- URA shall collect annual fuel supply data from all fuel importers operational in Maldives and crosscheck whether total imports of each petroleum product tallies with fuel supply data provided by the supplier, adjusted for storage.

#### **Electricity**

- URA shall collect electricity generation (diesel based and renewable) through the electricity data collection form from STELCO, FENAKA, MWSC, MACL, and all the resorts
- Through STELCO and FENAKA, URA shall acquire gross generation by solar PV systems operating under net metering scheme and all other solar PV generation of captive generators such as resorts, and MWSC.









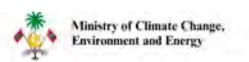


# **Electricity Sector**

Sanath Kumara













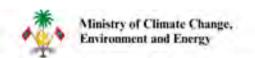
Capacity Building for Improved Transparency of Climate

Change Mitigation and Adaptation Actions in the Maldives

#### Introduction

- First country to reach 100% electrification, With diesel generators with some support from Solar PV generating electricity.
- Low and medium voltage electricity networks distributing the centrally generated electricity to the end users within a given island.
- In resorts and industries, the captive generators directly supply to the end use facilities.
- 3 islands Male', Hulhule (Airport Island), and Hulhumale' are allowing the generation in each island to be shared across a 132 kV transmission cable.
- In the inhabited islands, the electricity is supplied by the electricity utilities to the end users based on a uniform national tariff approved by the URA.











# Methodology - Data Collection

#### **Primary Data**

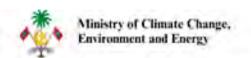
- State Electric Company Limited (STELCO)
- Fenaka Corporation Limited (FENAKA)
- Resort islands (Directly, from a few resorts)
- Maldives Airport Company Limited (MACL)
- Male Water and Sewage Company Limited (MWSC)

#### **Secondary Data**

- Annual Reports
- Electricity Data Books

**Data Collection Formats** – <u>Excel Sheet</u>, <u>Forms</u> etc..







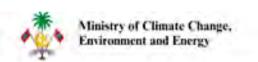




# **Methodology - Analysis**

- Analysis of Energy Supply and Demand
- Analysis of the characteristics of the socioeconomic system and the energy system as part of it









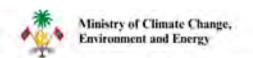


# **Methodology - Presentation**

- Total electricity use
- Specific Electricity use in different level such as micro, macro, end user etc..
- Per Capita Energy/Electricity use

Electricity use (GWh)	2019	2020	2021	2022
Resorts	538.0	308.1	643.2	787.5
Airport	38.0	28.2	42.3	36.7
Desalination plants	47.9	50.6	52.9	57.6
Household commercial and other	694.0	750.6	799.3	887.2
Total	1,317.9	1,137.5	1,537.7	1,769.0







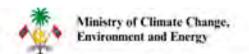




# **Electricity Generation**

- Electricity generation (for each generation center/Island)
  - Type of the generations Diesel and Solar generations
  - Installed capacity by unit/Generator
  - Installed capacity by Solar (Rooftop)
  - Fuel intake (Diesel)
  - Gross production by generators
  - Internal consumption and losses
  - Net production
  - Distribution losses
- Self generation of electricity
  - Installed capacity of generator
  - Installed capacity of Solar Rooftop
  - Fuel intake (Diesel)
  - Gross production
- Water desalination (Capacity and production)







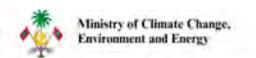




# **Electricity Consumption**

- Household (residential) sector
- Commercial/services sector
- Public Administration (lighting, air conditioning and others) sector
- Industrial sector
- Agriculture sector
- Street lighting







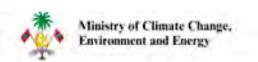




# **Assumptions**

- The difference between electricity generation and consumption reported by STELCO and FENAKA was considered as distribution losses
- Electricity generation from solar off-grid solar PV systems was considered as negligible, hence not considered for this analysis
- The electricity production/consumption of Male Airport was estimated based on the quantity of diesel consumed by the airport.









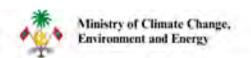


# Validation and Proposals for Future

Electricity generation and consumption under following types of generation need to be captured and verified by URA.

- Electricity generated by STELCO and FENAKA in GMR and in inhabited islands using:
  - Diesel generators
  - Own solar PV systems
  - IPP solar PV systems
  - Net metered solar PV systems
- Electricity generated in resort islands using:
  - Diesel generators
  - Solar PV systems
- Electricity generated by captive generators such as by MACL and MWSC using diesel generators and solar PV systems.







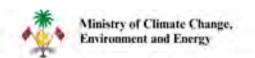




# Validation and Proposals for Future

- A unified method of witnessing the plant commissioning should be adopted by the regulator. All important plant information can be collected to a central repository (utility owned generators and privately owned generators).
- Fuel consumption and electricity generation data for each generator to be recorded (ideally on a daily basis)
- A survey should be carried out to assess and validate the available generation capacities of all generators (utility owned, privately owned, diesel or renewable energy) before an annual reporting framework is introduced on mandatory basis.
- Regulator to be empowered to enter private premises, inspect and gather data and information on all generators









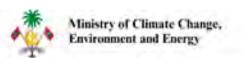


## **Resorts**

Ruvinath Ratnasinghe









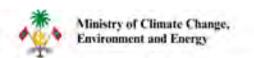




## Methodology

- For the preparation of the national energy balance of Maldives, electricity use in resorts were estimated
- Primary data on electricity generation/use of most resorts were not available
- Due to strong corelation between energy use and occupancy levels of resorts, estimates were done on 'per bed-night' basis
- Number of bed nights of the resorts were obtained from the Statistical Pocket Book 2023







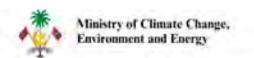




## Estimation of fuel per bed night

- Data from several sample resorts were obtained, including the following information
  - Distance to the resort from the main island (km)
  - Bed capacity
  - Bed nights per annum
  - Diesel power generation (kWh) per annum
  - Diesel consumption (litres) in power generation
  - Solar generation (kWh) per annum
  - Diesel consumption (litres) in boilers
  - Diesel consumption (litres) in other uses
  - LP gas consumption (kg) in cooking







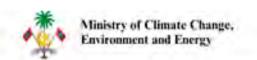




## **Electricity**

- A common electricity use value in kWh/bed-night-per annum was derived and the following were estimated
  - Electricity use
  - Electricity generation (diesel and solar)
  - Diesel consumption in power generation







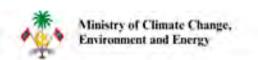




### LP gas usage

- A common consumption value for LP gas in kg/bed night per annum was derived and the following were estimated
  - LP gas consumption in cooking
- Other uses of fuels or other activities were not reported in the limited sample





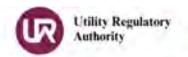


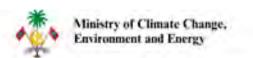




#### Formulae used

- The estimation of electricity
  - Electricity consumption<sub>(yr)</sub> (diesel) = diesel kWh/bed night<sub>(yr)</sub> \* total bed nights<sub>(yr)</sub>
  - Electricity consumption<sub>(yr)</sub> (solar) = solar generation<sub>(yr)</sub>
  - Production<sub>(vr)</sub> = (diesel + solar) consumption<sub>(vr)</sub>
  - Diesel consumption<sub>(yr)</sub> = diesel power plant efficiency \* diesel electricity  $production_{(yr)}$









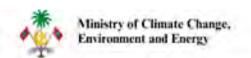


#### Use of LPG

The estimation of LPG in cooking

Consumption<sub>(yr)</sub> = LP gas kg/bed night<sub>(yr)</sub> \* total bed nights<sub>(yr)</sub>



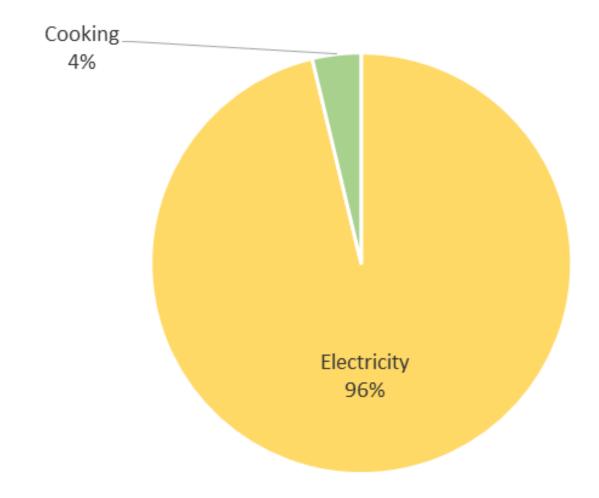




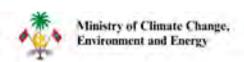




## **Energy Share in Resorts**











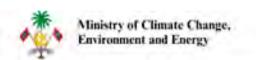


Capacity Building for Improved Transparency of Climate Change Mitigation and Adaptation Actions in the Mahlives

### **Assumptions**

- The sample of hotels assessed to derive the per bed night values is representative of all resorts in the country
- The percentage of solar generation in resorts was estimated on pro-rata basis
- The efficiency of power plants was considered to be equal to other power plant efficiencies used in thermal generation, derived from STELCO/FENAKA data







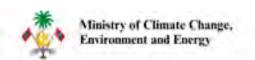




### Validation and Proposals for the Future

- Data should be collected from all resorts.
- Per bed-night calculations and estimations should be validated annually through a proper representative sample survey.
- An annual registration process can be used to acquire energy data and bed night data from all resorts.
- Fuel quantities issued from the resort storage must be properly accounted for.
- A survey should be carried out to develop a profile of a typical resort and updated at least at five-year intervals.







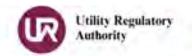


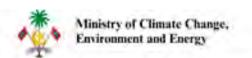


# **Transport Sector**

Harsha Wickramasinghe







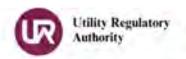


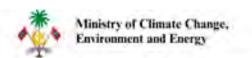




### Methodology

- Transport was considered under three categories
  - Land transport
  - Water-borne navigation
  - Aviation







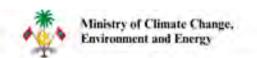




#### **Aviation**

- The imported quantity of Jet A1 was obtained from the MACL data sheet
- The disaggregation of Jet A1 fuel for the following types of transport was also obtained from the MACL data sheet
  - Domestic aviation
  - International aviation







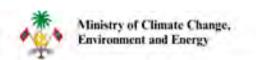




## Vehicle fleet (land)

- Limited vehicle fleet data is available in the Statistical Pocket Book 2023. Motor cars, motor cycles and the total land fleet inclusive of these categories was available from 2010 – 2020
- The following were estimated using the Forecast formula in MS excel
  - Motor cars for 2020 2022
  - Motor cycles for 2020 2022
  - Total (other) vehicles for 2020 2022







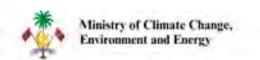




#### Other land vehicles

- The breakdown of the vehicle fleet for the period 2010 2012 was obtained from the Supply and Demand Study for Maldives 2012
- The proportions of lorries, vans/ buses, jeeps/ pickups and balance was calculated from the 'Other vehicle' totals for 2010 2012
- The average ratio was obtained from these three years









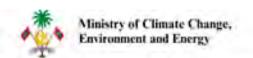


#### Other land vehicles

 The vehicle fleet from 2018 – 2022 was reconstructed using this average ratio

Registered fleet	2018	2019	2020	2021	2022
Motor cars	6,325	6,983	7,658	7,836	8,316
Motor cycle	89,897	100,513	106,821	111,177	118,381
Lorries/ trucks/ tractors	3,098	3,574	3,945	3,863	4,139
Van/ buses	2,343	2,704	2,984	2,923	3,131
Jeep, land rover/ pickup	4,721	5,447	6,012	5,888	6,307
Other vehicles	2,149	2,479	2,736	2,680	2,871







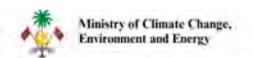




### **Fuel consumption of land vehicles**

- The breakdown of petrol and diesel vehicles (Nos.)
   were derived from the Demand and Supply Study 2010
   2012
- The number of km per day and km per litre were obtained from the above study







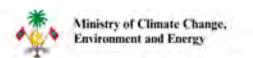




### **Petrol consumption**

- The importation of petrol was obtained from customs records
- Petrol is consumed only in land and water-borne transport. The qty consumed in land transport was calculated as shown below
  - Fuel usage <sub>(yr)</sub> (petrol) = number petrol vehicles <sub>(yr)</sub> \* number of km <sub>(yr)</sub> / km per litre
- The qty of petrol consumed in land transport was deduced from the imported amount and allotted to water-borne transport
  - Petrol usage (water)  $_{(yr)}$  =  $imported\ petrol_{(yr)}$   $land\ transport\ usage_{(yr)}$







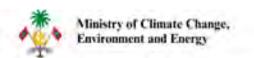




### **Diesel consumption**

- The importation of diesel was obtained from Custom records
- Diesel is consumed in transport, electricity generation, industries and agriculture
- The diesel quantity consumed in land transport is calculated as shown below
  - Fuel usage  $_{(yr)}$  (diesel) = number diesel vehicles  $_{(yr)}$  \* number of km  $_{(yr)}$  / km per litre











## Diesel in water transport

- The balance diesel is considered to be consumed in water-borne transport
- The diesel quantity consumed in water transport is calculated as shown below
  - Diesel usage (water)  $_{(yr)}$  = imported diesel  $_{(yr)}$  (land transport + electricity + industry + agriculture) usage  $_{(yr)}$







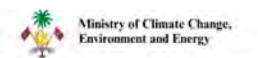




### **Assumptions**

- The reported diesel uses include transport, electricity, agriculture and industries
- The breakdown of the vehicle fleet, travel related parameters such as distance per litre, distance per vehicle per day...etc., remain the same as in the previous case







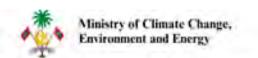




### Validation and Proposals for the Future

- Data on the active fleet for land and water vehicles/ vessels should be collected, if possible, each year. In the absence of annual data, a survey should be done at least once in three years to validate existing numbers
- A breakdown of petrol and diesel vehicles in the active/ registered fleet (land and water) should be collected annually
- Five-year surveys should be done to assess the km per day and km per litre for each category of vehicles (land and water)







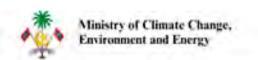




### Validation and Proposals for the Future

- An annual registration process can be used to count the active fleet for land and the active flotilla of boats.
- A breakdown of fuel usage (electric, diesel and petrol) in the active/ registered fleet (land and water) could collected annually, if reporting of odometer readings are made mandatory
- A survey should be carried out to assess the consumption of transport service by each mode and general fuel efficiencies (km per litre) for each category of vehicles (land and water), at least at five-year intervals.









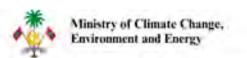


## **Fisheries**

Nimashi Fernando









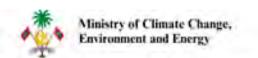




## Methodology

- Fishing is the main economic activity in Maldives and is considered under the agriculture sector
- Petroleum usage and fisheries activities were measured/estimated for the construction of the EB
- Total annual fish catches was obtained from the Statistical Pocket Book
   2023











## Methodology

- Fuel usage per fishing trip was obtained from previous surveys (Demand and supply study 2010 – 2012)
- Primary data on the petroleum usage and number of fishing trips per annum were not available
- Therefore, these were estimated on based on the total fish catches and fuel usage per trip, obtained from previous studies







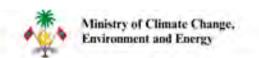




# Estimation of number of fishing trips

- Fish catches per annum for 2010 2012 were obtained from the Statistical Pocket Book 2023
- Number of fishing trips per annum for 2010 2012 were obtained from the Supply and Demand Study for Maldives 2010 – 2012
- The relationship between the above two parameters was calculated
- An average ratio was derived and used to estimate the number of fishing trips from 2018 – 2022









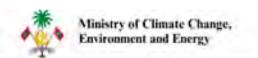


# Estimation of number of fishing trips

- The relationship between two parameters was calculated using the following formula
  - Ratio of fish trips to fish catch  $_{(yr)}$  = fish catch / number of fishing trips  $_{(yr)}$
- Results

	2010	2011	2012
Fish catch per (kt/yr)	122,175	120,836	120,866
Number of fishing trips (Nos.)	152,193	137,783	139,622
Ratio	0.80	0.88	0.87
Average ratios		0.85	







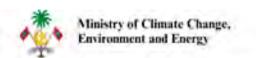




# Estimation of fuel usage

- Fuel usage per trip was obtained from the Supply and Demand Study for Maldives 2010 2012
- Formula used
  - Fuel usage  $_{(yr)}$  (diesel) = number of fishing trips  $_{(yr)}$  \* fuel usage per trip  $_{(l/trip)}$
- Quantity of fuel was converted to natural units using standard conversion factors





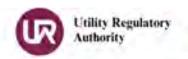


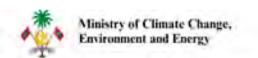




# **Assumptions**

- The number of fishing trips were proportionate to the fish catch
- Diesel was the predominant fuel used in fishing vessels
- Diesel per trip remained the same as in previous studies
- The usage of LP gas in fishing vessels was not significant
- Customs records on imported kerosene indicated minimal quantities, therefore, the usage of kerosene in fishing vessels was not significant







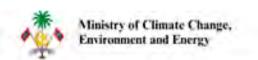




# Validation and Proposals for Future

- Data should be collected on number of fishing trips annually, if possible
- In the absence of annual data, number of past fishing trips for at least ten years should be used to derive an average ratio on the number of fishing trips to fish catch
- Types of fuel and average quantities per trip should be recorded annually









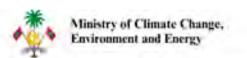


## **Emissions**

Nimashi Fernando













#### Methodology

- Only carbon dioxide (CO<sub>2</sub>) were calculated in this section
- CO<sub>2</sub> from all sectors was calculated following the methodologies in 2006 IPCC
   Guidelines for National Greenhouse Gas Inventories
- Tier I approach was adopted owing to the paucity of detailed data
- The calculation used to calculate CO<sub>2</sub> emissions;
  - Emissions (CO<sub>2</sub>) = Fuel consumption \* Emission factor







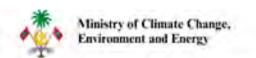




#### **Relevant chapters**

- Chapter 3 Mobile Combustion of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories was referred for;
  - Transport diesel, petrol and Jet A1 consumption
  - Agriculture diesel consumption in fishing boats
- Chapter 2 Stationary Combustion of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories was referred for;
  - Industry electricity
  - Resorts electricity and LP gas
  - Household, commercial and other electricity and LP gas







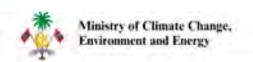




#### **Emission factors**

Type of fuel	Density	Energy content		Emission factor
	g/cm <sup>3</sup>	GJ/tonne	toe/tonne	tCO₂/toe
Diesel	0.84	43.33	1.04	3.06
Petrol	0.75	44.80	1.07	2.84
Jet A1	0.80	44.59	1.07	2.92
LP gas	0.54	47.31	1.13	2.57



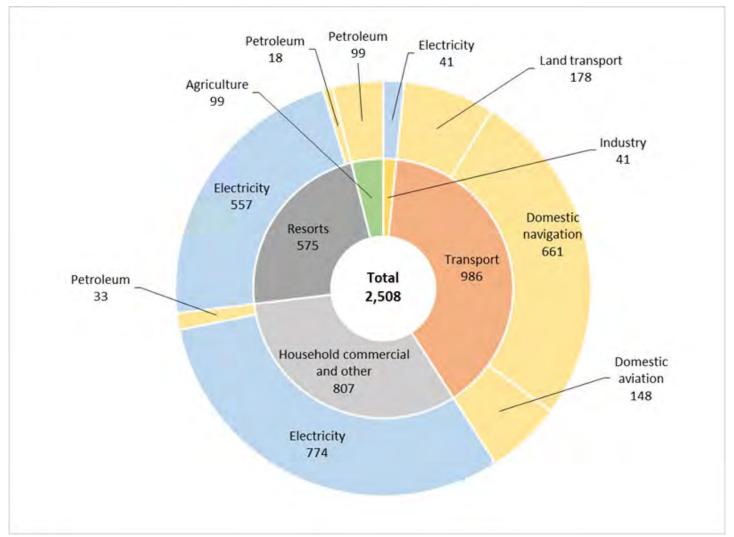




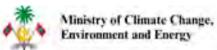




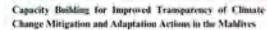
#### Emission sources in Gg – 2022















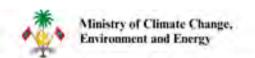


## **Electricity emission factors**

Emission factor	2018	2019	2020	2021	2022
Total GWh (diesel)	778	1,423	1,243	1,662	1,882
Total electricity emissions (kt)	606	1,097	955	1,199	1,372
Emission factor (kg of CO2/kWh)	0.78	0.77	0.77	0.72	0.73

Avoided emissions	2018	2019	2020	2021	2022
Solar generation (GWh)	4	8	10	68	71
Avoided emissions (kt of CO2)	3	6	8	49	52



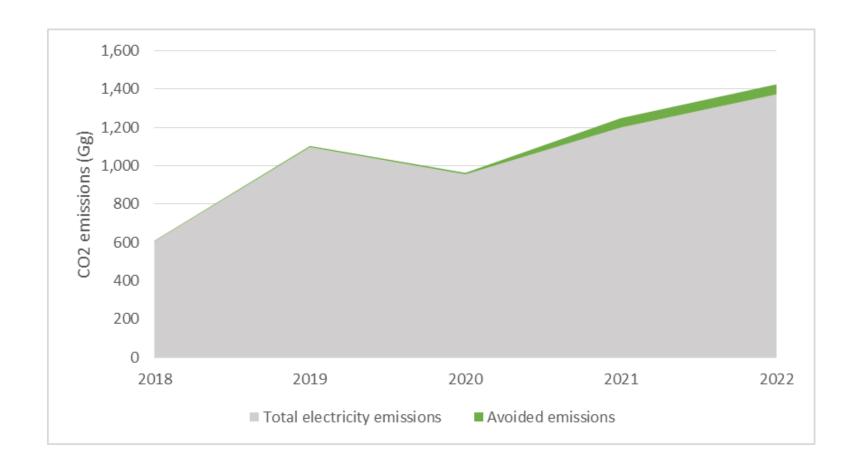


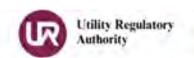


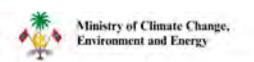




#### **Electricity emissions and avoided emissions**









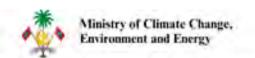




#### **Assumptions and validation**

- CO<sub>2</sub> emissions are calculated based on fuel consumption of corresponding activities
- Therefore, the assumptions applied in those calculations apply to these calculations as well
- Data validation activities applied for activity data will directly apply to emissions as well







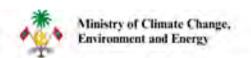




#### **Proposals for the Future**

- A better and more accurate emission portfolio must be compiled for the country, especially in view of the CoP21 matters and related NDC reporting requirements.
- A characterisation of the transport system (driving cycles, age related impact on emissions and modal shares/transport demand etc.) shall be undertaken at regular intervals
- A profile of all electricity generators must be created and supplemented with real time stack emission monitoring.











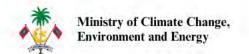
Annex 3: Presentation on Continuous Reporting Mechanism for Supply and Demand Study

# Continuous Reporting Mechanism for Supply and Demand Study

Harsha Wickramasinghe













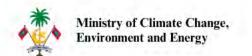


# Energy Information: The Status Quo

- Data sources are scattered unlike any other energy system
- 2. Data collection efforts are many, not quite consistent
- 3. Publication of ESDS is intermittent and project driven
- 4. Data, especially end use data are mostly aggregated
  - a. Customer categorization used is not very methodical
- 5. Energy data sharing only at the discretion of the provider
  - a. Very good with energy supply industry
  - ь. Quite poor in captive energy systems (e.g. resorts)











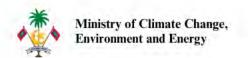




# Need for Change

- Reporting of climate information, especially climate action such as NDC has made publication a compulsory affair
  - a. Offers a unique opportunity to resolve many of the data issues
  - b. Climate data reporting requires comprehensive energy data and more
- 2. Need for a centralized planning approaches in the energy sector
  - a. It is no longer a matter only for the energy user/provider











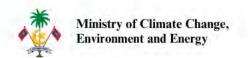


## A Great Opportunity

- 1. Accurate data and information will strengthen the 'numbers' perspective of the decision makers
  - a. Better planning, better decisions and better results
- 2. An opportunity to make ESDS a routine
  - a. Almost a ritual or an SOP















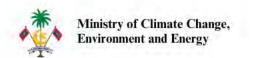
#### The Root Causes

- Scattered nature of the industry
  - a. Power grid limited to three islands and a vast number of individual power houses and oil depots
- 2. Reports are produced only on demand
- 3. Project driven strenuous effort as opposed to process driven effort



- 4. Little or no legal compulsion
  - a. An in depth analysis of the prevalent laws not yet undertaken













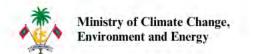
# Needs for Improvement

- The ESDS effort has various issues affecting the accuracy and the timeliness of the publication.
- 2. These issues can be broadly classified into:
  - A. Economic data including demographics and business registry
  - B. Unreported events
  - c. Energy data base data and operational data



- D. Aggregation of different data streams
- E. Role separation and assignment of responsibility
- 3. Given the complexity of these issues, the five types will be dissected separately













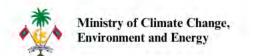
#### A. Economic Data

- 1. Proper assignment of players and users to sub sectors
  - a. Clear identification of suppliers, importers, stockists, wholesalers, intermediaries, value adders, retailers and vendors of energy commodities
  - b. Distinction between players and referees/coaches must be ensured
- 2. Proper assignment of energy users to sub sectors
  - a. International Standard Industry Classification (ISIC) is proposed



- 3. Demographic data, including housing related expected
  - a. Mid year estimates are proposed to be used
- 4. Price and financial data
  - a. Year end data from the Maldivian Monetary Authority







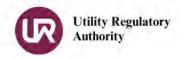


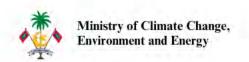




## B. Unreported Events

- Events which can alter the energy supply or demand can occur without the knowledge of the authorities
  - a. Large captive power plants may be powering industrial concerns
  - b. Installation of diesel power systems / upgrading or retirement in private organisations
  - c. Installation of renewable energy equipment or energy saving equipment in residences, private or public organisations
  - d. Import of energy uncommon commodities (e.g. charcoal briquettes or wood chips)
  - e. Use of fuel wood or residues as cooking fuels in residences / resorts
  - f. Mid-sea refueling of coastal vessels
  - g. Use of energy commodities for non-energy uses











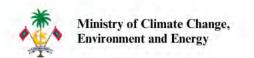


## C. Base and Operational Energy Data

- Base data refers to capacities and other 'as built' parameters of energy facilities
- 2. Operational data refers to variable inputs and outputs of an energy facility
- 3. These two types of data needs to be treated separately













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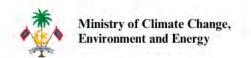
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## **Energy Industry Base Data**

- Accurate and up to date inventory of power plants and other energy facilities (e.g. capacity of oil storage tanks)
  - Date of commissioning, rated capacity, present capacity and retirements need to be reported and a complete and current inventory of energy sector assets is required
  - Equally applicable to renewable energy plants, including the smallest rooftop system
- A register of new plants being energised in a given year
  - a. A method to take note of import of power generation / storage equipment
  - b. A government authority to witness commissioning
  - c. Essential in reporting emissions related to NDC tracking













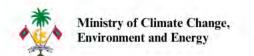
# Energy industry operational data

- A clear and concise data request format needs to be developed to answer the 5W+H questions (What, Where, Whose, for Whom, since When + How much)
- 2. A principled reporting culture: a one month cycle with year end reconciliation will be suitable
  - a. Monthly follow up of non-compliant players
  - o. A quarterly summary to highlight data deficiencies



- c. Plausibility checks > data warehousing > submit to analysts
- 3. Resolve any fuel type classification issues
  - a. A unified system based on the HS codes must be adopted by all players









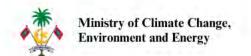




# D. Aggregation of Different Data Streams

- Due to several reasons, energy use in end use sectors are reported in a single data stream
  - a. Some industries are reported as businesses
  - b. Power generation fuel might be used for other purposes
  - c. Separation of diesel consumption among sea transport and land transport could be difficult
  - d. Diesel consumption between fishing vessels and passenger ferries could be reported together
- A committed programme to disaggregate these data streams must be undertaken
  - a. No immediate success to be expected, incremental progress ensured
  - b. Many surveys and censuses will have to be used













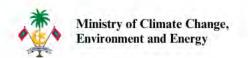
#### Industrial Data

- Mainly deals with industrial thermal energy and electricity in a production environment
  - a. Need to identify industries under a particular economic sub sector (ISIC)
  - ы. Updated business registry, employees, value added etc.

4

- c. Captive power generation to be accounted
- d. Share of energy cost in total production cost
- 2. Periodic industrial census necessary to update the business registry
  - a. Capturing new industries at the inception is important













## Transport Data

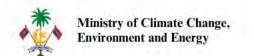
- 1. Road transport (including road vehicles and rail)
  - a. Number of vehicles by category, type of fuel, vintage, freight vs.
     passenger from the registrar (need to strike out discarded units)
  - b. Average distance driven
  - c. Average fuel consumption



- 2. Air transport
  - a. Fuel used by international carriers vs. domestic carriers
  - b. Freight vs. passenger craft and type of aircraft
  - c. Number of passengers flown and weight of goods transported

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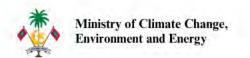


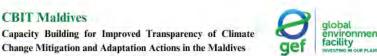


## Transport Data...

- Sea transport
  - Sale of marine fuels to international ships vs. national ships
  - Number of coastal ships and cargo ships by type, size and capacity
  - Number of passengers and distance
  - Weight of goods and distance
  - Issue of national fleet division (coastal vs. deep sea)
- A systematic approach is necessary
  - To keep track of the active fleets of road, water and air transport
  - Annual safety checks? Emission tests?
  - Odometer readings to be made a submission at annual registration
  - Surveys to disaggregate road vs. sea vs. fisheries fuel consumption etc.











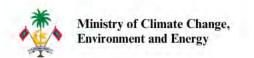




# Other (Residences, State and Businesses)

- A convenient lumping of residential, business, government services and agriculture demand
  - Data pertaining to residential units (number, location, size and energy use)
  - ы. Private businesses (floor space, persons employed and energy use)
  - c. Government services (offices, hospitals, schools, hotels, places of worship and public space lighting)
- 2. Census data to be extrapolated and surveys to be carried out
  - a. An appliance use characterisation every five years
  - ь. Building survey (at least a sample survey)











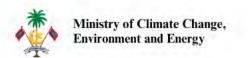


# Agriculture Data

- 1. Fisheries (Fish catch, number of vessels by type and engine capacity, average working hours, fuel use per each type of boat)
  - a. Energy use per tonne of fish catch
  - ы. Post harvest industry (processing and drying)
- 2. Any land based agricultural activities
  - a. Monitored in terms of energy used per tonne of crop













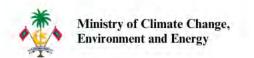
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## A National Energy Statistics System

- The proposals will lead to a set of standard statistical indicators for the Maldives
  - a. Essential indicators to be chosen by the due authorities from among a longer list of indicators
- These indicators require data from both the energy sector and the national statistics
- 4
- 3. Some indicators proposed and how these can be computed are given in the next deck of slides





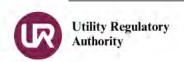


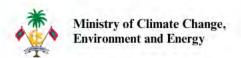




## Petroleum imports

1	Parameter Code	En 1
2	Parameter Name	Imports of LP gas, Jet A1, petrol and diesel
3	Definition / Description	The total quantity of each fuel imported to the country
4	Method of Computation	Summation of the total fuel qty imported
5	Unit of Measurement	kt
6	Method of Data Collection	Maldives Customs records
7	Level of Disaggregation	National
8	Authorised Institution	Maldives Customs
9	Related Institution	N/A
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual





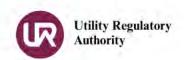


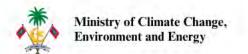




# Foreign bunkering

1	Parameter Code	En 2
2	Parameter Name	Diesel usage in foreign aviation and bunkering
3	Definition / Description	Diesel usage in foreign bunkering
4	Method of Computation	Fuel qty pumped into vessels leaving Maldives
5	Unit of Measurement	kt
6	Method of Data Collection	Annual data collection from relevant institutes
7	Level of Disaggregation	National
8	Authorised Institution	FSM
9	Related Institution	N/A
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual









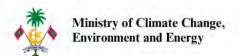


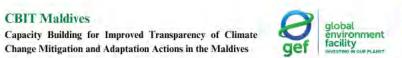
# Thermal power

1	Parameter Code	Elect 1
2	Parameter Name	Power generation in thermal power plants (utility owned)
3	Definition / Description	Annual power generation in thermal power plants
4	Method of Computation	Data collection and aggregation of data from power utilities
5	Unit of Measurement	GWh
6	Method of Data Collection	Data collected from relevant institutes
7	Level of Disaggregation	National
8	Authorised Institution	STELCO and FENAKA
9	Related Institution	N/A
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual

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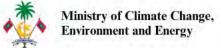


## Solar power

1	Parameter Code	Elect 2
2	Parameter Name	Power generation from solar power plants (utility owned)
3	Definition / Description	Annual power generation in solar power plants
4	Method of Computation	Data collection and aggregation of data from utilities
5	Unit of Measurement	GWh
6	Method of Data Collection	Data collected from relevant institutes
7	Level of Disaggregation	National
8	Authorised Institution	STELCO and FENAKA
9	Related Institution	N/A
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual

Change Mitigation and Adaptation Actions in the Maldives











## **Captive Generation**

1	Parameter Code	Elect 3
2	Parameter Name	Power generation and consumption in the airport
3	Definition / Description	The airport is considered as a captive generation plant. Therefore, its generation and consumption are indicated separately. It is assumed that the generated power is consumed in total and losses are negligible.
4	Method of Computation	Should be obtained from the airport authorities
5	Unit of Measurement	Electricity generation and consumption in GWh and fuel consumption in kt
6	Method of Data Collection	Data collected from the airport authorities
7	Level of Disaggregation	N/A
8	Authorised Institution	MACL
9	Related Institution	N/A
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual







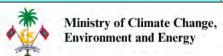




## **Captive Generation**

1	Parameter Code	Elect 4
2	Parameter Name	Power generation and consumption in water desalination plants
3	Definition / Description	Desalination plants are considered as captive generation plants. Therefore, its generation and consumption are indicated separately. It is assumed that the generated power is consumed in total and losses are negligible.
4	Method of Computation	Data should be obtained from RO plants and aggregated.
5	Unit of Measurement	Electricity generation and consumption in GWh, capacity in MW and fuel consumption in kt
6	Method of Data Collection	Data collected from RO plants
7	Level of Disaggregation	National
8	Authorised Institution	URA
9	Related Institution	STELCO and FENAKA
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual











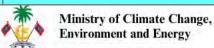
## **Electricity Generation in Resorts**

1	Parameter Code	Elect 5
2	Parameter Name	Power generation and consumption in resorts
3	Definition / Description	Resorts use diesel as a fuel to generate power. Solar based power generation is available in certain resorts.
4	Method of Computation	Data should be obtained from a representative sample of resorts and aggregated.
5	Unit of Measurement	Electricity generation and consumption in GWh, capacity in MW and fuel consumption in kt
6	Method of Data Collection	Data collected from resorts
7	Level of Disaggregation	Atoll level
8	Authorised Institution	URA
9	Related Institution	Resorts
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual

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Change Mitigation and Adaptation Actions in the Maldives





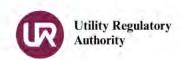


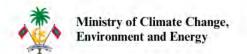


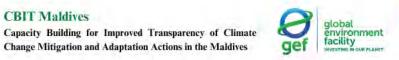


## Electricity generation HH, commercial and other category

1	Parameter Code	Elect 6
2	Parameter Name	Electricity consumption in the 'Household, commercial and other' category
3	Definition / Description	Electricity consumption in the 'Household, commercial and other' category excludes the electricity consumption in captive generation plants
4	Method of Computation	Data to be obtained from relevant institutes
5	Unit of Measurement	GWh
6	Method of Data Collection	Utility records
7	Level of Disaggregation	National
8	Authorised Institution	STELCO and FENAKA
9	Related Institution	N/A
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual







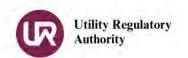


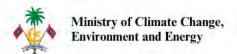


Change Mitigation and Adaptation Actions in the Maldives

### Jet A1 usage

1	Parameter Code	Tr 1
2	Parameter Name	Jet A1 usage in foreign and domestic aviation
3	Definition / Description	Disaggregated consumption data for Jet A1 in foreign and domestic aviation
4	Method of Computation	Jet A1 distribution to domestic and international aviation
5	Unit of Measurement	kt
6	Method of Data Collection	Annual data collection from the Airport authorities
7	Level of Disaggregation	National
8	Authorised Institution	MACL
9	Related Institution	N/A
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual







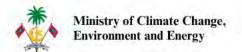


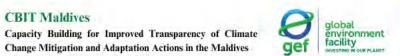


#### Fleet Data of Land Vehicles

1	Parameter Code	Tr 2
2	Parameter Name	Vehicle fleet data- land vehicle
3	Definition / Description	The breakdown of vehicles in service, by category
		Fuel by type and km/l
4	Method of Computation	To be obtained from the Transport authorities
5	Unit of Measurement	Nos.
		Percentage
6	Method of Data Collection	Survey reports and records
7	Level of Disaggregation	Atoll level
8	Authorised Institution	Transport Ministry
9	Related Institution	Maldives Customs
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual









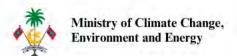


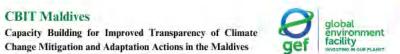
Change Mitigation and Adaptation Actions in the Maldives

#### Fleet Data of Vessels

1	Parameter Code	Tr 3
2	Parameter Name	Vehicle fleet data- water-borne vessels
3	Definition / Description	The breakdown of vessels in service, by category Fuel by type and km/l
4	Method of Computation	To be obtained from the Transport authorities
5	Unit of Measurement	Nos. Percentage
6	Method of Data Collection	Survey reports and records
7	Level of Disaggregation	Atoll level
8	Authorised Institution	Transport Ministry
9	Related Institution	Maldives Customs
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual









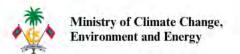


Change Mitigation and Adaptation Actions in the Maldives

## Agriculture

1	Parameter Code	Agr 1
2	Parameter Name	Fuel usage in the fisheries industry
3	Definition / Description	Diesel usage in fishing vessels, fish catch, number of fishing trips per annum
4	Method of Computation	To be obtained from the Transport authorities
5	Unit of Measurement	Nos. kt
6	Method of Data Collection	Survey reports and records
7	Level of Disaggregation	National
8	Authorised Institution	Transport Ministry
9	Related Institution	
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual







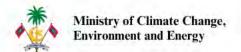




### **LPG Consumption**

1	Parameter Code	En 3
2	Parameter Name	LP gas consumption
3	Definition / Description	Disaggregated consumption data for LP gas
4	Method of Computation	LP gas distribution to different sectors
5	Unit of Measurement	kt
6	Method of Data Collection	Annual sales data of LP gas companies
7	Level of Disaggregation	Atoll level
8	Authorised Institution	LP gas companies
9	Related Institution	Receiving agencies
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual





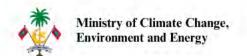






1	Parameter Code	En In 1
2	Parameter Name	Rate of electrification
3	Definition / Description	An indication of the spread and reach of electricity network in the country.
4	Method of Computation	Total number of households with an electricity connection / total number
		of households in the country
5	Unit of Measurement	Percentage
6	Method of Data Collection	STELCO and FENAKA
7	Level of Disaggregation	Atoll level
8	Authorised Institution	URA
9	Related Institution	[to be decided]
10	Data Collection Frequency	Annual estimates of housing units and decennial censuses
11	Dissemination Frequency	Provisional data - annually. Validation decennially
12	Notes	Should decide on including off-grid electricity, solar battery systemsetc.



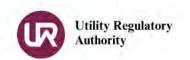


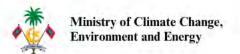






1	Parameter Code	En In 2
2	Parameter Name	Share of household income spent on fuel and electricity
3	Definition / Description	An indication of relative impact of energy prices on standard of living
4	Method of Computation	HH income spent on fuel and electricity/ HH income
5	Unit of Measurement	Percentage
6	Method of Data Collection	HH income and expenditure survey
7	Level of Disaggregation	National
8	Authorised Institution	[to be decided]
9	Related Institution	[to be decided]
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual
12	Notes	Transport, electricity and cooking fuel should be included



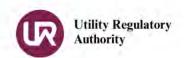


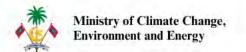






1	Parameter Code	En In 3					
2	Parameter Name	Energy use per capita					
3	Definition / Description	indication of energy use in terms of total primary energy supply, total al consumption and final electricity use per capita					
4	Method of Computation	Energy use (total primary energy supply, total final consumption and electricity use)/ total population					
5	Unit of Measurement	J or kWh per capita					
6	Method of Data Collection	Energy Balance					
7	Level of Disaggregation	N/A					
8	Authorised Institution	URA					
9	Related Institution	[to be decided]					
10	Data Collection Frequency	Annual					
11	Dissemination Frequency	Annual					
12	Notes	HH appliance penetration and a five year periodic survey on end-use practices is needed for validation.					





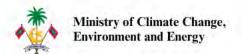






1	Parameter Code	En In 4			
2	Parameter Name	Energy use per unit of GDP			
3	Definition / Description	An indication of the total primary energy supply, total final consumption and electricity used to generate a unit of gross domestic product			
4	Method of Computation	Energy use (total primary energy supply, total final consumption and electricity use)/ GDP			
5	Unit of Measurement	toe/USD kWh/USD			
6	Method of Data Collection	Energy Balance and Statistical Reports of the Statistics Bureau			
7	Level of Disaggregation	N/A			
8	Authorised Institution	URA			
9	Related Institution	[to be decided]			
10	Data Collection Frequency	Annual			
11	Dissemination Frequency	Annual			



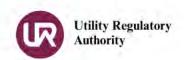


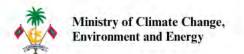






1	Parameter Code	En In 5
2	Parameter Name	Transmission and distribution losses in the electricity system
3	Definition / Description	An indication of energy lost in electricity transmission and distribution
4	Method of Computation	Total energy lost in transmission/ total net energy generation
		total energy lost in distribution/ total net energy generation
5	Unit of Measurement	Percentage
6	Method of Data Collection	STELCO and FENAKA
7	Level of Disaggregation	N/A
8	Authorised Institution	[to be decided]
9	Related Institution	[to be decided]
10	Data Collection Frequency	Annual
11	Dissemination Frequency	Annual





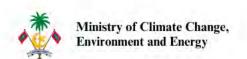






# Thank you!









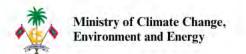


## Continuous Publication

Jinesha Kodikara













Capacity Building for Improved Transparency of Climate

Change Mitigation and Adaptation Actions in the Maldives

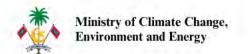


#### Continuous Publication

- 1. Study the readership profile (who will gain what, by reading the report and accessing data)
- 2. Study the information needs to be fulfilled by the publication
  - a. Climate action reporting
  - b. SDG monitoring
  - c. Many other purposes and users
- 3. Publication interval
  - a. Variable at present, propose to adopt an annual calendar













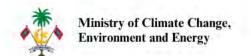
Capacity Building for Improved Transparency of Climate Change Mitigation and Adaptation Actions in the Maldives



## E. Role Separation

- 1. Appoint a Working Group to coordinate and supervise the effort
  - a. Comprising of members from the URA, Statistics, Customs, Tourism, Climate Change etc. who are not active participants in the energy market
  - b. Primary function to lead the data collection effort, ensuring all data nodes comply and provide data on a regular basis. Setting the tone for the publication, including the draft table of contents to be the secondary function.
- Convene the Data Analysis Group
  - a. Led by the URA team, supported by the Stat bureau and key players
  - b. Primary function Analyse data and prepare interim and final energy stats for the country
  - Secondary functions Identify data gaps and writing of ToRs for surveys and research required to fill data gaps
  - d. Tertiary functions Consume survey reports, disaggregate data and drive continuous improvements in the process and the publication







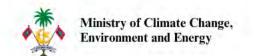




## E. Role Separation

- Appoint an Editorial Board
  - Editor in Chief, supported by sector writers from energy players, end users, creative writer, language editor and graphic content creators
  - Primary function Publish the ESDS report on annual basis
  - Secondary functions to digest the numerical content provided by the Analysts Group and create appropriate written and graphical content for the readership
  - Tertiary functions prepare and present the publication and conduct validation workshops, obtain authority to publish the report and final publication.











## Proposed Calendar of Events (Preliminaries)

Ref.	Activity	Preceding Year	Dec	Jan	Feb	Mar
1	Collect monthly data from players	URA				
2	Conduct plausibility checks and data cleaning	DAG				
3	Generate quarterly compliance reports	DAG				
4	Remind data providers on year end processes		URA			
5	Collect closing stock data with December data			URA		
6	Update operating plant inventory			DAG		
7	Obtain business registry updates				URA	
8	Collect year end custom records			URA		
9	Collate 12 month data set and reconcile				DAG	
10	Collect economic and financial data					URA

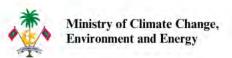
URA – Utility Regulatory Authority (Task Owner)

DAG – Data Analysis Group

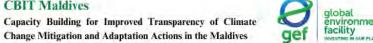
EB - Editorial Board

EiC Editor in Chief









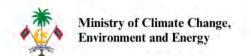




## Proposed Calendar of Events (Data Analysis)

Ref.	Activity	Mar			Арі		r	
11	Conduct preliminary data analysis				DAG			
12	Validation of interim data tables					URA		
13	Entry of data into database (time series)						DAG	
14	Update of Surveys and Research 'wish list'					DAG		
15	Create infographics and other graphics						EB	
16	Approval of infographics							URA







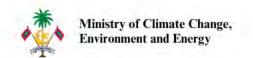




# Proposed Calendar of Events (Compilation)

Ref.	Activity	Ma	r	Α	pr		May		Ju	n		Ju	ı	
17	Write sector narratives					EB								
18	Collate sector narratives and write main content						Ei							
19	Language and consistency checks							EB						
20	Compilation of draft final report								ЕВ					
21	Extraction of short content								URA					
22	Approval from the authorities										URA			
23	Pre-press preparations												EB	
													<b></b>	<b>&gt;</b>
24	Publication													URA





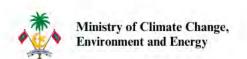






# Thank you!











#### Annex 4: Workshop Participant List

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Stakeholder Consultation on Energy Supply and Demand Study

Consultancy Services to Conduct Energy Supply and Demand Study

CBIT Maldives Project

Date: 25th November 2024

Time: 8:45 - 14:00 hrs

Venue: Auditorium - MCCEE

Section: Climate Change Department

Name	Designation	Organization	contact no	Email Address	Signature
Ahmed Waheed	Director	Climate Change Department, MCCEE			_
2 Mohamed Inaz	Project Technical Coordinator	CBIT Maldives Project, MCCEE			<u>-</u>
3 Fathimath Raufa Moosa	Project Technical Coordinator	BTR Project, MCCEE			-
4 Ahmed Masoon	Programme Officer	Climate Change Department, MCCEE			-
5 Fathmath Maishan	Programme Analyst	CBIT Maldives Project, MCCEE			+
6 Hussain Rasheed	Project Manager	ЕРОСН			1
7 Amila Wickramasinghe	Consultant	SLEMA			_
8 R.D. Rathnasinghe	Consultant	SLEMA			-
9 Sanath Kumara	Consultant	SLEMA			_
10 Nimashi Fernando	Consultant	SLEMA			-
11 Jinesha Kodikara	Consultant	SLEMA			-
12 Mohamed Rassam	Director	ЕРОСН			-
13 Nabeel Quraish	Local Consultant	ЕРОСН			-
14 Fizna Yoosuf	Director	Utility Regulatory Authority			-
15 Naifa Hassan	Assistant Director	Utility Regulatory Authority			-
16 Ahmed Naufal	Engineer	Utility Regulatory Authority			
17 Hawwa Liuza	Assistant Director	Energy Department, MCCEE			-
18 Rizna Rasheed	Project Coordinator	Energy Department, MCCEE			-
19 Ahmed Raoof Mohamed	Assistant Statistical Officer	Energy Department, MCCEE			

0	Hamiyya Latheef	Deputy Director General	Ministry of Transport and Civil Aviation	_	_
-		Senior Customs Officer	Maldives Customs Services (MCS)		
-	Ahmed Inaan	Chief Product Officer	Maldives Ports Limited (MPL)		
	Ahmed Sinan	Manager, Corporate Administration	IASL		
24	Ali Waheed	Manager, Facilities & Maintenance	IASL		†
25	Ali Hashim	Assistant Engineer	STELCO		ŧ
	Aneesa Yoosuf	Gender Expert for CBIT Maldives Project	Riyan Pvt Ltd		2
27		Engineer	MACL, PGAM, PO		1
28	TIGACIAC	Team Leader	SLEMA		-
29	1	1.4	MIFCO	_	<u>u</u>
30	1	Program officer	MCC EE		-
31		Assistant manager	Maldive Gas		2
33	2 Zammath Khalee	1 GHA Inventory	DAS PUT LTD		- '
3	3 7,000	3 2 2 1 7	16.		1 1 1
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3	35				

#### Annex 5: Photographs of the workshop







