



Ministry of Tourism and  
Environment



Utility Regulatory  
Authority

# Energy Supply and Demand Study for the Maldives

2018 - 2022

## CBIT Maldives

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



global  
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facility  
INVESTING IN OUR PLANET



**Prepared for:**

Utility Regulatory Authority (URA), Maldives

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Ministry of Tourism and Environment

**Consultant:**

Sri Lanka Energy Managers Association  
(SLEMA)



In Association with  
EPOCH Associates Pvt. Ltd.

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Consultants



## List of Abbreviations

<b>ADB</b>	Asian Development Bank
<b>BESS</b>	Battery Energy Storage System
<b>BR</b>	Biosphere Reserve
<b>CCD</b>	Climate Change Department
<b>CEA</b>	Controlled Environment Agriculture
<b>CIF</b>	Climate Investment Fund
<b>COVID</b>	Coronavirus Disease
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>EIA</b>	Environmental Impact Assessment
<b>EMS</b>	Energy Management System
<b>EPA</b>	Environmental Protection Agency
<b>FEM</b>	Fuel Express Maldives
<b>FENAKA</b>	FENAKA Corporation Limited
<b>FPV</b>	Floating Photovoltaic Panels
<b>FSM</b>	Fuel Supplies Maldives
<b>GDP</b>	Gross Domestic Product
<b>GEF</b>	Global Environment Facility
<b>GHG</b>	Greenhouse Gas
<b>GWh</b>	Gigawatt hour
<b>IPP</b>	Independent Power Producer
<b>IRENA</b>	International Renewable Energy Agency
<b>IWRM</b>	Integrated Water Resource Management
<b>kW</b>	kilowatt
<b>kWh</b>	kilowatt hour
<b>LNG</b>	Liquefied Natural Gas
<b>LP Gas</b>	Liquefied Petroleum Gas
<b>MCCEE</b>	Ministry of Climate Change, Environment and Energy, reclassified as Ministry of Tourism and Environment (MoTE), effective from 01/02/2025
<b>MIFCO</b>	Maldives Industrial Fisheries Company
<b>MMS</b>	Maldives Meteorological Service
<b>MTE</b>	Ministry of Tourism and Environment
<b>MSW</b>	Municipal Solid Waste
<b>MTCA</b>	Ministry of Transport and Civil Aviation
<b>MTCC</b>	Maldives Transport and Contracting Company
<b>MVR</b>	Maldivian Rufiyaa
<b>MW</b>	Megawatt
<b>MWSC</b>	Male' Water and Sewerage Company
<b>NDCs</b>	Nationally Determined Contributions
<b>POISED</b>	Preparing Outer Islands for Sustainable Energy Development
<b>PPA</b>	Power Purchase Agreement
<b>PV</b>	Photovoltaic
<b>RO</b>	Reverse Osmosis
<b>SDG</b>	Sustainable Development Goals
<b>SEC</b>	Specific Energy Consumption
<b>SIDS</b>	Small Island Developing States
<b>SLEMA</b>	Sri Lanka Energy Managers Association
<b>SOEs</b>	State Owned Enterprises
<b>STELCO</b>	State Electric Company Limited
<b>STO</b>	State Trading Organisation
<b>SUV</b>	Sports Utility Vehicle
<b>UN</b>	United Nations
<b>UNDP</b>	United Nations Development Programme
<b>USD</b>	United States
<b>USAID</b>	United States Agency for International Development

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## Executive Summary

This report presents the findings of the Energy Supply and Demand Study (ESDS) for the Maldives for the period 2018–2022. The Maldives, an island nation of 1,192 islands across 26 atolls in the Indian Ocean, had a population of 579,330 at the end of 2022. The country achieved universal electricity access in 2008, with supply dominated by diesel generation and a growing but still modest contribution from solar power.

In 2022, the Total Primary Energy Supply (TPES) reached 35,107 TJ, with petroleum fuels accounting for 99% and solar contributing just 1%. Total energy demand was 22,470 TJ, led by the transport sector (62%), followed by households, commercial, agriculture and other uses (37%), and industry (1%). The COVID-19 pandemic led to reduced demand in 2020–2021, but consumption quickly recovered in 2022.

Electricity generation increased steadily from 1,242 GWh in 2018 to 1,886 GWh in 2022. Diesel accounted for 96% of generation, while solar contributed 4%. Installed capacity rose from 253 MW to 406 MW during this period, supported by growth in solar PV capacity to 20 MW and battery energy storage to 8.5 MWh. STELCO's share of total generation capacity rose from 43% to 55%, while FENAKA's share decreased to 45%. Resorts also expanded generation, from 464 GWh in 2018 to 787 GWh in 2022, reflecting growth in tourism infrastructure. Diesel consumption for power rose from 307 kt in 2018 to 433 kt in 2022.

Electricity use grew from 1,160 GWh in 2018 to 1,779 GWh in 2022, with increases across industry, households, and resorts. By 2022, solar generation reached 71.4 GWh, a notable expansion from less than 1% of supply before 2020, underlining the growing commitment to renewable energy.

Petrol, diesel, LPG, and Jet A1 imports all increased over the study period, with power plants consuming about two-thirds of imported diesel. By 2022, imports of diesel reached 651 kt and petrol 89 kt. Fuel prices, which fell temporarily during the pandemic, rose sharply afterwards: petrol and diesel prices climbed to MVR 13.92 (USD 0.91) per litre in 2022, compared with around MVR 10.45 (USD 0.68) in 2018. Electricity generation costs remain among the highest in South Asia, ranging from USD 0.19–0.70/kWh depending on location. Domestic consumers receive significant subsidies, covering more than half the cost, with a block tariff structure in place.

STELCO and FENAKA are the two main utility companies. STELCO primarily supplies urban centres and served 54% of customer accounts in 2022, while FENAKA operates numerous smaller plants across 155 islands. Customer accounts grew from 116,119 in 2018 to 149,196 in 2022, driven by population growth, tourism development, and increasing electrification. STELCO served 81,859 accounts across 34 islands, while FENAKA served 67,967 accounts.

Transport energy demand in 2022 was 13,875 TJ, of which domestic navigation accounted for 68%, domestic aviation 15%, and land transport 15%. This reflects the dispersed geography of the country and reliance on sea and air transport between islands. Households, commercial, agriculture and other uses accounted for 8,388 TJ, while industry consumed 207 TJ, mainly in desalination. Resorts consumed 3,133 TJ, with 91% from electricity, and fisheries used 1,358 TJ, entirely petroleum based.

Total CO<sub>2</sub> emissions were 2,508 Gg in 2022. Transport accounted for 986 Gg, households and commercial uses for 807 Gg, and resorts for 575 Gg. The emission factor declined from 0.78 kg

CO<sub>2</sub>/kWh in 2018 to 0.73 in 2022 due to solar adoption. Solar generation avoided 56 Gg of CO<sub>2</sub> emissions in 2022, compared with only 3 Gg in 2018.

Economic indicators highlight the energy sector's growing weight in the national economy. Petroleum imports amounted to USD 831 million in 2022, representing 24% of total imports, compared with 15% in 2018. Per capita energy use increased from 36,971 MJ in 2018 to 38,786 MJ in 2022, while per capita electricity use grew from 2,265 to 3,071 kWh. Energy intensity rose marginally to 4.2 TJ per USD million GDP.

High energy costs remain a burden for households. Men, more likely to hold formal employment, tend to absorb these costs, while women, particularly in outer islands, face greater challenges in managing households and small businesses under rising costs. Gender disparities in technical roles persist, reflecting cultural barriers that discourage women from entering STEM fields, alongside limited access to training and role models.

The Maldives is among the world's most climate-vulnerable countries, particularly to rising sea levels. Reducing dependence on fossil fuels and scaling up renewable energy are critical for meeting the country's Nationally Determined Contributions (NDCs) and for building resilience. The Maldives has committed to generating 33% of its electricity from renewable sources by 2028, as reaffirmed at COP28. Achieving this target will require substantial policy and investment support, focusing on energy security, affordability, equity, climate resilience, and a just transition that creates jobs and new economic opportunities.

Overall, the 2018–2022 period reflects both progress and challenges. The Maldives has expanded solar generation and improved efficiency but continues to rely heavily on imported petroleum. Accelerating the renewable energy transition is vital to reducing costs, strengthening energy security, and achieving long-term sustainability.



## Key Energy Statistics

Energy supply (TJ)	2018	2019	2020	2021	2022
Petroleum	28,039	31,575	25,658	30,474	<b>34,832</b>
Renewable energy	14	29	37	245	<b>275</b>
<b>Total</b>	<b>28,053</b>	<b>31,604</b>	<b>25,695</b>	<b>30,719</b>	<b>35,107</b>

Energy imports (kt)	2018	2019	2020	2021	2022
Petrol	69	85	59	73	<b>89</b>
Diesel	526	583	503	581	<b>651</b>
LPG	15	17	13	17	<b>18</b>
Jet A1	140	167	73	138	<b>178</b>

Installed capacities (MW) *	2018	2019	2020	2021	2022
Thermal power (diesel)	247	332	369	342	<b>386</b>
Renewable (solar)	7	8	13	14	<b>20</b>
<b>Total</b>	<b>253</b>	<b>341</b>	<b>381</b>	<b>356</b>	<b>406</b>

*\*Only includes capacities of utilities*

Electricity production (GWh)	2018	2019	2020	2021	2022
Thermal power (diesel)	733	828	874	954	<b>1,020</b>
Renewable (solar)	4	8	10	12	<b>21</b>
Desalination plants (diesel)	41	48	51	53	<b>58</b>
Resorts thermal power (diesel)	464	538	308	587	<b>732</b>
Resorts renewable (solar)	-	-	-	56	55
<b>Total</b>	<b>1,242</b>	<b>1,423</b>	<b>1,243</b>	<b>1,662</b>	<b>1,886</b>

Electricity use (GWh)	2018	2019	2020	2021	2022
Resorts	464	538	308	643	<b>787</b>
Airport*	33	38	28	42	<b>37</b>
Desalination plants	41	48	51	53	<b>58</b>
Household, commercial, and other	621	714	764	810	<b>897</b>
<b>Total</b>	<b>1,160</b>	<b>1,338</b>	<b>1,151</b>	<b>1,548</b>	<b>1,779</b>
Transmission and distribution loss	82	85	92	114	<b>107</b>

*\*Only refers to the Malé-Velana International Airport*

Total demand (TJ)	2018	2019	2020	2021	2022
Petroleum	14,754	16,574	12,597	14,074	<b>16,064</b>
Electricity	4,176	4,816	4,144	5,575	<b>6,406</b>
<b>Total</b>	<b>18,931</b>	<b>21,390</b>	<b>16,740</b>	<b>19,648</b>	<b>22,470</b>

Demand by sector (TJ)	2018	2019	2020	2021	2022
Industry	148	173	182	191	<b>207</b>

Transport	12,723	14,593	10,678	12,010	<b>13,875</b>
Other	6,060	6,625	5,881	7,448	<b>8,388</b>
<b>Total</b>	<b>18,931</b>	<b>21,390</b>	<b>16,740</b>	<b>19,648</b>	<b>22,470</b>

Industry (TJ)	2018	2019	2020	2021	2022
Desalination plants	148	173	182	191	<b>207</b>
<b>Total</b>	<b>148</b>	<b>173</b>	<b>182</b>	<b>191</b>	<b>207</b>

Transport (TJ)	2018	2019	2020	2021	2022
Land transport	1,721	1,943	1,909	2,099	<b>2,339</b>
Water-borne navigation	9,347	10,754	7,963	8,301	<b>9,418</b>
Domestic aviation	1,655	1,896	806	1,609	<b>2,118</b>
<b>Total</b>	<b>12,723</b>	<b>14,593</b>	<b>10,678</b>	<b>12,010</b>	<b>13,875</b>

Other (TJ)	2018	2019	2020	2021	2022
Resorts	1,807	2,108	1,391	2,517	<b>3,133</b>
Household, commercial and other	2,932	3,334	3,189	3,662	<b>3,897</b>
Agriculture	1,322	1,182	1,300	1,269	<b>1,358</b>
<b>Total</b>	<b>6,060</b>	<b>6,625</b>	<b>5,881</b>	<b>7,448</b>	<b>8,388</b>

CO <sub>2</sub> emissions (kt)	2018	2019	2020	2021	2022
Agriculture	97	86	95	93	<b>99</b>
Industry	31	36	36	37	<b>41</b>
Transport	908	1,040	764	855	<b>986</b>
Resorts	374	429	257	455	<b>575</b>
Household, commercial, and other	610	681	700	755	<b>807</b>
<b>Total</b>	<b>2,020</b>	<b>2,272</b>	<b>1,852</b>	<b>2,196</b>	<b>2,508</b>

CO <sub>2</sub> emissions	2018	2019	2020	2021	2022
Average emission factor (kg of CO <sub>2</sub> /kWh)	0.78	0.77	0.77	0.72	<b>0.73</b>

Energy economic indicators	2018	2019	2020	2021	2022
Energy intensity (TJ/GDP USD million USD)	6.0	6.3	7.7	6.5	<b>6.6</b>
Percapita energy use (MJ/person)	36,971	40,061	30,032	34,570	<b>38,786</b>
Percapita electricity usage (kWh/person)	2,265	2,505	2,065	2,724	<b>3,071</b>
Petroleum imports as a share of total imports (%)	15%	16%	14%	18%	<b>24%</b>

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# 1. Maldives and Its Energy Landscape

## 1.1. Location and Geography of the Maldives

The Republic of Maldives is an archipelago in the Indian Ocean, 475 km Southeast of the coast of India. The Maldives consists of 1,192 islands, dispersed across 26 geographical atolls. Currently, 191 Islands are inhabited. The total land area of the Maldives is approximately 300 km<sup>2</sup>, extending approximately 820 km from north to south and 130 km east to west. The northern tip of the Maldives is just north of 7° N latitude, and the southern tip is just south of the equator. The Maldives is centred at approximately 73° East longitude<sup>1</sup>.

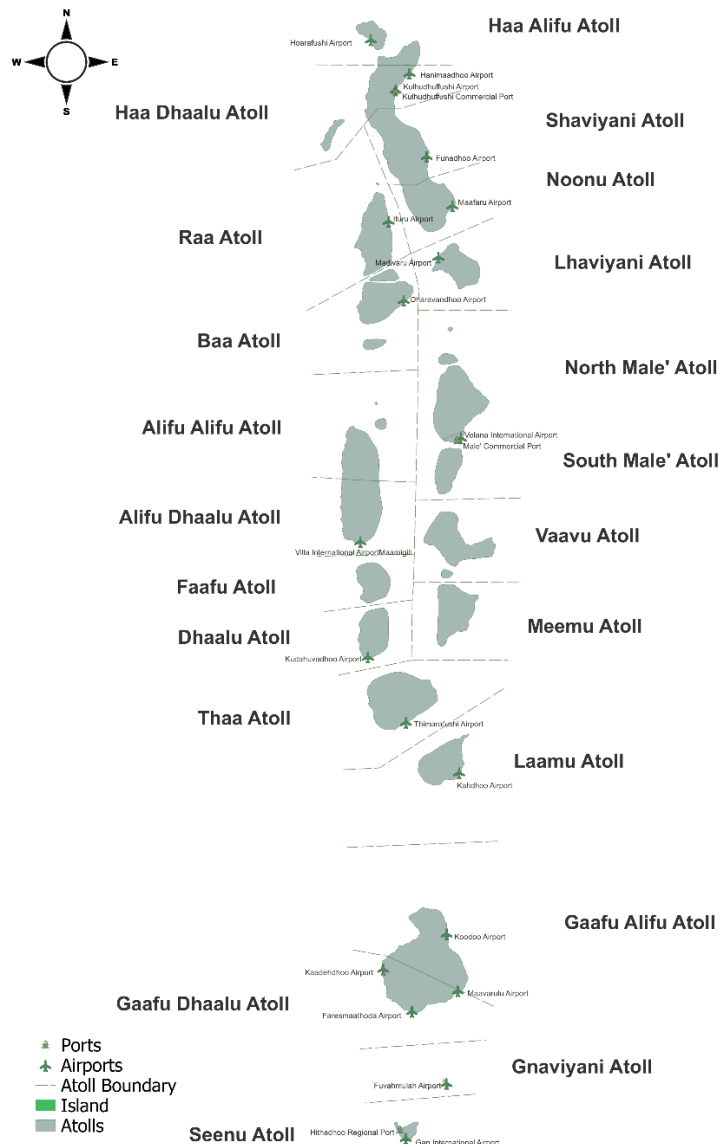


Figure 1-1 Map of the Maldives

## 1.2. Climatic Conditions

The Maldives has an equatorial climate with high humidity and average temperatures between 27° and 29° Celsius all year. The monsoon seasons, however, are not well defined. The monsoons are best defined in the northern part of the country. This region has distinct monsoon seasons including the

<sup>1</sup> Wind Energy Resource Atlas for Sri Lanka and the Maldives, National Renewable Energy Laboratory, 2003,

strong southwest monsoon from June through September and a noticeable northeast monsoon from December through February. However, at the southern end of the Maldives on Addu Atoll, there is not as strong a monsoon signal with winds speeds fairly uniform throughout the year. The average annual precipitation ranges increase from north to south with between 1,500 mm and 2,000 mm in the northern part of the country to around 2,500 mm at Gan Island on the Addu Atoll.

### 1.3. Demography

Out of 1,192 islands, 191 are inhabited and by 2022, the population of the Maldives was 579,330. A significant portion of the population is concentrated around the capital city Male' with 41% of the total resident population living in the capital and 46% of the resident population living in the outer islands<sup>2</sup>. Tourism is the main economic sector of the Maldives with 172 resort islands currently in operation<sup>3</sup>. Apart from the inhabited islands and the resorts, a few islands are designated as industrial or agricultural islands.

### 1.4. Maldives Energy Sector

The Maldives faces significant challenges in meeting its energy needs due to the absence of proven fuel reserves, leading to a reliance on imported fuels. These fuels are distributed to various islands in small quantities *via* vessels. Each island typically has its own power generation unit, mainly using diesel generators. These generators often operate with substantial reserve capacity to ensure reliability and to accommodate future demand increases, resulting in low loading levels, especially during off-peak hours. This decentralised and generally inefficient electricity generation system, combined with the high costs of importing and distributing fuel, lead to considerably higher power generation costs in the Maldives compared with other South Asian countries. The cost disparity is further exacerbated by the differences in generator efficiency: luxury resorts tend to invest in low-noise, efficient generators, while smaller inhabited islands often rely on less efficient equipment. In addition to power generation, fuel is also needed for other sectors such as transportation, fishing, agriculture, and industries. Collectively, they contribute to the high cost of energy.

Since petroleum fuel is imported, the Maldives is vulnerable to global oil price fluctuations. To keep energy affordable, the government provides subsidies that help maintain the power system. However, these subsidies place a heavy burden on the national economy, draining foreign currency reserves and limiting investment in other critical sectors. This underscores the urgent need for the Maldives to explore alternative energy sources to enhance energy security and economic stability<sup>4</sup>.

The Maldives faces severe challenges due to rising sea levels, with estimates suggesting that around 80% of the country could become uninhabitable by 2050. This dire prediction is based on the accelerating rate of sea level rise, which has increased from about 1.5 mm per year in 1900 to 4.8 mm per year today<sup>5</sup>. As a result, frequent flooding and freshwater scarcity are expected to make many of the low-lying islands uninhabitable even before full submersion occurs. The situation is compounded by coastal erosion and the vulnerability of the islands to climate change, putting the very existence of the Maldives at risk within the next few decades<sup>6</sup>. The government is quite aware of the challenges it faces and implements precautionary measures including tapping the renewable energy resources to provide electricity, reduce reliance on imports and foreign exchange drain, and combatting the impacts of climate change. The Maldives achieved universal access to electricity in 2008, long before

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<sup>2</sup> Island & Atoll Level Indicator Sheets, Maldives Bureau of Statistics, 2022.

<sup>3</sup> Tourism Yearbook, Ministry of Tourism, 2023

<sup>4</sup> A Brighter Future for Maldives Powered by Renewables: Road Map for the Energy Sector 2020–2030, Asian Development Bank, 2020



the other countries in the region reached this target. There are clear signs of the Maldives attempting to transform into a low carbon economy strongly supported by the energy sector with diminishing reliance on imported fossil fuels. Accordingly, the energy sector plays a very prominent role, dominating the development agenda of the Maldives.

## **1.5. Energy Sector Governance**

The Maldives operates as a Presidential Republic, where the President serves as both the head of state and the Head of government. The unicameral parliament, known as the People's Majlis, consists of 93 seats filled through elections held every five years. This body is responsible for legislative duties and has the authority to approve the President's cabinet appointments. At the local level, governance is decentralised, with Atoll Councils managing each of the country's administrative divisions (Atolls), and Island Councils overseeing individual inhabited islands. Members of these councils are elected by their respective communities. The Maldives' energy sector operates under the broad policy guidance of the President's Office, with many ministries and institutions executing these policies.

### **1.5.1. The Maldives Energy Act**

The Maldives Energy Act (Law No. 18/2021 of 2021) establishes a legal framework of standards and laws for the provision of energy in the Maldives, dealing with both the production and consumption of energy<sup>7</sup>.

The Act makes it mandatory to obtain permits prior to producing electricity or providing electricity services *via* a grid, for business purposes in the Maldives. Licenses for service producers producing electricity as a utility service are to be provided after a bidding process, with exemptions provided to state-owned enterprises (SOEs). The Act also makes it mandatory to obtain a license to provide power engineering services and further requires service providers engaged in petroleum products to obtain licenses for exploration, extraction, refining, importation, exportation, storage, wholesale and retail sale of petroleum products, and owning and operating vehicles and vessels used for transportation of petroleum products. The Act states that priority is to be given for local inventions used in the production and distribution of electricity.

The Act lays down the policies for granting energy service provider licenses, and the transition to a renewable-energy based economy to meet the carbon-neutral goals of the Maldives. It further outlines regulations for taking action against individuals who intentionally damage energy resources and services, as well as against energy service providers who falls short of achieving expected levels of energy services delivery.

### **1.5.2. National Policy Structure**

The Maldives Energy Policy and Strategy 2024–2029 outlines the Maldives' commitment to achieving 33% of national electricity needs from renewable sources by 2028, as announced by President Dr. Mohamed Muizzu at CoP28<sup>8</sup>. Serving as a framework for the government, industry, and the civil society, it emphasises targeted initiatives, robust regulations, and strategic investments for a sustainable energy future. The policy focuses on diversifying the energy mix by promoting renewable energy adoption, encouraging private sector investment, and introducing sustainable transportation. Improving energy efficiency is prioritised through public awareness, expanded efficiency standards,

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<sup>7</sup> Maldives Energy Act (Law No. 18 of 2021), Government of Maldives, 2021.

<sup>8</sup> Paving the Way For a Just Energy Transition in Maldives – Road Map for the Energy Sector 2024–2033, Ministry of Climate Change, Environment and Energy, Republic of Maldives, 2024.

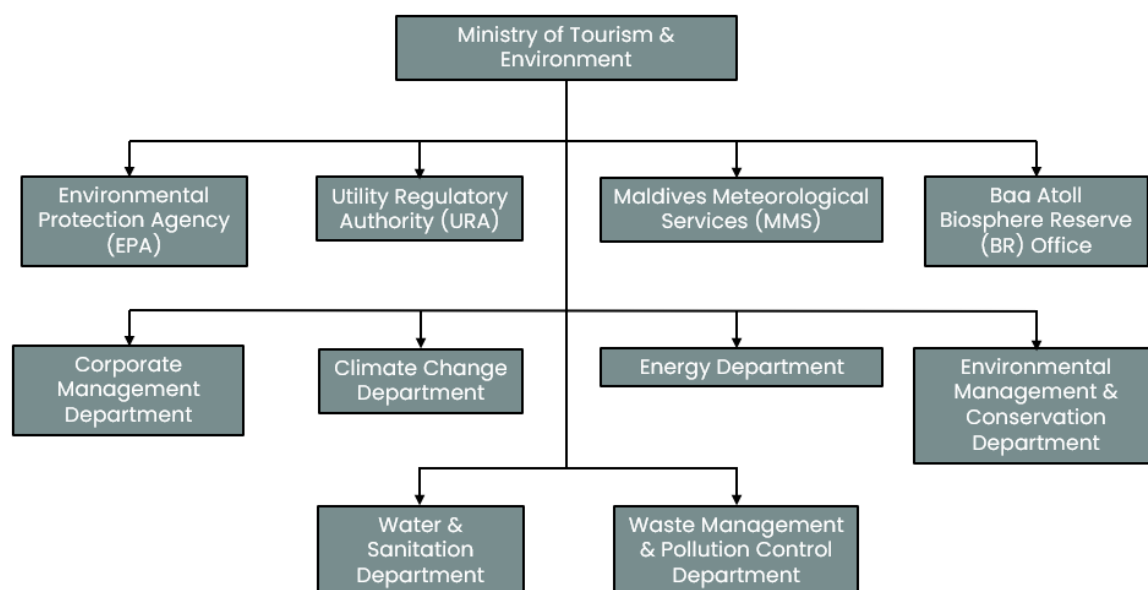
sustainable building practices, and low-emission fuels. To enhance energy access, the policy includes targeted subsidies, tariff reviews, increased fuel storage, and the promotion of locally available renewable energy. Strengthening energy governance involves reinforcing regulations, establishing reliable data collection, building institutional capacity, and enhancing international cooperation. Finally, public awareness and engagement will be promoted through investments in research, innovation, and financing mechanisms to accelerate sustainable energy solutions.

## 1.6. Energy Sector Institutions

Brief descriptions of the different institutions having a stake in the Maldivian energy sector are presented in the following sections.

### 1.6.1. Ministry of Tourism and Environment

The government body, the Ministry of Tourism and Environment (MoTE) is the key ministry related to the energy sector of the Maldives. The ministry works towards a cleaner, greener and safer Maldives, and is responsible for implementing government policies, regulations, programmes and projects related to provision of clean and affordable energy services. The purview of the ministry also expands to advocating for the rights of the small island developing states (SIDS) in the fight against climate change by mobilising finance to adapt and mitigate the negative impacts of climate change. This ministry also coordinates sustainable development goals within the government while being responsible for the protection and preservation of the natural environment. The mandate of the ministry also includes the provision of clean water, clean and healthy environment which is free from pollution, appropriate sewerage services, and protection of the islands from coastal erosion.



*Figure 1-2 Institutional Framework for Climate Change, Environment, and Energy*

#### 1.6.1.1. Energy Department

The Energy Department is the key department having a significant and a direct stake in the energy sector within the ministry. This department oversees formulating policies related to the energy sector in line with the legislative framework of the Maldives. It strengthens international cooperation to boost

both investment and know-how in the energy sector and is committed to raising awareness on energy resources and consumption.

#### **1.6.1.2. Climate Change Department**

The key responsibility of the Climate Change Department is formulating policies and standards to address the challenges of climate change within the country's legislative framework while considering international conventions and practices. Accordingly, this Department is responsible for ensuring and integrating sustainable financing into low emission development measures and climate change adaptation actions, building climate-resilient infrastructures, and ensuring energy security. This Department advocates for climate actions and policies at the national, regional, and international levels while playing a pivotal role in leading international negotiations on climate change.

#### **1.6.1.3. Utility Regulatory Authority**

The Utility Regulatory Authority (URA), established under the Maldives Energy Act, is responsible for regulating and overseeing the energy sector, including licensing energy providers and ensuring compliance with relevant laws. It reviews and approves energy tariffs to ensure they are fair and aligned with the national energy policy while maintaining the financial viability of service providers. URA protects consumer rights by ensuring reliable service delivery and addressing complaints and disputes. It sets and enforces quality, safety, and reliability standards for energy services, promotes the adoption of renewable energy technologies, and facilitates their integration into the electricity grid. Additionally, URA collects and reports data on energy supply, distribution, and consumption to inform policy decisions. It ensures environmental compliance of energy projects through coordination with relevant authorities and through environmental impact assessments. The Authority also resolves disputes within the sector, advises the government on energy policy, and is empowered to set ceiling prices for electricity services in inhabited islands, ensuring all service fees are regulated under the Act.

### **1.6.2. Energy Utilities and Authorities**

The history of providing electricity in the Maldives dates back to 1949. Initially, the Maldives had an installed capacity of 14 kW, and it supplied electricity to about 50 residences of the capital city, Male'. During the period 2018 – 2022, electricity service in the Maldives was provided by three main state-owned utilities, namely State Electric Company Limited, FENAKA Corporation Limited and Male' Water and Sewerage Company Private Limited.

#### **1.6.2.1. State Electric Company Limited (STELCO)**

STELCO is a fully state-owned enterprise under the Ministry of Finance. STELCO is engaged in generation, transmission, distribution and retailing of electricity in the atolls of Kaafu, Ari and Vaavu. By 2022, STELCO served customers through 34 independent power plants and seven water desalination plants as well as five sewerage systems on different islands<sup>9</sup>.

#### **1.6.2.2. FENAKA Corporation Limited (FENAKA)**

Established in 2012 by a presidential decree, FENAKA is a fully state-owned utility company under the Ministry of Finance. FENAKA provides electricity, water and sewerage mainly to the outer island communities of the Maldives. The company operates 149 powerhouses providing electricity to 155 inhabited islands from 16 atolls. In 2022, FENAKA introduced a scheme for solar photovoltaic (PV) systems connected to the main electricity grid and operated as net-metering systems, encouraging households to invest in their own power generation.

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<sup>9</sup> Annual Report, STELCO, 2022.

In 2022, FENAKA commenced providing ice to fishermen, for which it acquired 14 ice plants. These are expected to continuously supply ice to the fishermen at affordable prices. Apart from the provision of electricity, FENAKA also provides clean water supply to 49 islands and sewerage facilities to 67 islands

<sup>10</sup>.

#### **1.6.2.3. Male' Water and Sewerage Company (MWSC)**

MWSC was established in 1995 and is the pioneer organisation in water production and wastewater management systems in the Greater Male' Region. MWSC is also an SOE with 80% ownership held by the government and the balance 20% held by Hitachi Limited. MWSC embarked on providing electricity services to the island of R. Dhuvaaafaru in 2014 under its integrated utility services model. Power is mainly generated through diesel, and the company is shifting towards renewable energy for power generation. The MWSC is also engaged in waste management. Overall, MWSC serves over 50% of Maldivians and has expanded its operations to production and distribution of bottled water, polyethylene and polyvinyl chloride (PVC) pipes from the manufacturing sector as well as into providing engineering solutions and engaging in trading. Additionally, MWSC operates their own diesel generators for power generation to run the desalination plants for the capital city and the Greater Male' Region.

#### **1.6.2.4. State Trading Organisation (STO)**

STO is a publicly quoted company in the Maldives, with the majority stake with the government. Trading is a core segment of STO's business which has several departments. The Energy Department of STO is the supplier of fuels to the Maldives. A key objective of this department is to ensure energy security of the Maldives. The department operates in the Kaafu Atoll out of Funadhoo terminal which has a storage capacity of 59,000 barrels of petrol and 291,000 barrels of diesel. STO sources products from established oil suppliers and employs its own fleet of tankers from its source of origin to end customers. Petrol and diesel required by the utility infrastructure, resorts, and private customers are supplied by STO. Fuel Supplies Maldives (FSM) is a subsidiary of STO established to distribute fuel within the country. FSM has a network of fuel stations in major cities to provide users with 95% petrol and low sulphur diesel.

#### **1.6.2.5. Island Councils**

The Decentralisation Act of the Maldives mandates the Local Councils to provide and ensure basic utility services such as electricity, water, sanitation and sewerage systems to the island communities. However, these Councils lack the technical resources and capacity to provide such services in practice. Most of the utility services in the islands have traditionally been provided by State Owned Enterprises (SOEs) operating in the islands. SOEs remained as the service providers to the island communities even after the amended law entrusted the Councils to provide the basic utility services. The law stipulates that if the Councils want to assign the functions of provision of services to a third party, such must be executed by virtue of an agreement. The main electricity utilities, *viz.*, STELCO and FENAKA continue supplying electricity to the communities of inhabited islands while the MWSC supplies electricity to the R. Dhuvaaafaru and Villa Hakatha provides electricity to Adh. Maamigili.

### **1.6.3. Other Ministries**

#### **1.6.3.1. Ministry of Tourism**

Tourism is very vital to the Maldives' economic prosperity, wellbeing of the people, and its development success. Tourism propelled the Maldives from a least developed country to an upper-middle-income country. The Maldives Monetary Authority (MMA) estimated that the tourism sector

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<sup>10</sup> Providing Essential Water and Sewerage Services Across the Maldives, FENAKA, 2024.

receipts have recorded USD 4.5 billion in 2022<sup>11</sup>. The Ministry of Tourism was reclassified and is referred to as Ministry of Tourism and Environment (MoTE) effective from February 1, 2025. MoTE is the policy making institution for the tourism sector in the Maldives. Further, the tourism industry being highly energy intensive, the influence to the energy sector by this ministry is significant.

#### **1.6.3.2. Ministry of Transport and Civil Aviation**

This ministry is the main policy making institution in the transport sector which is obligated with policies and regulatory aspects on land, sea and air transportation in the Maldives. It is entrusted with strengthening transport connectivity and providing transport-related administrative services. This ministry is able to provide an overview of the transport sector and provide data on land and sea transport vessels. As most transport vessels are run by fuel, the transport sector is a large energy consumer. Therefore, the impact to the energy sector by the ministry is significant.

#### **1.6.3.3. Ministry of Fisheries and Ocean Resources**

The ministry aims to transform the fisheries sector into a sustainably managed, market-driven system that supports food security, economic growth, and natural resource protection. Fisheries play a vital role in livelihoods and the Maldives' GDP. Activities like fishing, preserving, drying, and processing—especially tuna canning—use significant energy, with tuna exports mainly going to Europe. Therefore, the ministry is an important stakeholder of the energy sector.

### **1.6.4. Other State Agencies**

#### **1.6.4.1. Maldives Industrial Fisheries Company (MIFCO)**

MIFCO is a state-owned fishing company established to create and enhance economic value for the local fishing community and to support the Maldives economy. This entity is engaged in transforming the fishing industry to add commercial value to the daily fish catch. To facilitate this endeavour, MIFCO operates fish processing plants and freezing systems. Currently there are four major MIFCO factories across the Maldives, in the atolls of Lhaviyani, Gaaf Aliff, Kaafu, and Seenu where its operations are conducted. These energy intensive processes and systems make MIFCO a significant consumer of energy.

#### **1.6.4.2. Maldives Transport and Contracting Company (MTCC)**

MTCC is a state-owned enterprise operating public marine and land transport services between and within the islands of the Maldives, apart from being a civil and marine constructor. MTCC operates a fleet of high-speed ferries, speed boats and buses, and holds the transport activity data and data on fuel consumption. Therefore, the MTCC is a significant stakeholder in the energy sector of the Maldives.

#### **1.6.4.3. Invest Maldives**

Invest Maldives is the lead government agency under the Ministry of Economic Development and Trade which is responsible for investment promotion, facilitation, and registration in the Maldives. This institution offers a one-stop shop to facilitate potential investments into the Maldives. The government promotes investments on renewable energy projects under Independent Power Producer (IPP) licenses and the sale of the generated power to the utility companies under Power Purchase Agreements (PPA). These are open for land based, roof-mounted or floating solar PV systems and other renewable energy technologies. Potential investors also have the option of partnering with the private sector entities such as resort operators to transfer to renewable and smart energy solutions. Therefore, this agency has a great potential to contribute to the energy sector of the Maldives.

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<sup>11</sup> Maldives Monetary Authority, Annual Report 2022, pp. 17

### 1.6.5. Multilateral Agencies

Multilateral agencies such as the World Bank Group, Asian Development Bank (ADB), United Nations (UN), especially United Nations Development Program (UNDP), and the United States Agency for International Development (USAID), etc., also play an active supporting role in the energy sector of Maldives.

### 1.6.6. Resorts

Each resort in the Maldives is essentially an individual island with their own infrastructure, including its electricity system. The primary source of electricity in these resorts are diesel generators. The commissioned generators operate independently on each island, meeting the demand for power by the resorts ensuring a steady and reliable supply of electricity for them to operate smoothly. The use of diesel generators is a practical solution given the geographical dispersion of the islands, as it allows for independent operation without the need for extensive power grids. The diesel power generators, although most of which are low noise generators, are typically located in a separate area of the resorts. This helps to minimise the noise levels, and make it is convenient for the technical staff in maintaining the systems. This setup ensures that guests can enjoy their stay without any interruptions or inconveniences.

Supplying potable water is a significant challenge in the Maldives as islands lack freshwater sources. The resorts typically use desalination plants to remove salt and other impurities from seawater by using reverse osmosis process. These plants convert seawater into freshwater which is used for multiple purposes such as for drinking, cooking, and irrigation. Desalination is an energy-intensive process that increases the demand for electricity in the resorts.

The Maldives is also exploring renewable energy options aligning with the global energy transition towards renewable energy. The islands' geographical location near the equator makes them well exposed to abundance of sunlight throughout the year. Therefore, the resorts have a significant potential to generate solar power as an alternative. At the same time, the Maldivian government promotes harnessing of solar energy not only aiming at reducing the country's dependence on imported fuels, but also to reduce its carbon footprint contributing towards climate change mitigation. Several resorts have already installed rooftop solar panels reducing the burden on diesel generators.

Floating solar PV is an emerging renewable energy sector in the Maldives. The solar panels are mounted on floating structures and placed near the island shores in the lagoon areas. The solar PV panels are connected to the electricity grid of the resort islands *via* submarine cables to form hybrid power systems with diesel generators.

## 2. Energy Resources

### 2.1. Imported Energy Resources

The Maldives does not have indigenous petroleum fuels, but has a sizable renewable energy resource such as solar, wind, and some forms of ocean energy. The potential to produce green hydrogen with any surplus renewable energy also has attracted the attention of energy planners. The Maldives has experienced that, by making investments in renewable energy, either by the private sector or the government, it is possible to reduce the cost of power generation, expenditure on fuel imports, and lessen the financial strain on the government.

The main primary energy source of the Maldives is imported fossil fuels. More than 10% of the country's GDP drains out as fuel imports, of which a major portion is used to generate power. Petrol is used mostly for road transportation, whereas diesel is used in power generation, in maritime transportation, and in industries such as water desalination and in the agriculture sector such as fisheries. Cooking and water heating are done mostly using Liquid Petroleum (LP) gas. In small, inhabited islands, LP gas has replaced biomass as the primary energy source in the residential sector. The aviation industry uses aviation fuel, creating a considerable demand, as the geographically dispersed country is served by a thriving domestic aviation industry. All inhabited and resort islands receive shipments of aviation fuel, LP gas, and diesel. The importation of finished petroleum products is summarised in Table 2-1.

*Table 2-1 Importation of Petroleum Products*

	2018	2019	2020	2021	2022
<b>Petroleum product import (kt)</b>					
Petrol	68.6	84.7	58.6	72.5	88.6
Diesel	526.2	582.6	503.4	581.1	651.1
LP gas	15.0	16.9	13.1	16.8	17.6
Jet A1	140.0	166.7	73.1	138.0	178.0

Diesel and Jet A1 are the products imported in the largest quantities. The vast geography of the Maldives has made it quite expensive to operate the energy industry mainly because of very high cost of logistics and higher labour requirement of it.

#### 2.1.1. Solid Fuels

The amount of firewood used has been decreasing over time due to the shift towards modern fuels like LP gas. Currently there is no systematic collection of data on the nation's coal and wood energy condition. Based on the information that is currently available, coal is not used to produce energy in the Maldives.

#### 2.1.2. Liquid Fuels

The inhabited islands of the Maldives are served by 186 diesel generators with a combined installed capacity of around 214 MW, supported by more than 16 MW of renewable energy plants. The Male' Water and Sewerage Company Pvt. Ltd. (MWSC) operates one generator at R. Dhuvaafaru, while STELCO operates 35 generators, including all those located in the Greater Male' Region. FENAKA is the main electricity service provider for outer atolls with 148 generators. An extra 144 MW of power generation capacity is available on resort islands, which are run separately from the government, while about 20 MW are available in industrial islands.



The Maldives attained universal access to electricity in 2008. However, despite this remarkable achievement, the Maldives has one of South Asia's most expensive power generation systems. The primary source of electricity is diesel generators, which explains the reason for the high cost of electricity. Since fuel in the Maldives is imported and transported in small quantities by boat to each island, the country's vast geographical dispersion further increases transportation costs, making fuel significantly more expensive. The cost of power generation is prohibitively high, ranging from USD 0.19 to USD 0.70 per kWh, depending on the system's efficiency and size. In the Maldives, the most efficient diesel generators supply power at USD 0.23 to USD 0.33 per kWh cost range, although costs can reach as high as USD 0.70 per kWh for some of the smaller inhabited islands<sup>12</sup>.

Desalination plants, industry and agriculture in the Maldives aims at an integrated water resource management (IWRM) approach based on cost effective adaptation measures. In this method, desalination technologies enhance the accessibility, dependability, and affordability of fresh water. Male' City began to use water desalination in the 1980s. Following the massive damage to groundwater aquifers and storage facilities caused by the 2004 tsunami, it was later introduced to additional high population density islands. The Maldives census (2014) states that desalination facilities provide 30% of the drinking water in Male' and 7% of the water in smaller inhabited islands. Diesel generators are used in desalination plants. Desalination plants are built by the government and then turned over to FENAKA for operation and maintenance.

Cost of diesel used in desalination are not covered by regulated water fees, resulting in significant losses. The fishing sector, which uses refrigeration, is the second-biggest economic sector in the Maldives. In 2018, there was a 5.5% increase in fish catch over 2017. In 2018, 43.5% of the total amount of fish caught was exported. There were 22 active fishing businesses in the Maldives at the time of the census in 2014. Using diesel generator sets, the majority of them produced their own electricity. Six islands in the Maldives are leased for farming and are known as agricultural islands.

The remoteness of the nation and its widely dispersed population result in costly and fuel-intensive transportation of people, products, and services. Although there is a countrywide transportation network of ferries and jetties serving all inhabited islands, better connectivity between the low-lying islands is necessary to support the Maldives' development ambitions. Over the past ten years, there has been a sharp increase in the expected consumption of diesel fuel used in maritime transportation. The amount of diesel used in ships increased from 149,000 t to 195,000 t annually between 2017 and 2019. Between 2010 and 2018, there were 14,003 registered vessels, up from 9,687 in 2010. Specifically, the number of "Dhonis" for passenger's transportation has increased from 5,840 to 7,246 over this period.

The Greater Male' Region and Addu City use a significant portion of the petroleum fuels used in land transportation. Vehicles are also present on other populated islands, resorts, industrial, and agricultural islands, but in smaller numbers. Over the past ten years, there has been a sharp increase in the anticipated amount of petrol consumed for road transportation. The amount of petrol utilised annually for road transportation has increased from 58,000 t to 85,000 t between 2017 and 2019. Between 2010 and 2018, the number of registered automobiles has more than doubled, rising from 46,028 t to 108,532 t. In 2018, 83% of all vehicles with an active registration were motorcycles.

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<sup>12</sup> World Bank Group. 2020a. Project Appraisal Document of the Accelerating Sustainable Private Investments in Renewable Energy (ASPIRE) Project. Report No. 145392-MV. Washington, DC

### **2.1.3. Gaseous Fuels**

Cooking uses up most of the nation's imports of LP gas. The amount of LP gas imported increased to 16,885 t in 2019 from 14,483 t in 2017. Standard LP gas cylinders are used to provide LP gas to the end user. In the absence of any meaningful measures to curtail the usage of LP gas for cooking, the demand for LP gas is projected to increase at a 4% annual pace until it hits 25,000 t by 2030.

Maldivian Gas (Pvt.) Ltd. and Villas Gas are the LP gas distributors in Maldives. Maldivian Gas distributes cooking gas to more than 100,000 consumers across the Maldives. Maldivian Gas Pvt. Ltd. is a subsidiary of State Trading Organization PLC. In addition to LPG gas, Maldivian Gas distributes various industrial gases including refrigerant gases, Industrial Oxygen, Industrial Nitrogen, Acetylene, Argon, Helium, Carbon dioxide, and Nitrous Oxide. Villa Gas runs the biggest LP gas storage and bottling facility in the Maldives.

## **2.2. Indigenous Energy**

In the absence of any locally sourced fossil fuel resource, this discussion will be limited to the renewable energy resources.

Renewable energy sources including solar, wind, and biomass could be used by the Maldives to meet their energy needs. Hybrid energy systems that include solar, wind, diesel and LP gas have demonstrated access to energy supply in pilot projects and have the potential to be applied at national scale. Solar PV panels are currently the only renewable energy source used for commercial purposes.

### **2.2.1. Biomass**

Although limited in quantity and widely spread throughout the nation, biomass resources are found to be mostly derived from the coconut trees. Coconut shells and coconut husks...etc., are available for the use as energy resources. The quantities are insufficient for regional solutions and transporting them to an area with high energy use would require complex logistics causing significant increase in carbon emissions. When energy-conversion technology becomes more affordable, marine biomass is expected to become a valuable resource in the long run. However, no systematic evaluation of the marine biomass resources has been undertaken in the Maldives.

Waste to energy projects, which depend on municipal solid waste (MSW) attracted the attention of the government, not only as an energy project, but also as a waste management solution. There is a combined capacity of 15MW of waste to energy projects under construction in both Addu and Greater Male' Region. These plants, when in operation will introduce a third primary energy resource to the energy supply of the Maldives.

### **2.2.2. Ocean Resources**

Maldives experiences ocean currents influenced by monsoon winds, rising sea surface temperatures and ocean acidification as main environmental challenges. Electricity can be generated by different marine renewable energy options such as tides, waves, ocean currents, ocean thermal energy conversion (OTEC) technologies, and salinity gradients etc. It is expected that most of these resources will have considerable impacts from climate change. On the technology maturity, apart from tidal power generation, the other options are not widely commercialised or used in the world. Further, there is a dearth of data pertaining to ocean based renewable energy resources in the Maldives, and therefore, it is hard to estimate the potential impacts on power generation from these options.

### **2.2.3. Solar Energy**

Solar energy is extensively harnessed in Maldives particularly in the capital city Male' and in the resorts. Solar PVs can be considered as the most promising renewable energy technology to exploit the vast solar resource in the country as it has an annual solar irradiation in the order of 1,200 kWh/m<sup>2</sup> in many parts of the country<sup>13</sup>. Ample solar resources exist throughout the year for virtually all locations in the Maldives for PV applications, such as solar home systems and remote power applications. In the Maldives in particular, the high levels of solar resource throughout the entire country make it well suited for off-grid, island-based solar PV applications as an alternate to, or supplement to, diesel power generators. Because of the general high level of cloudiness and humidity associated with tropical settings such as this, the resources for concentrating solar power are generally less than adequate, except for certain times of the year. The seasonal variability in the Maldives is also larger than the spatial variability across the country at any given time, but less dramatic. Again, the period of highest solar resource is in March and April, when the region is transitioning from the northeast to the southwest monsoon<sup>14</sup>.

On-site resource assessments have been conducted in some islands. However, a comprehensive solar resource assessment covering the whole area of the Maldives is yet to be realised. Considering other factors that affect the viability of the interventions, the projects already implemented show a higher rate of success. Several inhabited islands are successfully implementing the solar PV project through hybrid systems as part of the Preparing Outer Islands for Sustainable Energy Development (POISED) project<sup>15</sup>. The state-owned utilities and resorts have tested and continued to expand solar PV projects while rooftop solar systems too have gained momentum.

PV panels are installed on the roofs of diesel power plants, schools, water desalination plants, sewage plants, and public buildings. PV panels are connected to the diesel power plants through an energy management system (EMS) that enhances the regulation of power supply. When compared to the present costs of power supplied by diesel generators, this hybrid solutions are capable of providing a quick payback for the investments.

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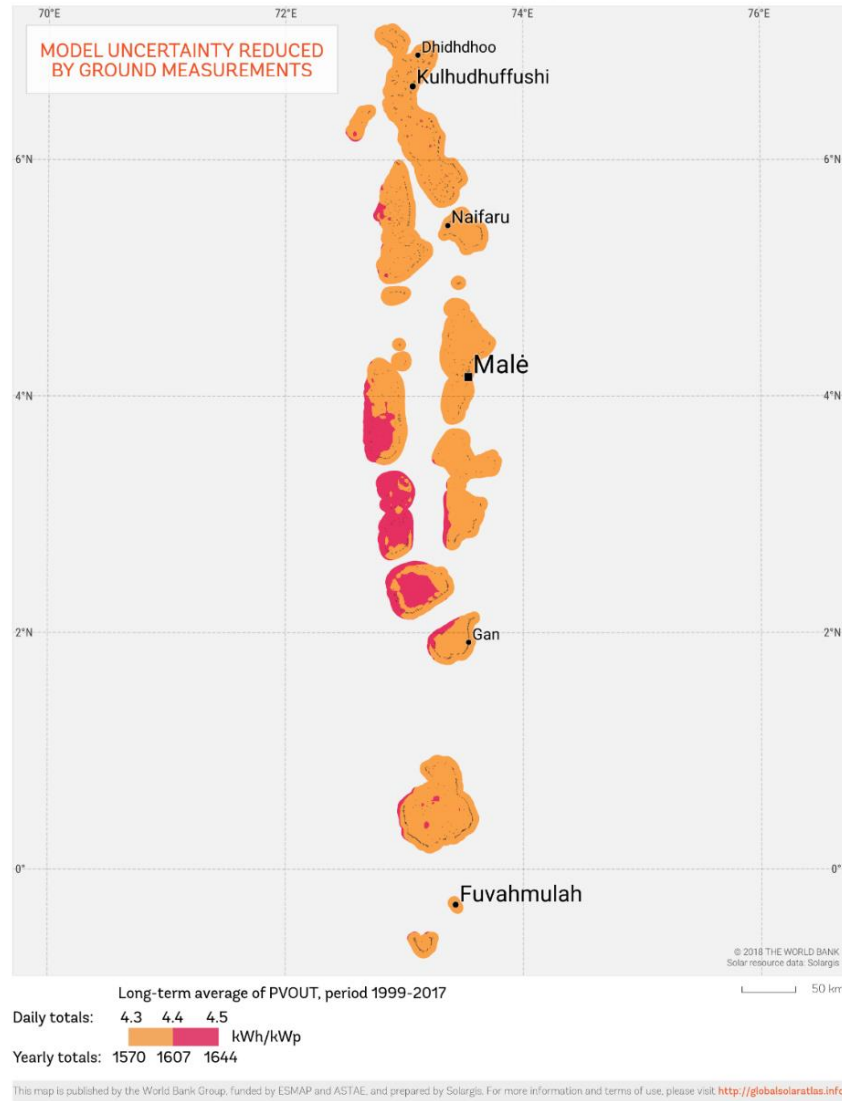
<sup>13</sup> Asian Development Bank, 2024

<sup>14</sup> National Renewable Energy Laboratory. Solar Resource Assessment for Sri Lanka and the Maldives.

<sup>15</sup> A Brighter Future for Maldives Powered by Renewables: Road Map for the Energy Sector 2020–2030, Asian Development Bank, 2020

SOLAR RESOURCE MAP

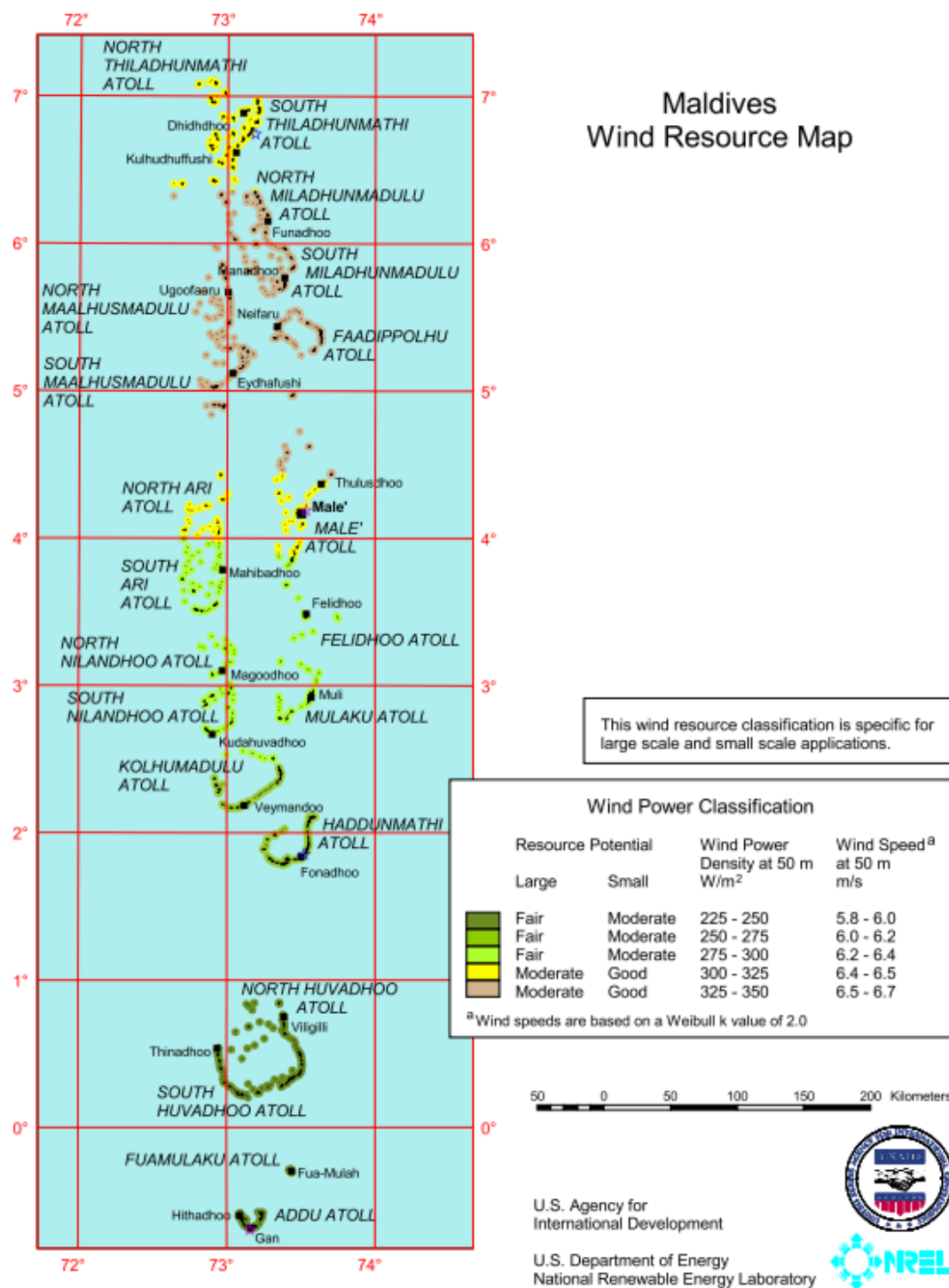
# **PHOTOVOLTAIC POWER POTENTIAL MALDIVES**



*Figure 2–1 Solar Power Potential Map of the Maldives*

## 2.2.4. Wind Energy

Wind resources of the Maldives are shown in Figure 2-2.



**Figure 2-2 Wind Resource Map of the Maldives**

The highest wind resource is found between 4.5° N Lat and approximately 6.5° N Lat. North Maalhusmadulu, South Maalhusmadulu, North Miladhunmadulu, South Miladhunmadulu, and Faadippolhu atolls are estimated to have the best resource in the Maldives. This level of resource is estimated to be good for small-scale applications and moderate for large-scale applications. North

and south of this area the wind resource is slightly lower but still considered good for small-scale and moderate for large-scale wind applications.

The Maldives is influenced by monsoon flows but the annual and seasonal patterns vary from north to south because strengths of the monsoon flows change with proximity to the equator. The strongest west monsoon occurs in the extreme north of the Maldives while the strongest northeast monsoon occurs in the north-central part of the country. The highest wind resource in the Maldives is located where the northeast monsoon is strongest.

Even though these wind speeds are not considered as commercially viable for major wind farm projects, they are nevertheless competitive enough to rival diesel-generated electricity<sup>16</sup>. However, more research is required to determine whether such projects are economically feasible. The potential for large-scale onshore wind projects employing 2 MW turbines is projected to be 80 MW, but only the industrial islands in the Greater Male' region have this potential due to factors such as the power grid capacity of individual islands, land availability, and logistical constraints. The installation of mid-sized wind turbines with rated capacities ranging from around 100 kW to 300 kW could be investigated for other islands as well.

The Atolls in the Greater Male' Region, which has the highest demand for electricity, feature extremely steep slopes and deep seawaters. This presents a significant obstacle for the construction of turbine foundations. The visual impacts of wind turbines could also be a disturbance for tourist activities.

#### **2.2.5. Other Renewable Resources**

No geothermal energy potential sites in the Maldives are found in the records, and due to the lack of hills and mountains to facilitate any fall of water streams to harness energy in them, Maldives does not have a potential for geothermal power or hydropower generation. Biogas systems in small scale may also provide cooking fuel to resorts.

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<sup>16</sup> Paving the Way For a Just Energy Transition in Maldives Road Map For The Energy Sector 2024-2033, Ministry of Climate Change, Environment and Energy Republic of Maldives, 2023.

### 3. Energy Supply

Maldives is one of the few countries in South Asia to have a continuous and unrestricted supply of energy to its entire population. With the inhabitants scattered across the archipelago, the availability of convenient forms of energy to support sea and air transport has enabled the population to connect as a nation and for the key economic activities such as hospitality industry to thrive.

Supply of energy to meet the country's energy demand can be done through different means. Indigenous primary energy supply is the most preferable as the cost of sourcing primary energy is generally lower compared with other options. Most countries use fossil fuels such as coal and crude oil as the imported energy, either in their primary form or as a finished product, despite not having any indigenous petroleum resources, the energy supply has historically been petroleum based, sourced as imported oil and gas. The use of firewood as a cooking fuel has ceased, increasing the reliance on imported fuel even at household level.

With the rapid development of renewable energy technologies around the world, Maldives has initiated its transition to renewable sources to meet at least part of its energy requirement. Policies and plans are in place to increase the use of renewable energy sources as a means of reducing the cost of importing oil to the country and also in support of the global endeavour to reduce carbon emissions. With the ongoing energy transitioning programmes taking full effect, the energy supply landscape of Maldives is likely to be much different to what is being reported in this report.

#### 3.1. Primary Energy Supply

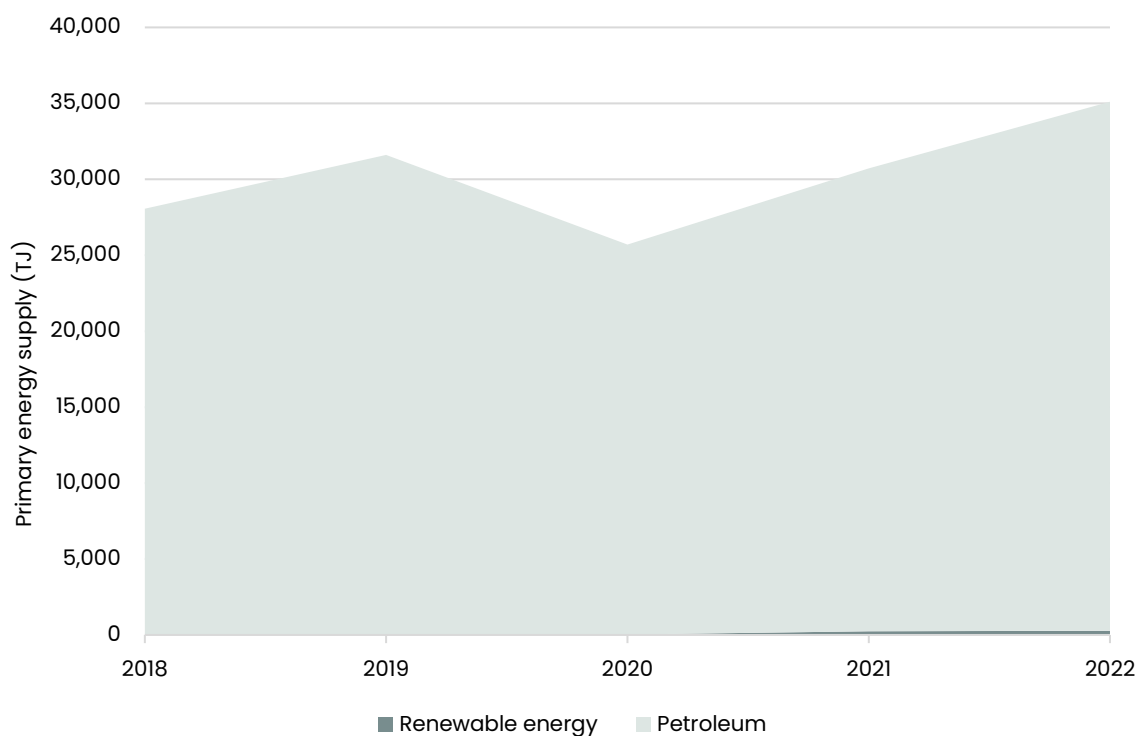
Primary energy sources are the energy sources that are found in nature. Crude oil, natural gas, renewable energy, and nuclear fuels are the typical primary energy forms available for supply of energy to a country. However, Maldives does not have any known petroleum reserves such as crude oil or natural gas or fuels used for nuclear energy.

The primary energy portfolio of the Maldives consists of petroleum and solar power as the single renewable energy resource. The energy supply, however, is dominated by petroleum (Table 3-1).

*Table 3-1 Primary Energy Supply*

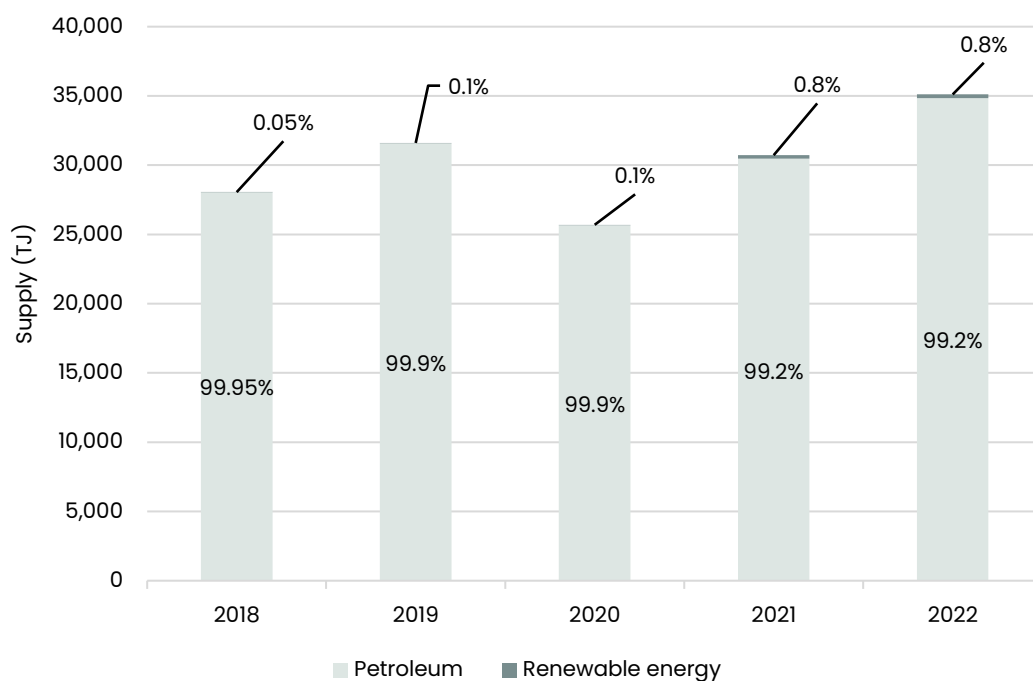
	2018	2019	2020	2021	2022
<b>Primary energy supply (TJ)</b>					
Petroleum	28,039	31,575	25,658	30,474	34,832
Renewable energy	14	29	37	245	275
<b>Total</b>	<b>28,053</b>	<b>31,604</b>	<b>25,695</b>	<b>30,719</b>	<b>35,107</b>
<b>Share of primary energy supply (%)</b>					
Petroleum	99.95%	99.9%	99.9%	99.2%	99.2%
Renewable energy	0.05%	0.1%	0.1%	0.8%	0.8%

The penetration of solar resources remains low, as indicated in Figure 3-1. Further, the energy supply in 2020 declined, owing to the COVID – 19 pandemic, but, bounced back to normalcy in the subsequent years.



**Figure 3-1 Evolution of the Primary Energy Supply**

Owing to the increased penetration of solar, the share of renewable energy in the energy supply portfolio has marginally increased over the years. However, by 2022, the share of renewable energy was still less than 1% Figure 3-2.



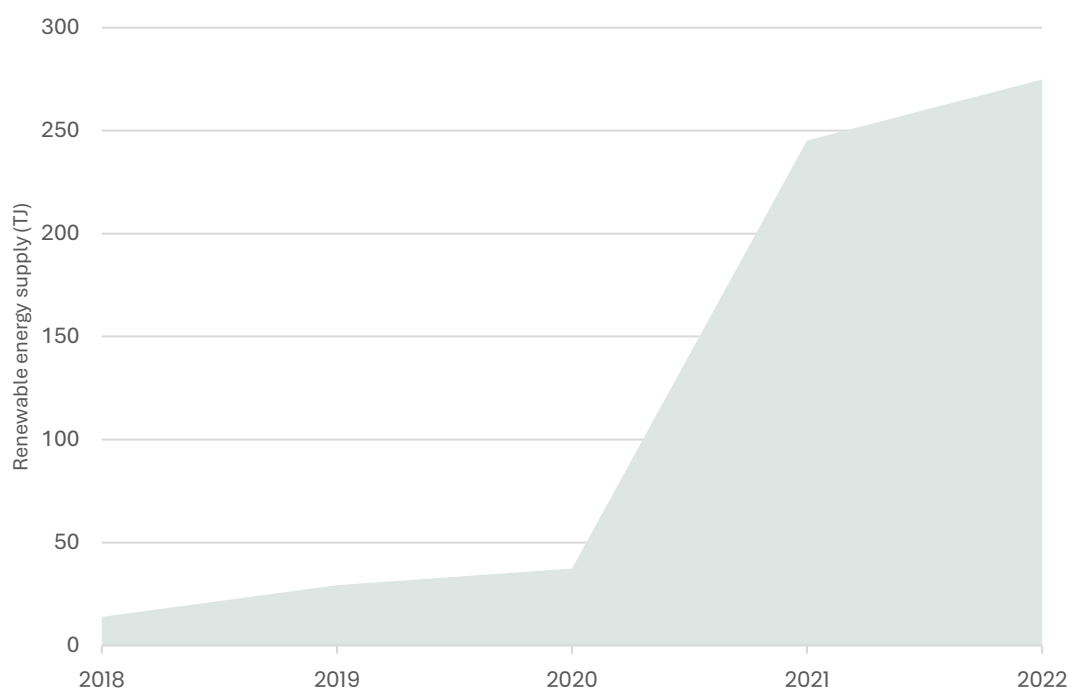
**Figure 3-2 Share of Primary Energy Resources by Type**



Among the indigenous renewable energy resources available in Maldives, solar power is the only commercially exploitable energy form with realistic scale. With the recent developments in solar PV technology, reduction in solar PV costs and the abundance of solar resource, electricity generation using solar PV has become the preferred energy supply form in Maldives. Limitation in land availability and daily cycling of resource availability (i.e. resource being available only during daytime) is hindering the adoption of this technology at a wider scale. However, the role of solar power as a primary energy supply form will continue to gain traction due to the lower environmental damage caused by solar PV technology compared with the alternatives available.

Identifying the benefits of using solar PV systems for electricity generation, the two electricity utilities operating in Maldives, STELCO and FENAKA, have installed solar PV systems in their own and government owned buildings. The electricity generated by these solar PV systems is fed into the island's utility grids for consumption by electricity users. Similarly, the electricity utilities have engaged private developers to build, own, and operate solar PV power plants and supply electricity to the island electricity networks. Thirdly, electricity consumers are also allowed to install solar PV systems in their rooftops for own consumption and for the excess generation to be supplied to the grid. Electricity generation using rooftop solar PV systems is done in some of the resort islands to supplement the electricity sourced through conventional diesel generators. Due to the cost advantage of solar PV electricity generation in comparison with diesel generation, more and more resorts are adopting this renewable energy option, increasing the overall primary energy supply of the country.

Figure 3-3 shows the growth in primary energy supply in Maldives through solar PV based renewable energy sources over the period from 2018 to 2022.



*Figure 3-3 Primary Energy Supply in the Form of Renewable Energy*

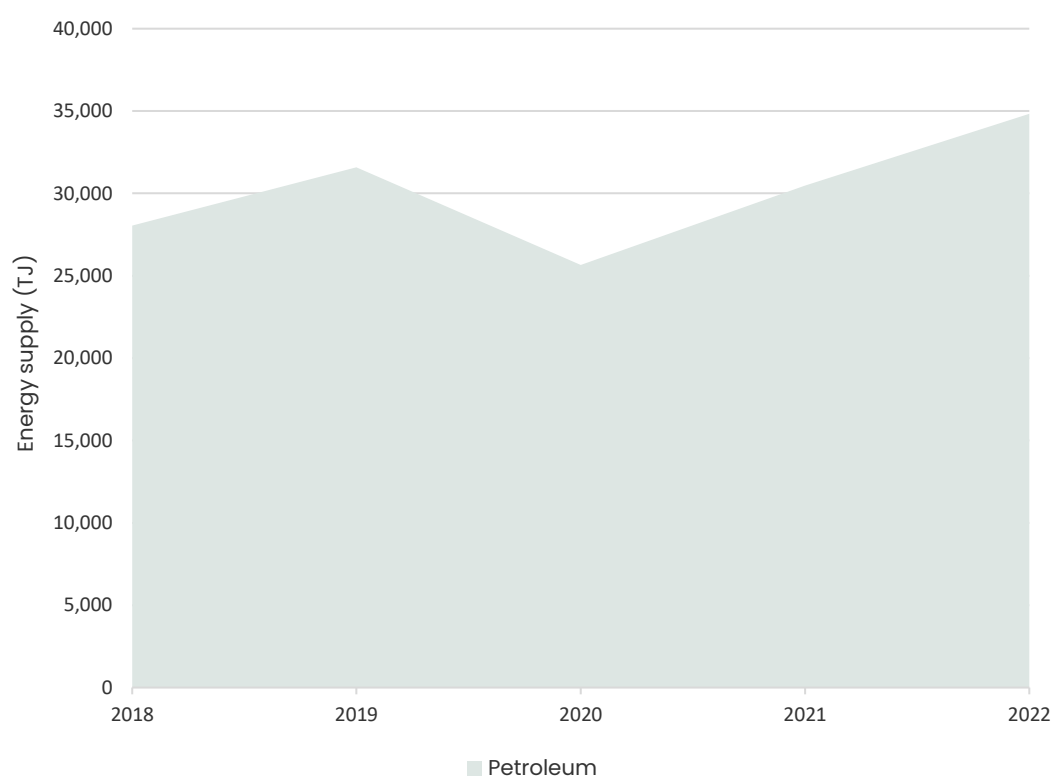
It is observed that a significant growth in solar energy supply has occurred from 2020 to 2021. This is mainly due to several large-scale solar PV installation projects across various islands being implemented during this period. However, this growth was stalled by 2022 due to the impact of COVID 19 pandemic, which caused delays in some of the renewable energy initiatives that were happening in the country.

## 3.2. Imports

Energy requirement of the country that is not met through indigenous primary energy sources need to be imported. Typical imported energy sources are coal, natural gas, and crude oil. However, due to the smaller scale of energy use, Maldives does not have facilities to use coal or natural gas nor a refinery to produce finished petroleum products from crude oil. Therefore, all energy imports are in the form of finished petroleum products. Importation of electricity using cross-border transmission lines is also not possible due to the long distance it has with even the closest neighbouring country.

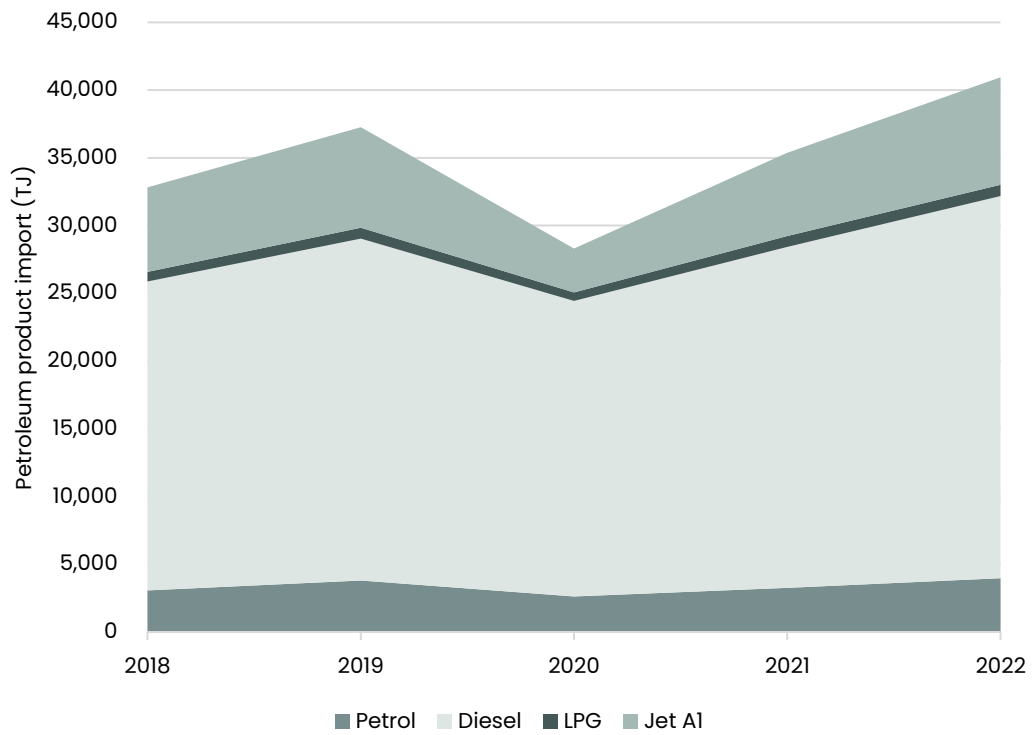
### 3.2.1. Petroleum

For decades, petroleum has been the main source of energy in Maldives. Despite the emergence of solar PV as a primary energy supply form in recent years, overall energy supply in Maldives is still dominated by imported petroleum products. Figure 3-4 shows the energy supplied by petroleum products over the period from 2018–2022. Apart from the decline in the energy supply during the COVID 19 pandemic in 2020–2021, petroleum-based energy supply was still on the rise, mainly owing to the increase in energy demand in the country outpacing the solar PV adoption rate.



**Figure 3-4 Energy Supply by Petroleum Products**

Petroleum is imported to Maldives in the form of diesel, petrol, LP gas and Jet A1. Figure 3-5 shows the share of energy supply from each type of petroleum product.



*Figure 3-5 Share of Different Petroleum Products Imported*

## 4. Energy Conversion

Energy conversion facilities in the Maldives are dominated by diesel power plants, with growing contributions from solar PV systems, supported by hybrid systems that incorporate some volume of battery energy storage. Given the country's geographical challenges and dispersed island geography, these facilities vary in scale, capacity and in the energy resources utilised. Following section provides details of the main types of energy conversion facilities in the Maldives.

### 4.1. Installed Generation Capacities

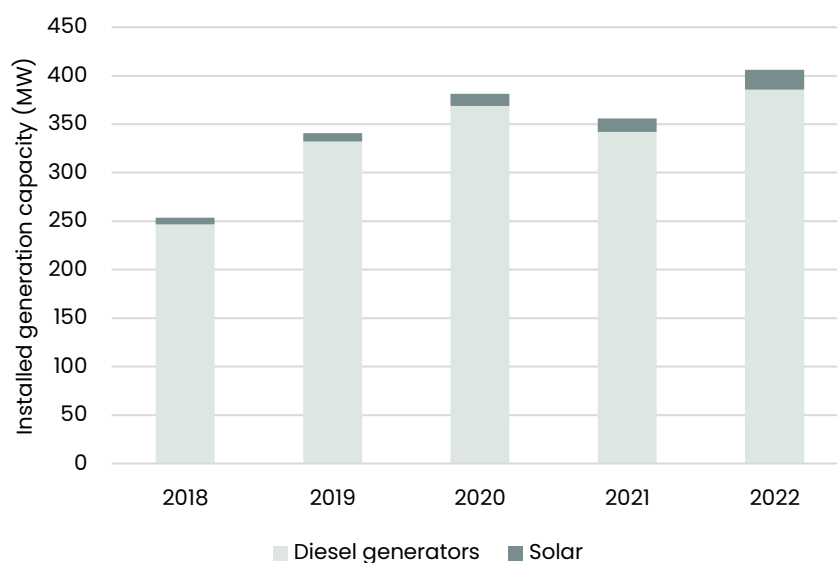
As the main power source, diesel power plants account for most electricity generation in the Maldives. Due to the logistical constraints of connecting islands through a grid, most of these plants operate independently to supply power to individual islands. Solar PV systems emerge as a renewable electricity source in the recent years.

The installed generation capacities of Utilities as tabulated in Table 4-1, demonstrates a progressive enhancement in the energy infrastructure from 2018 to 2022, with a notable shift towards integrating renewable energy sources alongside traditional diesel generators. The capacities of diesel generators have increased from 247 MW in 2018 to 386 MW in 2022, highlighting a growth in baseline energy provision. Solar PV installations, both rooftop and ground-mounted, have shown significant growth, with total solar capacity expanding from 7 MW<sub>p</sub> in 2018 to 20 MW<sub>p</sub> in 2022.

*Table 4-1 Installed Generation Capacity*

	2018	2019	2020	2021	2022
<b>Installed capacity (MW)*</b>					
Diesel generators	247	332	369	342	386
Solar	7	8	13	14	20
<b>Total</b>	<b>253</b>	<b>341</b>	<b>381</b>	<b>356</b>	<b>406</b>

\*Note – only the capacities of electricity utilities are included.



*Figure 4-1 Installed Generation Capacities*

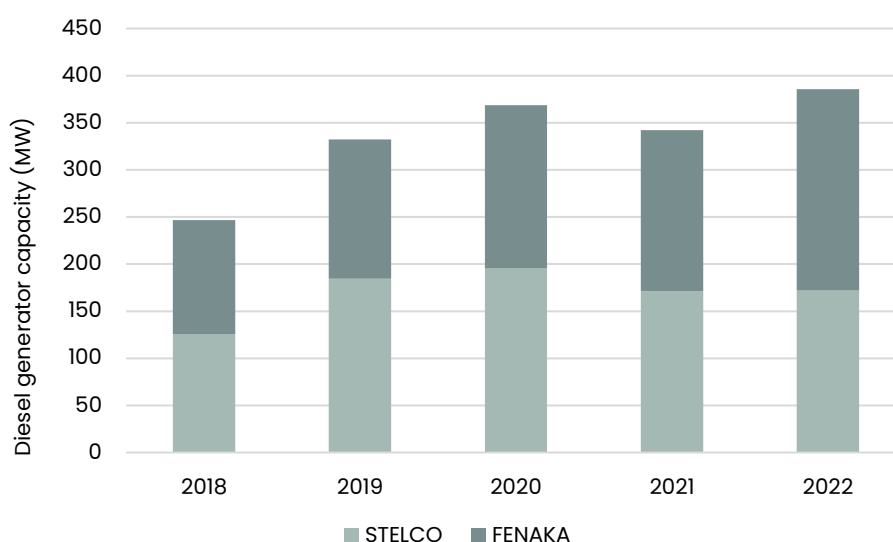
These increases are complemented by a rise in net metering capacity, reflecting an enhanced consumer participation and supportive policy frameworks for solar energy.

#### 4.1.1. Diesel Power Plants

When considering the facilities and operations of diesel power plants in the Maldives, they generally consist of small to medium-sized generator sets installed in containerised units or purpose-built buildings. These facilities are equipped with multiple diesel engines and alternators to generate electricity, and most of them operate continuously to ensure a consistent power supply.

Diesel plants are costly to operate due to fuel import costs, and they contribute significantly to CO<sub>2</sub> emissions. Fuel transport to remote islands poses logistical challenges, and the maintenance of these plants involve complex operations.

When considering the facilities and operations of diesel power plants in the Maldives, they generally consist of small to medium-sized generator sets installed in containerised units or purpose-built buildings. These facilities are equipped with multiple diesel engines and alternators to generate electricity, and most of them operate continuously to ensure a consistent power supply.



*Figure 4-2 Installed Diesel Generator Capacities*

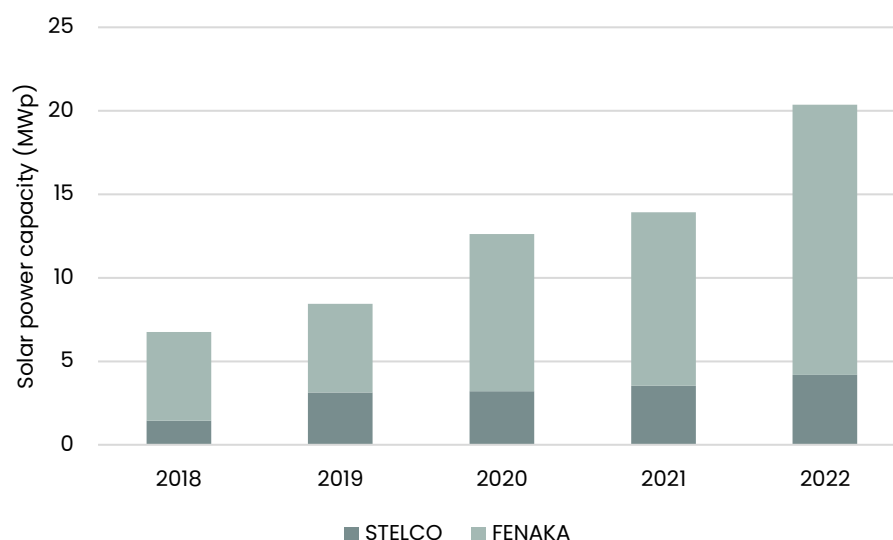
As illustrated in Figure 4-2, both utilities have installed equal capacities in diesel generators. This illustration, however, does not take into concern the installed capacities of diesel generators in resorts and industries, owing to the lack of data.

#### 4.1.2. Solar Power

Solar PV installations are increasing in the Maldives, driven by efforts to reduce the dependence on diesel generation. Solar PV systems are deployed mostly as on-site rooftops systems whilst ground-mounted systems, and even floating installations are considered as viable emerging technologies for the Maldives.

Solar power generation has varying levels of significances in different contexts. Solar power generation in the capital of Male' involves several solar installations on rooftops of government and

commercial buildings, reducing diesel consumption in the city. Resort solar power installations, however, are meant to meet the electricity demand either partially or fully, reducing their reliance on diesel or enhancing sustainability. Outer Islands solar projects, funded by initiatives like the Climate Investment Fund, have been installed in smaller islands as a part of the community electrification program. Moreover, many solar facilities in the Maldives are combined with Battery Energy Storage Systems (BESSs) to store excess power generated during peak sunlight hours and supply power at night or during cloudy weather.



*Figure 4-3 Installed Solar PV Capacities*

The solar PV capacity has shown significant growth from 2018 to 2022, highlighting a positive trend in renewable energy adoption. Further, the installed capacities of FENAKA was higher than that of STELCO, as illustrated in Figure 4-3. The installed capacity of solar PV rose from 7 MWp in 2018 to 20 MWp by 2022. This near threefold increase reflects a concerted effort towards leveraging solar energy, both through rooftop and ground-mounted systems.

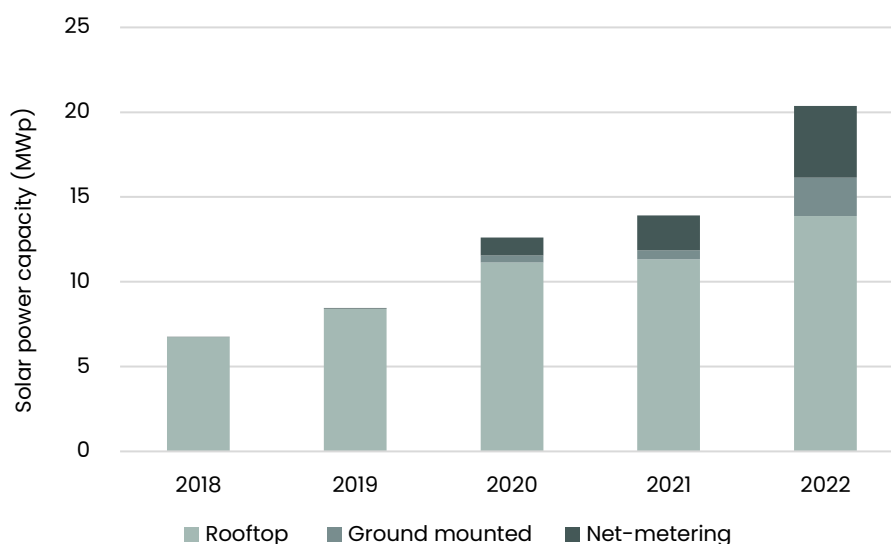
Solar power was installed as rooftop systems, ground mounted systems and net-metered systems. Table 4-2 summarises the installed capacities in solar by type of technology. The most popular installations include rooftop solar PV systems.

*Table 4-2 Solar PV Capacities by the Type of Installation*

	2018	2019	2020	2021	2022
Rooftop	6.7	8.4	11.1	11.3	13.9
Ground mounted	0	0	0	1	2
Net-metering	0.02	0.02	1.06	2.06	4.23
<b>Total</b>	<b>6.8</b>	<b>8.4</b>	<b>12.6</b>	<b>13.9</b>	<b>20.4</b>

All capacities are given in MWp

as presented in Figure 4-4, solar installations have increased in capacity over the years.



*Figure 4-4 Solar Installations by the Type of Installation*

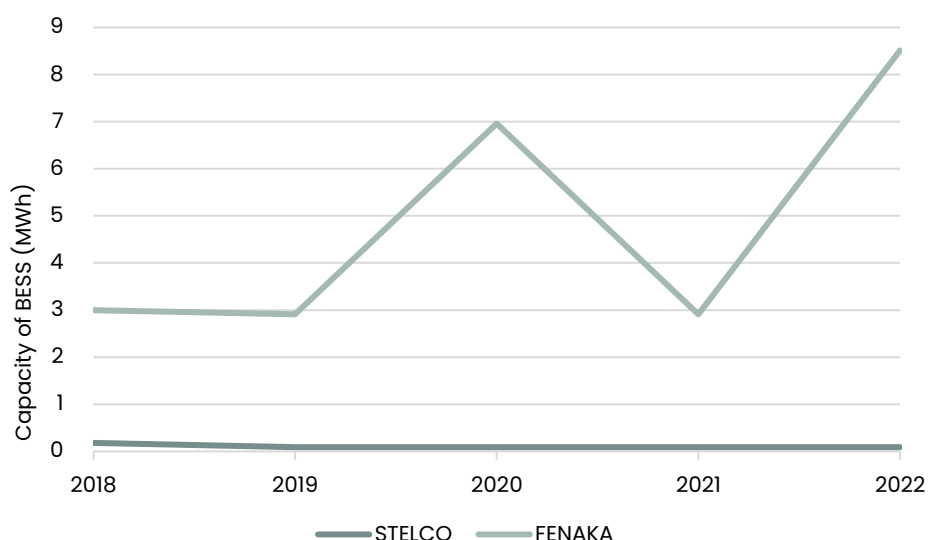
#### 4.1.3. Battery Energy Storage Systems

Battery energy storage systems (BESSs) enable the flexibility to store energy from intermittent sources like solar and release it when needed. Table 4-3 summarises the battery energy storage systems available with the Utilities. Operations carried out by the Utilities involves a sizable BESSs with varying capacities of storage and power delivery capabilities.

*Table 4-3 Battery Energy Storage Capacities*

	2018	2019	2020	2021	2022
<b>Capacity of battery energy storages (MWh)</b>					
STELCO	0.2	0.1	0.1	0.1	0.1
FENAKA	2.8	2.8	6.9	2.8	8.4
<b>Total</b>	<b>3.0</b>	<b>2.9</b>	<b>7.0</b>	<b>2.9</b>	<b>8.5</b>

The BESS capacity of FENAKA is higher than that of STELCO Figure 4-5. However, a decline in BESS capacity was observed in 2021, and regained previous proportions by 2022.



*Figure 4-5 Capacity of Battery Energy Storage Systems*

## 4.2. Power Generation

Overall, electricity supply grew from 1,242.1 GWh in 2018 to 1,886.5 GWh in 2022. This substantial increase reflects the rising energy demands across various sectors, particularly in resorts and other sectors. The contribution of renewable energy, while growing, remains overshadowed by the dominant role of diesel, emphasising the need for a more balanced energy portfolio as the country continues to develop. Electricity generation by place of generation is tabulated in Table 4-4.

*Table 4-4 Electricity Generation by Point of Generation*

	2018	2019	2020	2021	2022
Thermal power (diesel)	699.8	790.5	845.5	912.1	983.6
Renewable (solar)	3.9	8.1	10.4	11.6	21.1
Male International Airport (diesel)	33.0	38.0	28.2	42.3	36.7
Desalination plants (diesel)	41.0	47.9	50.6	52.9	57.6
Resorts thermal power (diesel)	464.4	538.0	308.1	586.8	732.3
Resorts renewable power (solar)	0.0	0.0	0.0	56.5	55.2
<b>Total</b>	<b>1,242.1</b>	<b>1,422.6</b>	<b>1,242.7</b>	<b>1,662.2</b>	<b>1,886.5</b>

*All generation figures are in GWh*

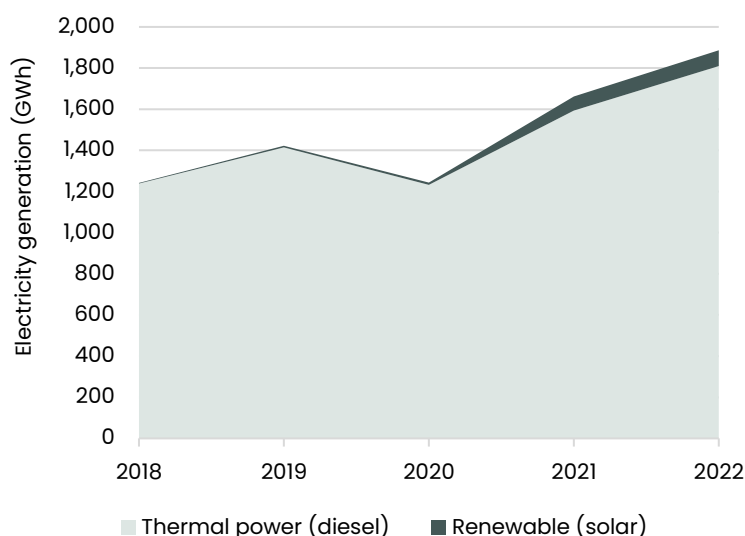
The share of solar in total generation has been marginal across the period in concern, compared to the dominant component of diesel, as indicated in Table 4-5 and Figure 4-6.

*Table 4-5 Electricity Generation Resource*

	2018	2019	2020	2021	2022
Thermal power (diesel)	1,238.3	1,414.5	1,232.4	1,594.1	1,810.2
Renewable (solar)	3.9	8.1	10.4	68.1	76.3
<b>Total</b>	<b>1,242.1</b>	<b>1,422.6</b>	<b>1,242.7</b>	<b>1,662.2</b>	<b>1,886.5</b>



The share of solar in the total electricity generation in 2022 was 4%, whereas the share of diesel was 96%.



*Figure 4-6 Total Generation by Resource*

As indicated in Table 4-6, except in 2020, diesel consumption in power generation has grown steadily. This upward trend underscores the significant use of fossil fuels within the energy sector and indicates an increasing reliance on diesel power to meet energy demands and. Diesel use in electricity generation rose from 307 kt in 2018 to 433 kt in 2022.

*Table 4-6 Fuel Use in Power Generation*

	2018	2019	2020	2021	2022
Diesel (kt)	307	346	301	379	433
<b>Total (kt)</b>	<b>307</b>	<b>346</b>	<b>301</b>	<b>379</b>	<b>433</b>

### 4.3. Supply of Electricity by Utilities

The following section details the provision of electricity by the two Utilities, STELCO and FENAKA.

#### 4.3.1. Supply of Electricity by STELCO

STELCO operates the main diesel power facilities, particularly in urban centres like Male', where demand is the highest. STELCO supplies electricity to mostly the residential, commercial, and industrial sectors in Male'.

As indicated in Table 4-7, during the period from 2018 to 2022, both fuel consumption and electricity generation of STELCO has increased from diesel sources, highlighting the growing energy demands of the islands served by STELCO. The diesel consumption rose from 128 million litres in 2018 to 163 million litres in 2022, marking a 27% increase, while diesel-generated electricity grew by 33%, from 489 GWh to 651 GWh in the corresponding period. This confirms that, despite efforts to diversify energy sources, diesel remains the primary fuel used to meet the electricity demand. Similarly, electricity use rose from 440 GWh in 2018 to 607 GWh in 2022.

Solar power generation also saw a significant growth during this period, increasing from 4 GWh in 2018 to 10 GWh in 2022. However, solar still represents a small fraction of the total energy mix compared with diesel.

*Table 4-7 Electricity Supply and Demand in STELCO Service Areas*

	2018	2019	2020	2021	2022
Diesel Used (million litres)	128	141	144	150	163
Diesel generation (GWh)	489	547	552	595	651
Solar generation (GWh)	4	4	4	4	10
Use (GWh)	440	506	511	541	607

Note: STELCO serves 34 islands.

Details of the cumulative power plant capacities served by the STELCO are tabulated in Table 4-8

*Table 4-8 STELCO Electricity Supply Capacities*

	2018	2019	2020	2021	2022
Diesel generators	125	185	195	171	172
Solar PV	1	3	3	4	4
<b>Total</b>	<b>127</b>	<b>188</b>	<b>199</b>	<b>175</b>	<b>176</b>

All capacities are in MW

#### 4.3.2. Supply of Electricity by FENAKA

FENAKA Corporation operates a considerable number of smaller-scale diesel power plants across many islands, focusing on delivering power to communities living in remote islands.

FENAKA data from 2018 to 2022 reveals a substantial increase in both fuel consumption and electricity generation, primarily driven by diesel power. Diesel fuel consumption rose from 79 million litres in 2018 to 118 million litres in 2022, reflecting a 49% increase. Correspondingly, electricity generation from diesel increased by 55%, from 251 GWh in 2018 to 390 GWh in 2022. This sharp rise underscores the growing energy demand across the islands, which saw the electricity use rise from 222 GWh in 2018 to 348 GWh in 2022, indicating a significant growth in energy use along.

Solar power generation, while showing some progress, remains a smaller fraction of the total energy mix. By the end of 2022, solar power generation had increased to 11 GWh. Despite the growth in solar power, the heavy reliance on diesel continues, emphasising the need for a more aggressive renewable energy strategy to reduce the environmental impact and reliance on fossil fuels while keeping pace with rising electricity demand.

*Table 4-9 Electricity Supply and Demand in FENAKA Operating Areas*

	2018	2019	2020	2021	2022
Diesel Used (million litres)	79	91	104	109	118
Diesel generation (GWh)	251	292	344	370	390
Solar generation (GWh)	-	4	6	7	11
Use (GWh)	222	255	304	322	348

Note: FENAKA serves 154 islands, using 149 power plants with a combined demand of approximately 90 MW.

Details of the cumulative power plant capacities served by the FENAKA are presented in Table 4-5.

**Table 4-10 FENAKA Electricity Supply Capacities**

	2018	2019	2020	2021	2022
Diesel generators	121	148	173	171	214
Solar	5	5	9	10	16
<b>Total</b>	<b>127</b>	<b>153</b>	<b>183</b>	<b>181</b>	<b>230</b>

All capacity values are given in MW

#### 4.4. Captive Power Generation in Resort Islands

Captive power generation refers to the generation of electricity by an entity for its own use, rather than for sale to a central or national grid. In this setup, facilities like industrial plants, manufacturing units, and private establishments (such as resorts) generate their own electricity on-site to meet specific energy needs.

In the Maldives, captive power generation is a common arrangement in resort islands. Given the country's unique geography, resort islands are typically isolated from the main grid and must be self-sufficient in meeting their power needs.

#### 4.5. Solar Thermal Systems

Solar thermal systems are mainly used for heating applications rather than electricity generation, with notable service water heating applications in the tourism and residential sectors. In the Maldives, solar hot water systems are increasingly adopted in the residential sector, particularly in urban areas like Male', as well as in certain inhabited islands where solar installations are feasible. These systems capitalise on the abundant sunshine to provide a renewable and cost-effective source of hot water for households, reducing dependence on electricity or gas for heating needs.

The most common type used in residential applications, flat plate collectors are affordable and provide sufficient heating for regular household needs, like showers, dishwashing, and laundry.

#### 4.6. Diesel Power Plants

Diesel is consumed in different categories of power plants. A summary of powerplants which use diesel, other than the power plants operated by the utilities, is given below.

Airport – Electricity is generated in Male' airport using diesel generators. As indicated in Table 4-11, in 2018, the electricity generation in the Male Airport was 33.0 GWh, which peaked in 2021 and reverted to normalcy in 2022 (37 GWh). The corresponding quantity of diesel used is also given in Table 4-11.

**Table 4-11 Power Generation at Male Airport**

	2018	2019	2020	2021	2022
Electricity generation (GWh)	33	38	28	42	37

Diesel use (kt)	8	9	7	10	8
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Electricity generation in 2020 was the lowest in the period of concern, wherein these low levels could be attributed to travel restrictions imposed during the COVID – 19 pandemic.

Desalination plants – Desalination plants are a critical component in island water supply which are highly energy-intensive. Desalination plants consistently increased their diesel-powered electricity supply, growing from 41 GWh in 2018 to 58 GWh in 2022. This upward trend aligns with the rising need for desalination services, potentially driven by increased population growth and water demand. The reliance on diesel for desalination suggests a key area where renewable energy could be integrated to reduce emissions. Power generation in desalination plants used 10 kt of diesel in 2018, while the corresponding value for 2022 was 13 kt.

**Table 4-12 Power Generation in Desalination Plants**

	2018	2019	2020	2021	2022
Electricity generation (GWh)	41	48	51	53	58
Diesel (kt)	10	11	11	12	13

Table 4-12 indicates that the electricity use in desalination plants have increased over the years. Electricity generation in desalination plants has risen from 41 GWh in 2018 to 58 GWh in 2022. The corresponding diesel use was 10 kt in 2018, which rose to 13 kt in 2022.

**Table 4-13 Power Generation in Resorts**

	2018	2019	2020	2021	2022
Electricity generation – diesel (GWh)	464	538	308	587	732
Electricity generation – solar (GWh)	-	-	-	56	55
Diesel use (kt)	115	132	76	140	176

Resorts demonstrated an increase in diesel-powered electricity generation. According to Table 4-13, the electricity generation in resorts from diesel was 464 GWh in 2018, which increased to 732 GWh in 2022. The corresponding diesel used in 2018 was 115 kt, which increased to 176 kt in 2022. Solar generation was reported in resorts only for 2021 and 2022. These in combination reflects the significant development and expansion within the resort sector, leading to a much higher demand for energy, predominantly met through diesel power plants. In the Maldives, resort islands rely heavily on self-contained power generation systems with nearly 144 MW of combined capacity. Resorts use diesel generators as the primary source of electricity, which is essential for meeting the high energy demands of luxury accommodations, including air conditioning, water desalination, and lighting.

## 5. Energy Distribution and Pricing

The petroleum sector is the backbone of energy supply in the Maldives and has a significant impact on economic sectors such as tourism, transportation, and fisheries. This section covers the energy distribution architecture, key players in the petroleum sector, consumer sectors, and the evolution of energy pricing.

### 5.1. Industry Structure

The Maldives imports nearly all its energy needs, primarily in the form of finished petroleum fuels. Diesel is the most important fuel in the energy mix, accounting for about 99% of electricity generation. The energy infrastructure is relatively simple, with storage facilities scattered across key Atolls, primarily in the Greater Male region and other major islands. Most islands operate their own small-scale diesel power plants, making the system decentralised but highly vulnerable to fluctuations in global oil prices.

In the Maldives, key players in fuel supply include several companies specialising in both retail and bulk distribution. Here are some of the notable suppliers:

**State Trading Organisation (STO):** STO operates through its subsidiary, Fuel Supplies Maldives (FSM), and provides petrol, diesel, and marine fuels. FSM manages fuel stations in major urban centres and supplies fuel for resorts, utilities, and other infrastructure needs from the Funadhoo Terminal<sup>17</sup>.

**The Hawks Pvt. Ltd.:** The Hawks imports and distributes fuel, including petrol and diesel, across various islands. The company is also involved in bunkering services for maritime clients, expanding its fleet to support growing fuel demands in the Maldives and beyond seven tankers with capacity 1,000 m<sup>3</sup> to 10,500 m<sup>3</sup>, 14 barges with capacity 1,000 m<sup>3</sup> to 10,500 m<sup>3</sup> and 21 vessels which are continuously in operation<sup>18</sup>.

**Maldives Gas Pvt. Ltd.:** Specialising in LPG distribution, Maldives Gas serves both domestic and industrial sectors. It is also active in diversifying energy solutions and operates gas storage terminals throughout the country<sup>19</sup>.

**Maldives Oil Company (MOC):** A key player offering a range of fuel products, including diesel, petrol, and kerosene. MOC cater to marine vessels, local industries, and other sectors, with their operations based in Male.

#### 5.1.1. Role of the STO in the Energy Sector and the Petroleum Market

STO is the main fuel supplier in the Maldives, operating the Funadhoo terminal with storage for 39,576 tons of diesel and 7,021 tons of petrol. It supplies fuel for utilities, resorts, and private use, and has launched international bunkering services in Ihavandhippolhu with Vitol. STO plays a key role in

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<sup>17</sup> STO Energy – Fuel Products from Source of Origin to End-customers. <https://www.sto.mv/business/energy?utm> Accessed on October 16, 2025.

<sup>18</sup> For Reliable, High- Quality Fuel Supply: The Hawks Private Limited <https://corporatemaldives.com/for-reliable-high-quality-fuel-supply-the-hawks-private-limited/?utm> Accessed on October 16, 2025.

<sup>19</sup> Maldives Gas Pvt Ltd. <https://www.sto.mv/subsidiaries/gas?utm> Accessed on October 16, 2025

national energy security by sourcing fuel from major global suppliers and using its own tankers. It dominates the fuel market and distributes fuel across islands and resorts, ensuring steady supply. Prices are set based on global trends but regulated by the government. Through its subsidiary Fuel Supplies Maldives (FSM), it runs fuel stations offering 95 octane petrol and low sulphur diesel. STO is also exploring renewable energy options to support national sustainability goals. In 2021, a new energy licensing regime was introduced to regulate petroleum activities, requiring permits for fuel storage, transport, and sales.

## 5.2. Consumer Sectors

The major energy consumers in the Maldives are tourism, transportation, residential, and public services, each with unique end use patterns.

**Tourism Sector:** As a key pillar of the Maldivian economy, the tourism industry demands significant amount of energy. Resorts and hotels consume substantial amount of electricity for air conditioning, water desalination, lighting, and recreational facilities. Many tourist establishments operate their own diesel generators, contributing heavily to the national energy demand and carbon footprint. Efforts are underway to reduce this dependency by integrating solar energy and battery storage solutions. Renewable energy projects supported by international organisations aim to offset some of the fossil fuel consumption, promoting sustainability across resorts and other tourism operations<sup>20</sup>.

**Transportation Sector:** The Maldives relies heavily on fossil fuels for transportation, with marine transport and aviation being critical to connecting the numerous islands. This sector consumes a large share of the imported petroleum products used for ferry services, speedboats, domestic air travel, and seaplanes<sup>21</sup>.

**Residential and Public Services:** Energy demand in the residential sector is increasing, driven by rising living standards and access to modern appliances. Public services, including healthcare facilities and government buildings, also account for a significant portion of electricity consumption. With an archipelago structure, energy distribution is complex and costly, as smaller islands often depend on decentralised diesel power systems<sup>22</sup>.

**Fisheries and Agriculture:** Although smaller in scale compared with tourism and transportation, the fisheries sector requires energy for cold storage, processing, and transportation of fish products. Agricultural activities, though limited, also contribute to energy use through irrigation systems and agricultural machinery<sup>23</sup>.

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<sup>20</sup> Leading the world in renewable energy <https://maldives.globalfdireports.com/energy?> Accessed on October 16, 2025

<sup>21</sup> Transport and Climate Profile Maldives <https://asiantransportobservatory.org/documents/209/Maldives-transport-and-climate-policy.pdf> Accessed on October 16, 2025

<sup>22</sup> Preparing Outer Islands for Sustainable Energy Development Project (Project No. 46122) <https://www.adb.org/sites/default/files/linked-documents/46122-003-ssa.pdf> Accessed on October 16, 2025

<sup>23</sup> Paving the Way for a Just Energy Transition In Maldives, <https://www.environment.gov.mv/v2/download/4333/> Accessed on October 16, 2025.

### 5.3. Pricing

Energy prices in the Maldives are heavily influenced by global oil markets due to the nation's dependence on imported fossil fuels. The cost of diesel, gasoline, and LP gas can fluctuate significantly based on international price trends. Energy pricing is regulated by the government, which sets retail prices for consumers, while also offering subsidies, particularly to lower-income households, to shield them from price shocks.

Time-series data on energy prices in the Maldives reveals steady increases in fuel prices over recent years, particularly when the global oil market has faced disruptions. Diesel prices, which directly impact electricity generation costs, have seen steady increments, although the government has implemented certain subsidies to alleviate the burden on vulnerable populations.

However, until the renewable energy sector matures, the Maldives will continue to face price volatility linked to the international oil market. The island geography further complicates the logistics of fuel distribution, adding costs that are eventually passed on to consumers. Resort islands often absorb higher costs due to their reliance on private power generation, while residents in urban areas like Male' benefit from government-regulated pricing.

#### 5.3.1. Finished Product Imports and Variations in Selling Prices

A summary of the primary fuel price changes in Male over the past five years for key fuels such as petrol, diesel (marine gas oil), Jet A1, and cooking gas (LPG) is presented below.

Fuel prices in the Maldives, as in much of the world, are highly influenced by global events, including geopolitical tensions, supply chain disruptions, and demand shifts due to the COVID-19 pandemic. The Maldives' heavy reliance on fuel imports, especially for energy and transportation, makes it particularly vulnerable to these external shocks. Prices in all categories have seen a steady rise since the low point in 2020, driven by increasing global oil prices and economic recovery.

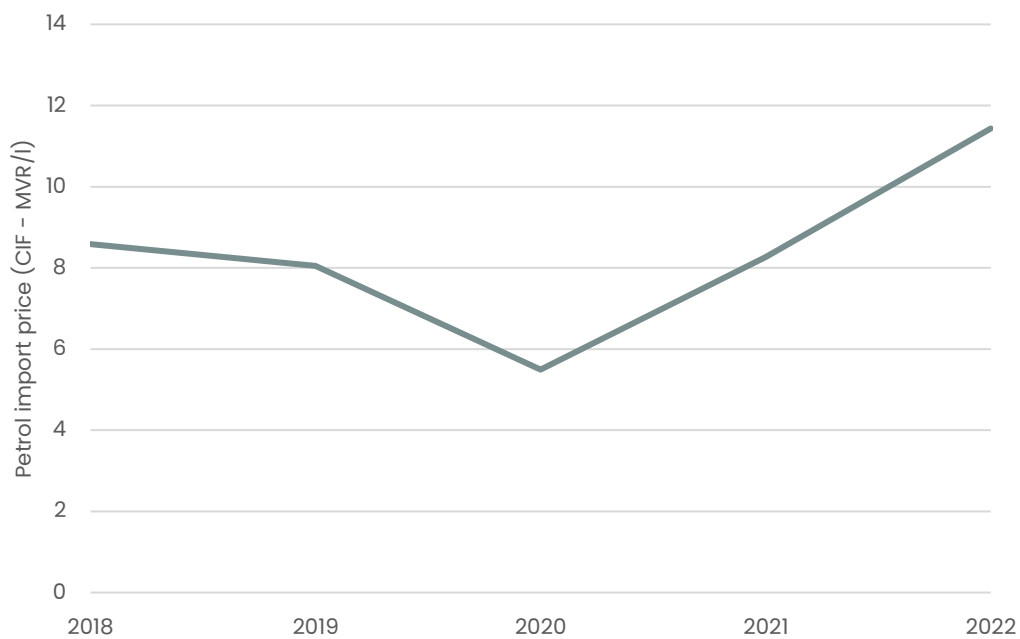
##### 5.3.1.1. Petrol Prices (Gasoline)

The price of petrol in the Maldives has seen significant fluctuations driven by changes in global oil prices. In 2018, import price of petrol hovered around MVR 8.0 per litre. However, during the COVID-19 pandemic in 2020, global demand decreased, leading to a reduction in petrol prices to about MVR 5.5 per litre<sup>24</sup>. By the end of 2021, prices began to increase again, reaching around MVR 8.3 due to global supply chain disruptions and rising crude oil prices. In 2022, petrol prices surged further, climbing to about MVR 11.5<sup>25</sup>, as indicated in Figure 5-1.

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<sup>24</sup> Adhadhu News. "Fuel imports and energy security. : <https://adhadhu.com/article/54263>  
Accessed on October 21, 2025

<sup>25</sup> Raajje MV. "Maldives fuel pricing trends and changes. <https://raajje.mv/55558> Accessed on October 21, 2025



*Figure 5-1 Petrol Import Prices*

The variation in retail prices of petrol over the years is illustrated in Figure 5-2.

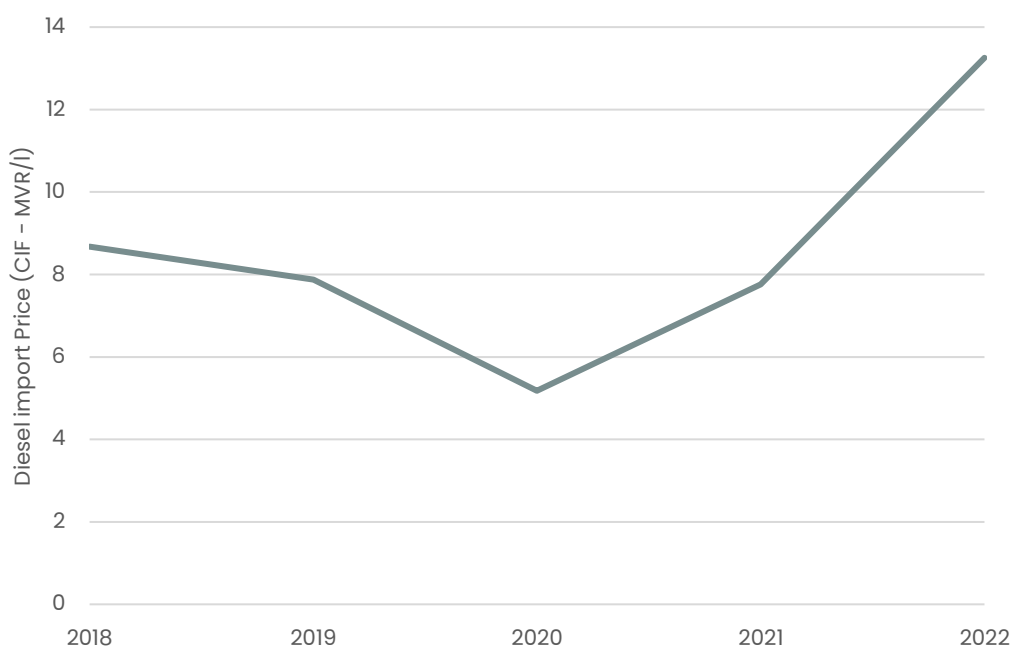


*Figure 5-2 Variation of Retail Price of Petrol*



### 5.3.1.2. Diesel

Diesel, which plays a crucial role in both power generation and marine transportation in the Maldives, experienced significant changes. In 2018, diesel import prices were approximately MVR 8.7 per litre. Prices fell slightly during the pandemic, dropping to around MVR 5.2 in 2020<sup>26</sup>, but surged back to MVR 7.8 in early 2021<sup>27</sup>. By 2022, amid global energy crises and geopolitical tensions, diesel prices increased again to around MVR 13.3<sup>28</sup>, as indicated in Figure 5-3.



*Figure 5-3 Diesel Import Prices*

<sup>26</sup> PSM News. "Government subsidies and energy policies." Available at: <https://psmnews.mv/en/88074> Accessed on October 21, 2025

<sup>27</sup> PSM News. "Maldives energy pricing framework." Available at: <https://psmnews.mv/en/65596> Accessed on October 21, 2025

<sup>28</sup> Sun Online. "Petroleum market analysis in the Maldives." Available at: <https://sun.com.mv/53752> Accessed on October 21, 2025

The variation in retail prices of diesel over the years are illustrated in Figure 5-4.



*Figure 5-4 Variation of Retail Price of Diesel*

### 5.3.1.3. Jet A1

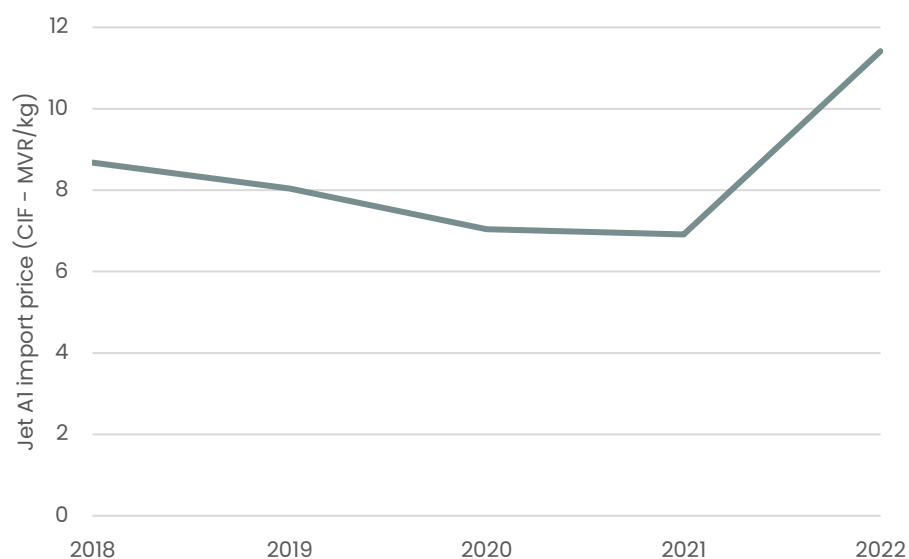
The aviation fuel sector saw somewhat volatile prices, with more sensitivity to global economic conditions. Prices in 2018 were around MVR 8.7 per litre<sup>29</sup>. During the pandemic, Jet A1 prices dropped due to the sharp decline in international travel in 2020. As air travel picked up in 2021, prices escalated, and by mid-2022<sup>30</sup>, they hovered at around MVR 11.5<sup>31</sup>.

The variation in Jet A1 import cost over the years are illustrated in Figure 5-5.

<sup>29</sup> Edition MV. "Parliamentary discussions on energy policies." Available at: <https://edition.mv/parliament/8547> Accessed on October 21, 2025.

<sup>30</sup> Atoll Times. "Bunkering and fuel logistics in the Maldives." Available at: <https://atolltimes.mv/post/business/120> Accessed on October 21, 2025.

<sup>31</sup> Raajje MV. "Maldives fuel pricing trends and changes." Available at: <https://raajje.mv/55558> Accessed on October 21, 2025

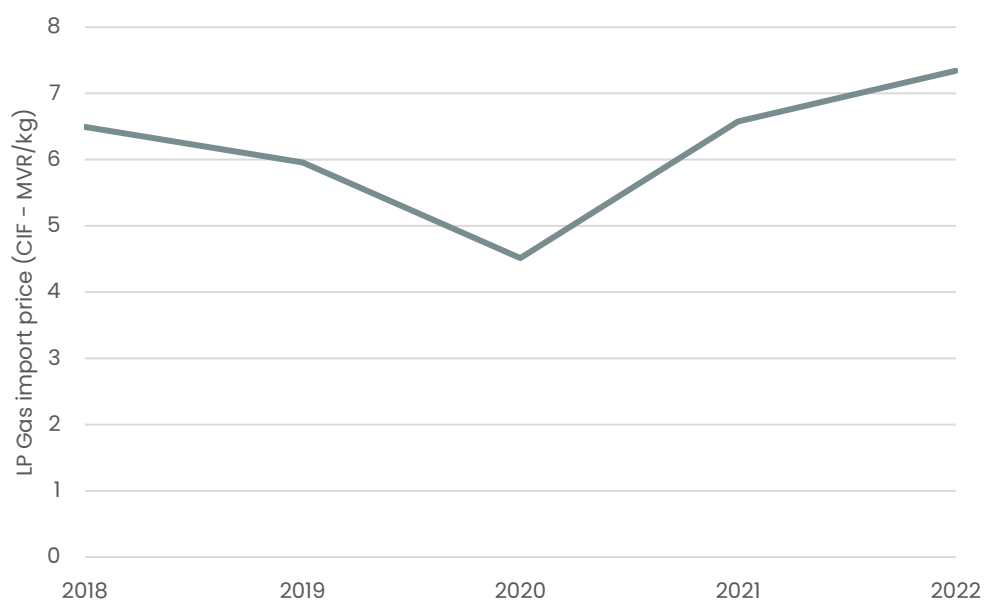


*Figure 5-5 Jet A1 Prices*

#### 5.3.1.4. Cooking Gas (LP Gas)

Cooking gas, primarily used by households and businesses in the Maldives, saw less dramatic changes compared to other fuel types. Official records of LP gas prices in Maldives from 2018 to 2022 are not available.

The variation of LP gas import prices over the years are illustrated in Figure 5-6.



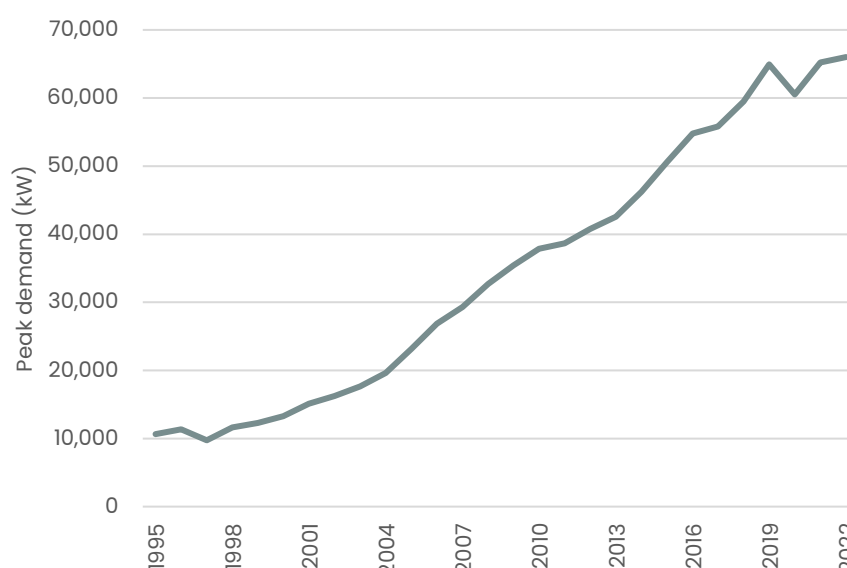
*Figure 5-6 LP Gas Prices*

## 5.4. Electricity Sector

Electricity supply systems with the islands of the Maldives operate independently, having separate generation and distribution facilities, essentially functioning as mini grids. Transport of diesel in small parcels *via* vessels further inflates generation costs, making electricity generation in the Maldives one of the most expensive in South Asia.

However, the customer tariffs for electricity varied between USD 0.097/kWh and USD 0.45/kWh due to the generous subsidies provided by the government to certain sections of the society. To alleviate the burden on domestic consumers, the government provides subsidies that cover more than half of the electricity costs, including both a fuel surcharge subsidies and usage subsidies.

The primary consumers of electricity in the Maldives include residential households, government institutions, commercial establishments, resorts, desalination plants, and industries—particularly the fisheries and agriculture sectors. These sectors contribute to a steadily increasing annual demand for electricity, driven by economic growth and expanding infrastructure.



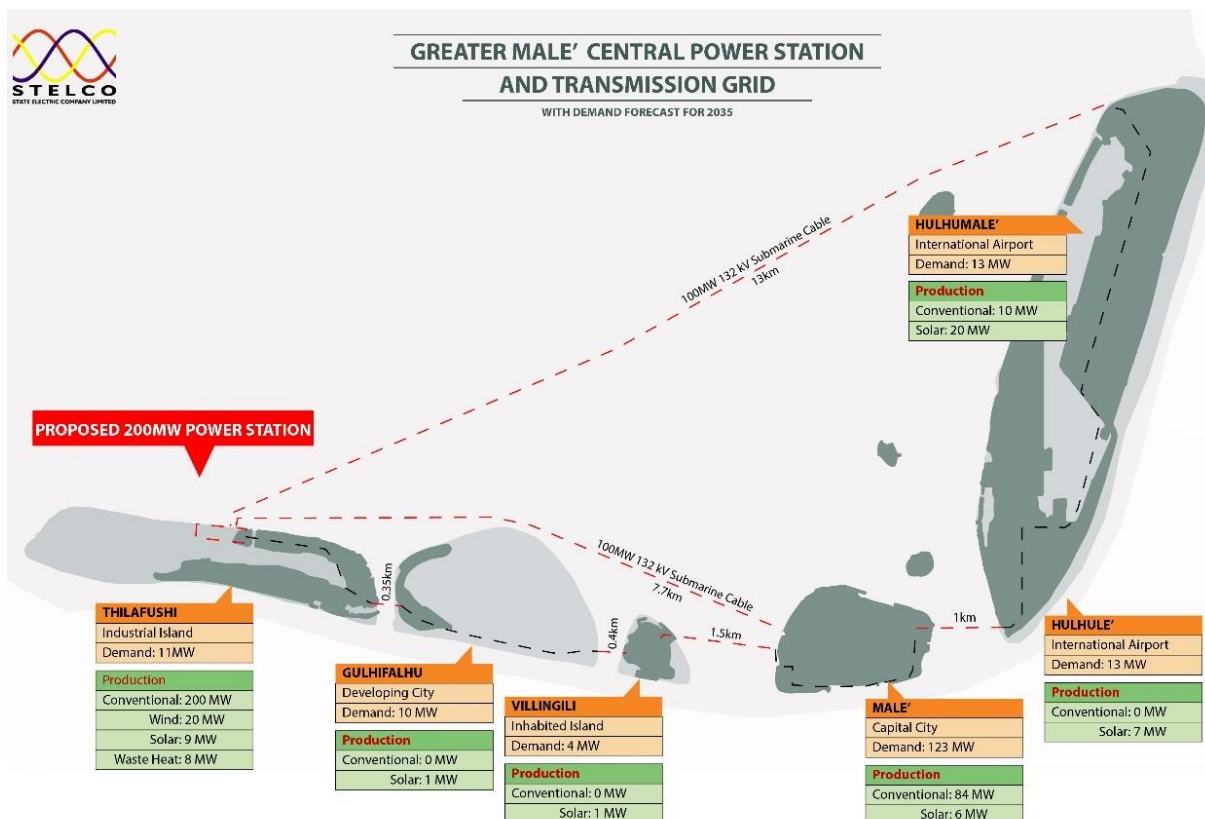
**Figure 5-7 Male' Peak Demand Growth from 1991 – 2021**

In the Maldives, STELCO uses 11 kV medium voltage for distribution within islands, 415 V three phase electricity connections to supply electrical energy to residents and small commercial clients, and 230 V single phase for residential customers.<sup>32 33–34</sup> Due to ever-growing demand and limited structure of the city of Male', STELCO interconnects the Greater Male' region, Male', Hulhumale', and Hulhule with a 132 kV submarine cable. This network of high voltage transmissions enables the transfer of excess electricity, increasing the reliability and efficiency of the network. In STELCO's case, traditional utility infrastructure calls for a 132 kV submarine cable at a distance of 20 – 25 km which would be needed to encircle the interconnections of Male', Hulhumale', and Hulhule.

<sup>32</sup> Powering the Maldives: The Story of STELCO, <https://thearrival.mv/powering-the-maldives-the-story-of-stelco/>, By Adam Azim, 5 September 2024, Focus, News

<sup>33</sup> Voltage in Maldives, <https://www.sinalda.com/world-voltages/asia/voltage-maldives/>, Last Updated: 01 November 2021

<sup>34</sup> STELCO's electricity network: a key to modernization, <https://avas.mv/en/88626>, last update 17th February 2025



*Figure 5-8 Electricity Network Expansion of Greater Male' Region*

The medium voltage distribution network at 11 kV stretches over hundreds of kilometres in total, across a number of islands, while local distribution uses low voltage cables at 400 V (three phase) and 230 V (single phase). In Greater Male' itself, the electricity utility, STECO, maintains around ten to fifteen substations while many more are available on other islands. There are also several hundred transformers distributing energy to the consumers<sup>35 36 37</sup>.

FENAKA Corporation is engaged in operations in 154 Islands and has developed an efficient power distribution network comprising approximately 200 km of 11 kV medium voltage distribution lines and about 300 km low voltage distribution lines. Recently, 15 km of medium voltage and 9.8 km of 230 V low voltage cables were installed in Laamu Atoll to interconnect the Isdhoo, Kalaidhoo and Dhanbidhoo grids. In addition, FENAKA has over 30 such substations, where voltages are changed and distributed outward and around 150 transformers of different capacities are being used for proper distribution of electricity supply within the service area<sup>38</sup>.

<sup>35</sup> <https://psmnews.mv/en/>

<sup>36</sup> STECO tests Malé, Hulhulé, Hulhumalé electricity interconnection project, <https://timesofaddu.com/2021/07/19/stelco-tests-male-hulhule-hulhumale-electricity-interconnection-project/>, By Mohamed Fathih Abdul Muhsin, July 19, 2021, 10:01

<sup>37</sup> <https://en.sun.mv/67901>, STECO successfully synchronizes powerhouses in Male', Hulhumale, Published by Jul 19, 2021

<sup>38</sup> 6 STECO's electricity network: a key to modernization, <https://avas.mv/en/88626>, last update 17th February 2025

### 5.4.1. Electricity Pricing

The Maldives Energy Act, which became effective from October 2021, provides a robust legal framework to regulate the electricity sector, focusing on expanding renewable energy and ensuring energy sustainability. It requires that licenses are necessary for generating electricity and for provision of grid services, aiming to modernise electricity delivery and to promote renewable energy integration. The Ministry of Tourism and Environment is responsible for setting renewable energy targets and ensuring that service providers integrate renewable energy into the national grid.

Electricity pricing in the Maldives has traditionally been high due to the reliance on imported fuel. Over the years, the government has offered subsidies to manage electricity prices, especially for low-income households and vulnerable communities. A tiered pricing structure is used to ensure equitable access, where high-consumption users pay higher rates, cross-subsidy sing those with lower use. There are also ongoing efforts to gradually reduce subsidies and introduce more sustainable pricing models as renewable energy sources expand.

The tariff published in STELCO for the Greater Male' Region is indicated in Table 5-1. Tariffs are available under the domestic, commercial and government and institute categories.

*Table 5-1 Electricity Tariff Rates of the Greater Male' Region*

Tariff band (30 Days)	Domestic (MVR/kWh)	Tariff band (30 Days)	Commercial (MVR/kWh)	Tariff Band (30 Days)	Government and institutions (MVR/kWh)
Units 0 - 100	1.50	Units 0 - 100	3.30	Units 0 - 100	3.30
Units 101 - 200	1.70	Units 101 - 300	3.35	Units 101 - 300	3.35
Units 201 - 300	2.15	Units 301 - 500	3.65	Units 301 - 500	3.65
Units 301 - 400	2.50	Units 501 - 600	4.00	Units 501 - 600	4.00
Units 401 - 500	2.95	Units 601 - 3000	4.35	Above 600 units	4.35
Units 501 - 600	3.55	Units 3001 - 10,000	5.75		
Above 600	4.25	Above 10,000 units	6.65		

Tariffs for outer islands are given in Table 5-2. Tariffs have been set under three categories, viz., domestic, commercial, and government and institutes.

**Table 5-2 Electricity Tariff Rates of the Outer Islands**

<b>Tariff band (30 Days)</b>	<b>Domestic (MVR/kWh)</b>	<b>Commercial (MVR/kWh)</b>	<b>Government and institutions (MVR/kWh)</b>
Units 0 – 100	1.50	3.25	4.50
Units 101 – 200	1.70	3.75	5.75
Units 201 – 300	2.15	4.75	6.50
Units 301 – 400	2.50	6.00	7.50
Units 401 – 500	2.95	6.00	7.50
Units 501 – 600	3.55	6.00	7.50
Units > 600	4.25	6.00	7.50

## 6. Energy Demand

Energy demand in the Maldives is categorized into domestic, industrial, transport, and other sectors. The domestic category comprises residential energy use, while energy use in desalination plants is listed under the industrial category. Transport is further subdivided into road, aviation and water-borne navigation, while resorts and fisheries activity are discussed under the 'other' category.

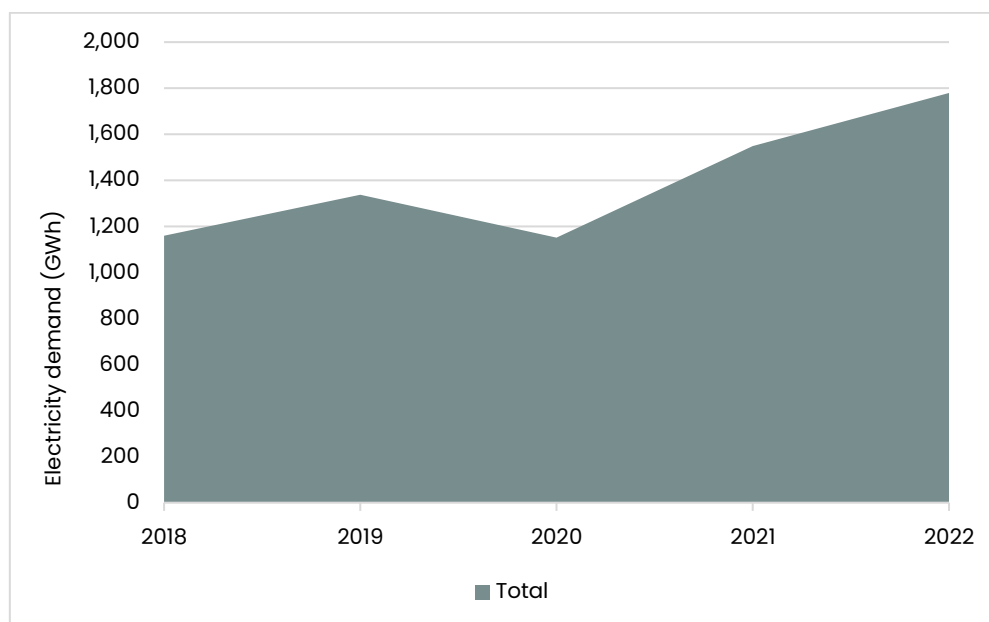
### 6.1. Electricity Demand

The electricity demand in the Maldives has increased over the years, owing to economic development. The total electricity demand in the country in 2022 was 1,779.2 GWh.

*Table 6-1 Electricity Demand Growth*

	2018	2019	2020	2021	2022
<b>Electricity use (GWh)</b>					
Industry	41.0	47.9	50.6	52.9	57.6
Residential, commercial and other	1,118.9	1,289.7	1,100.3	1,495.3	1,721.6
<b>Total</b>	<b>1,159.9</b>	<b>1,337.6</b>	<b>1,150.8</b>	<b>1,548.3</b>	<b>1,779.2</b>
<b>Demand growth (%)</b>					
Industry		17%	6%	5%	9%
Residential, commercial and other		15%	-15%	36%	15%
<b>Total</b>		15%	-14%	35%	15%

The demand for electricity in 2022 increased by 15%, compared with the demand in 2021. Similarly, the demand contracted by 14% in 2020, attributing to the stalemated economic activity during the COVID – 19 pandemic as indicated in Table 6-1 and Figure 6-1.



*Figure 6-1 Electricity Demand*



The major portion of electricity generation in the Maldives comes from diesel power plants, with a marginal contribution from solar PV installations. Table 6-2 summarises the fuel consumption in power generation.

*Table 6-2 Diesel Use in Power Generation*

	2018	2019	2020	2021	2022
Inhabited islands (kt)	173.8	194.1	207.9	217.5	236.2
Resorts (kt)	115.4	132.1	75.8	139.9	175.8
Desalination plants (kt)	9.8	11.3	11.3	11.7	12.9
Airport* (kt)	7.8	8.8	6.5	9.5	8.3
<b>Total (kt)</b>	<b>306.7</b>	<b>346.2</b>	<b>301.5</b>	<b>378.6</b>	<b>433.2</b>

\*Note: Male International Airport

### 6.1.1. Electricity Demand served by STELCO and FENAKA

Electricity use in STELCO and FENAKA areas are categorised into domestic, business, government and other. The number of customer accounts under each entity are tabulated in (Table 6-3 and Table 6-4)<sup>39</sup>.

*Table 6-3 Number of Customer Accounts of STELCO*

	2018	2019	2020	2021	2022
Domestic	43,869	47,077	49,552	59,201	61,511
Business/Special	13,993	16,424	16,531	17,663	17,951
Government	1,659	2,299	2,044	1,772	1,769
Other	558	12	15	566	628
<b>Total</b>	<b>60,079</b>	<b>65,812</b>	<b>68,142</b>	<b>79,202</b>	<b>81,859</b>

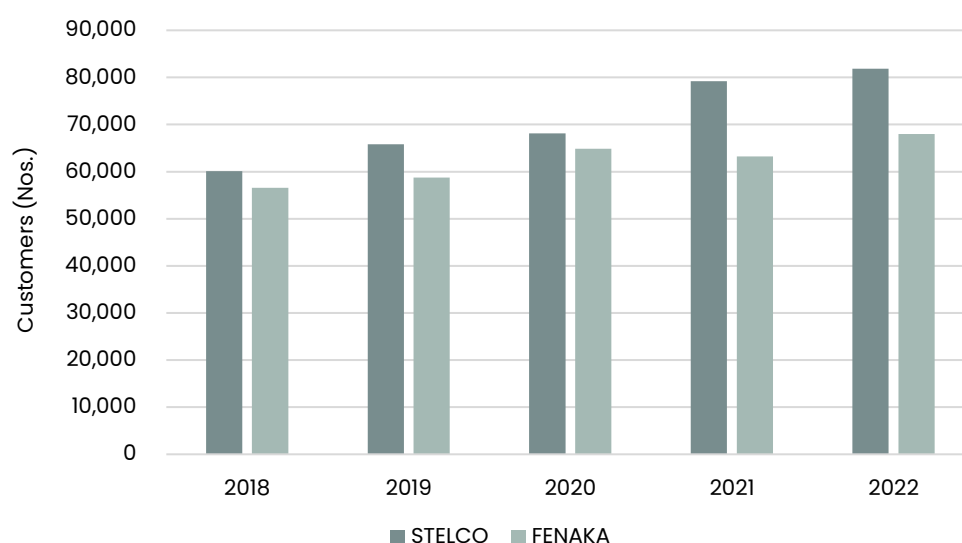
*Table 6-4 Number of Customer Accounts of FENAKA*

	2018	2019	2020	2021	2022
Domestic	44,520	46,218	50,955	49,819	52,641
Business/ Special	9,232	9,571	10,234	10,177	11,804
Government	2,846	2,963	3,699	3,245	3,520
Other	-	-	-	2	2
<b>Total</b>	<b>56,598</b>	<b>58,752</b>	<b>64,888</b>	<b>63,243</b>	<b>67,967</b>

The residential sector is the largest customer segment, driven by the demand for air conditioning, lighting and household appliances, especially in the densely populated areas of Male' and the surrounding atolls. The industrial sector remains relatively small, but fish processing and boat-building activities contribute to the overall energy demand. According to recent data, the number of registered electricity users in the Maldives has steadily increased, driven by population growth and economic development, particularly in urbanised Atolls.

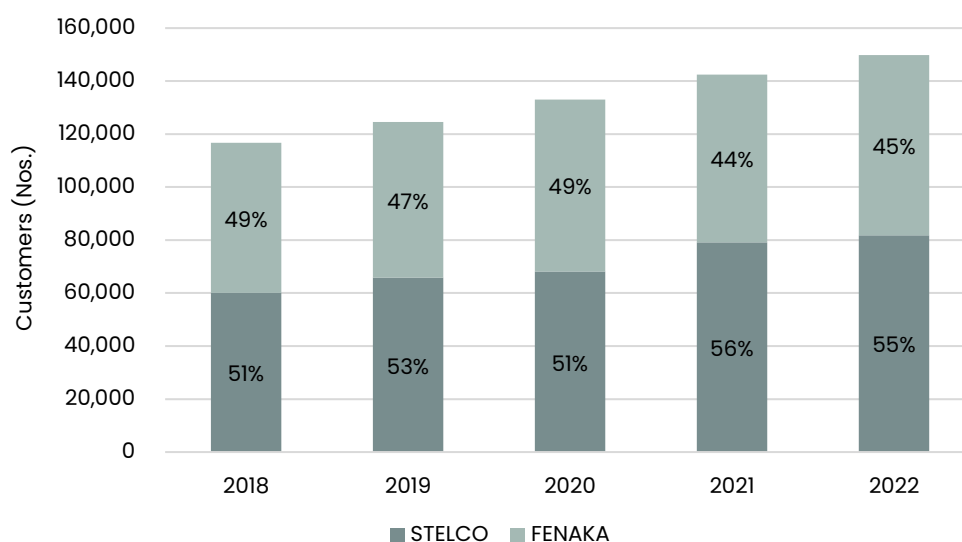
<sup>39</sup> Annual Report 2022, STELCO

The tourism sector, which forms the backbone of the economy, is also a significant consumer of electricity, as resorts and hotels require round-the-clock energy supply for guest services and operations, they operate own diesel generators.



**Figure 6-2 Total Customer Accounts of STELCO and FENAKA**

Figure 6-2 illustrates the number of customer accounts by utility, wherein STELCO serves a bigger customer base. As indicated in Figure 6-3, STELCO possesses over 50% of the customer base, across all years.



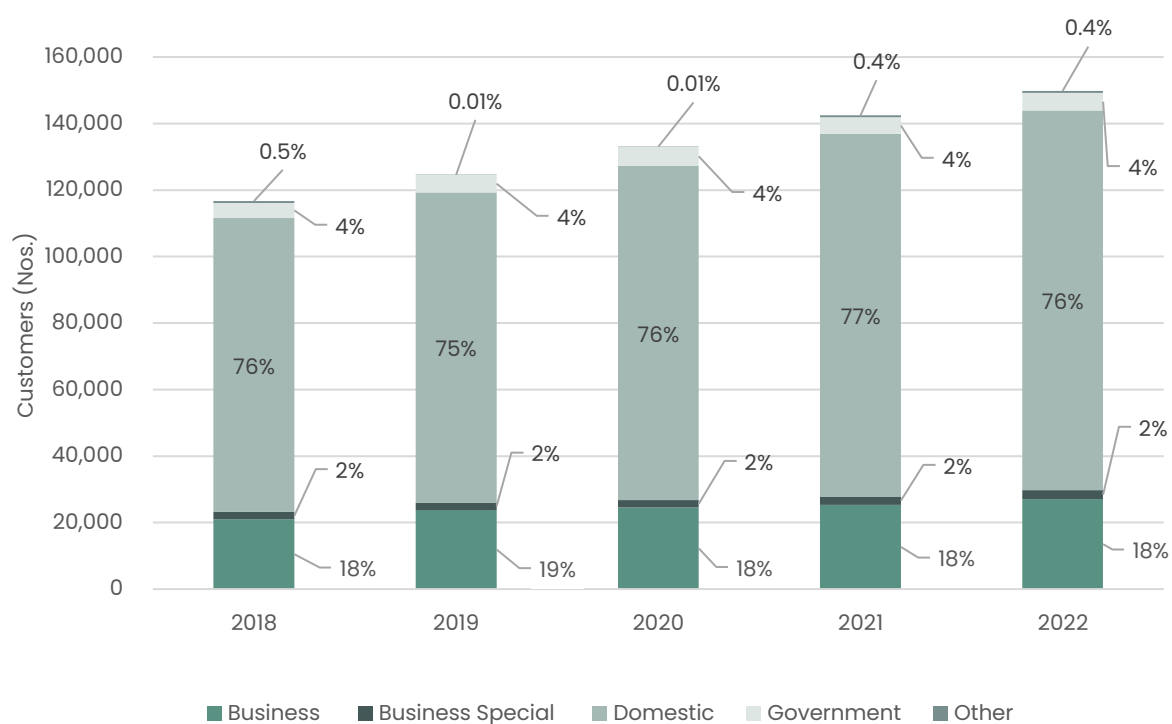
**Figure 6-3 Shares of Electricity Customers in 2022**

The total number of customer accounts in the Maldives is given in Table 6-5. The total number of customer accounts were calculated by aggregating STELCO and FENAKA accounts under appropriate categories. The highest number of accounts was in the domestic category.

**Table 6-5 Total Customer Accounts**

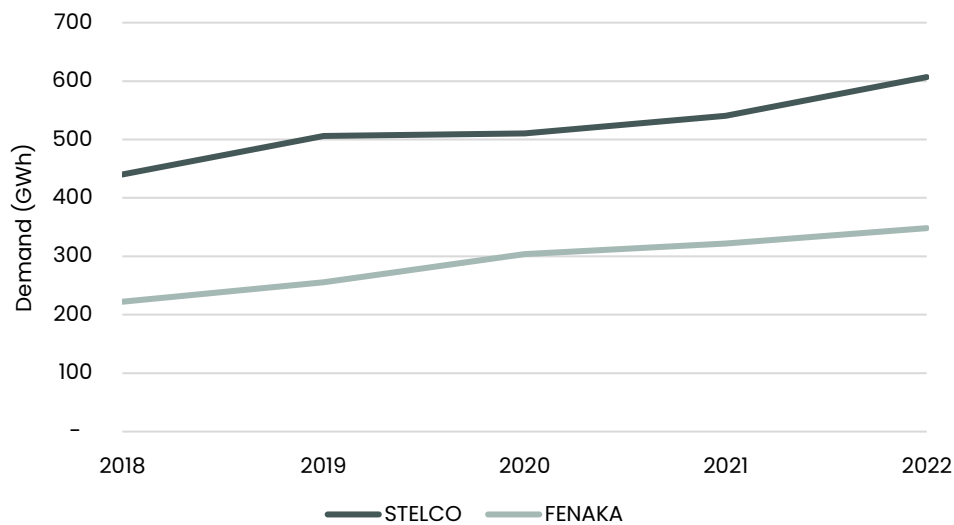
	2018	2019	2020	2021	2022
Domestic	88,389	93,295	100,507	109,020	114,152
Business/ Special	23,225	25,995	26,765	27,840	29,755
Government	4,505	5,262	5,743	5,017	5,289
Other	558	12	15	568	630
<b>Total</b>	<b>116,119</b>	<b>124,552</b>	<b>133,015</b>	<b>141,877</b>	<b>149,196</b>

Customer accounts under the domestic category account for 76%, while customer accounts under the business / special category account for 20%. The balance 4% falls under the government category, with a marginal share less than 1% under the 'other' category.



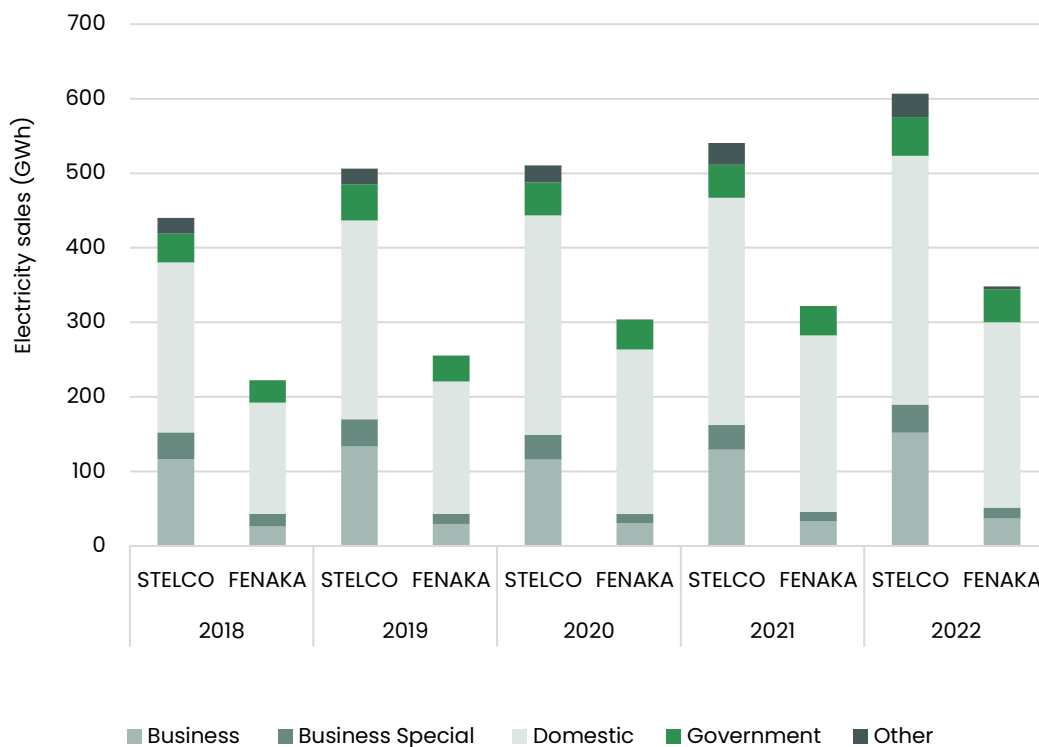
**Figure 6-4 Share of Customer Accounts by Category in 2022**

As shown in Figure 6-5, electricity use in the Maldives has been growing continuously over the five years from 2018 to 2022 due to the strong demand from the residential, tourism, and industrial sectors. The main factors for this growth are infrastructure development in the tourism sector, increased population in inhabited islands and an increase in electrification of services such as desalination and fisheries. This growth was also a result of the continuous efforts of the two state-owned utilities STELCO and FENAKA in further expanding the reach of their services while improving grid reliability.



**Figure 6-5 Electricity Demand Growth of STELCO and FENAKA**

Figure 6-6 indicates the sale of electricity by category by the two utilities. Sales of STELCO are greater than that of FENAKA in all categories.



**Figure 6-6 Electricity Sales of STELCO and FENAKA by Customer Category**

The specific electricity use in the Maldives has undergone a steady growth over the years, driven by urbanisation and rapid growth of commercial activities.

As summarised in Table 6-2, owing to the increase in population, infrastructure development, and increased tourism related activities, electricity demand in both STELCO and FENAKA service areas have increased.

**Table 6-6 Trends in Electricity Demand Growth of the Electricity Utilities**

	2018	2019	2020	2021	2022
Generation by diesel plants (GWh)	741	838	896	965	1,041
Year-on-year growth (%)	-	12%	6%	7%	7%
Generation by solar PV (GWh)	4	8	10	12	21
Year-on-year growth (%)	-	52%	22%	11%	45%
Customer demand (GWh)	662	762	814	863	955
Year-on-year growth (%)	-	13%	6%	6%	10%

Analysis of the rate of increase in the number of customer accounts and the rate of increase in electricity consumption in FENAKA service areas shows positive trends. Results are tabulated in Table 6-7.

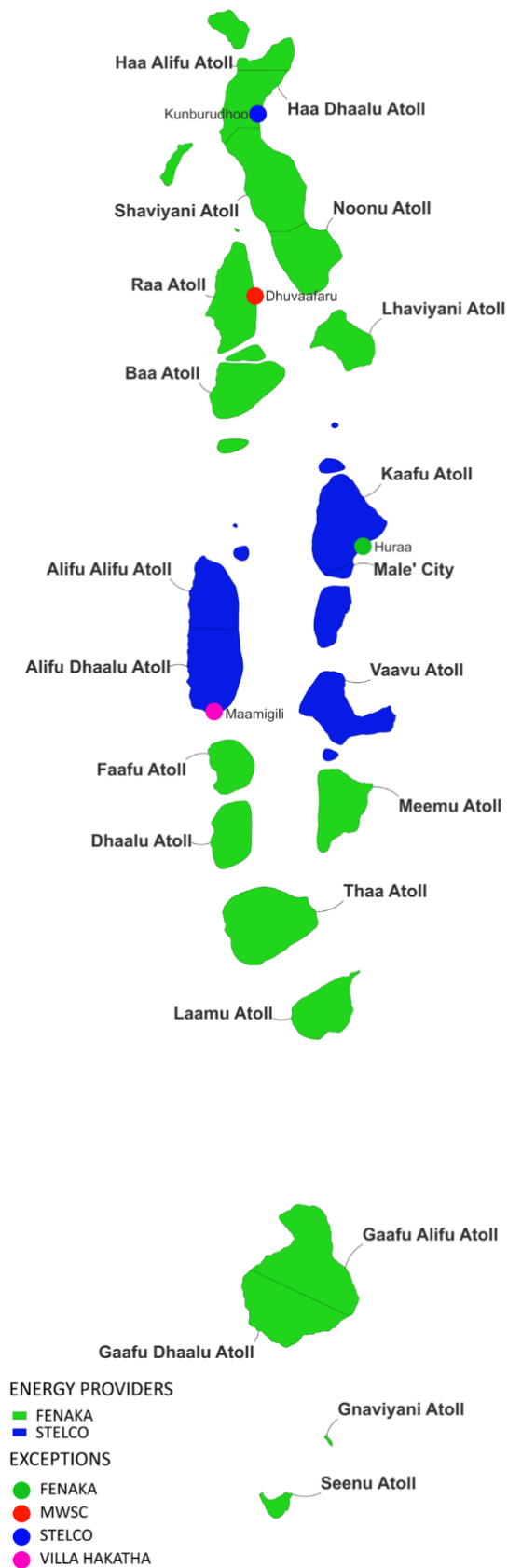
**Table 6-7 Growth in Customer Accounts and Electricity Demand in FENAKA Service Areas**

	2018	2019	2020	2021	2022
Year-on-year growth in customer accounts (%)	-	7%	7%	7%	5%
Year-on-year growth in electricity use (%)	-	15%	7%	6%	11%

Figure 6-7 maps the electricity service providers across different atolls. As shown the map, the capital region (Malé city and surrounding islands) is largely covered by STELCO, whereas the outer atolls predominantly served by FENAKA. Some atolls, such as Gaafu Dhaalu Atoll, are split between the two providers. Additionally, specific islands are marked with coloured dots to indicate exceptions where different providers operate: MWSC and VILLA HAKATHA. The map visually highlights the geographical distribution of electricity providers and exceptions within the Maldives. Corresponding data is systematically presented in the Table 6-8.

**Table 6-8 Electricity Service Providers by Geographical Coverage**

Service provider	Number of islands/cities	Details
STECLO	34	Provides electricity to central atolls including Kaafu, Alifu Alifu, Alifu Dhaalu, Vaavu, Greater Male' Region and Hdh. Kunburudhoo, except for Adh. Maamigili.
FENAKA	155	Provides electricity to the majority of the outer islands – the Southern and Northern atolls. Seenu, Gnaviyani, Gaafu Alifu, Gaafu Dhaalu, Laamu, Thaa, Dhaalu, Faafu and Meemu Atoll to the South. Haa Alif, Haa Dhaalu, Shaviyani, Noonu, Raa, Lhaviyani and Baa Atoll to the North except for the islands of Hdh. Kunburudhoo and R. Dhuvaafaru.
MWSC	1	Sole Electricity provider to R. Dhuvaafaru.
Villa Hakatha	1	Sole electricity provider to Adh. Maamigili.



*Figure 6-7 Electricity Service Providers by Atoll*

## 6.2. Petroleum

All petroleum products such as diesel, petrol, LP gas and Jet A1 are imported into the Maldives. Table 6-9 summarises the petroleum products imported to the Maldives. Largest volume of fuel imported was diesel, followed by Jet A1.

*Table 6-9 Petroleum Products Imported to the Maldives*

	2018	2019	2020	2021	2022
Petrol (kt)	68.6	84.7	58.6	72.5	88.6
Diesel (kt)	526.2	582.6	503.4	581.1	651.1
LPG (kt)	15.0	16.9	13.1	16.8	17.6
Jet A1 (kt)	140.0	166.7	73.1	138.0	178.0

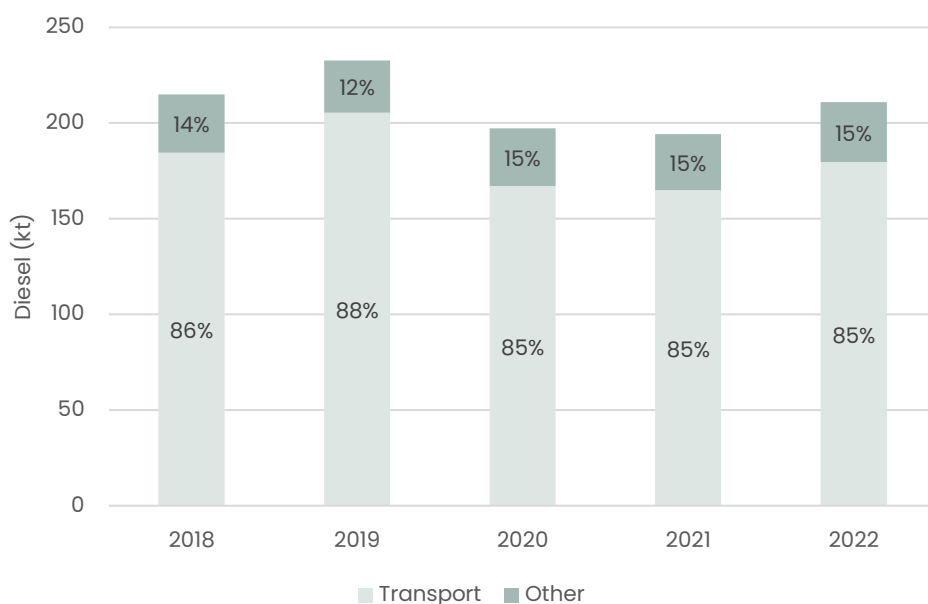
### 6.2.1. Diesel

Diesel is used in power generation, transport, and other activities such as fishing industry. Diesel used in power generation was presented previously and the balance diesel use is summarised in Table 6-10.

*Table 6-10 Diesel Use (Excluding in Power Generation)*

	2018	2019	2020	2021	2022
Transport (kt)	184	205	167	165	180
Other (kt)	31	27	30	29	31
<b>Total (kt)</b>	<b>215</b>	<b>233</b>	<b>197</b>	<b>194</b>	<b>211</b>

Diesel use in fisheries is given in the 'other' category. Accordingly, the highest volume of diesel was consumed in the transport sector. Figure 6-7 indicates that 85% of the diesel was used in transport activities, while the balance of 15% was consumed by other activities.



*Figure 6-8 Shares of Diesel Use in Transport and Other Sectors*

### 6.2.2. Petrol

Petrol is used only in transport. It is used in both land transport and water-borne transport. Table 6-11 summarises the petrol use in transport from 2018 to 2022.

*Table 6-11 Petrol Use*

	2018	2019	2020	2021	2022
Transport (kt)	69	85	59	73	89
<b>Total (kt)</b>	<b>69</b>	<b>85</b>	<b>59</b>	<b>73</b>	<b>89</b>

### 6.2.3. LP Gas

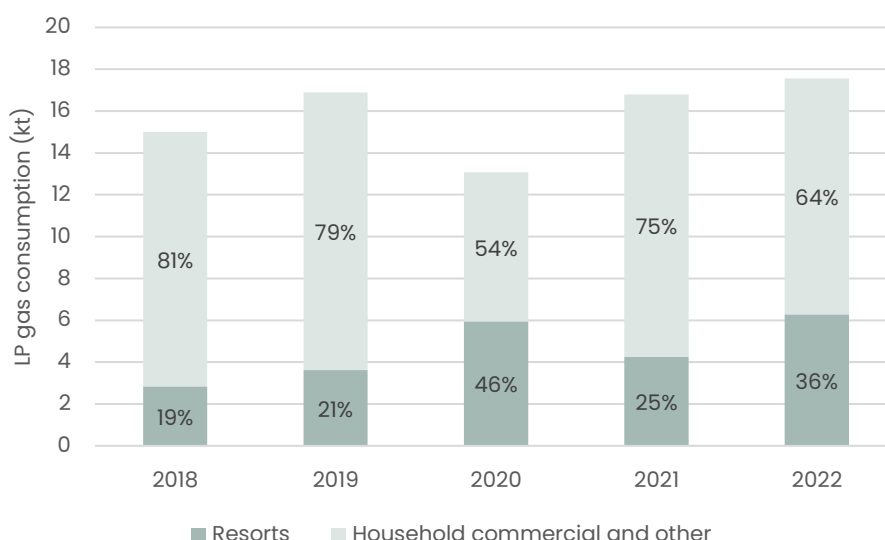
LP gas is used as the main cooking fuel in resorts and households. Table 6-12 summarises the LP gas use in these sub sectors. The residential sector uses the majority of LP gas imported to the Maldives.

*Table 6-12 LP Gas Use*

	2018	2019	2020	2021	2022
Resorts (kt)	2.8	3.6	6.0	4.2	6.3
Household, commercial and other (kt)	12.2	13.3	7.1	12.6	11.3
<b>Total (kt)</b>	<b>15.0</b>	<b>16.9</b>	<b>13.1</b>	<b>16.8</b>	<b>17.6</b>

As shown in Figure 6-8, out of the total LP gas use in 2022, the 'household, commercial and the other' subsector accounted for 64%, while the balance 36% was attributed to the resorts subsector. This consumption pattern is similar across all five years. Owing to the COVID 19 pandemic, the overall consumption of LP gas declined in 2020.





*Figure 6-9 LP Gas Use*

#### 6.2.4. Jet A1

Jet A1 is used in both domestic and international aviation. Table 6-13 summarises the use of Jet A1. After the drop in fuel use due to restricted air travel during 2020, Jet A1 use increased in 2021 and by 2022, the use exceeded the pre-pandemic levels.

*Table 6-13 Jet A1 Use in Aviation*

	2018	2019	2020	2021	2022
Aviation (kt)	140.0	166.7	73.1	138.0	178.0
<b>Total</b>	<b>140.0</b>	<b>166.7</b>	<b>73.1</b>	<b>138.0</b>	<b>178.0</b>

### 6.3. Sectoral Demand

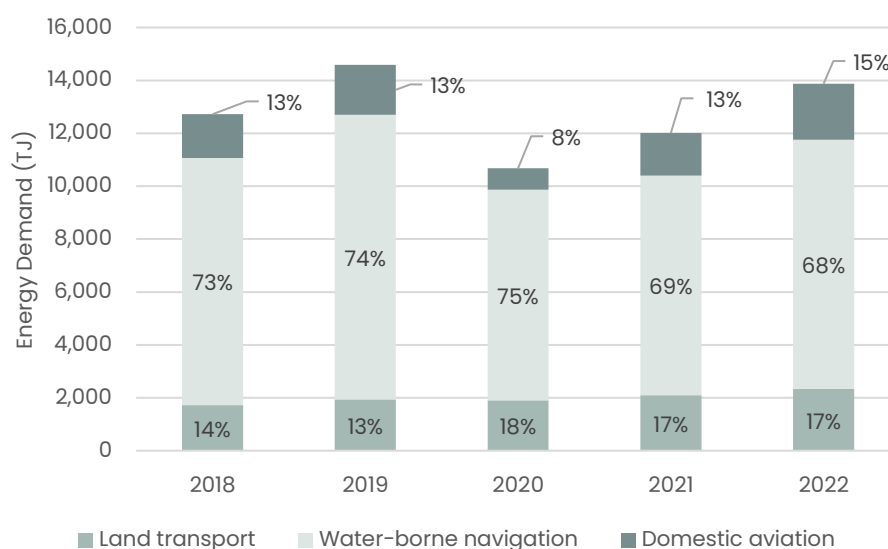
The following section of this chapter will explore the use of fuel in different sectors and subsectors.

#### 6.3.1. Transport

The Maldives being a collection of islands and owing to the fragmented nature of the geography, transport within the country is through sea transport (water-borne navigation) and air transport (domestic aviation). As indicated in Table 6-14, the share of water borne navigation and aviation transport was higher than that of land transport.

*Table 6-14 Energy Demand in the Transport Sector*

	2018	2019	2020	2021	2022
Land transport (TJ)	1,721	1,943	1,909	2,099	2,339
Water-borne navigation (TJ)	9,347	10,754	7,963	8,301	9,418
Aviation (TJ)	1,655	1,896	806	1,609	2,118



**Figure 6-10 Share of Energy Demand by Type of Transport**

During the five-year period from 2018 to 2022, the share of land transport ranged between 13% – 18%, while water-borne navigation ranged between 68% – 75% and the balance was occupied by domestic aviation.

Passenger transport to the country from other locations are mainly through international aviation and goods transport is mainly through international maritime routes. Petrol, marine gas oil (diesel) and Jet A1 are imported to the country to cater to the transport demand.

### 6.3.2. Air Transport

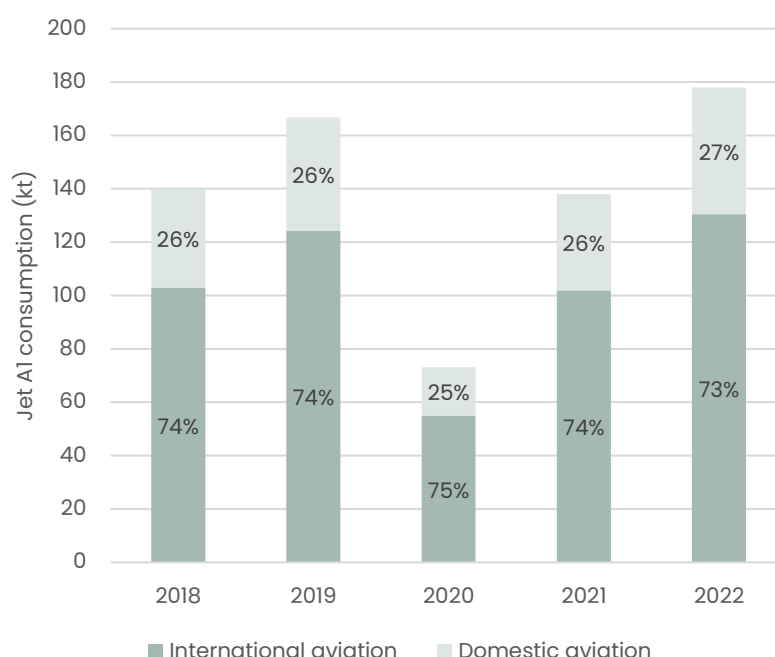
Air transport demand is due to international flights from the Maldives and domestic flights which transport passengers and goods mainly from the capital Male' to other islands and Atolls. There is a significant component of aviation bunkering at the airports, which is attributed to the refuelling of international flights. The Maldives has five airports, viz., Velana, Gan, Hanimaadhoo, Maafaru and Villa (Maamigili) that accommodate international flights and fifteen domestic airports.

The use of Jet A1 in domestic and international aviation is given in Table 6-15. The majority of Jet A1 was consumed for international aviation.

**Table 6-15 Use of Jet A1 in the Aviation Sector**

	2018	2019	2020	2021	2022
International aviation (kt)	103	124	55	102	130
Domestic aviation (kt)	37	43	18	36	48
<b>Total (kt)</b>	<b>140</b>	<b>167</b>	<b>73</b>	<b>138</b>	<b>178</b>
Domestic flight passengers ('000s)	2,103	2,385	815	1,685	2,417
International flight passengers ('000s)	3,732	4,184	1,357	2,942	4,231
Number of international flights	23,820	27,560	75,735	158,639	205,061

A sharp decline in the use of Jet A1 in 2020 is observed, owing to the travel restrictions imposed during the COVID-19 pandemic. This reduction in fuel use has bounced back with the economy gradually returning to normalcy. Across all years presented in Figure 6-11, the major share of Jet A1 use was for international aviation (74%, approximately), while the balance (26%) was for domestic aviation.



*Figure 6-11 Share of Jet A1 Use between International and Domestic Aviation*

### 6.3.3. Road Transport

A fleet of both publicly and privately owned vehicles is available for passenger transport within islands/atolls. Details of the fleet of petrol and diesel vehicles is tabulated in

Table 6-16, and Table 6-17 respectively.

*Table 6-16 Fleet of Petrol Vehicles*

	2018	2019	2020	2021*	2022*
Motor cars	5,819	6,424	7,045	7,209	7,650
Taxis	506	559	613	627	665
Motorcycles	89,897	100,513	112,000*	122,000	132,000
Lorries/trucks/tractors	155	179	132	153	185
Vans/buses	1,757	2,028	1,499	1,737	2,096
SUVs/pickups	2,124	2,451	1,812	2,099	2,534

*\*Data was imputed from the Statistical Pocket Book 2023 and previous studies and surveys carried out by the Ministry of Transport.*

Majority of petrol vehicles are motorcycles, followed by private cars. On the other hand, major share of diesel vehicles fall into the category of lorries/trucks/tractors, followed by SUVs/pickups.

*Table 6-17 Fleet of Diesel Vehicles*

	2018	2019	2020	2021*	2022*
--	------	------	------	-------	-------

Lorries/trucks/tractors	2,943	3,395	2,509	2,908	3,510
Vans/buses	586	676	500	579	699
SUVs/pickups	2,596	2,996	2,214	2,566	3,097
Other vehicles	2,149	2,479	1,832	2,123	2,563

\*Data was imputed from the Statistical Pocket Book 2023 and previous studies and surveys carried out by the Ministry of Transport.

Estimated distances travelled by petrol and diesel vehicles are tabulated in Table 6-18 and Table 6-19 respectively.

*Table 6-18 Distance Travelled by the Petrol Vehicle Fleet*

	2018	2019	2020	2021	2022
Motor cars	47	52	57	58	61
Taxis	18	20	22	23	24
Motorcycles	427	477	531	579	626
Lorries/trucks/tractors	2	3	2	2	3
Vans/buses	26	30	22	25	31
SUVs/pickups	16	18	13	15	18

All distances are in million km.

The highest mileage in petrol vehicles is operated by motorcycles, while the highest mileage for diesel vehicles is operated by lorries/trucks/tractors.

*Table 6-19 Distance Travelled by the Diesel Vehicles Fleet*

	2018	2019	2020	2021	2022
Lorries/trucks/tractors	43	50	37	42	51
Vand/buses	9	10	7	8	10
SUVs/pickups	19	22	16	19	23
Other vehicles	4	5	3	4	5

All distances are in million km.

Table 6-20 presents the estimated fuel use by petrol vehicles and the corresponding petrol use in 2022 was 44 kt. Across all years, the highest use of petrol was by motorcycles.

*Table 6-20 Fuel Use by Petrol Vehicles*

	2018	2019	2020	2021	2022
Motor cars	3	3	4	4	4
Taxis	1	1	1	1	2
Motorcycle	21	24	27	29	31
Lorries/trucks/tractors	-	-	-	-	-
Vans/buses	4	4	3	4	5
SUVs/pickups	2	2	1	2	2
<b>Total</b>	<b>31</b>	<b>35</b>	<b>36</b>	<b>40</b>	<b>44</b>

All fuel use values are in kt

Table 6-21 presents the estimated fuel use by the diesel vehicle fleet. Use of diesel was less than the use of petrol in road transportation. Across all years, the highest use of diesel was by lorries/trucks/tractor.

*Table 6-21 Fuel Use by Diesel Vehicles*

	2018	2019	2020	2021	2022
Lorries/trucks/tractors	5	5	4	4	5
Vans/buses	1	1	1	1	1
SUVs/pickups	2	2	1	2	2
Other vehicles	0.4	0.5	0.4	0.4	0.5
<b>Total</b>	<b>7</b>	<b>9</b>	<b>6</b>	<b>7</b>	<b>9</b>

All fuel use values are in kt

#### 6.3.4. Domestic Navigation

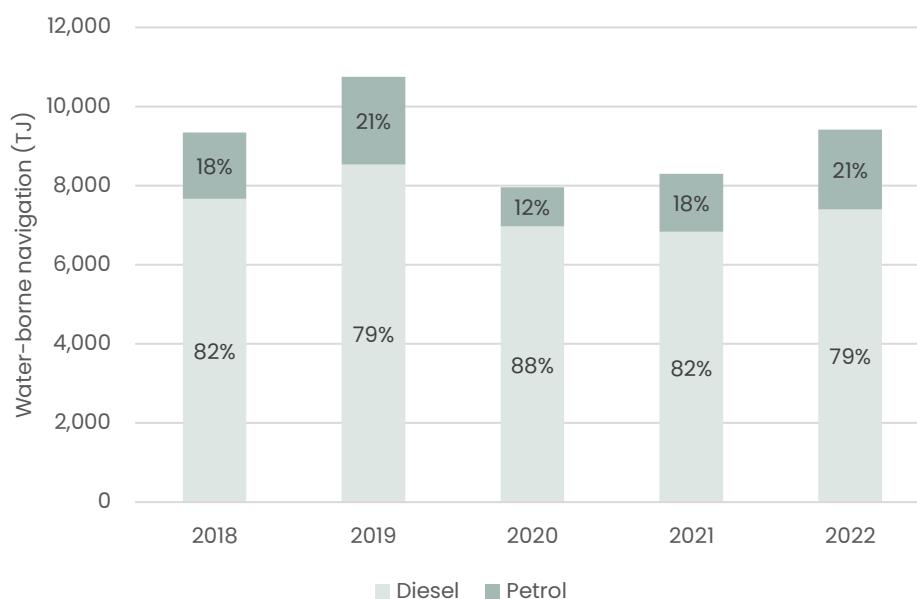
Water-borne navigation within the islands and atolls is used to ferry passengers and cargo. Records of the Ministry of Transport and Civil Aviation indicates the operation of 3,553 vessels during the years 2018–2022. Fishing vessels comprised 50% of the fleet while 35% was passenger transport vessels. Other vessels were used in tourism and cargo/bunkering related operations. Table 6-22 summarises the use of diesel and petrol in water-borne navigation. Diesel is the most used fuel in water-borne navigation.

*Table 6-22 Fuel Use in Water-borne Navigation*

	2018	2019	2020	2021	2022
Diesel	7,672	8,531	6,971	6,833	7,403
Petrol	1,675	2,223	992	1,468	2,015
<b>Total</b>	<b>9,347</b>	<b>10,754</b>	<b>7,963</b>	<b>8,301</b>	<b>9,418</b>

All fuel use values are in kt

The total energy use in water-borne navigation in 2022 was 9,418 TJ. 79% of this was from diesel, while the balance (21%) was from petrol, as illustrated in Figure 6-12 Fuel consumption was lowest in 2020, owing to the COVID – 19 pandemic.



*Figure 6-12 Share of Fuel in Water-borne Navigation*

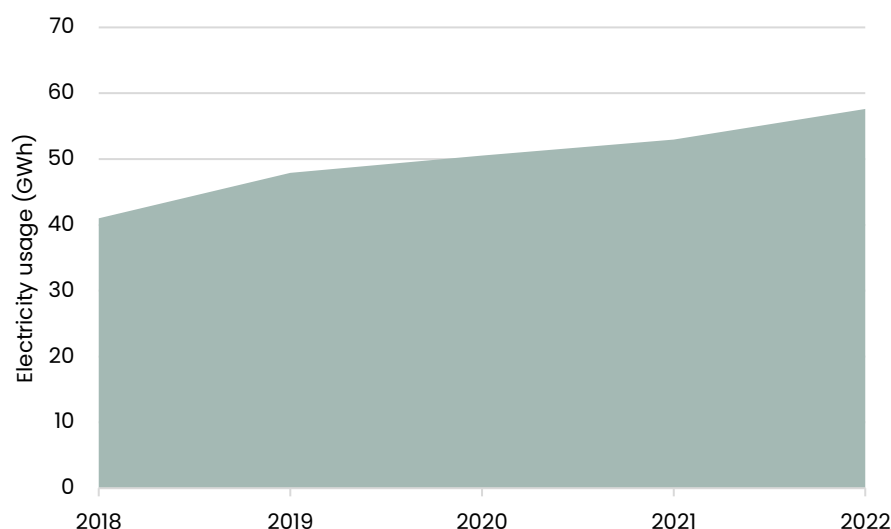
#### 6.4. Industry

Since the country is exhibiting a lower level of industrialisation, the substantial industrial demand is from desalination plants. Accordingly, electricity, as the main form of energy consumed by desalination plants, serves the energy demand in the industrial sector. Table 6-23 summarises the electricity consumption in industries.

*Table 6-23 Industrial Energy Demand*

	2018	2019	2020	2021	2022
Electricity (GWh)	41.0	47.9	50.6	52.9	57.6

Figure 6-13 illustrates an increasing trend in industrial electricity use over the years.



*Figure 6-13 Electricity Use in Industries*

The total water production from desalination plants has shown a steady increase, from 8,609 kt in 2018 to 10,807 kt in 2022. This growth is predominantly led by the expansion in Hulhumale, where water production surged from 1,510 kt in 2018 to 3,248 kt in 2022. Other areas such as Male and Villmale also contributed to the production, although Villmale saw a slight decrease in production from 287 kt in 2020 to 266 kt in 2022.

Following are other industrial applications in the Maldives, for which data on fuel consumption is not available. However, these activities are also considered under industrial applications.

#### 6.4.1. Cold Storage and Refrigeration:

**On-boat refrigeration.** Diesel-powered electricity is used by larger vessels to power on-boat ice production, though some plants are beginning to integrate on-boat refrigeration. Ice making or refrigeration is essential to preserve fish quality, requiring additional diesel fuel or electricity (if hybrid engines are used). However, smaller vessels often rely on ice supplied by land based cold storage facilities.

**Onshore cold storage facilities.** Facilities near landing sites store the catch before processing or export, requiring substantial energy for refrigeration. This energy demand is partially met by solar energy systems to offset diesel use.

#### 6.4.2. Processing Facilities:

**Canning and freezing.** Tuna canning, smoking, and freezing require a significant amount of energy for operations. These processes often use grid electricity if available or, alternatively, diesel-powered generators, especially in islands without grid connectivity.

**Water and waste management.** Processing facilities also require energy for water heating, water treatment, and waste processing to meet sanitary standards and minimise environmental impact.

#### 6.4.3. Ice Production and Distribution:

**Ice plants.** Fishermen rely heavily on ice to preserve their catch, and ice plants are energy-intensive operations. These plants use significant amounts of electricity or diesel-generated power to produce and store ice. In some areas, solar-hybrid ice plants are being piloted to help reduce reliance on diesel.

**Transportation of Ice.** Distribution of ice to fishing vessels requires fuel, particularly when transporting ice from the production facility to smaller islands or remote fishing areas.

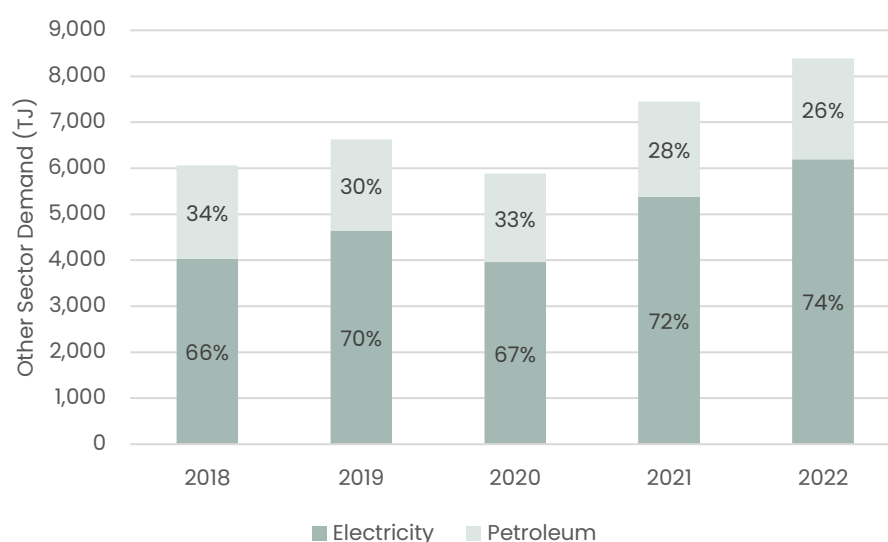
## 6.5. Other Uses

Domestic, resorts and agriculture are considered under the 'other' sector. Electricity accounts for a dominant share in the demand profile of this sector (Table 6-24).

*Table 6-24 Energy Demand of Other Sector*

	2018	2019	2020	2021	2022
Electricity (TJ)	4,029	4,644	3,962	5,384	6,199
Petroleum (TJ)	2,031	1,981	1,919	2,064	2,189
<b>Total (TJ)</b>	<b>6,060</b>	<b>6,625</b>	<b>5,881</b>	<b>7,448</b>	<b>8,388</b>

Out of the total energy demand in the other sector, generally, the contribution of electricity was higher than that of the contribution of petroleum, as indicated in Figure 6-14.



*Figure 6-14 Energy Demand of Other Sectors*

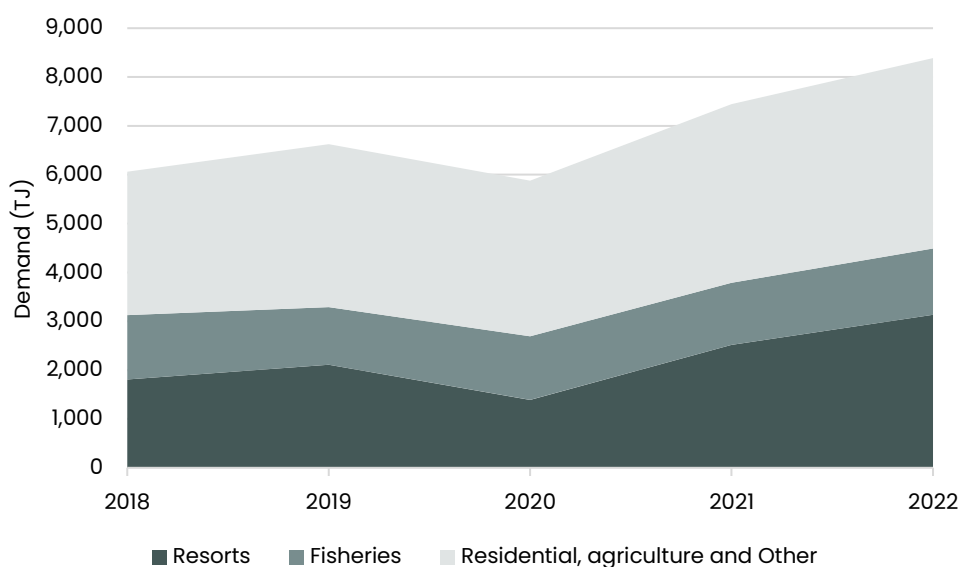
Table 6-25 and Figure 6-15 indicate that the highest contribution to the energy demand of the other sector is by household, commercial and 'other' subsector. This demand is closely followed by resorts, as the second highest contributor.

*Table 6-25 Other Sector Energy Demand by Subsector*

	2018	2019	2020	2021	2022
<b>Energy Demand (TJ)</b>					
Resorts	1,807	2,108	1,391	2,517	3,133
Fisheries	1,322	1,182	1,300	1,269	1,358
Residential, agriculture and other	2,932	3,334	3,189	3,662	3,897
<b>Total</b>	<b>6,060</b>	<b>6,625</b>	<b>5,881</b>	<b>7,448</b>	<b>8,388</b>
<b>Share of Demand (%)</b>					
Resorts	30%	32%	24%	34%	37%

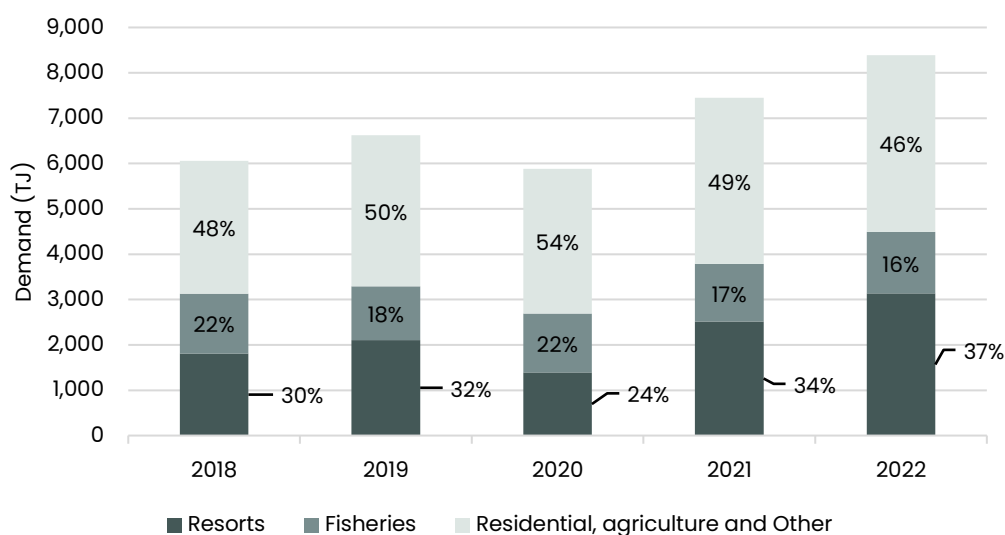


Fisheries	22%	18%	22%	17%	16%
Residential, agriculture and other	48%	50%	54%	49%	46%



*Figure 6-15 Other Sector Energy Demand by Subsector*

Figure 6-16 indicates that the residential, agriculture and 'other' subsector generally contributes by 50% (within the range of 48% – 54%) to the 'other' sector demand, while resorts contribute by 24% – 37%. The balance contribution is by fisheries, which is a main economic activity in the Maldives.



*Figure 6-16 Share of Other Sector Energy Demand by Subsector*

### 6.5.1. Resorts

Tourism is the largest contributor to the Maldives' GDP and a major employment generator. The country is known for its luxury resorts, pristine beaches and coral reefs, attracting tourists from around the world. Tourism also supports various sub-sectors, such as hospitality, water sports, transportation, and entertainment.

The tourism sector is the most energy-intensive service in the Maldives, driven by the needs of luxury resorts, hospitality services, and associated infrastructure. The high energy demand in tourism is primarily due to the island nation's dependence on international visitors, luxury accommodations, and energy-intensive services provided in remote island resorts. An in-depth analysis of the energy demand of the tourism sector of the Maldives is presented below:

The fuel use in resorts was estimated using parameters given in Table 6-26.

*Table 6-26 Parameters used in Estimating the Energy Demand in Resorts*

	Unit	2018	2019	2020	2021	2022
Total bed nights (thousands) <sup>a</sup>	per annum	9,478	10,688	3,985	10,073	12,260
Electricity use per bed-night (kWh) <sup>b</sup>	kWh/bed night	49	50	77	58	60
LP gas use per bed-night <sup>b</sup>	kg/bed night	0.3	0.3	1.5	0.4	0.5

Sources:

- Statistical Pocket Book 2023.
- Derived from a representative sample of resorts.

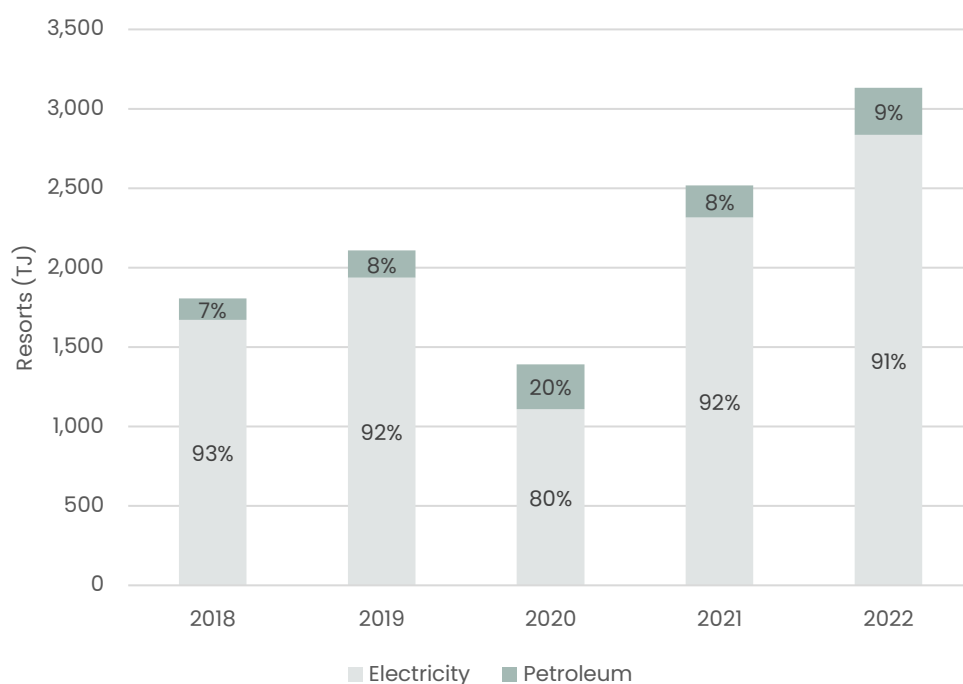
Both electricity and petroleum are used as fuels in the resorts subsector. The major share is taken by electricity, as indicated in Table 6-27. LP gas is the main petroleum fuel used in resorts. It is used as a cooking fuel.

Given the tropical climate, resorts consume a large amount of energy for air conditioning in guest rooms, restaurants, and other facilities. Energy is also required for refrigeration, cooking, and food storage in the restaurants and kitchens that serve tourists. Many resorts offer multiple dining options, which increases the demand for electricity and fuel for cooking. Resorts also need a consistent supply of hot water for guest use, which adds to the energy demand. In some cases, solar water heaters are used, but diesel is still the main energy source.

*Table 6-27 Energy Demand in Resorts by Energy Source*

	2018	2019	2020	2021	2022
<b>Energy demand (TJ)</b>					
Electricity	1,672	1,937	1,110	2,316	2,835
Petroleum	135	171	282	201	297
<b>Total</b>	<b>1,807</b>	<b>2,108</b>	<b>1,391</b>	<b>2,517</b>	<b>3,133</b>
<b>Share of demand (%)</b>					
Electricity	93%	92%	80%	92%	91%
Petroleum	7%	8%	20%	8%	9%

The share of electricity was substantially higher than that of the share of petroleum in the Resorts subsector, across all years, as illustrated below Figure 6-17. Other than in 2020, the share of electricity in all years was above 90%.



*Figure 6-17 Share of Energy Source in Resorts Subsectors*

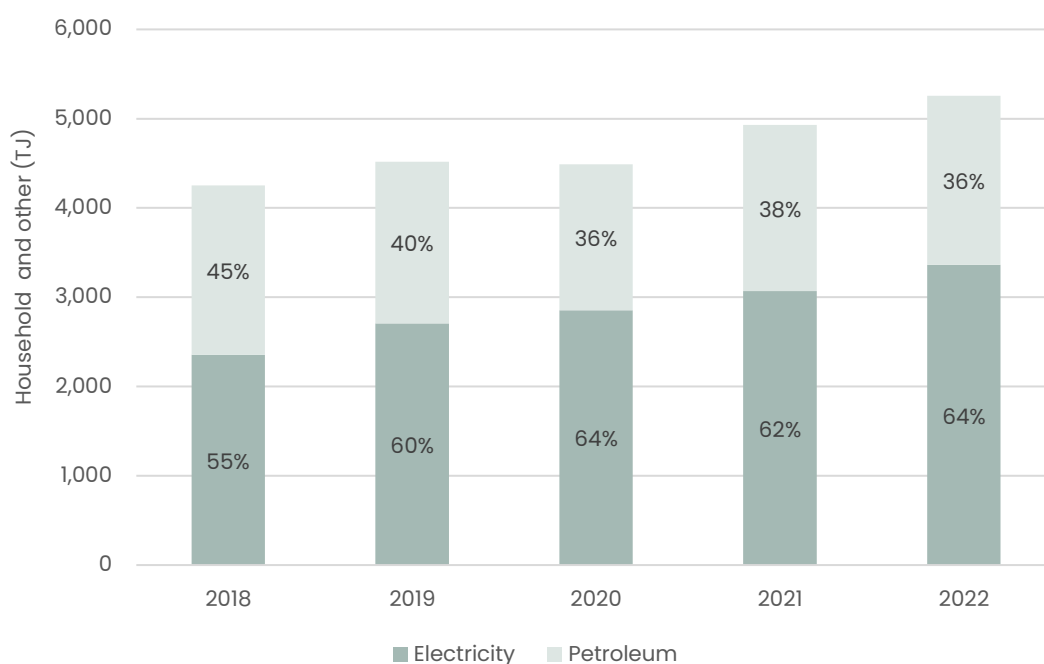
### 6.5.2. Household and Other

Electricity and petroleum are the contributory energy sources to the demand in the household and other subsector. Household, businesses and fisheries subsectors sans resorts, have been considered under this category. Electricity is the dominant energy source as indicated in Table 6-28.

*Table 6-28 Energy Demand in the Household, Commercial and Other Subsector*

	2018	2019	2020	2021	2022
<b>Energy demand (TJ)</b>					
Electricity	2,357	2,706	2,852	3,068	3,363
Petroleum	1,897	1,810	1,637	1,863	1,892
<b>Total</b>	<b>4,253</b>	<b>4,516</b>	<b>4,490</b>	<b>4,931</b>	<b>5,255</b>
<b>Share of demand (%)</b>					
Electricity	55%	60%	64%	62%	64%
Petroleum	45%	40%	36%	38%	36%

Generally, electricity contributed by 55% – 64% to the energy demand in the household, commercial and other subsector, while petroleum contributed by 36% – 45% Figure 6-18.



*Figure 6-18 Share of Energy Source in the Household, Commercial and Other Sectors*

### 6.5.3. Agriculture

Energy demand in the Maldivian fishing industry is primarily driven by fuel consumption for fishing vessels. Fishing, especially tuna fishing, is both a significant economic contributor and a traditional livelihood for many Maldivians. Fishing vessels in the Maldives predominantly use diesel for fuel, with demand based on fishing methods and the distance travelled. However, details on fuel usage in fishing vessels is not available, therefore indirect methods were used to estimate the corresponding fuel usages. Petroleum is the main fuel used in the agriculture subsector as indicated in Table 6-29. The demand for petroleum in agriculture in 2022 was 1,358 TJ.

*Table 6-29 Energy Demand in the Agriculture Sector*

	2018	2019	2020	2021	2022
Petroleum (TJ)	1,322	1,182	1,300	1,269	1,358
<b>Total (TJ)</b>	<b>1,322</b>	<b>1,182</b>	<b>1,300</b>	<b>1,269</b>	<b>1,358</b>

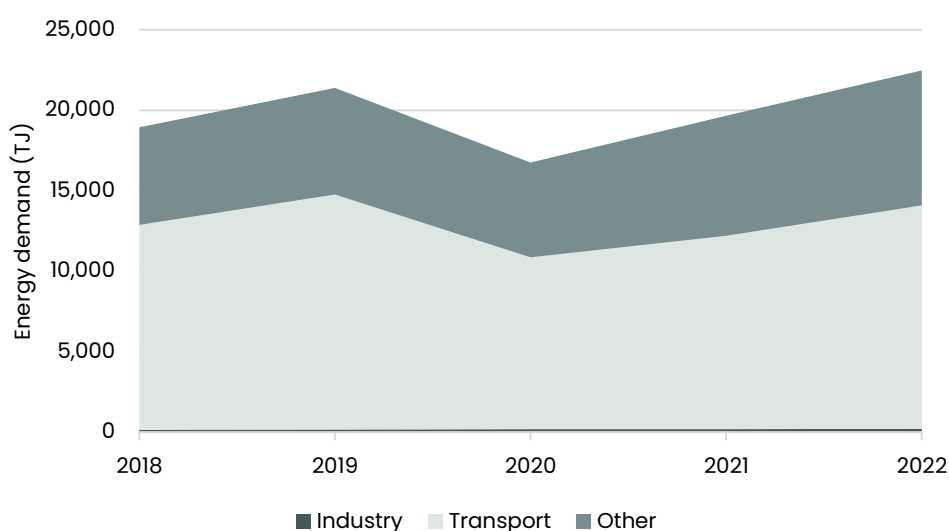
## 6.6. Total Demand

The total energy demand by sector in the Maldives is summarised in Table 6-30 and Figure 6-19.

*Table 6-30 Total Energy Demand by Sector*

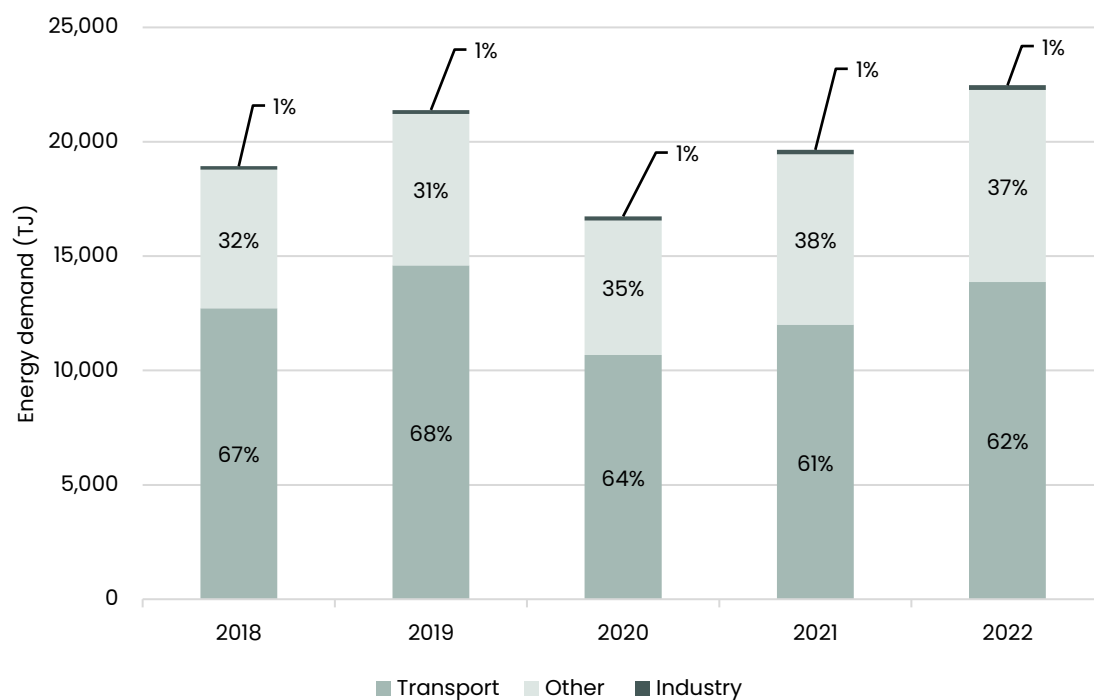
	2018	2019	2020	2021	2022
<b>Energy demand (TJ)</b>					
Industry	148	173	182	191	207
Transport	12,723	14,593	10,678	12,010	13,875
Other	6,060	6,625	5,881	7,448	8,388
<b>Total</b>	<b>18,931</b>	<b>21,390</b>	<b>16,740</b>	<b>19,648</b>	<b>22,470</b>
<b>Share of demand (%)</b>					
Industry	1%	1%	1%	1%	1%
Transport	57%	65%	48%	53%	62%
Other	27%	29%	26%	33%	37%

The energy demand dipped in 2020, owing to restrictions imposed during the COVID – 19 pandemic.



*Figure 6-19 Energy Demand by Sector*

The highest share in the energy consumption portfolio was attributed to transport in all years, where it ranged from 61% – 68%. This was followed by the energy consumption in the ‘other’ subsector, which ranged from 31% – 38%. The energy consumption of industries hovered around 1% in all years, as indicated in Figure 6-20.



*Figure 6-20 Share of Energy Demand by Sector*

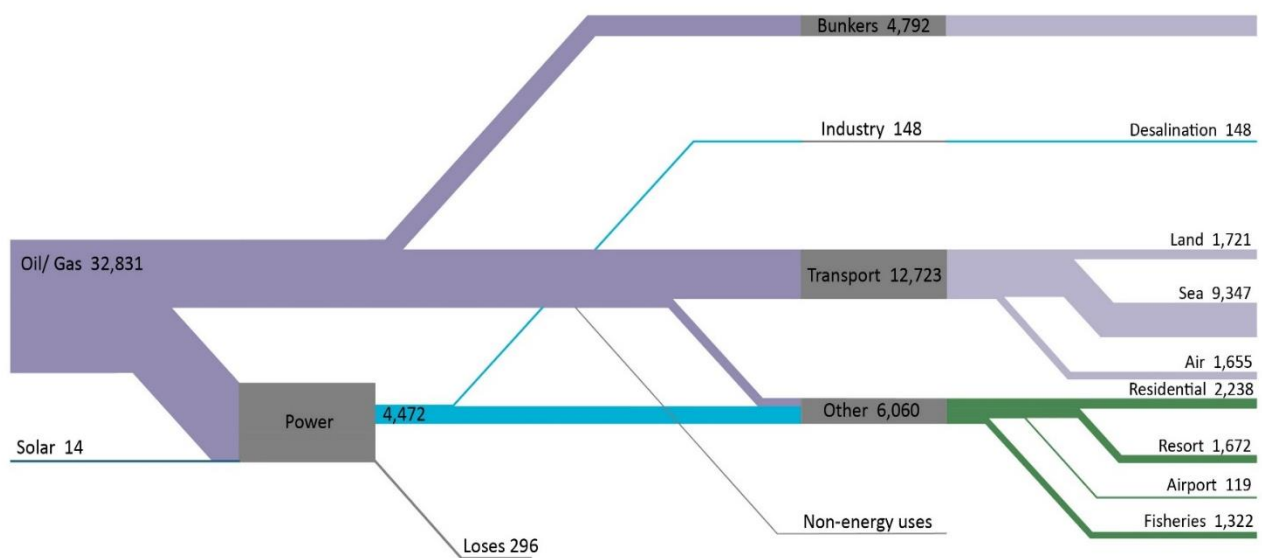
## 7. Energy Balance

### 7.1. Energy Balance 2018

The energy balance of 2018 is presented in Table 7-1 in Terajoules. The total demand in 2018 was 18,931 TJ. The transport sector contributed to this demand by 12,723 TJ, industries by 148 TJ, while the 'other' sector contributed by 6,060 TJ. The transport sector was entirely sourced by petroleum, while the industries sector was sourced by electricity. Electricity and petroleum contributed by 4,029 TJ and 2,031 TJ to the other sector, respectively. Individual commodities in original units are attached in Annex 1 of this report.

*Table 7-1 Energy Balance 2018 in Terajoules*

Maldives Energy Balance 2018 (in Tera Joules)							
	Renewable	Electricity	LP gas	Petrol	Jet A1 (kt)	Diesel	Total
<b>Supply</b>							
Primary Energy	39						39
Imports			710	3,075	6,244	22,802	32,831
Direct Exports							
Foreign Aviation				(1)	(4,590)	(201)	(4,792)
Statistical difference							
<b>Total Energy Supply</b>	<b>39</b>		<b>710</b>	<b>3,074</b>	<b>1,655</b>	<b>22,600</b>	<b>28,078</b>
<b>Energy Conversion</b>							
Thermal Power Plants		4,459				(13,289)	
Solar PV	(14)	14					
Own Use							
Conversion Losses							
Losses in Transmission and Distribution		(296)					(296)
Consumption for Non Energy Use							
<b>Total Energy Conversion</b>	<b>(14)</b>	<b>4,176</b>				<b>(13,289)</b>	
<b>Energy Use</b>							
<b>Industry</b>		148					148
Desalination		148					
<b>Transport</b>				3,075	1,655	7,993	12,723
Road Transport				1,400		321	1,721
Domestic navigation				1,675		7,672	9,347
Domestic Aviation					1,655		1,655
<b>Other</b>		4,029	710			1,322	6,060
Household, Commercial, Agriculture and Other		4,029	710			1,322	
<b>Total Energy Use</b>		<b>4,176</b>	<b>710</b>	<b>3,075</b>	<b>1,655</b>	<b>9,314</b>	<b>18,931</b>



All quantities are in terajoules (TJ)

*Figure 7-1: Energy Balance 2018*

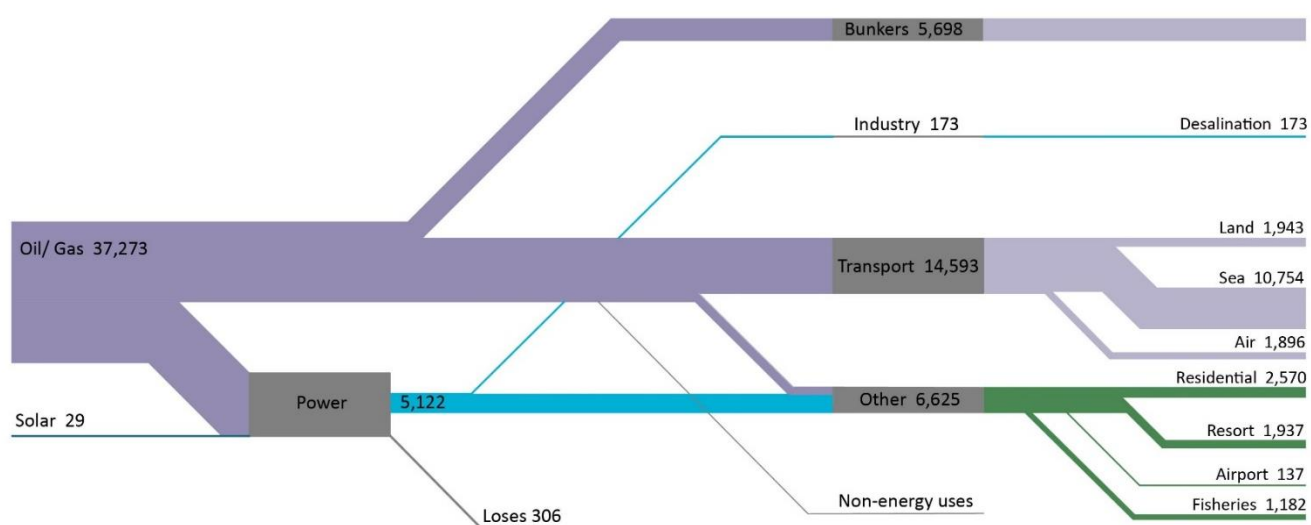


## 7.2. Energy Balance 2019

The energy balance of 2019 is presented in Table 7-2 in Tera Joules. The total demand in 2019 was 21,390 TJ. The transport sector contributed to this demand by 14,593 TJ, industries by 173 TJ, while the 'other' sector contributed by 6,625 TJ. The transport sector was entirely sourced by petroleum, while the industries sector was sourced by electricity. Electricity and petroleum contributed by 4,644 TJ and 1,981 TJ to the other sector, respectively. Individual commodities in original units are attached in Annex 1 of this report.

*Table 7-2 Energy Balance 2019 in Terajoules*

Maldives Energy Balance 2019 (in Tera Joules)							
	Renewable	Electricity	LP gas	Petrol	Jet A1	Diesel	Total
<b>Supply</b>							
Primary Energy	82						82
Imports			799	3,795	7,433	25,246	37,273
Direct Exports							
Foreign Aviation					(5,537)	(161)	(5,698)
Statistical difference							
<b>Total Energy Supply</b>	<b>82</b>		<b>799</b>	<b>3,795</b>	<b>1,896</b>	<b>25,085</b>	<b>31,657</b>
<b>Energy Conversion</b>							
Thermal Power Plants		5,093				(15,004)	
Solar PV	(29)	29					
Own Use							
Conversion Losses							
Losses in Transmission and Distribution		(306)					(306)
Consumption for Non Energy Use							
<b>Total Energy Conversion</b>	<b>(29)</b>	<b>4,816</b>				<b>(15,004)</b>	
<b>Energy Use</b>							
<b>Industry</b>		173					173
Desalination		173					
<b>Transport</b>				3,795	1,896	8,902	14,593
Road Transport				1,572		371	1,943
Domestic navigation				2,223		8,531	10,754
Domestic Aviation					1,896		1,896
<b>Other</b>		4,644	799			1,182	6,625
Household, Commercial, Agriculture and Other		4,644	799			1,182	
<b>Total Energy Use</b>		<b>4,816</b>	<b>799</b>	<b>3,795</b>	<b>1,896</b>	<b>10,084</b>	<b>21,390</b>



All quantities are in terajoules (TJ)

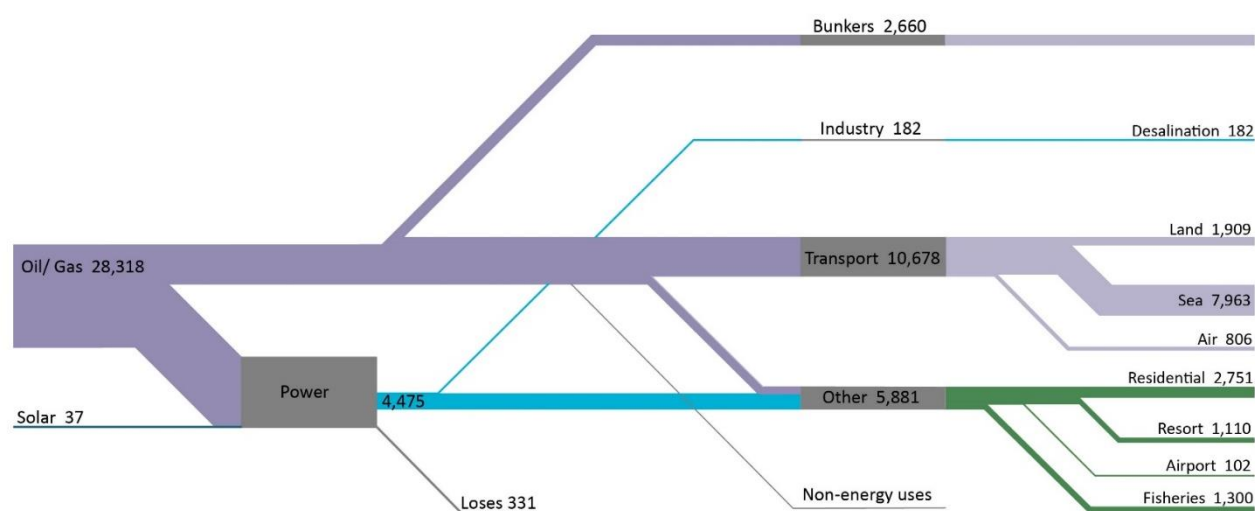
*Figure 7-2: Energy Balance 2019*

### 7.3. Energy Balance 2020

The energy balance of 2020 is presented in Table 7-3 in Tera Joules. The total demand in 2020 was 16,740 TJ. The transport sector contributed to this demand by 10,678 TJ, industries by 182 TJ, while the 'other' sector contributed by 5,881 TJ. The transport sector was entirely sourced by petroleum, while the industries sector was sourced by electricity. Electricity and petroleum contributed by 3,962 TJ and 1,919 TJ to the other sector, respectively. Individual commodities in original units are attached in Annex 1 of this report.

*Table 7-3 Energy Balance 2020 in Terajoules*

<b>Maldives Energy Balance 2020 (in Tera Joules)</b>							
	<b>Renewable</b>	<b>Electricity</b>	<b>LP gas</b>	<b>Petrol</b>	<b>Jet A1</b>	<b>Diesel</b>	<b>Total</b>
<b>Supply</b>							
Primary Energy	104						104
Imports			619	2,627	3,261	21,812	28,318
Direct Exports							
Foreign Aviation					(2,454)	(206)	(2,660)
Statistical difference							
<b>Total Energy Supply</b>	<b>104</b>		<b>619</b>	<b>2,627</b>	<b>806</b>	<b>21,606</b>	<b>25,762</b>
<b>Energy Conversion</b>							
Thermal Power Plants		4,437				(13,064)	
Solar PV	(37)	37					
Own Use							
Conversion Losses							
Losses in Transmission and Distribution		(331)					(331)
Consumption for Non Energy Use							
<b>Total Energy Conversion</b>	<b>(37)</b>	<b>4,144</b>				<b>(13,064)</b>	
<b>Energy Use</b>							
<b>Industry</b>		182					182
Desalination		182					
<b>Transport</b>				2,627	806	7,245	10,678
Road Transport				1,635		274	1,909
Domestic navigation				992		6,971	7,963
Domestic Aviation					806		806
<b>Other</b>		3,962	619			1,300	5,881
Household, Commercial, Agriculture and Other		3,962	619			1,300	
<b>Total Energy Use</b>		<b>4,144</b>	<b>619</b>	<b>2,627</b>	<b>806</b>	<b>8,545</b>	<b>16,740</b>



All quantities are in terajoules (TJ)

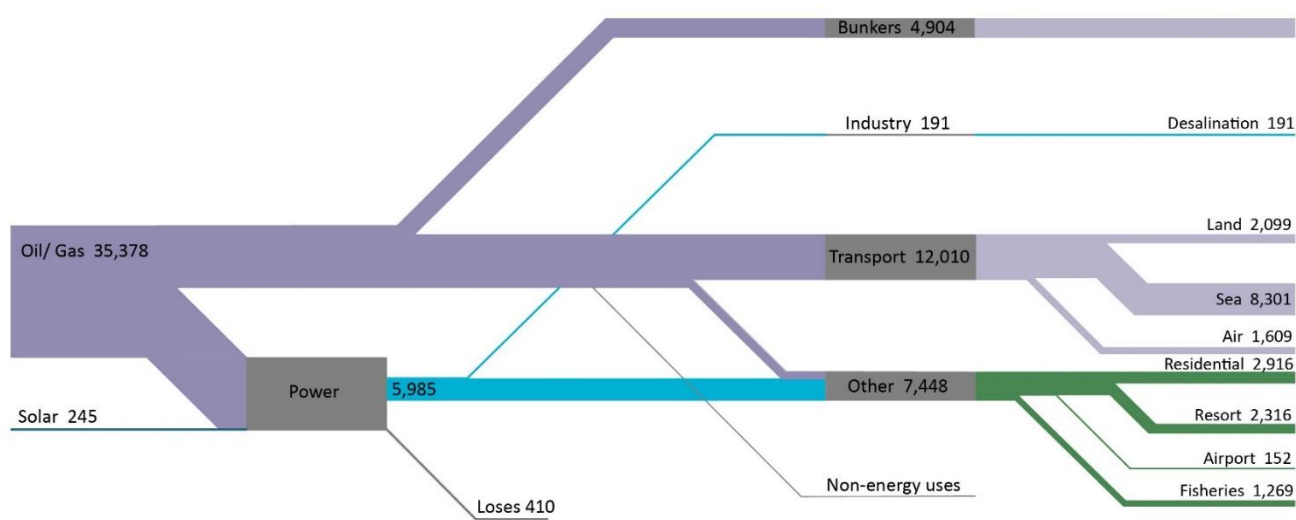
*Figure 7-3: Energy Balance 2020*

## 7.4. Energy Balance 2021

The energy balance of 2021 is presented in Table 7-4 in Tera Joules. The total demand in 2021 was 19,648 TJ. The transport sector contributed to this demand by 12,010 TJ, industries by 191 TJ, while the 'other' sector contributed by 7,448 TJ. The transport sector was entirely sourced by petroleum, while the industries sector was sourced by electricity. Electricity and petroleum contributed by 5,384 TJ and 2,064 TJ to the other sector, respectively. Individual commodities in original units are attached in Annex 1 of this report.

*Table 7-4 Energy Balance 2021 in Terajoules*

<b>Maldives Energy Balance 2021 (in Tera Joules)</b>							
	<b>Renewable</b>	<b>Electricity</b>	<b>LP gas</b>	<b>Petrol</b>	<b>Jet A1</b>	<b>Diesel</b>	<b>Total</b>
<b>Supply</b>							
Primary Energy	684						684
Imports			795	3,250	6,153	25,180	35,378
Direct Exports							
Foreign Aviation					(4,544)	(360)	(4,904)
Statistical difference							
<b>Total Energy Supply</b>	<b>684</b>		<b>795</b>	<b>3,250</b>	<b>1,609</b>	<b>24,820</b>	<b>31,158</b>
<b>Energy Conversion</b>							
Thermal Power Plants		5,740				(16,406)	
Solar PV	(245)	245					
Own Use							
Conversion Losses							
Losses in Transmission and Distribution		(410)					(410)
Consumption for Non Energy Use							
<b>Total Energy Conversion</b>	<b>(245)</b>	<b>5,575</b>				<b>(16,406)</b>	
<b>Energy Use</b>							
<b>Industry</b>		191					191
Desalination		191					
<b>Transport</b>				3,250	1,609	7,150	12,010
Road Transport				1,782		317	2,099
Domestic navigation				1,468		6,833	8,301
Domestic Aviation					1,609		1,609
<b>Other</b>		5,384	795			1,269	7,448
Household, Commercial, Agriculture and Other		5,384	795			1,269	
<b>Total Energy Use</b>		<b>5,575</b>	<b>795</b>	<b>3,250</b>	<b>1,609</b>	<b>8,419</b>	<b>19,648</b>



All quantities are in terajoules (TJ)

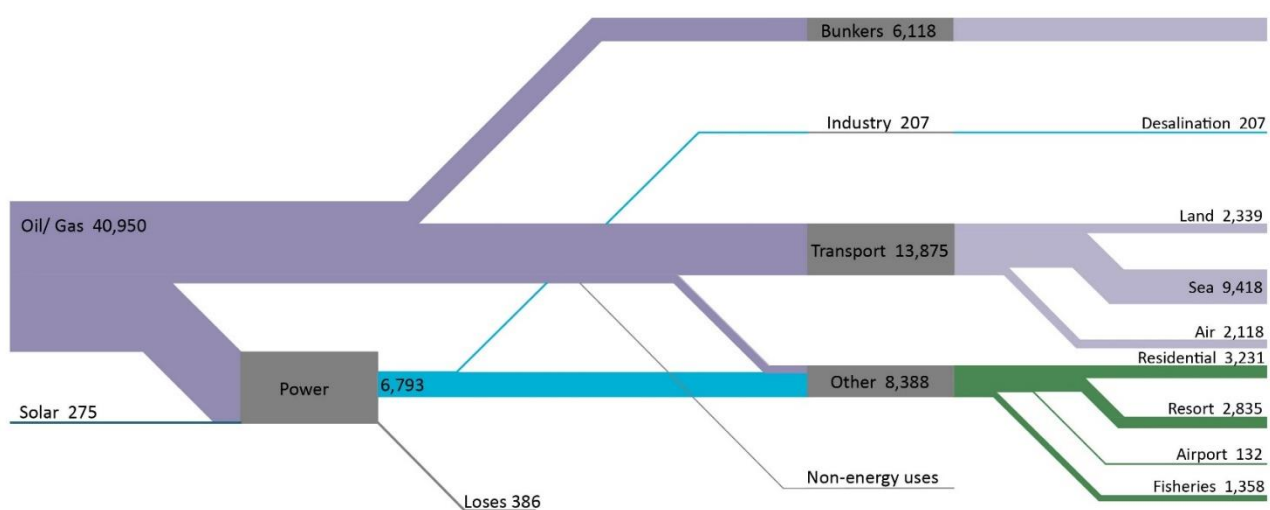
*Figure 7-4: Energy Balance 2021*

## 7.5. Energy Balance 2022

The energy balance of 2022 is presented in Table 7-5 in Tera Joules. The total demand in 2022 was 22,470 TJ. The transport sector contributed to this demand by 13,875 TJ, industries by 207 TJ, while the 'other' sector contributed by 8,388 TJ. The transport sector was entirely sourced by petroleum, while the industries sector was sourced by electricity. Electricity and petroleum contributed by 6,199 TJ and 2,189 TJ to the other sector, respectively. Individual commodities in original units are attached in Annex 1 of this report.

*Table 7-5 Energy Balance 2022 in Terajoules*

<b>Maldives Energy Balance 2022 (in Tera Joules)</b>							
	<b>Renewable</b>	<b>Electricity</b>	<b>LP gas</b>	<b>Petrol</b>	<b>Jet A1</b>	<b>Diesel</b>	<b>Total</b>
<b>Supply</b>							
Primary Energy	767						767
Imports			831	3,971	7,935	28,214	40,950
Direct Exports							
Foreign Aviation					(5,817)	(302)	(6,118)
Statistical difference							
<b>Total Energy Supply</b>	<b>767</b>		<b>831</b>	<b>3,971</b>	<b>2,118</b>	<b>27,912</b>	<b>35,599</b>
<b>Energy Conversion</b>							
Thermal Power Plants		6,518				(18,773)	
Solar PV	(275)	275					
Own Use							
Conversion Losses							
Losses in Transmission and Distribution		(386)					(386)
Consumption for Non Energy Use							
<b>Total Energy Conversion</b>	<b>(275)</b>	<b>6,406</b>				<b>(18,773)</b>	
<b>Energy Use</b>							
<b>Industry</b>		207					207
Desalination		207					
<b>Transport</b>				3,971	2,118	7,786	13,875
Road Transport				1,956		383	2,339
Domestic navigation				2,015		7,403	9,418
Domestic Aviation					2,118		2,118
<b>Other</b>		6,199	831			1,358	8,388
Household, Commercial, Agriculture and Other		6,199	831			1,358	
<b>Total Energy Use</b>		<b>6,406</b>	<b>831</b>	<b>3,971</b>	<b>2,118</b>	<b>9,144</b>	<b>22,470</b>



All quantities are in terajoules (TJ)

*Figure 7-5: Energy Balance 2022*



## 8. Energy and Socio Economics

The Maldives faces several socio-economic challenges in its energy sector, particularly as it attempts to transition from a fossil fuel-dependent economy to one that embraces renewable energy. These challenges are interwound with its geography, heavy reliance on tourism, limited financial resources, and policy constraints.

### 8.1. Energy Indicators

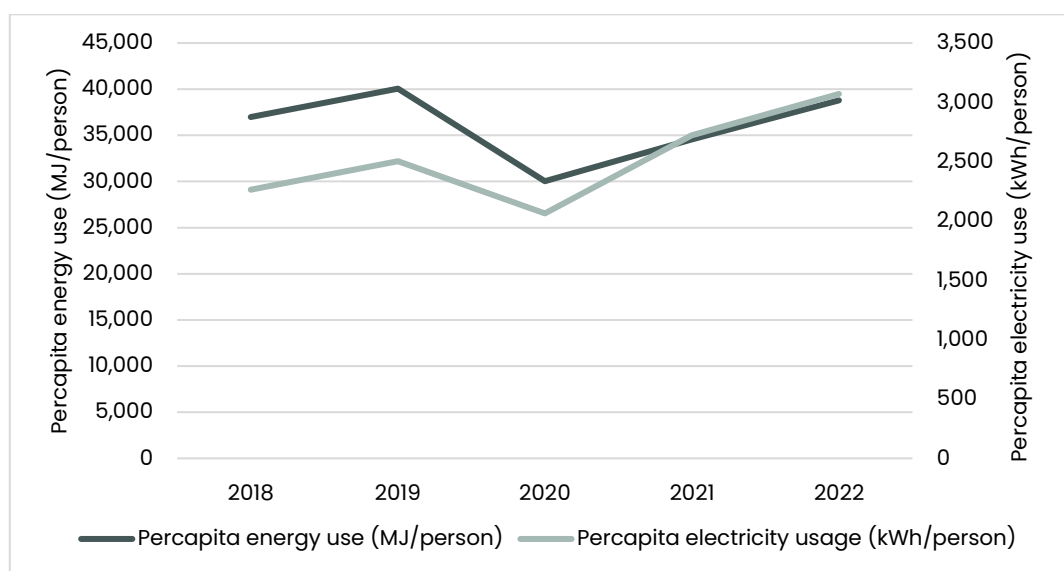
During the period from 2018 to 2022, the per capita energy use of the Maldives ranged between 30,000 – 40,000 MJ per person, while the per capita electricity use ranged between 2,200 and 3,000 kWh per person (Table 8-1).

*Table 8-1 Energy Indicators for the Maldives*

Energy Indicators	2018	2019	2020	2021	2022
Mid-year population*	512,038	533,941	557,426	568,362	579,330
Total energy use (TJ)	18,931	21,390	16,740	19,648	22,470
Per capita energy use (MJ/person)	36,971	40,061	30,032	34,570	38,786
Total electricity use (GWh)	1,160	1,338	1,151	1,548	1,779
Per capita electricity use (kWh/person)	2,265	2,505	2,065	2,724	3,071

\*Note: Projected mid-year population of the Maldives published by the Maldives Bureau of Statistics.

The per capita energy use declined in 2020 but started increasing in the subsequent years. Before the COVID – 19 pandemic, the per capita energy use of the Maldives was on an increasing trend. As seen in Figure 8-1, despite increasing its per capita energy consumption in 2021 and 2022, the economy has not yet recovered in full from the setback that ensured from the pandemic in 2020.



*Figure 8-1 Per Capita Energy and Electricity Consumption*

A similar pattern in electricity consumption is visible, with a dip in 2020 and a gradual increase in the subsequent years. However, interestingly, post-pandemic per capita electricity consumption has surpassed the levels that prevailed prior to the pandemic.

## 8.2. Energy Intensity of the Economy

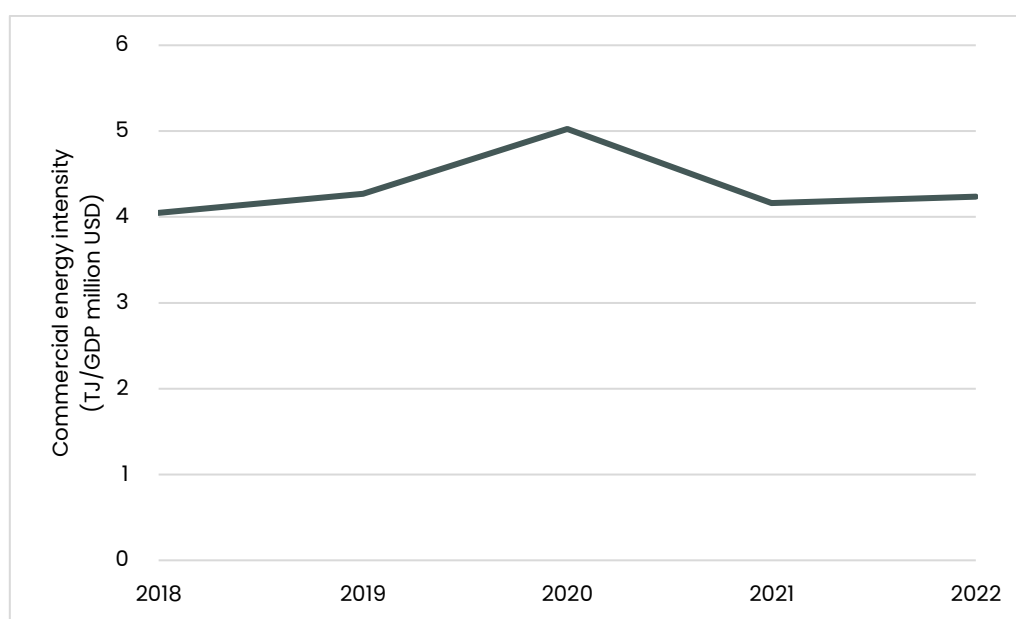
The energy portfolio of the Maldives is dominated by petroleum, while a marginal share is sourced from renewable energy. Therefore, the energy intensity of the Maldives, as tabulated in Table 8-2, and illustrated in Figure 8-2, increased marginally in 2020 and resumed to former proportions in subsequent years.

*Table 8-2 Energy Intensity*

Energy Intensity	2018	2019	2020	2021	2022
Electricity (TJ)	4,176	4,816	4,144	5,575	6,406
Petroleum (TJ)	14,754	16,574	12,597	14,074	16,064
<b>Total energy use (TJ)</b>	<b>18,931</b>	<b>21,390</b>	<b>16,740</b>	<b>19,648</b>	<b>22,470</b>
Real GDP (million USD)*	4,677	5,009	3,331	4,722	5,303
<b>Energy intensity (TJ/GDP million USD)</b>	<b>4.0</b>	<b>4.3</b>	<b>5.0</b>	<b>4.2</b>	<b>4.2</b>

\*Note: 2014 is taken as the GDP base year.

The increase in 2020 could be attributed to low economic output and travel restrictions imposed during the COVID – 19 pandemic period.



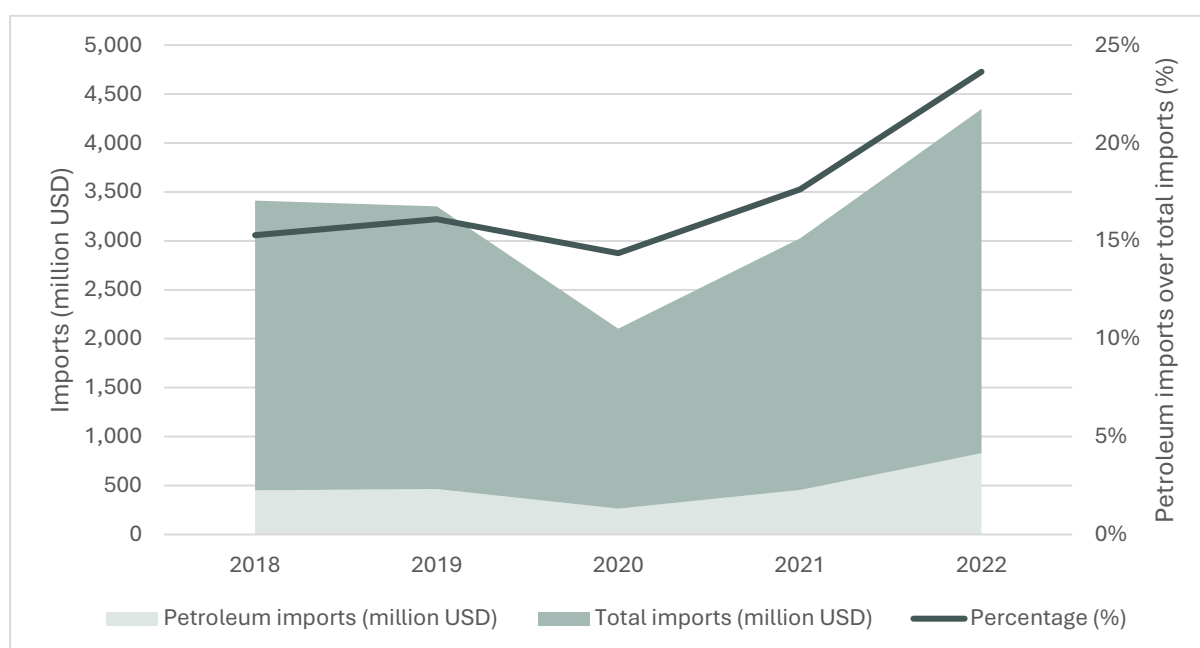
*Figure 8-2 Commercial Energy Intensity*

Impact of petroleum products on the trade balance is tabulated in Table 8-3 and graphically presented in Figure 8-3. The highest percentage of petroleum imports to total imports was recorded in 2022, where almost a quarter of the import cost was for the importation of petroleum products.

*Table 8-3 Impact of Petroleum Product Imports on Trade Balance*

	2018	2019	2020	2021	2022
Total imports (million USD)	2,960	2,888	1,838	2,573	3,516
Petroleum imports (million USD)	452	465	264	454	831
Percentage (%)	15%	16%	14%	18%	24%

According to Figure 8-3, the percentage of petroleum imports against total imports generally ranged between 15% – 24%. However, in 2020, import of petroleum products were limited, owing to the travel restriction and limited economic activity linked with the COVID – 19 pandemic and this decline is clearly visible in Figure 8-3.



*Figure 8-3 Impact of Petroleum Product Imports on Trade Balance*

### 8.3. Energy Security and Socio – Economic Stability

The Maldives' reliance on imported fossil fuels to meet its energy demand poses risks not only for energy security but also for economic stability of the country. According to Asian Development Bank, post COVID, fuel imports accounted to about 10% of the overall GDP of the country <sup>40</sup>. The vulnerability to global fuel supply and price fluctuations affects the cost of electricity, which, in turn, impacts the broader economy of the country. This dependence on fossil fuels also contributes to inflation and increased energy costs, particularly in remote islands where transporting fuel is quite expensive.

High energy costs in the Maldives have also impacted small and medium enterprises (SMEs), which form the backbone of the country's economy. Businesses in the tourism, fisheries, and agriculture sectors face operational challenges due to expensive and unreliable electricity. The high cost of

<sup>40</sup> A Brighter Future for Maldives Powered by Renewables: Road Map for the Energy Sector 2020–2030, Asian Development Bank, 2020.

diesel-based electricity reduces profit margins and limits the ability of businesses to grow and invest in new opportunities.

For the critical tourism industry, which accounts for nearly 28% of the Maldives' GDP<sup>41</sup>, energy efficiency and renewable energy solutions are key to profitability. By investing in renewable energy, the Maldives is not only addressing climate concerns but also improving its energy security while saving costs. While renewable energy solutions lead to a high capital cost, they offer savings over time compared to fossil fuels since they do not require a constant fuel supply to run the diesel generators. These savings can be used to diversify the domestic economy into other sectors. Many resorts and hotels are increasingly adopting solar PV technology to reduce their operational costs, promote environmental sustainability, and enhance their market appeal to eco-conscious travellers.

To implement the Nationally Determined Contributions (NDC's) similar to other Small Island Developing State (SIDS) countries, the Maldives must adopt specific targets and implement strong and conducive policies to incorporate a substantial amount of renewable energy into the electricity supply mix. Although the current efforts and applications are focused on residential electricity supply, energy applications can be introduced to other sectors such as agriculture, fisheries and maritime transport<sup>42</sup>.

#### **8.4. Social Equity and Energy Affordability**

The Maldives achieved universal access to electricity to all inhabited, commercial and resort islands in 2008<sup>43</sup>. However, the high cost of electricity due to the reliance on imported fuel has been a significant issue for households. The cost of electricity is amongst the highest in South Asia<sup>44</sup> despite the heavily subsidised rate at which the government provides fuel to the two electricity utility companies. This energy burden affects household spending patterns, reducing disposable income for other necessities such as education and healthcare.

In the Greater Malé Region, where infrastructure is more developed and incomes tend to be higher, men and women both face the pressure of high electricity bills, but with different coping mechanisms. Men, who are more likely to be employed in formal sectors, often absorb the energy costs through relatively stable incomes. Women in urban centres, although more economically active than women in outer islands, may still experience challenges managing households or running small businesses from home. However, the availability of energy-efficient appliances, public services, and better access to alternatives helps ease the overall burden in urban settings.

In contrast, in rural and outer islands, the gender disparities are sharper, and the impacts are more severe. Limited employment opportunities make households often rely on irregular incomes, and women who are typically home based feel the brunt of energy rationing more directly. High electricity costs in these areas force many women to restrict appliance use, increasing their domestic workload and reducing comfort and convenience. Women's economic activities, such as home-based food preparation or crafts, become less viable due to high operational costs, while poor access to digital

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<sup>41</sup> Maldives: Economy, globalEDGE Michigan State University, 2024.

<sup>42</sup> Small Island States at a Crossroads: The Socioeconomics of Transitioning to Renewables, Aarti Reddy and others, 2024.

<sup>43</sup> Maldives Energy Policy and Strategy- Ministry of Environment and Energy, Republic of Maldives, 2023.

<sup>44</sup> 'Preparing Outer Island Sustainable Electricity Development Project (POISED).

tools limits their educational and income-generating opportunities. Men in these regions may also face constraints, particularly in energy-reliant jobs like boat operation or refrigeration for fisheries—but are more likely to migrate or shift to urban centres for work, leaving women to shoulder household energy management alone.

The geographical dispersion of the islands also creates disparities in energy access and affordability between the capital and outer islands. While the capital Greater Male' Region benefits from a more stable power supply system and better grid infrastructure, smaller Atolls rely on decentralised, diesel-powered mini grids which are both inefficient and expensive which can constitute to a major portion of household budgets, further increasing the socio-economic inequality with respect to access to and productive use of electricity.

Renewable energy solutions, particularly decentralised solar PV systems, offer a path to energy equity by providing cost-effective and reliable energy to remote communities. Solar projects not only reduce the cost of electricity but also help bridge the urban-rural divide, improving the overall quality of life for island communities. The Preparing Outer Island Sustainable Electricity Development Project (POISED) backed largely by the Climate Investment Fund (CIF) and Asian Development Bank (ADB) is the first new major investment in the energy infrastructure to bring solar PV-battery-diesel hybrid systems to key outer island locations of Maldives and improve the efficiency of power generation <sup>45</sup>.

## **8.5. Climate Change Resilience and Economic Impacts**

The Maldives is one of the world's most vulnerable countries to climate change, particularly rising sea levels, which pose a direct threat to the nation's mere existence. The socio-economic implications of environmental degradation are severe, potentially leading to climate migration and displacement, loss of livelihoods (particularly in tourism and fishing), and damage to infrastructure.

Maldives government's Energy Policy and Strategy 2024-2029<sup>46</sup> consists of five main policies to reduce the dependence on imported fuel and to increase its energy supply using renewable resources. By focusing on renewable energy, the Maldives is not only working towards reducing its carbon footprint but also building resilience against climate-induced disasters. Cleaner energy solutions, combined with climate adaptation projects, offer a way to safeguard the country's socio-economic future. Job Creation and Economic Diversification

With the global increase in power generation, the energy sector workforce has also increased significantly. According to IRENA's annual review of Renewable Energy and Jobs 2024, there is an annual global increase in renewable energy jobs from 13.7 million in 2022 to 16.2 million in 2023<sup>47</sup>. The highest percentage of workforce in renewable energy jobs is observed in the solar PV industry representing 44% of the world's total. With the increasing demand for electricity and the policies that the Maldivian government are looking to implement to achieve their climate pledges and targets, the renewable energy sector presents significant opportunities for job creation and economic diversification in the Maldives.

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<sup>45</sup> Maldives: POISED on the Road to Renewables, Climate Investment Funds, 2020.

<sup>46</sup> Energy Policy and Strategy Ministry of Climate Change, Environment and Energy Republic of Maldives, 2024.

<sup>47</sup> Renewable Energy and Jobs: Annual Review, International Renewable Energy Agency, 2024.

As the government increases investments in solar and energy efficiency projects, there is a growing need for skilled labour in renewable energy development, installation, and maintenance. This transition creates job opportunities not only in urban centres, but also in more remote Atolls where solar projects are being deployed for both technical and non-technical personnel.

## 8.6. Energy Sector Workforce

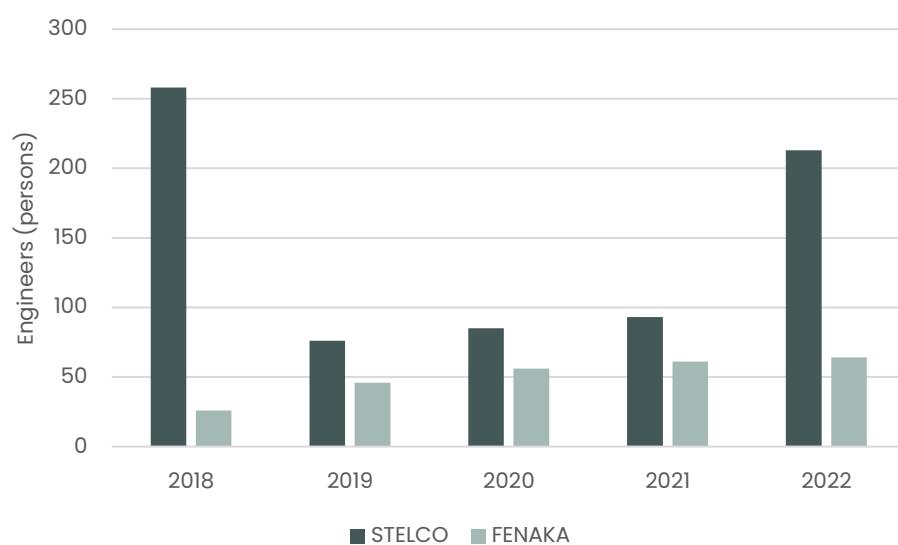
As shown in Table 8-4 and Table 8-5, engineers and technical staff at STELCO and FENAKA from 2018 to 2022 have been at a stable employment status and in certain categories, experiencing a persistent growth. While the number of technical staff has steadily increased at FENAKA, situation at STELCO had been somewhat different. Though not presented here, female employment in these grades has been very low in both organisations. The gender disparity in technical roles within the energy sector is largely driven by deep-rooted social and cultural barriers. Traditional gender norms in the Maldives often discourage women from pursuing careers in science, technology, engineering, and mathematics (STEM), viewing these fields as male dominated. Limited access to vocational training, mentorship, and role models for young women further restricts their entry into technical professions. Additionally, societal expectations around caregiving and household responsibilities can limit women's availability for full-time or shift-based work common in the energy sector, reinforcing occupational segregation and perpetuating gender inequality.

*Table 8-4 Engineers Employed at STELCO and FENAKA*

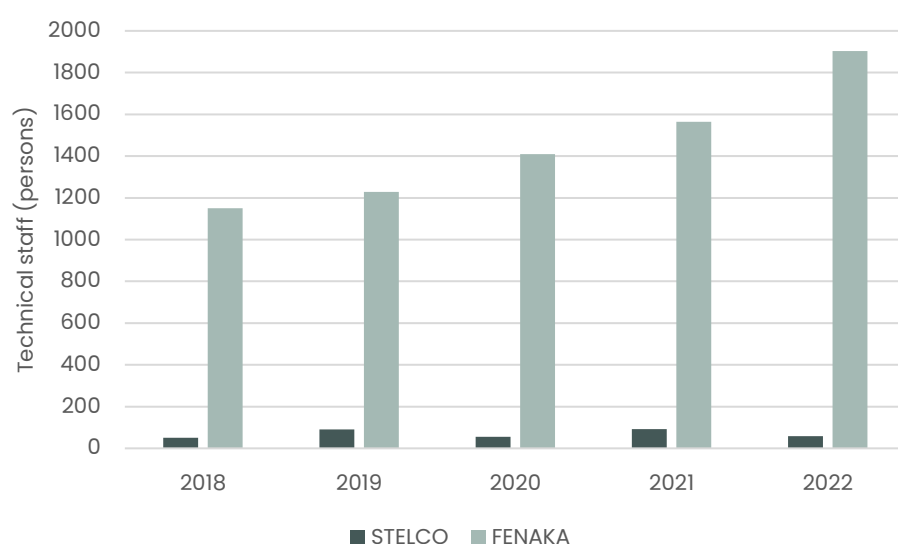
	2018	2019	2020	2021	2022
<b>STELCO</b>	258	76	85	93	213
<b>FENAKA</b>	26	46	56	61	64

*Table 8-5 Technical Staff Employed at STELCO and FENAKA*

	2018	2019	2020	2021	2022
<b>STELCO</b>	50	90	55	92	59
<b>FENAKA</b>	1,151	1,228	1,410	1,564	1,904



*Figure 8-4 Engineers Employed at STELCO and FENAKA*



*Figure 8-5 Technical Staff Employed at STELCO and FENAKA*

*Table 8-6 Management Staff Employed at STELCO and FENAKA*

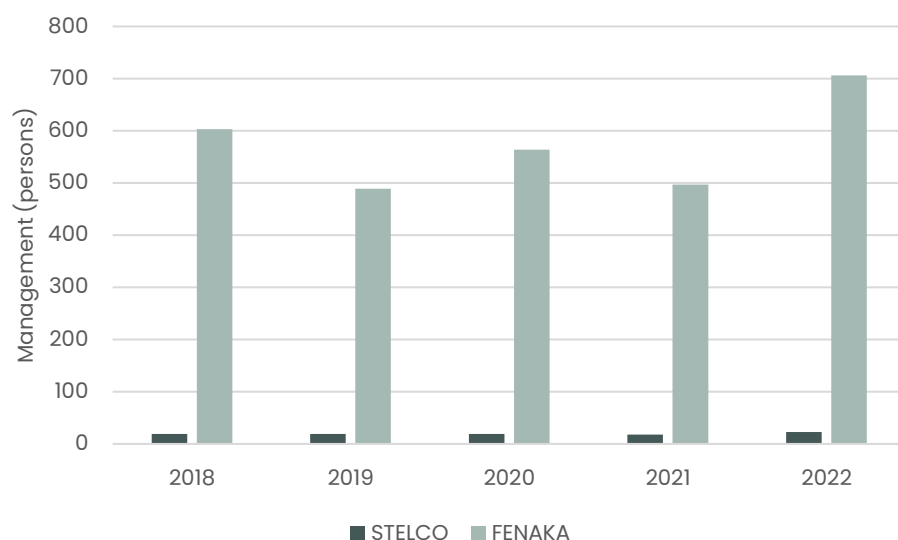
	2018	2019	2020	2021	2022
<b>STELCO</b>	19	19	19	18	23
<b>FENAKA</b>	603	489	564	497	706

*Table 8-7 Administrative Staff Employed at STELCO and FENAKA*

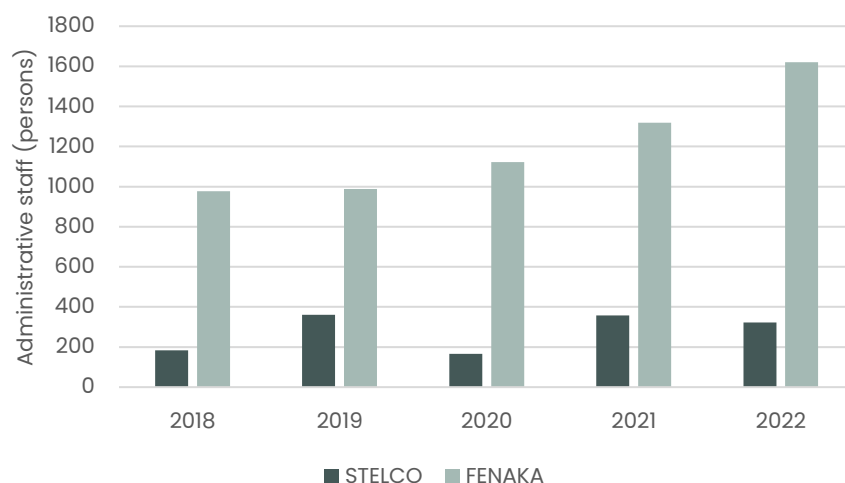
	2018	2019	2020	2021	2022
<b>STELCO</b>	183	360	166	357	322
<b>FENAKA</b>	977	989	1,122	1,319	1,620

As shown in Table 8-6 and Table 8-7, employment across non-technical roles from 2018 to 2022 has seen some growth.

Although the gender disaggregated employment data was available to a certain extent, such data was not verified independently. However, this information indicated that the employment of women in the energy sector remained quite low across most employment categories. The limited female presence in leadership roles reflects broader issues such as unequal access to professional development, and a lack of supportive policies for women's career growth. These disparities underscore the importance of implementing gender-responsive human resource strategies including mentorship, leadership training, and inclusive career progression pathways to ensure equitable representation at all levels within the energy sector.



**Figure 8-6 Management Staff Employed at STELCO and FENAKA**



**Figure 8-7 Administrative Staff Employed at STELCO and FENAKA**

This analysis highlights a clear expansion of the workforce across many categories, with steady increases in employment opportunities in the energy industry. However, compared to FENAKA's



disaggregated and categorized reporting of staff across various roles and levels including detailed year on year trends, STELCO's data is more limited in scope and consistency. Several roles (such as commercial and corporate services) lack gender-disaggregated data in certain years or are not reported at all, making it more difficult to conduct a comprehensive analysis of employment patterns and progress toward gender equity.

With planned investments to upscale renewable energy projects in the outer islands through donor funded projects, further renewable energy related employment opportunities are expected in the Maldives. Training programs aimed at developing the technical skills needed for solar installations and grid management are critical to ensuring that these job opportunities benefit local populations. International development agencies and the Maldivian government have worked to promote vocational training programs that can enhance employment prospects, particularly for youth and women in the workforce.

## 8.7. Challenges for a Just Transition

Countries such as Maldives with their economies dependent upon fossil fuels face significant challenges in phasing out fossil fuel driven energy supply to clean energy technologies in favour of clean energy technologies. A just energy transition, that does not leave anyone behind must actively address structural inequalities that social groups face including gender-based disparities which disproportionately affect women. Proactively anticipating the following challenges within a just framework is key to facilitate institutional and structural changes to overcome potential transition barriers. Failure to timely restructure its economy will increase the vulnerability of its society <sup>48</sup>

### 8.7.1. Lack of Technical Expertise and Workforce Development

The Maldives lacks the local technical expertise and skilled workforce required to support the renewable energy transition.

**Dependence on Foreign Experts.** Due to a shortage of qualified local professionals, the Maldives often relies on foreign technical expertise to design, install, and maintain renewable energy systems. This reliance increases both capital and operational costs and slows down the deployment of new technologies. It is crucial to address the skills shortages within the energy sector amongst the locals to ensure that both the current workers and the youth entering into the labour market within the energy sector possess the necessary skills.

**Education and Training Gaps.** There are limited vocational training programmes in renewable energy technology within the country. This skills gap makes it difficult to develop a local workforce capable of supporting the country's long-term energy goals that facilitate a just energy transition.

### 8.7.2. Policy and Regulatory Challenges

Although the Maldivian government has committed to expanding renewable energy, several challenges exist in the policy and regulatory framework.

**Slow Policy Implementation:** The Maldives has set ambitious targets for renewable energy, such as achieving carbon neutrality by 2030, and, making 33% of the energy produced by the country to come

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<sup>48</sup> Measuring the Socio-Economics of Transition: Focus on Jobs, Rabia Ferroukhi, Xavier Garcia and Bishal Parajuli, 2020.

from renewables by 2028. However, policy implementation has been slow, and there are delays in establishing regulatory frameworks that incentivise large-scale renewable energy investments.

**Fragmented Policies.** In some cases, energy policies are not well-coordinated across different government agencies and levels of governance, leading to inefficiencies in execution and progress. Without streamlined processes, it becomes difficult to attract private investment and ensure project success.

### 8.7.3. Limited Energy Awareness

Public awareness about the long-term economic and environmental benefits of renewable energy is limited.

**Need for Public Engagement:** Increasing public awareness and education on the benefits of renewable energy is crucial to garnering support for the government's renewable energy policies and ensuring their successful implementation.

### 8.7.4. Gender Dimensions and Workforce Inequality

One of the key challenges to a just energy transition in the Maldives is the limited participation of women in energy policy, planning, decision-making and implementation. The constitution of the Maldives prohibits discrimination between men and women in employment. The Gender Equality Act (2016) ensures equal protection and benefits for both men and women. The Decentralisation Act (2019) makes provisions to increase female participation in local governance requiring 33% of council seats to be reserved for women. The enrolment of women in Science, Technology, Engineering and Mathematics (STEM) related academic courses is generally low, although the Maldives has near-equal literacy rates for both boys and girls, and women outnumber men in tertiary education. Despite national commitments to gender equality and the inclusion of Gender Equality and Social Inclusion (GESI) principles in the Maldives Energy Road Map women remain significantly underrepresented in the leadership structures of key institutions such as FENAKA and STELCO. Data shows that women hold fewer than 15% of middle and senior management roles at FENAKA, and only 2 to 5 women occupied management positions at STELCO between 2018 and 2022 <sup>49</sup>. Moreover, technical leadership roles where strategic decisions about renewable energy systems and infrastructure are made remain overwhelmingly male-dominated.

A just energy transition must be inclusive, not only for who receives clean energy, but also in who shapes the transition itself. The absence of women in policymaking restricts the potential for transformative change and undermines the principles of equity and social justice that underpin the concept of a just transition. Without women in decision making roles, energy systems are less likely to address some specific challenges faced by women in outer islands, home based workers, and female headed households who are often disproportionately affected by high energy costs, unreliable access, and limited economic opportunities.

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<sup>49</sup> Paving the Way for a Just Energy Transition in Maldives Road Map for the Energy Sector 2024–2033, Ministry of Climate Change, Environment and Energy Republic of Maldives, 2023.

**Promote Women’s Participation in the Energy Workforce.** Set gender equity targets for hiring in technical roles across public utilities and renewable energy projects and develop scholarships, apprenticeships, and vocational training programs targeting girls and young women, particularly from rural and outer islands along with establishing mentorship and leadership development programs for women in mid-career stages.

**Mainstream GESI in Energy Policy and Project Design.** Ensure all future energy projects, including rooftop solar and hybrid mini-grids, include dedicated components for women’s training, employment, or enterprise development by Involving Women’s Development Committees (WDCs) and community women in the planning and implementation of island-level energy solutions.

## 9. Emission Factors

The emission of carbon dioxide (CO<sub>2</sub>) from all end use sectors for Maldives, was calculated following the methodologies detailed in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories<sup>50</sup>. This Guideline provides details on choosing an approach to calculate the emissions, depending on the level of data available. Activity data and emission factors for the inventory have been subdivided into Tiers as set out in Volume 1 General Guidance. The Tier 1 sections set out the steps needed for the simplest calculation methods, or the methods that require the least data.

The Tier 1 approach was adopted for the calculations of emissions of CO<sub>2</sub> for all activities considered in this report, owing to the paucity of detailed data. The calculation used to calculate CO<sub>2</sub> emissions is given below.

$$\text{Emissions (CO}_2\text{)} = \text{Fuel consumption} \times \text{Emission factor}$$

The below sections summarise the emission calculations for each energy sector activity considered in this report.

### 9.1. Total Emissions

The total CO<sub>2</sub> emission of Maldives for the period from 2018 – 2022 is tabulated in Table 9-1. The highest contribution each year is attributed to transport, followed by the household, commercial and other sector. The least contribution is from the industry sector.

*Table 9-1 Emissions by Sector*

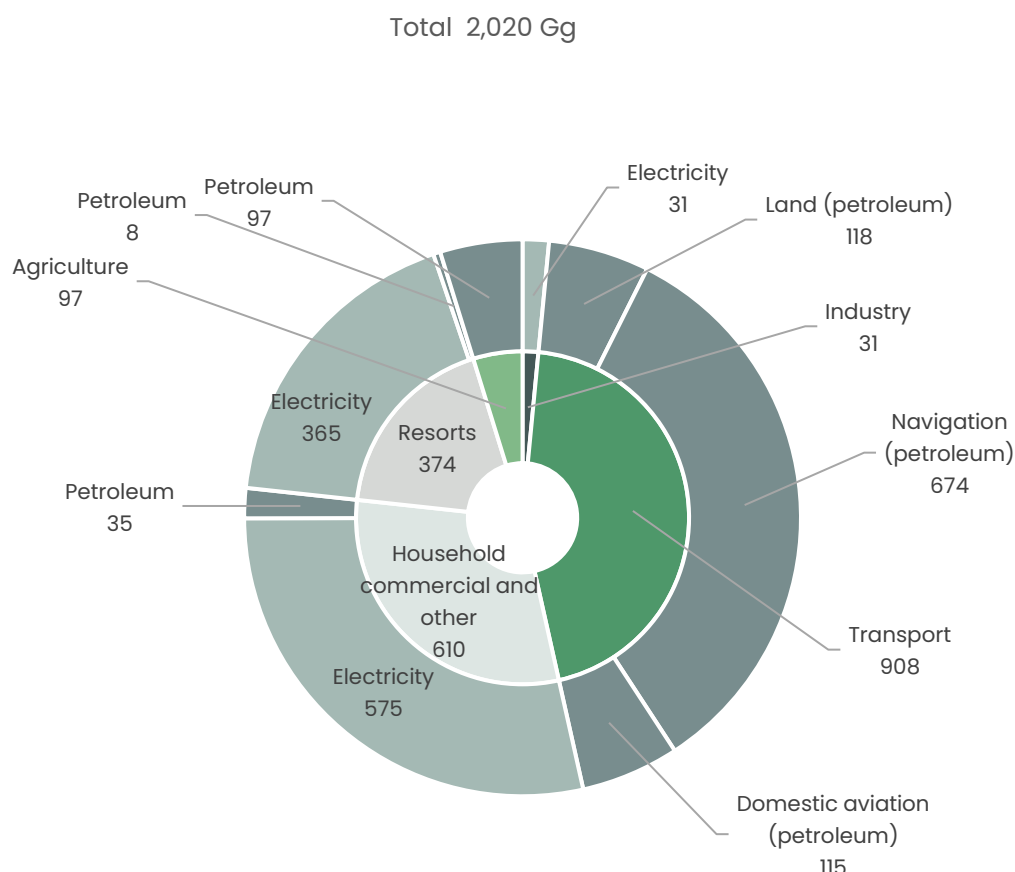
	2018	2019	2020	2021	2022
Agriculture	97	86	95	93	99
Industry	31	36	36	37	41
Transport	908	1,040	764	855	986
Resorts	374	429	257	455	575
Household, Commercial and Other	610	681	700	755	807
<b>Total</b>	<b>2,020</b>	<b>2,272</b>	<b>1,852</b>	<b>2,196</b>	<b>2,508</b>

All emission values are given in Gg of CO<sub>2</sub>-eq

Power generation in Maldives is dominated by diesel generation. The contribution by the single renewable resource, solar is marginal at present. However, with an accelerated programme, the ability of renewable energy contribution to the reduction of CO<sub>2</sub> emissions cannot be downplayed.

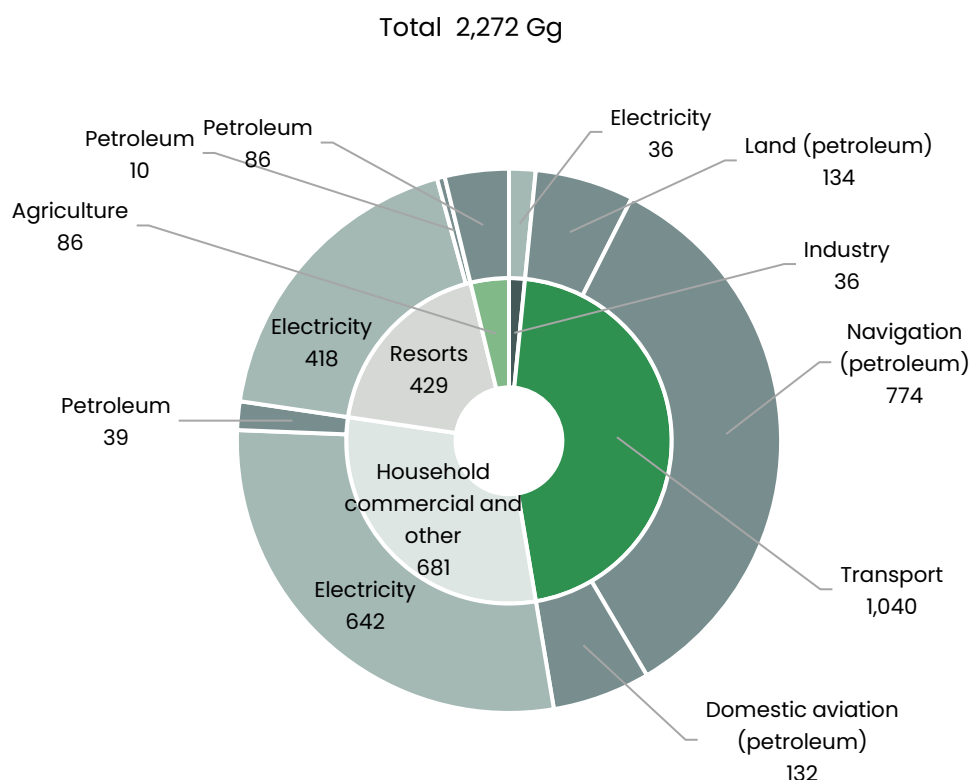
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<sup>50</sup> 2006 IPCC Guidelines for National Greenhouse Gas Inventories



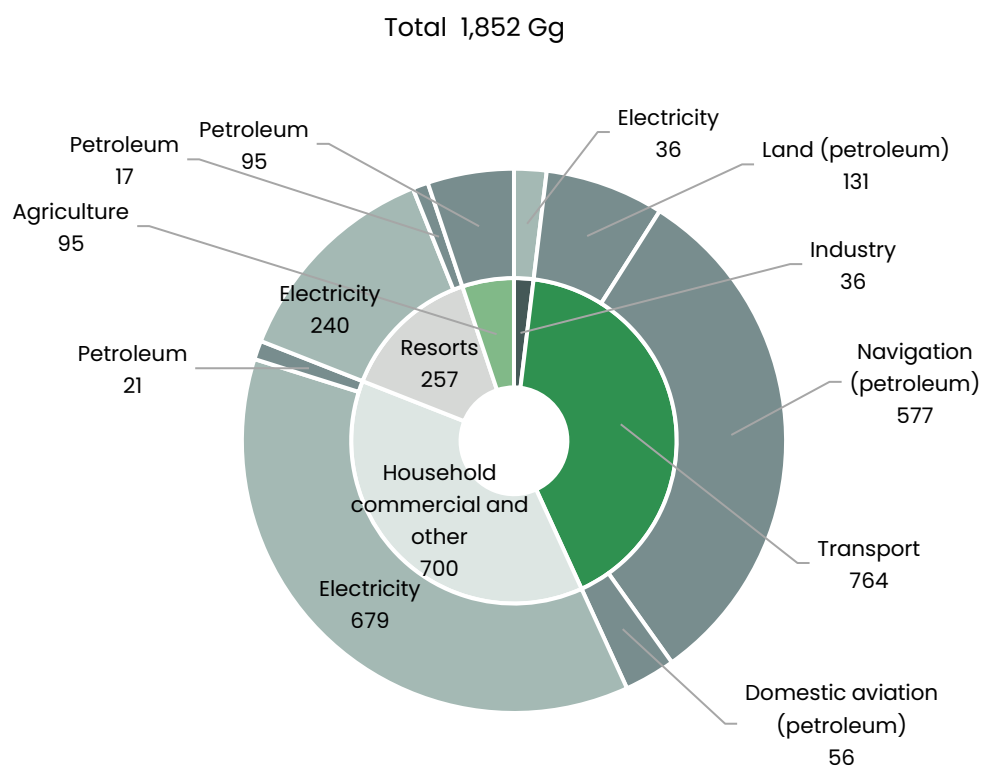
**Figure 9-1 CO<sub>2</sub> Emissions in 2018**

Figure 9-1 illustrates the CO<sub>2</sub> emissions budget of 2018. The total quantity of CO<sub>2</sub> emitted in 2018 was 2,020 Gg, while the household, commercial and other sector contributed by 610 Gg, transport sector contributed by 908 Gg, resorts contributed by 374 Gg, agriculture contributed by 97 Gg and industries contributed by 31 Gg. The emissions of petroleum usage in land transport, water-borne navigation and domestic aviation contributed 118 Gg, 674 Gg and 115 Gg, respectively. Emissions from electricity and petroleum in the household commercial and other sector were 575 Gg and 35 Gg, respectively. Emissions from electricity and petroleum in resorts were 365 Gg and 8 Gg, respectively. All emissions in the agriculture sector (fishing industry) (97 Gg) are attributed to petroleum usage, while all emissions in the industrial sector (31 Gg) are attributed to electricity usage.



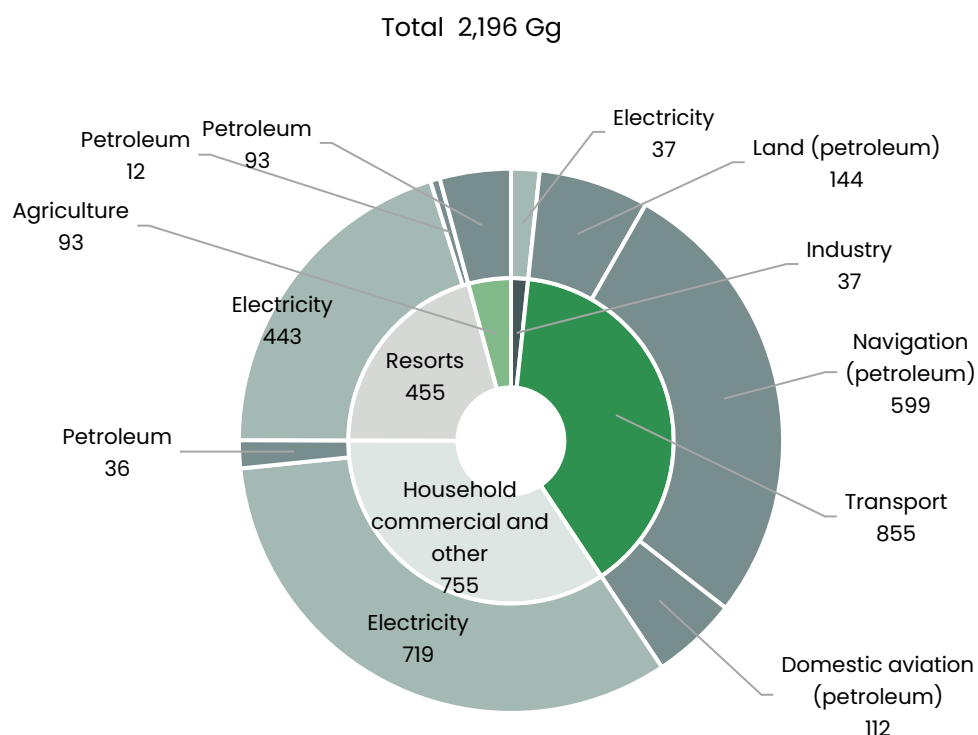
*Figure 9-2 CO<sub>2</sub> Emissions in 2019*

Figure 9-2 illustrates the CO<sub>2</sub> emissions budget of 2019. The total quantity of CO<sub>2</sub> emitted in 2019 was 2,272 Gg, while the household, commercial and other sector contributed by 681 Gg, transport sector contributed by 1,040 Gg, resorts contributed by 429 Gg, agriculture contributed by 86 Gg and industries contributed by 36 Gg. The emissions of petroleum usage in land transport, water-borne navigation and domestic aviation contributed 134 Gg, 774 Gg and 132 Gg, respectively. Emissions from electricity and petroleum in the household commercial and other sector were 642 Gg and 39 Gg, respectively. Emissions from electricity and petroleum in resorts were 418 Gg and 10 Gg, respectively. All emissions in the agriculture sector (fishing industry) (86 Gg) are attributed to petroleum usage, while all emissions in the industrial sector (36 Gg) are attributed to electricity usage.



*Figure 9-3 CO<sub>2</sub> Emissions in 2020*

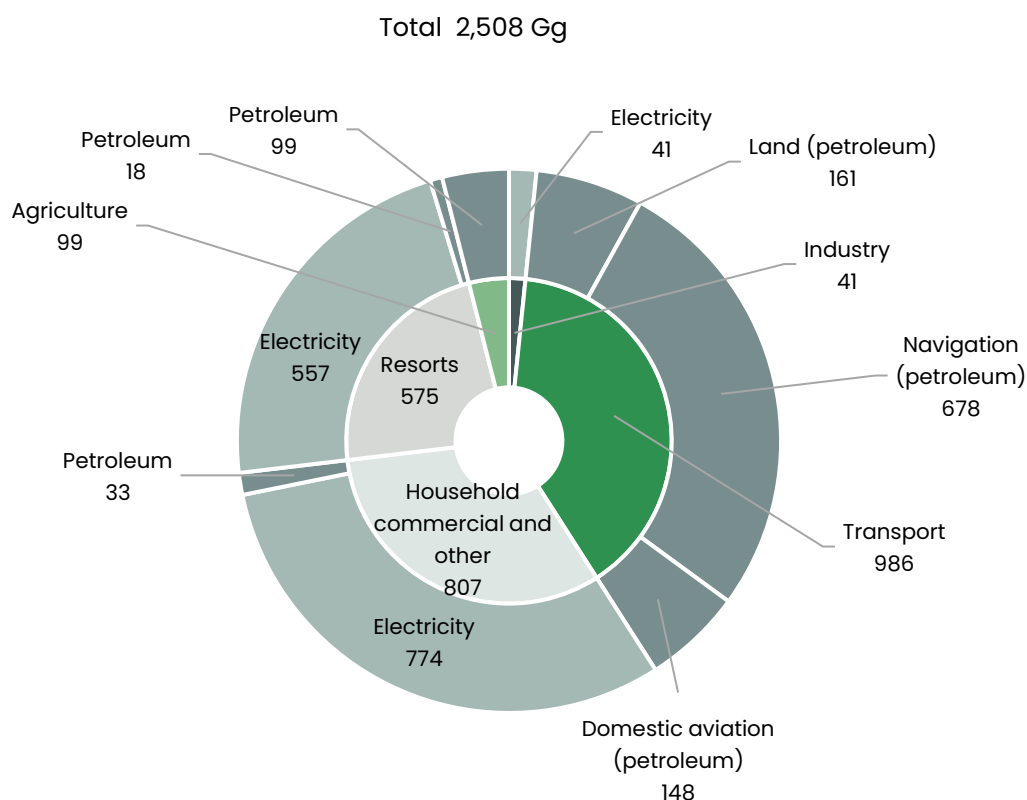
Figure 9-3 illustrates the CO<sub>2</sub> emissions budget of 2020. The total quantity of CO<sub>2</sub> emitted in 2020 was 1,852 Gg, while the household, commercial and other sector contributed by 700 Gg, transport sector contributed by 764 Gg, resorts contributed by 257 Gg, agriculture contributed by 95 Gg and industries contributed by 36 Gg. The emissions of petroleum usage in land transport, water-borne navigation and domestic aviation contributed 131 Gg, 577 Gg and 56 Gg, respectively. Emissions from electricity and petroleum in the household commercial and other sector were 679 Gg and 21 Gg, respectively. Emissions from electricity and petroleum in resorts were 240 Gg and 17 Gg, respectively. All emissions in the agriculture sector (fishing industry) (95 Gg) are attributed to petroleum usage, while all emissions in the industrial sector (36 Gg) are attributed to electricity usage.



**Figure 9-4 CO<sub>2</sub> Emissions in 2021**

Figure 9-4 illustrates the CO<sub>2</sub> emissions budget of 2021. The total quantity of CO<sub>2</sub> emitted in 2021 was 2,196 Gg, while the household, commercial and other sector contributed by 755 Gg, transport sector contributed by 855 Gg, resorts contributed by 455 Gg, agriculture contributed by 93 Gg and industries contributed by 37 Gg. The emissions of petroleum usage in land transport, water-borne navigation and domestic aviation contributed 144 Gg, 599 Gg and 112 Gg, respectively. Emissions from electricity and petroleum in the household commercial and other sector were 719 Gg and 36 Gg, respectively. Emissions from electricity and petroleum in resorts were 443 Gg and 12 Gg, respectively. All emissions in the agriculture sector (fishing industry) (93 Gg) are attributed to petroleum usage, while all emissions in the industrial sector (37 Gg) are attributed to electricity usage.





**Figure 9-5 CO<sub>2</sub> Emissions in 2022**

Figure 9-5 illustrates the CO<sub>2</sub> emissions budget of 2022. The total quantity of CO<sub>2</sub> emitted in 2022 was 2,508 Gg, while the household, commercial and other sector contributed by 807 Gg, transport sector contributed by 986 Gg, resorts contributed by 575 Gg, agriculture contributed by 99 Gg and industries contributed by 41 Gg. The emissions of petroleum use in land transport, water-borne navigation and domestic aviation contributed 161 Gg, 678 Gg and 148 Gg, respectively. Emissions from electricity and petroleum in the household commercial and other sector were 774 Gg and 33 Gg, respectively. Emissions from electricity and petroleum in resorts were 557 Gg and 18 Gg, respectively. All emissions in the agriculture sector (fishing industry) (99 Gg) are attributed to petroleum use, while all emissions in the industrial sector (41 Gg) are attributed to electricity usage.

## 9.2. Emission Factors for Electricity Generation

The average emission factor for electricity generation is tabulated in Table 9-2. The average emission factor for 2022 is 0.73 kg of CO<sub>2</sub>/kWh.

**Table 9-2 Emission Factors**

	2018	2019	2020	2021	2022
Total generation using diesel (GWh)	1,242	1,423	1,243	1,662	1,886
Total emissions (kt)	971	1,097	955	1,199	1,372
Emission factor (kg of CO <sub>2</sub> /kWh)	0.78	0.77	0.77	0.72	0.73

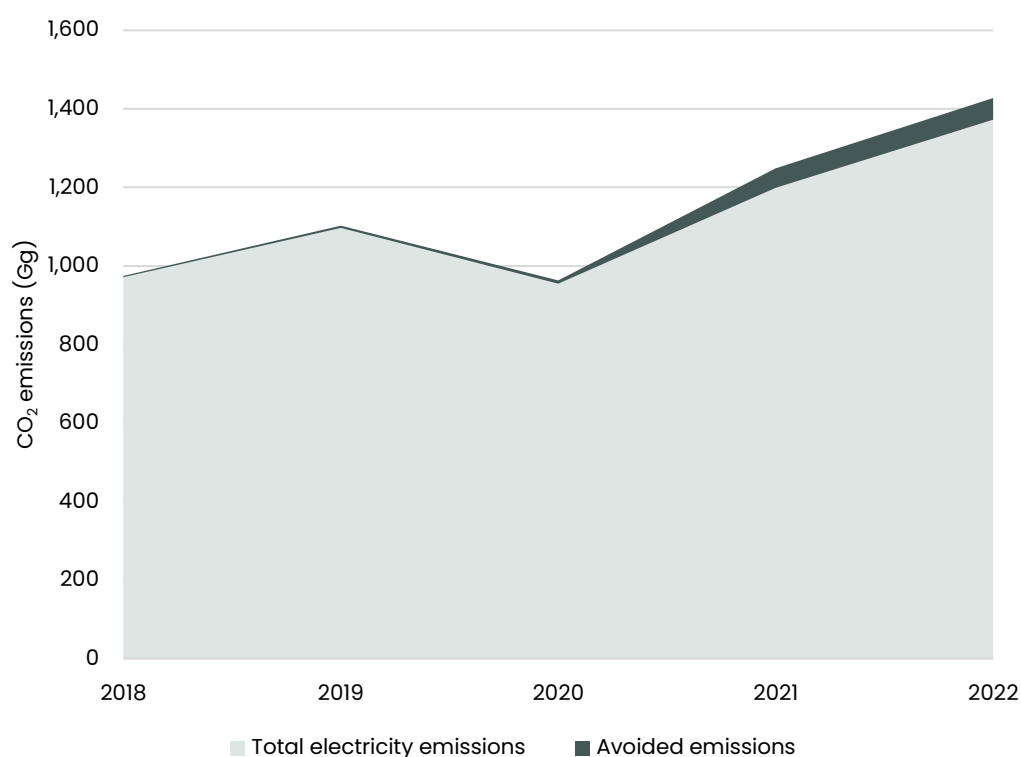
### 9.3. Avoided Emissions

Solar is the single renewable energy resource used for power generation in Maldives. However, since solar is a renewable resource, the generation of solar electricity contributes to the avoidance of fossil fuel-based power generation, hence, averting the emission of a corresponding quantity of CO<sub>2</sub>. The avoided CO<sub>2</sub> emissions are given in Table 9-3 and illustrated in Figure 9-6.

Power generation in Maldives is dominated by diesel generation. The contribution by the single renewable resource, solar, is marginal at present. Therefore, the avoided release of CO<sub>2</sub> is also marginal, as depicted in Figure 9-6. However, with an accelerated programme, the ability of renewable energy to contribute to reduction of CO<sub>2</sub> emission cannot be downplayed.

*Table 9-3 Avoided Emissions by Solar Power*

	2018	2019	2020	2021	2022
Solar power generation (GWh)	4	8	10	68	76
Avoided emissions (Gg of CO <sub>2</sub> -eq)	3	6	8	49	56



*Figure 9-6 Actual and Avoided CO2 Emissions*

Power generation in Maldives is dominated by diesel generation. The contribution by the single renewable resource, solar, is marginal at present. Therefore, the avoided generation of CO<sub>2</sub> is also marginal, as depicted in Figure 9-6. However, with an accelerated programme, the ability of renewable energy to contribute to reduction of CO<sub>2</sub> emissions cannot be downplayed.

## 9.4. Emissions of the Electricity Sector

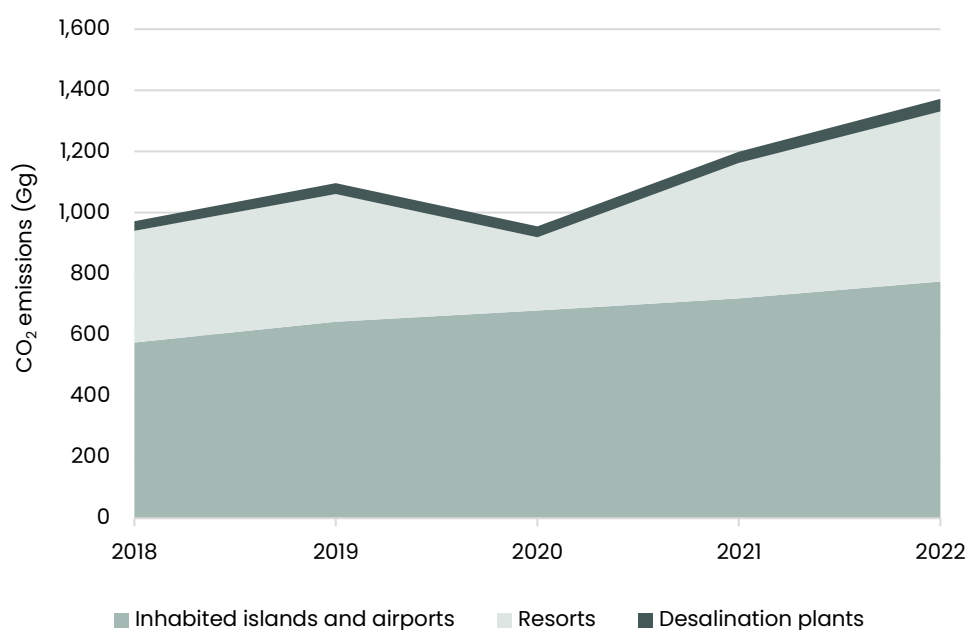
Thermal power plants in Maldives, generate electricity using diesel as the fuel. Electricity emissions have been calculated for inhabited islands, resorts, desalination plants and airport. Emissions were calculated following the methodology in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 2 – Stationary Combustion<sup>51</sup>. Calculated emissions are depicted in Table 9-4 and Table 9-7.

*Table 9-4 Electricity Sector Emissions*

	2018	2019	2020	2021	2022
Inhabited islands and airports	575	642	679	719	774
Resorts	365	418	240	443	557
Desalination plants	31	36	36	37	41
<b>Total</b>	<b>971</b>	<b>1,097</b>	<b>955</b>	<b>1,199</b>	<b>1,372</b>

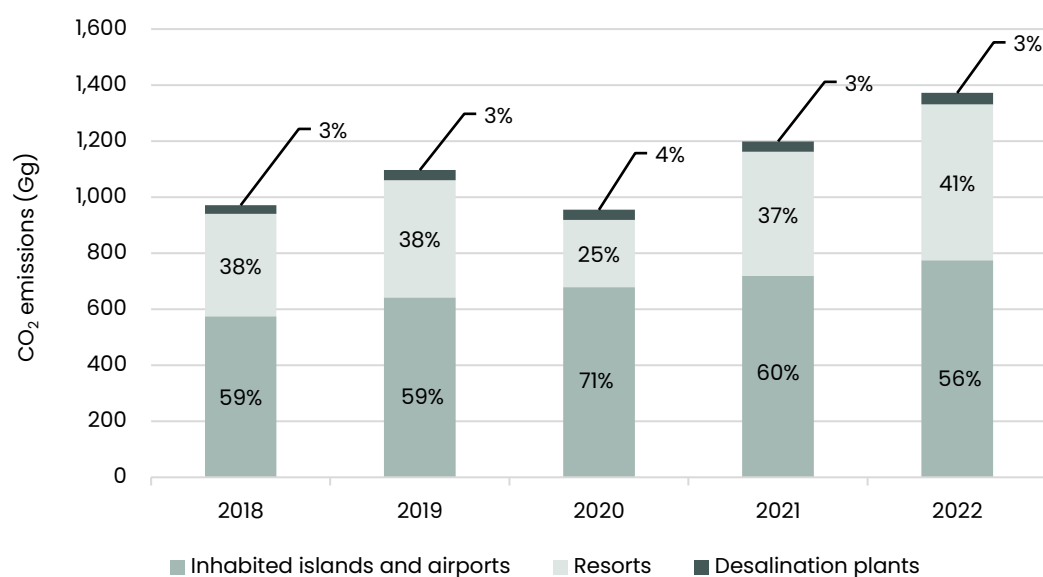
All emission values are given in Gg of CO<sub>2</sub>-eq

Emissions were highest from inhabited islands, across all years, and ranged between 56% – 71%. The second highest contribution by resorts, which ranged from 25% – 41%, as indicated in the emission balance illustrated in Figure 9-7



*Figure 9-7: Electricity Sector Emissions*

<sup>51</sup> Chapter 2, Guidelines for National Greenhouse Gas Inventories, IPCC, 2006



*Figure 9-8 Contribution to Electricity Sector Emissions*

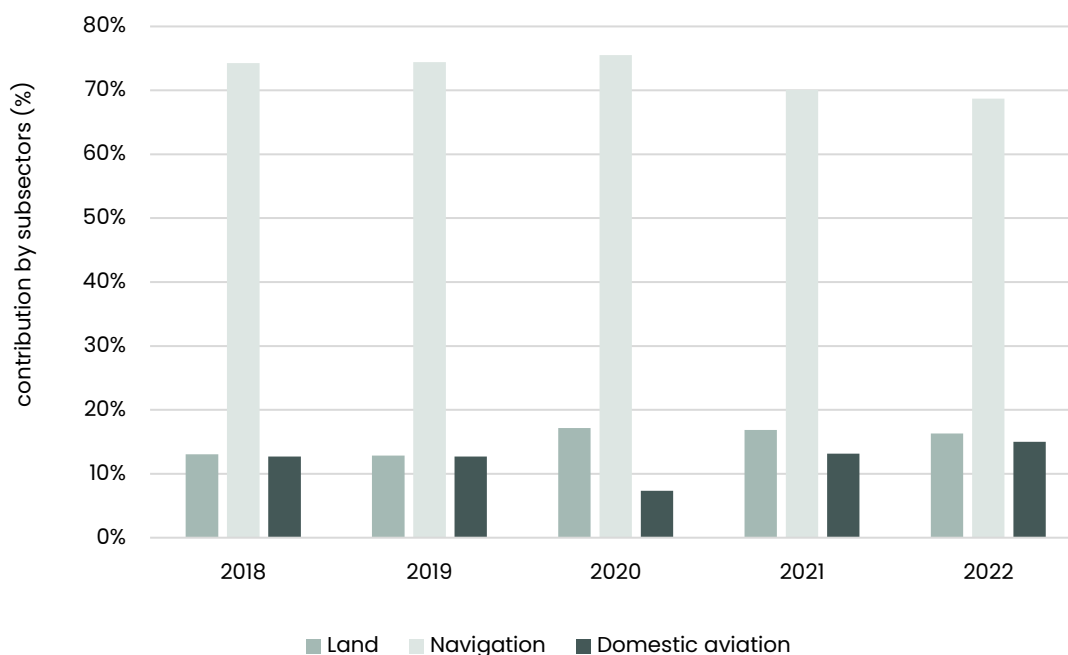
## 9.5. Transport Sector Emissions

The emissions of the transport sector were calculated using the methodology detailed in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 3 – Mobile Combustion<sup>52</sup>. Emissions in the transport sector are attributed to the emissions from land transport, water-borne navigation and domestic aviation (Table 9-5). All sub sectors in transport consume petroleum fuels, either as diesel or petrol.

*Table 9-5 Transport Sector Emissions*

	2018	2019	2020	2021	2022
<b>Emissions</b>					
Land transport (Gg of CO <sub>2</sub> -eq)	118	134	131	144	161
Water-borne navigation (Gg of CO <sub>2</sub> -eq)	674	774	577	599	678
Domestic aviation (Gg of CO <sub>2</sub> -eq)	115	132	56	112	148
<b>Total (Gg of CO<sub>2</sub>-eq)</b>	<b>908</b>	<b>1,040</b>	<b>764</b>	<b>855</b>	<b>986</b>
<b>Share of emissions</b>					
Land (%)	13%	13%	17%	17%	16%
Navigation (%)	74%	74%	76%	70%	69%
Domestic aviation (%)	13%	13%	7%	13%	15%

<sup>52</sup> 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 3 – Mobile Combustion



**Figure 9-9 Contribution to Transport Sector Emissions**

According to Figure 9-9, navigation has recorded the highest emissions of CO<sub>2</sub> in all years (60% - 80%), but 2020. Emissions may have dipped in 2020, perhaps owing to the travel restrictions imposed during the COVID – 19 pandemic. Emissions from land transport and domestic aviation are moderate, as illustrated above.

#### 9.5.1. Land Transport

Both petrol and diesel are consumed in land transport. Both these fuels are fossil fuels; therefore, they emit CO<sub>2</sub>. The emission of petrol is higher than that of diesel, in all years, as indicated in Table 9-6.

**Table 9-6 Land Transport Emissions**

	2018	2019	2020	2021	2022
Diesel vehicles (Gg of CO <sub>2</sub> -eq)	23	27	20	23	28
Petrol vehicles (Gg of CO <sub>2</sub> -eq)	95	107	111	121	133
<b>Total (Gg of CO<sub>2</sub>-eq)</b>	<b>118</b>	<b>134</b>	<b>131</b>	<b>144</b>	<b>161</b>
Diesel vehicles (%)	20%	20%	15%	16%	17%
Petrol vehicles (%)	80%	80%	85%	84%	83%

#### 9.5.2. Domestic Navigation

Both petrol and diesel are consumed in water-borne navigation. The emission from diesel is higher than that of petrol, as indicated in Table 9-7, which also indicates that domestic navigation is dominated by diesel.

*Table 9-7 Water-borne Navigation Emissions*

	2018	2019	2020	2021	2022
Diesel vessels (Gg of CO <sub>2</sub> -eq)	561	624	509	499	541
Petrol vessels (Gg of CO <sub>2</sub> -eq)	114	151	67	100	137
<b>Total (Gg of CO<sub>2</sub>-eq)</b>	<b>674</b>	<b>774</b>	<b>577</b>	<b>599</b>	<b>678</b>
Diesel vessels (%)	83%	81%	88%	83%	80%
Petrol vessels (%)	17%	19%	12%	17%	20%

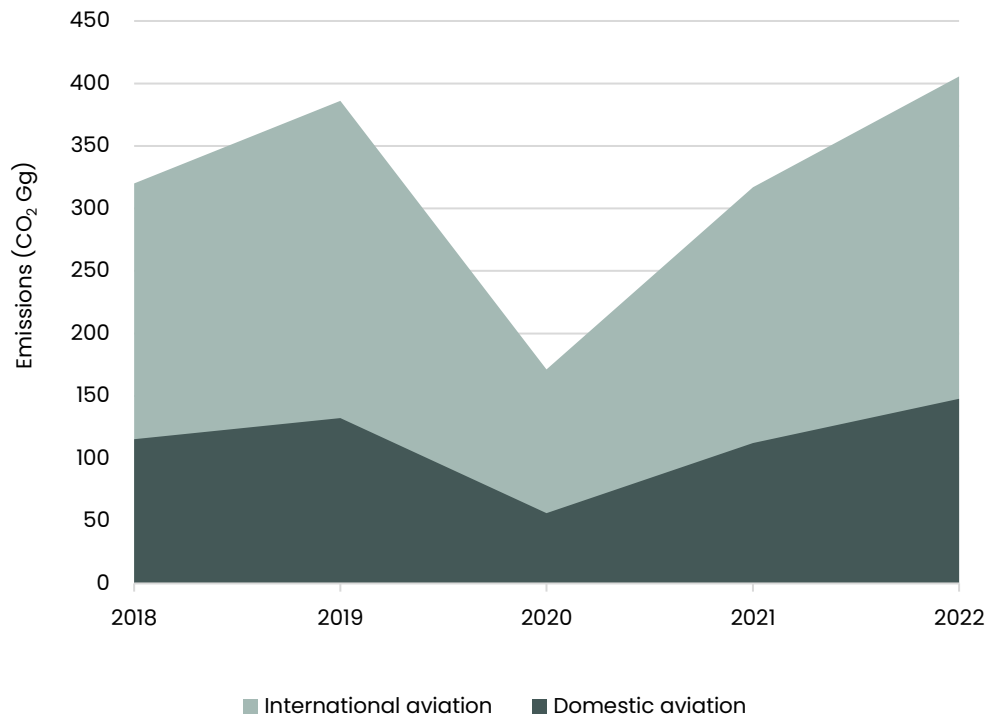
## 9.6. Aviation Sector

The emissions of domestic and international aviation have been tabulated in Table 9-8 and illustrated in Figure 9-11.

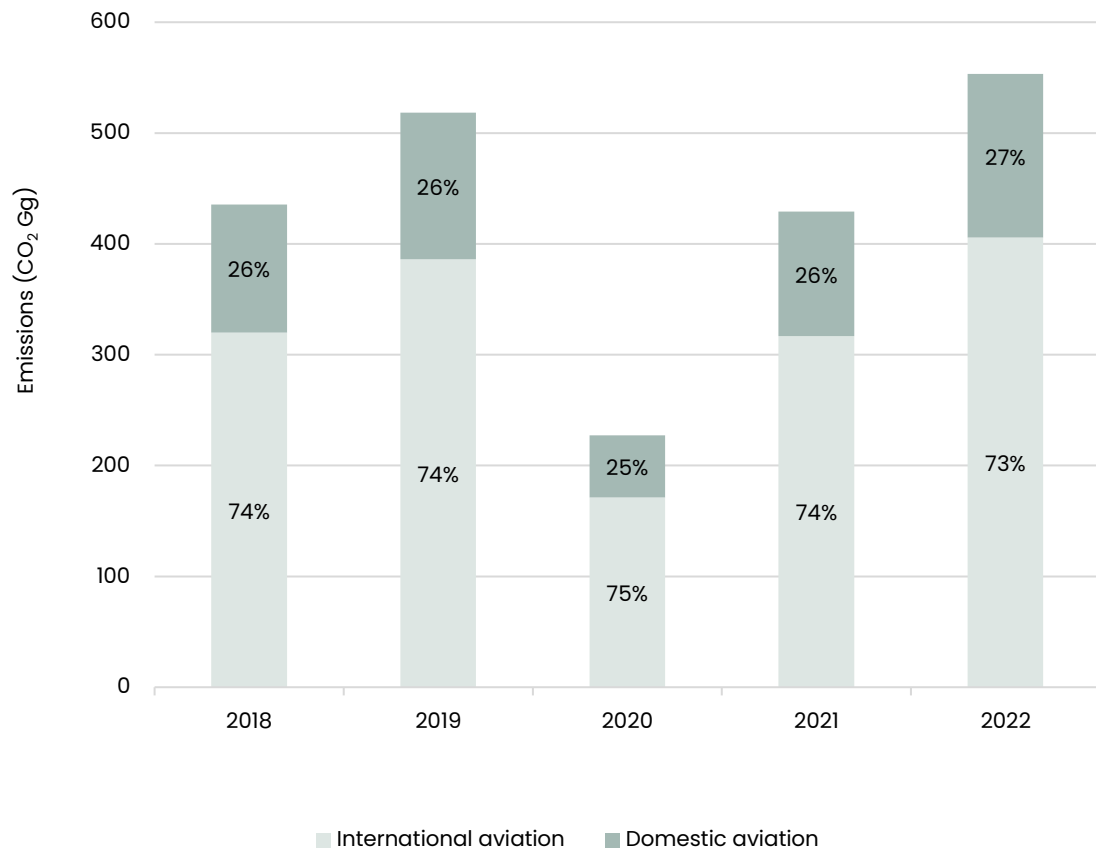
*Table 9-8 Aviation Sector Emissions*

	2018	2019	2020	2021	2022
International aviation (Gg of CO <sub>2</sub> -eq)	320	386	171	317	406
Domestic aviation (Gg of CO <sub>2</sub> -eq)	115	132	56	112	148
<b>Total (Gg of CO<sub>2</sub>-eq)</b>	<b>435</b>	<b>518</b>	<b>227</b>	<b>429</b>	<b>553</b>
International aviation %	74%	74%	75%	74%	73%
Domestic aviation %	26%	26%	25%	26%	27%

Emissions have dipped in 2020, owing to the COVID – 19 pandemic, but have gradually returned to former levels in 2021 and 2022. Approximately 73% of the aviation CO<sub>2</sub> emissions balance can be attributed to international aviation in all years Figure 9-9. As depicted in Table 9-8, the share of emissions in international aviation has ranged between 73% – 75% in all years.



**Figure 9-10 Aviation Sector Emissions**



**Figure 9-11 Contribution to Aviation Sector Emissions**

## 9.7. Industry Sector

CO<sub>2</sub> emissions from the desalination plants are counted as the emissions of the industrial sector. The emissions from desalination plants are owing to the use of electricity. As indicated in Table 9-9, the emissions are generally between 30 – 40 Gg of CO<sub>2</sub>-eq per annum.

*Table 9-9 Industrial Emissions*

	2018	2019	2020	2021	2022
Desalination plants (Gg of CO <sub>2</sub> -eq)	31	36	36	37	41

## 9.8. Agriculture Sector

Fishing is considered as a subsector under agriculture. The emissions from the fishing industry are mainly attributed to the diesel usage in fishing vessels. Emissions from the fishing industry are given in Table 9-10, where it is indicated that emissions generally range between 90 Gg – 100 Gg of CO<sub>2</sub>-eq.

*Table 9-10 Fishing Industry Emissions*

	2018	2019	2020	2021	2022
Diesel vessels (Gg of CO <sub>2</sub> -eq)	97	86	95	93	99

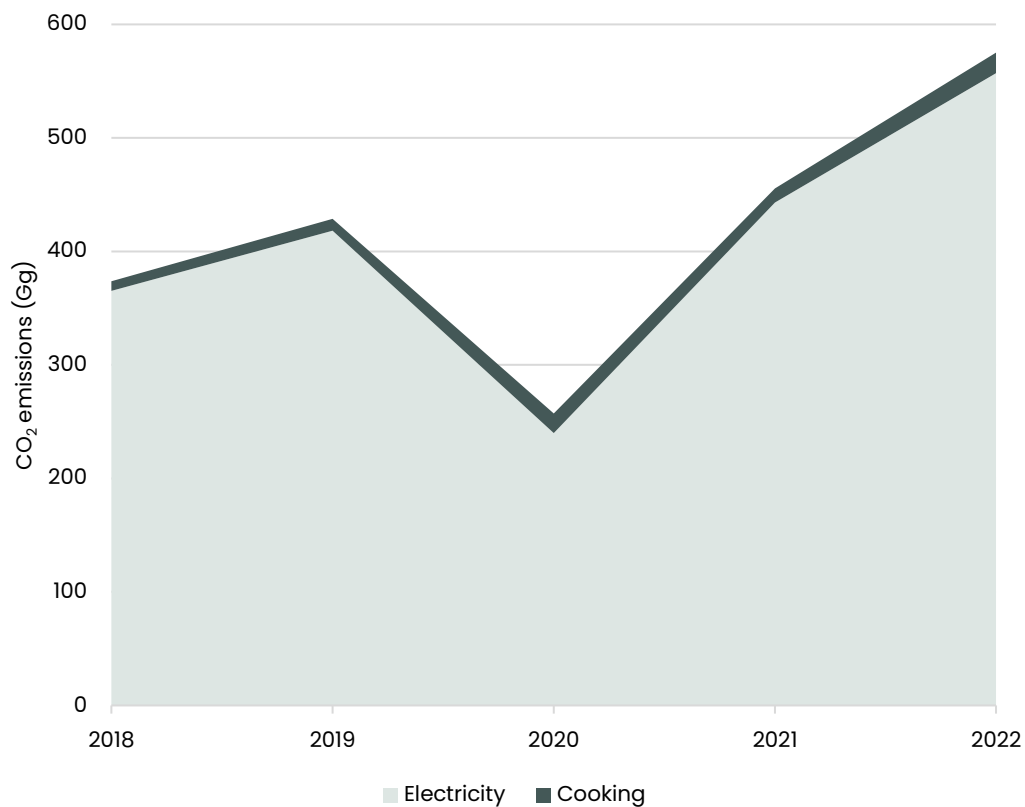
## 9.9. Resorts

CO<sub>2</sub> emissions of resorts are given in Table 9-11. Electricity usage contributes to the majority of emissions. Figure 9-12 illustrates that the emissions of resorts was primarily owing to electricity. The emissions in 2020 however, were less compared to other years, owing to limited operations rendered by the pandemic.

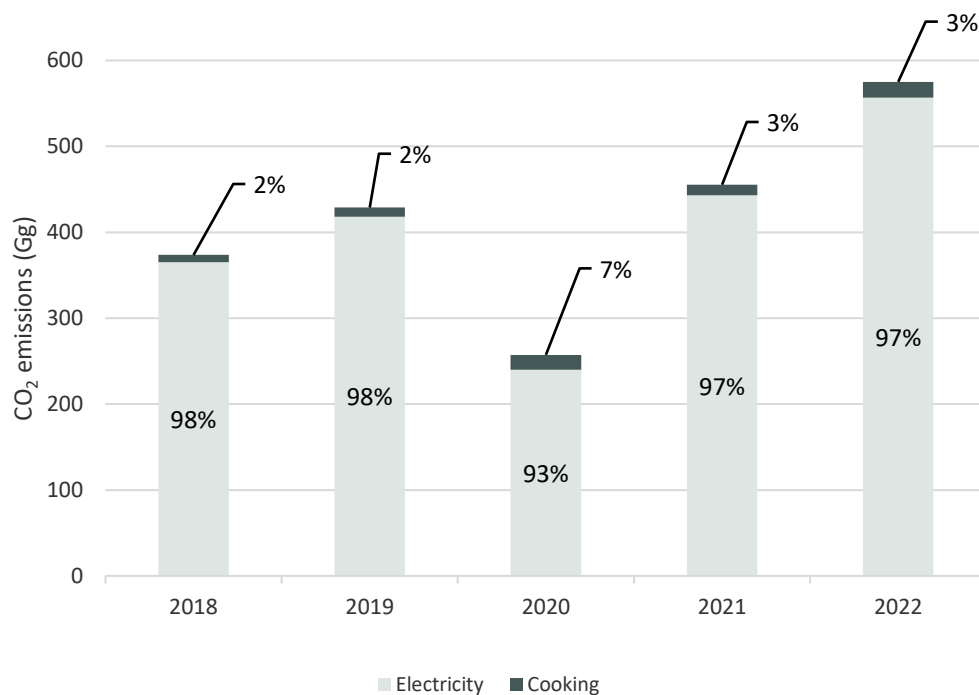
*Table 9-11 Resorts Emissions*

	2018	2019	2020	2021	2022
Electricity (Gg of CO <sub>2</sub> -eq)	365	418	240	443	557
Cooking (Gg of CO <sub>2</sub> -eq)	8	10	17	12	18
<b>Total (Gg of CO<sub>2</sub>-eq)</b>	<b>374</b>	<b>429</b>	<b>257</b>	<b>455</b>	<b>575</b>





**Figure 9-12 Resorts Emissions**



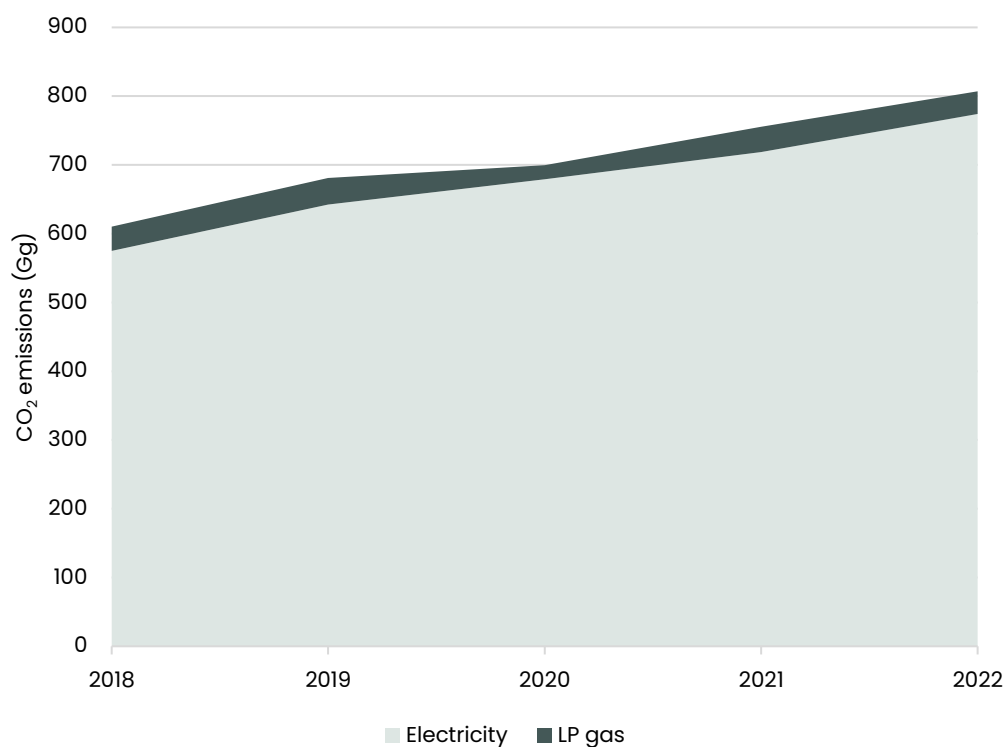
**Figure 9-13 Contribution to Resorts Emissions**

## Residential and other sectors

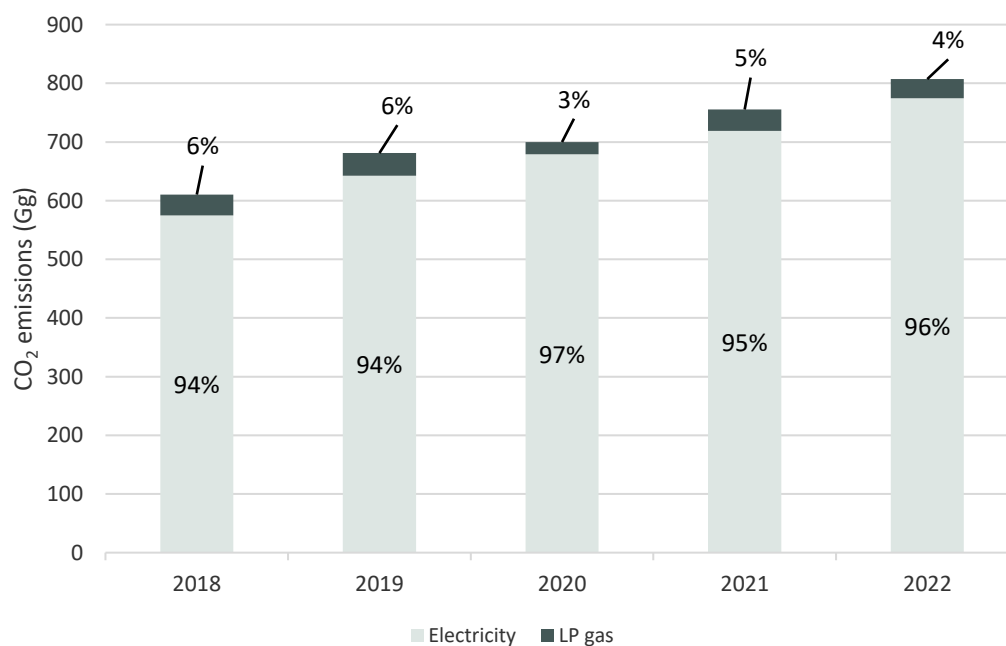
CO<sub>2</sub> emissions of household, commercial and other sectors are shown in Table 9-12. The emissions of the airport are also considered under this sector. The highest contributor to CO<sub>2</sub> emissions in this sector is electricity. The balance is attributed to the use of LP gas, mainly for cooking purposes, as also illustrated in Figure 9-14.

*Table 9-12 Household, Commercial, and Other Sector Emissions*

	2018	2019	2020	2021	2022
Electricity (Gg of CO <sub>2</sub> -eq)	575	642	679	719	774
LP gas (Gg of CO <sub>2</sub> -eq)	35	39	21	36	33
<b>Total (Gg of CO<sub>2</sub>-eq)</b>	<b>610</b>	<b>681</b>	<b>700</b>	<b>755</b>	<b>807</b>



**Figure 9-14 Contribution to Household, Commercial and Other Sector Emissions**



**Figure 9-15 Contribution to Household, Commercial and Other Sector**

Figure 9-15 indicates that, more than 94% of emissions each year in the emissions of the household, commercial and other sector were attributed to the electricity usage, while the balance was attributed to LP usage in cooking.

## 10. Energy Sector Performance and Future Outlook

The energy sector of the Maldives, like most countries in the region faced the eventful 2018–2022 period in a challenging environment. Nonetheless, the country entered a decisive period in the energy transition and is looking forward to accelerating its journey in realising energy sustainability. This chapter will provide a commentary of the ongoing and proposed programmes of the energy sector. It will also include a narrative of the long-term trends impacting the energy sector.

### 10.1. Background

The five-year period under discussion in this publication was governed by the National Energy Policy and Strategy of the Maldives which was published in 2016. The energy sector operations reflect many things on the direction provided by this document. The sector was under a strong institutional framework which managed to deliver many results for the energy sector. This section will describe these elements which formed the background for the energy sector operations of the 2018–2022 period, presented in the previous sections.

### 10.2. Energy Policy

The national energy policy framework which prevailed during the period 2018 – 2022 in the Maldives was the Maldives National Energy Policy and Strategy 2016<sup>53</sup>. The government has emphasised the aspects such provision of access to affordable and reliable electricity services to all citizens, enhancing of energy security, moving towards renewable energy based electricity supply and promotion of energy efficiency and conservation in this document. This policy was founded on seven principles:

- i. Creating an enabling environment for the growth of a reliable and sustainable energy sector and meeting the constitutional obligation of the government in the provision of electricity to every inhabited island at reasonable standards commensurate to the island.
- ii. Reducing over-reliance of the energy sector and the national economy on fossil fuels through the diversification of energy supplies.
- iii. Improving energy efficiency and energy conservation.
- iv. Encouraging the adoption of low-carbon technologies in production, distribution and energy consumption through promotion of a healthy lifestyles.
- v. Exploiting local energy resources and renewable technologies
- vi. Engaging the private sector participation in the development of the energy sector, energy services and quality assurance mechanisms
- vii. Ensuring energy equity through social protection and mechanisms and/or safety nets for vulnerable groups of the population

The Maldives Energy Policy and Strategy 2016 consists of revised policies derived from Maldives Energy Policy and Strategy of 2010. The 2016 policy document set out policy statements, their objectives, and strategies in line with the government Manifesto and Sustainable Development Goals (SDGs), Goal 7. The policy carried five main elements as described below:

- (1) Strengthen the institutional and regulatory framework of the energy sector
- (2) Promote energy conservation and efficiency
- (3) Increase the share of renewable energy in the national energy mix

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<sup>53</sup> Maldives Energy Policy and Strategy 2016

- (4) Improve the reliability and sustainability of electricity service and maintain universal access to electricity
- (5) Increase national energy security

Each of the above policy elements had specific objectives and was instrumental in driving 32 key strategies which aligned with these objectives.

### **10.3. Energy Sector Regulation**

The regulatory framework related to the subject of energy in the Maldives evolved in many aspects during the 2018 – 2022 period. Until 2021, the energy sector regulation was a function of the Maldives Energy Authority (MEA). This was established in 2006 as a delegated authority under the public utilities law 4/96 (Provision of Utility Services Act) and a presidential decree. MEA was vested with the powers to regulate the provision of all electricity services in the Maldives as a public utility service. It operated under the guidance of a governing board as an independent regulatory entity affiliated to the Ministry of Environment and Energy. This functioned as a separate division within the ministry. MEA was entrusted with regulating the energy sector by the implementation of relevant regulations.

In late 2020, the Utility Regulatory Authority Act (Law 26/2020) came into effect, changing the status quo. This replaced the MEA by the Utility Regulatory Authority as an executive body which became independent from the ministry and established as an autonomous entity. It is entrusted with the regulation of the public utility services such as electricity, water, sewerage, and waste management. The Section 4 of the new Act has listed 39 responsibilities of the URA. With the establishment of URA, utility regulation functions that have been carried out by individual agencies were transferred to URA. Accordingly, the URA took over regulating the electricity services that were previously carried out by the MEA.

In October 2021, The Maldives Energy Act (Law No. 18/2021 of 2021) was gazetted. It repealed the Utility Services Act (Law Number 4/96). This Act establishes a legal framework of standards and laws pertaining to the provision (generation and use) of energy in the Maldives and recognises the rights of both consumers and the service providers. It also includes the quality the providers must uphold, and the responsibility of reasonable pricing. The new Act details the duties and responsibilities of the respective institutions and introduced a new licensing regime in the Maldives to regulate the country's energy sector. The Act and Regulations also provide a framework to increase the use of renewable energy and transitioning towards the goal of net zero carbon.

The Maldives Energy Act stipulates requirements to survey the renewable energy resources in the Maldives and publish an inventory of such resources, establish targets for the generation of electricity from renewable energy sources, and make arrangements for service providers to feed renewable energy to the electricity grid. Further it emphasises giving priority to renewable energy resources when multiple resources are available. This Act also spells out mandatory requirements to obtain permits for generating electricity and providing electricity services via a grid and to obtain a license to provide power engineering services. This Act also empowers the URA to determine price ceilings for electricity services whilst issuing licenses for electricity generation after a bidding process (except for state-owned enterprises). The Act mandates the initiation of projects to increase efficiency of energy usage. The URA is given the authority to set the standards for energy or electricity appliances, and prohibiting production and importation of appliances that do not meet them. The URA is mandated

to rank resorts, tourist hotels, buildings and factories in terms of energy economisation and use. It also can issue 'Energy Efficiency Certificates' to those energy users who meet energy usage standards, and direct the users with over a threshold monthly energy usage to undertake energy audits by the energy auditors registered with the URA<sup>54</sup>.

#### **10.4. Energy Sector Institutions**

The energy sector has primarily been driven by the Ministry of Tourism and Environment (previously identified as the Ministry of Climate Change, Environment and Energy), with the power utilities STELCO and FENAKA playing the main role and Malé Water & Sewerage Company Pvt. Ltd. providing some services to the capital city of Male. The energy sector was under the purview of The Ministry of Environment, Climate Change and Technology at the beginning of 2018, and it was made to the Ministry of Climate Change, Environment and Energy in 2021. However, there were no much changes in its structure during the five-year period. The Maldives Energy Authority which was part of the ministry was made independent of the ministry, and moved to a different physical location with the establishment of the Utility Regulatory Authority.

#### **10.5. Ongoing and proposed programmes**

In the Maldives, 750GWh of electricity was generated in 2018, counting all the inhabited islands. Out of this, 440GWh was generated and used in the Greater Male region. An estimated 210 MW of diesel generation capacity was operating in the resort islands. The total renewable energy capacity in operation was estimated to be 36.5 MW in Maldives by the end 2019.

With assistance from the Asian Development Bank (ADB), the Maldives launched the POISED initiative in 2014 with the goal of transition towards to less expensive generation by converting the 160 outer islands' diesel-based energy systems into hybrid systems<sup>55</sup>.

Over the course of the five years 2018–2022, rooftop solar PV installations in the Greater Male Region have expanded, peaking at more than 3,000 kW at the beginning of 2020. Under a twenty-year power purchase agreement, Hulhumale has operated 1.5 MW of rooftop solar PV systems since March 2018 at a fixed cost of USD0.21/kWh. A second project that was put out to bid in 2019 has a capital cost buydown component and a fixed price of USD0.109/kWh for 15 years through a power purchase agreement. The goal of the project is to equip Greater Male with 5 MW of solar PV power. The project implementation began in 2022 and is scheduled to be completed in 2023–2024 period.

The POISED project by ADB has been instrumental in helping the remaining inhabited islands increase their renewable energy penetration from less than 0.1 MW in 2008 to more than 21.5 MW in 2020 over 70 outer islands and eight Atolls. Solar PV systems, battery energy storage systems, sufficient energy management systems, and effective diesel generator sets are examples of hybrid systems. The upgrading of distribution networks to enable high levels of penetration of renewable energy is another focus area of the POISED Project. ADB approved additional funding in 2020 to assist cross-sector pilot projects pertaining to the transportation and fisheries sectors and to expand hybrid systems in an additional 12 outer islands.

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<sup>54</sup> CTL Strategies, 2022

<sup>55</sup> POISED on the Road to Renewables, Climate Investment Funds, 2020

The heavy reliance on fossil fuels across these sectors presents challenges in terms of sustainability, cost, and environmental impact. This has prompted government initiatives and international support for the Maldives' transition towards renewable energy solutions, such as solar and wind, to achieve their ambitious net-zero emissions targets by 2030.

Moreover, the Maldives is working toward introducing renewable energy sources to reduce its dependence on imported fuel and improve energy security. The Maldives Energy Act, gazetted in 2021, outlines the framework for transitioning to net-zero carbon emissions, primarily through expanding solar and wind energy capacity. The act requires the mandatory integration of renewable energy into the national grid and the prioritisation of clean energy projects.

### **10.6. Solar PV Technology**

Maldives, as a country is moving away from fossil fuels which it had heavily dependent for power generation by the utilities as well as by the resort hotels engaged in captive power generation. Both these sectors have introduced solar PV technology as a source of supplementary renewable energy to reduce dependence on imported diesel. These initiatives, made as a response to climate change and towards transitioning to net zero carbon emissions have contributed to derive substantial cost savings as well. The installed capacity of solar power has increased significantly from 2018 to 2022 while the installed solar energy as a share of the total installed capacity and the share of solar electricity generated from the total electricity generated also have increased. The trend will continue well into the future, gaining ground from the historically low solar PV equipment prices in the region.

### **10.7. Battery Energy Storage Systems**

Maldives has adopted energy storage with solar PV technology, absorbing the variability of the renewable energy supply. The energy storage capacity and the power supplied by the technology almost tripled during the five-year period of interest.

The introduction of solar PV technology and battery energy storage systems have changed the structure of the power supply of the Maldives significantly requiring many changes in the energy infrastructure. Several renewable energy service companies and consultants in renewable energy have come to play important roles in private sector investments in the energy projects. Similarly, energy service companies (ESCOs) have come up, delivering energy efficiency services increasing in numbers from 2018 – 2022 in the Maldives. Similar to the solar PV technology price reduction, the installed cost of battery energy storage will continue to reduce in the future, albeit in a slower rate. Nonetheless, the role played by energy storage in the Maldivian energy landscape will be quite visible in the future.

### **10.8. Electric Vehicles**

The vehicle population in the Maldives has grown during 2018 – 2022, also witnessing an influx of a considerable number of electric vehicles in the Maldives. Among them, the growth of electric motor bicycle fleet has become quite visible in the country. The Ministry of Transport and Civil Aviation and STELCO also have contemplated to install charging stations incorporating solar PV generation in different locations in the capital city of Male. Similar to other sustainable energy technologies discussed above, the electric vehicles too will be a mainstream element in the national fleet in the

coming years, if favourable fiscal policies and other such concessions are afforded to the technology until scale benefits bring down the costs to levels in par with internal combustion engine vehicles.

## **10.9. Energy sector long term trends**

As the world enters a decisive phase of climate action, the Maldives too has to prepare for the global impacts the climate change has brought in. The long-term trend identified as the energy transition, in which the energy sector investments are gradually shifting from fossil fuel programmes to sustainable energy programmes has realised historically lowest cost of electricity, gaining from the larger scale of manufacturing operations connected to renewable energy conversion technologies. For an island nation with no proven fossil fuel resources, the favourable impact of these global trends will be a blessing. Burdened with high cost of power generation, the Maldives have already begun to reap the benefits of cheaper solar power, offsetting a noticeable share of diesel power generation. The lower cost of generation and maturity of technologies will accelerate the solar integration drive, leading to further cost reductions.

### **10.9.1. Vision for the energy sector for the updated NDCs**

Maldives' higher dependency on importation of fossil fuels for energy and the hospitality sector (tourism, particularly resorts) and fisheries for its economic stability have shown its vulnerabilities in the recent past. The country is making great efforts to enhance its resilience by strengthening its energy security. Further, the challenges from climate change also has shown great threats to its mere existence. These factors are seriously considered in the policies and plans of different time scales.

### **10.9.2. National Energy Policy and Strategy 2024 - 2029**

The government of Maldives declared its National Energy Policy and Strategy 2024 - 2029 in the year 2024, realising that the country faces significant challenges in ensuring a sustainable and secure energy future, as it heavily depends on fossil fuels imports for energy supply at present. This Policy sets out a comprehensive framework promoting energy security, sustainability, and affordability. It has emphasised its aim at transitioning towards a low-carbon economy<sup>56</sup>. The table below provides a glimpse of the key policy statements and their objectives. This document further outlines different strategies to adopt in order to achieve the respective objectives.

- (1) Increase the Share of Renewable Energy in the National Energy Mix
- (2) Promote Energy Efficiency and Conservation
- (3) Improve Energy Security and Affordability
- (4) Strengthen Institutional Capacity and Regulatory Framework
- (5) Promote Energy Research and Development

These new policy elements have a broader outlook on the future and have captured the essence of energy transition, when compared to the previous policy framework. It strives to encourage and facilitate public and private sector to utilise renewable energy in different sectors of economy and also to increase energy efficiency in the supply and demand side, capturing the dual facets of sustainable energy development.

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<sup>56</sup> Maldives Energy Policy and Strategy, 2024



The new policy framework has a sharper focus on customer, and has stated its alignment to provide, affordable, reliable and sustainable electricity services by enhancing the power systems of the islands, possibly in par with the supply quality available in the capital city. It has also focussed on service providers, striving to improve their performance in the drive to maintain universal access to electricity.

Identifying the issues in providing an enabling environment for investments, the policy wishes to strengthen the capacity of sector institutions to manage, implement and regulate the activities and also to develop the legal, policy and regulatory instruments needed to make use of the investments.

In a fresh move, the policy is encouraging innovation and advance technological solutions in the energy sector through support of nationally and institutionally initiated research and development efforts.

### **10.9.3. Nationally Determined Contributions (NDCs)**

The Maldives revised and updated its Nationally Determined Contributions to the United Nations Framework Convention on Climate Change (UNFCCC) in the year 2020. This document has emphasised the commitments it makes towards climate change, where the energy sector is a significant player. The nation projects its emissions in the year 2030 to be 3,285 Gg CO<sub>2e</sub> under the Business As Usual (BAU) scenario, with 2011 as the base year. The emissions in Maldives in 2022 was estimated to be 2,508 Gg CO<sub>2e</sub>. This document has recognised that various actions are needed to be undertaken to achieve this target. The first activity so listed in this endeavour is the increasing of the electricity generation by renewable energy with storage and grid stabilisation, while making efforts to increase the share of renewable energy installed capacity to 15% by the public and private sectors (NDC, 2020). Further, in December 2023, at the delivery of the National Statement at the Conference of Parties (COP 28), HE. the Maldivian President revealed his country's commitment to develop renewable energy systems capable of providing an ambitious 33% of the nation's electrical energy needs by the year 2028 at the Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC or CoP28)<sup>57</sup>.

### **10.9.4. Road Map for the Energy Sector**

Ministry of Climate Change, Environment and Energy of the Maldives has published a Road Map for the Energy Sector for 2024 - 2033, aligning with the government's commitments of 33% stake by renewable energy of its electricity mix by 2028. It has identified that the electricity use in the country is annually increasing at about 5%, and is projected to reach 2,400 GWh by the year 2028, requiring an estimated 330 MW of additional renewable energy capacity. Further, it emphasises on the necessity to upgrade the existing power system to accommodate higher share of renewable energy, which also requires additional investments. The Road Map outlines 15 flagship interventions to fulfil the 25 strategies stated in the Energy Policy and Strategy 2024-2029.

## **10.10. Room for Renewable Energy Development**

The Maldivian government is keen to meet its energy demands from the indigenous energy sources. The country possesses solar energy potential across the islands, as well as wind energy potential at certain pockets. Introducing renewable sources of energy in the new ventures, including in

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<sup>57</sup> <https://presidency.gov.mv> accessed on 2025-01-11

replacement of retiring diesel generators have to compete with the already established systems. Therefore, renewable energy systems will have to compete against the status-quo. Further, the Maldives need to assess the technical, economical and logistical viability of such projects in order to promote renewable sources. Maldives being around maritime routes poses an advantage for it to consider generation of green hydrogen using renewable source of energy. It also has to consider battery or other energy storage systems if it wants to expand the use of variable renewable energy forms. The decentralised energy based aggregators and virtual power plants are some other options for Maldives to take the advantage of the dispersed nature of the islands and diffused nature of the resources.

## **10.11. Energy Transition**

The Maldives strives to depend less on fuel imports to meet its energy needs, while aiming at resilience to volatilities and reaching energy independence in the long run. The many challenges faced by the nation prompts to seek sustainable solutions by facilitating a just, inclusive and equitable energy transition. The government's policies and plans align in this direction. These are complemented by other policy statements on strengthening institutional capacity and regulatory framework and the promotion of energy research and development.

The Energy Policy and strategy of the Maldives include the policy statements such as increase the share of renewable energy in the national energy mix, promoting energy efficiency and conservation, and improving energy security and affordability directly address the just and equitable energy transition, and providing universal access to electricity. Realisation of the policy and strategy shall position the Maldives in the just and equitable energy transition pathway, opening avenues to reap the benefits as envisaged.

As per the revised and updated NDCs of the Maldives of 2020, the Maldivian government aims to reach net-zero by 2030 believing that it has a responsibility to take a transformational economic and environmental path to development. However, this is provided that it gets extensive support and assistance from the international community. The government also has made a commitment to develop a plan with consultation of development partners, donors and other stakeholders, to map-out a net-zero pathway (NDC, 2020).

The road map released in 2024 is aimed at paving the way for a just energy transition in Maldives. It has identified many flagship ventures to materialise the transition such as resource assessments, decarbonising transport, mainstreaming efficient consumption, introducing cost-reflective tariffs, replacing indirect subsidies, waste-to-energy projects, smart grids and interconnections, strengthening regulatory framework, developing institutional capacity and strengthening international corporation, public awareness, and ocean energy.

The steady increase in solar PV generation reflects a crucial shift in energy strategies aimed at reducing carbon emissions and dependence on non-renewable resources. These trends collectively demonstrate the energy sector's ongoing transition and the critical role played by renewable energy, particularly solar PV, in transitioning to a more sustainable energy landscape.

Desalination plants are a critical component in island water supply which are highly energy-intensive. The desalination process relies on electricity from either diesel generators or hybrid solar systems. The large desalination facilities operate in Male, Hulhumale, and some major resort islands and some

resorts with renewable energy systems are planning to integrate solar power into their desalination processes. Efforts are being made to enhance the energy efficiency of desalination processes through renewable energy and optimally sized efficient equipment.

Simultaneously, electricity use by the reverse osmosis (RO) plant also increased from 26,132 MWh to 32,105 MWh, indicating either increased production demands or decreased operational efficiency. The slow pace of solar PV integration suggests that more aggressive renewable energy adoption strategies are necessary. To mitigate the reliance on diesel and enhance sustainability, the expansion of renewable energy capacity, implementation of energy efficiency measures, and exploration of advanced, energy-efficient desalination technologies are crucial strategic recommendations.

The Maldives vision for the energy sector centres on delivering reliable, affordable, sustainable, and secure energy. It also stands on three pillars: energy efficiency in both supply and demand sides, the adoption of renewable energy, and harnessing technological innovation. Supply-side measures include refurbishment of diesel generators, use of dual-fuel generation, interconnection of islands, and reduction in distribution losses. On the demand side, the focus has been on improving energy efficiency in buildings and the stock of appliances. Other priority renewable energy programs involve solar PV, wind energy, and waste-to-energy. The technology and innovation fronts involve floating solar platforms, ocean energy, hydrogen, and fuel cells. With a net-zero greenhouse gas emission target in the long run by 2030 set, the country targets scaling up investments in renewable energy to reduce its reliance on imported diesel. These aspirations will require international support and private sector engagement to be fulfilled.

There are several studies that are being conducted to identify the RE potential, technical solutions, policy development and financial solutions required to increase the utilisation of renewable energy. Among the content available on this topic, the documents titled 'A Bright Future for Maldives powered by Renewables Road map for the energy sector 2020-2030' by the ADB, and 'Renewable energy roadmap for the Republic of Maldives' by International Renewable Energy Agency (IRENA) are noteworthy <sup>58</sup>.

Implementation of Diesel-Solar Hybrid Systems, building government's own renewable energy systems, purchase of Renewable Energy from IPP through PPAs, introduction of attractive Feed-in Tariffs, consumers involvement through the net-metering schemes, installation of solar water heating systems, work on limitations of mini-grids, improved technical expertise, formulation of conducive policies are some of the visible elements of the ongoing energy transition in the Maldives.

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<sup>58</sup> Renewable Energy Roadmap for the Republic of Maldives, IRENA, 2015.

## Annex 1 – Energy Commodities

Maldives Energy Commodities 2018 (in original units)						
	Renewable (GWh)	Electricity (GWh)	LP gas (kt)	Petrol (kt)	Jet A1 (kt)	Diesel (kt)
<b>Supply</b>						
Primary Energy	4					
Imports			15	69	140	526
Direct Exports						
Foreign Aviation				(0)	(103)	(5)
Statistical difference						
<b>Total Energy Supply</b>	<b>4</b>		<b>15</b>	<b>69</b>	<b>37</b>	<b>522</b>
<b>Energy Conversion</b>						
Thermal Power Plants		1,238				(307)
Solar PV	(4)	4				
Own Use						
Conversion Losses						
Losses in Transmission and Distribution		(82)				
Consumption for Non Energy Use						
<b>Total Energy Conversion</b>	<b>(4)</b>	<b>1,160</b>				<b>(307)</b>
<b>Energy Use</b>						
<b>Industry</b>		41				
Desalination		41				
<b>Transport</b>				69	37	184
Road Transport				31		7
Domestic navigation				37		177
Domestic Aviation					37	
<b>Other</b>		1,119	15			31
Household, Commercial, Agriculture and Other		1,119	15			31
<b>Total Energy Use</b>		<b>1,160</b>	<b>15</b>	<b>69</b>	<b>37</b>	<b>215</b>

Maldives Energy Commodities 2019 (in original units)						
	Renewable (GWh)	Electricity (GWh)	LP gas (kt)	Petrol (kt)	Jet A1 (kt)	Diesel (kt)
<b>Supply</b>						
Primary Energy	8					
Imports			17	85	167	583
Direct Exports						
Foreign Aviation					(124)	(4)
Statistical difference						
<b>Total Energy Supply</b>	<b>8</b>		<b>17</b>	<b>85</b>	<b>43</b>	<b>579</b>
<b>Energy Conversion</b>						
Thermal Power Plants		1,414				(346)
Solar PV	(8)	8				
Own Use						
Conversion Losses						
Losses in Transmission and Distribution		(85)				
Consumption for Non Energy Use						
<b>Total Energy Conversion</b>	<b>(8)</b>	<b>1,338</b>				<b>(346)</b>
<b>Energy Use</b>						
<b>Industry</b>		48				
Desalination		48				
<b>Transport</b>				85	43	205
Road Transport				35		9
Domestic navigation				50		197
Domestic Aviation					43	
<b>Other</b>		1,290	17			27
Household, Commercial, Agriculture and Other		1,290	17			27
<b>Total Energy Use</b>		<b>1,338</b>	<b>17</b>	<b>85</b>	<b>43</b>	<b>233</b>

Maldives Energy Commodities 2020 (in original units)						
	Renewable (GWh)	Electricity (GWh)	LP gas (kt)	Petrol (kt)	Jet A1 (kt)	Diesel (kt)
<b>Supply</b>						
Primary Energy	10					
Imports			13	59	73	503
Direct Exports						
Foreign Aviation					(55)	(5)
Statistical difference						
<b>Total Energy Supply</b>	<b>10</b>		<b>13</b>	<b>59</b>	<b>18</b>	<b>499</b>
<b>Energy Conversion</b>						
Thermal Power Plants		1,232				(301)
Solar PV	(10)	10				
Own Use						
Conversion Losses						
Losses in Transmission and Distribution		(92)				
Consumption for Non Energy Use						
<b>Total Energy Conversion</b>	<b>(10)</b>	<b>1,151</b>				<b>(301)</b>
<b>Energy Use</b>						
<b>Industry</b>		51				
Desalination		51				
<b>Transport</b>				59	18	167
Road Transport				36		6
Domestic navigation				22		161
Domestic Aviation					18	
<b>Other</b>		1,100	13			30
Household, Commercial, Agriculture and Other		1,100	13			30
<b>Total Energy Use</b>		<b>1,151</b>	<b>13</b>	<b>59</b>	<b>18</b>	<b>197</b>

Maldives Energy Commodities 2021 (in original units)						
	Renewable (GWh)	Electricity (GWh)	LP gas (kt)	Jet A1 (kt)	Aviation gas (kt)	Diesel (kt)
<b>Supply</b>						
Primary Energy	68					
Imports			17	73	138	581
Direct Exports						
Foreign Aviation					(102)	(8)
Statistical difference						
<b>Total Energy Supply</b>	<b>68</b>		<b>17</b>	<b>73</b>	<b>36</b>	<b>573</b>
<b>Energy Conversion</b>						
Thermal Power Plants		1,594				(379)
Solar PV	(68)	68				
Own Use						
Conversion Losses						
Losses in Transmission and Distribution		(114)				
Consumption for Non Energy Use						
<b>Total Energy Conversion</b>	<b>(68)</b>	<b>1,548</b>				<b>(379)</b>
<b>Energy Use</b>						
<b>Industry</b>		53				
Desalination		53				
<b>Transport</b>				73	36	165
Road Transport				40		7
Domestic navigation				33		158
Domestic Aviation					36	
<b>Other</b>		1,495	17			29
Household, Commercial, Agriculture and Other		1,495	17			29
<b>Total Energy Use</b>		<b>1,548</b>	<b>17</b>	<b>73</b>	<b>36</b>	<b>194</b>

Maldives Energy Commodities 2022 (in original units)						
	Renewable (GWh)	Electricity (GWh)	LP gas (kt)	Petrol (kt)	Jet A1 (kt)	Diesel (kt)
<b>Supply</b>						
Primary Energy	76					
Imports			18	89	178	651
Direct Exports						
Foreign Aviation					(130)	(7)
Statistical difference						
<b>Total Energy Supply</b>	<b>76</b>		<b>18</b>	<b>89</b>	<b>48</b>	<b>644</b>
<b>Energy Conversion</b>						
Thermal Power Plants		1,810				(433)
Solar PV	(76)	76				
Own Use						
Conversion Losses						
Losses in Transmission and Distribution		(107)				
Consumption for Non-Energy Use						
<b>Total Energy Conversion</b>	<b>(76)</b>	<b>1,779</b>				<b>(433)</b>
<b>Energy Use</b>						
<b>Industry</b>		58				
Desalination		58				
<b>Transport</b>				89	48	180
Road Transport				44		9
Domestic navigation				45		171
Domestic Aviation					48	
<b>Other</b>		1,722	18			31
Household, Commercial, Agriculture and Other		1,722	18			31
<b>Total Energy Use</b>		<b>1,779</b>	<b>18</b>	<b>89</b>	<b>48</b>	<b>211</b>





**Ministry of Tourism and  
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