2020 Environmental Statistics Compendium

2015-2019 Series

Government of Montserrat

Statistics Department Montserrat

Foreword

Over the past few decades, the importance of Environmental Statistics has been growing rapidly. A natural result of this has been the demand for and use of environmental indicators that have become especially urgent as humankind grapples with varying methods to protect and save the environment. Accurate, timely and internationally comparable Environmental Statistics are essential in guiding policy interventions to sustainably salvage our rapidly depleting forests and ensure the sustainability of our marine and other natural resources. The changing climate due largely to irresponsible human behavior is wreaking havoc especially on the poorer small island developing states. The need for current environmental data is accentuated in times of natural disasters such as hurricanes, flooding, earthquakes and other natural disasters.

The importance attached to Environmental Statistics is reflected in the international guidelines which recommend the collection, compilation, dissemination, and analysis of this sector of statistics, with equal urgency as that given to statistics and indicators in the Social, Economic and Demographic sectors. Urgently growing concerns about the impact of climate change, which threatens the very existence of human life on this planet have led our authorities to formulate and document at least one major goal that is directly related to the environment, as well as several indicators spread across the seventeen (17) Sustainable Development Goals to be achieved by all countries by 2030. Evidence of achievement will crucially depend on the availability of key Environmental Statistics and Indicators.

This current issue of the Environmental Compendium for Montserrat is the first of its kind and represents the efforts of the Statistics Department of Montserrat (SDM), working in close collaboration with its various partners, to address the need for Environmental Statistics and indicators. These data will guide key policies in this sector. Statistics and indicators of every type can only be efficiently and effectively generated through close collaboration with various national stakeholders. More importantly the generation of Environmental Statistics   is even more dependent on an even closer collaboration among all of the key stakeholders. The SDM is very appreciative and thankful to our various partners whose contributions were indispensable to the preparation of this publication and whose collaboration we will continue to rely on as we continue to develop these much needed data. The SDM intends to prepare and publish an Environmental Compendium at least every five (5) years or earlier.

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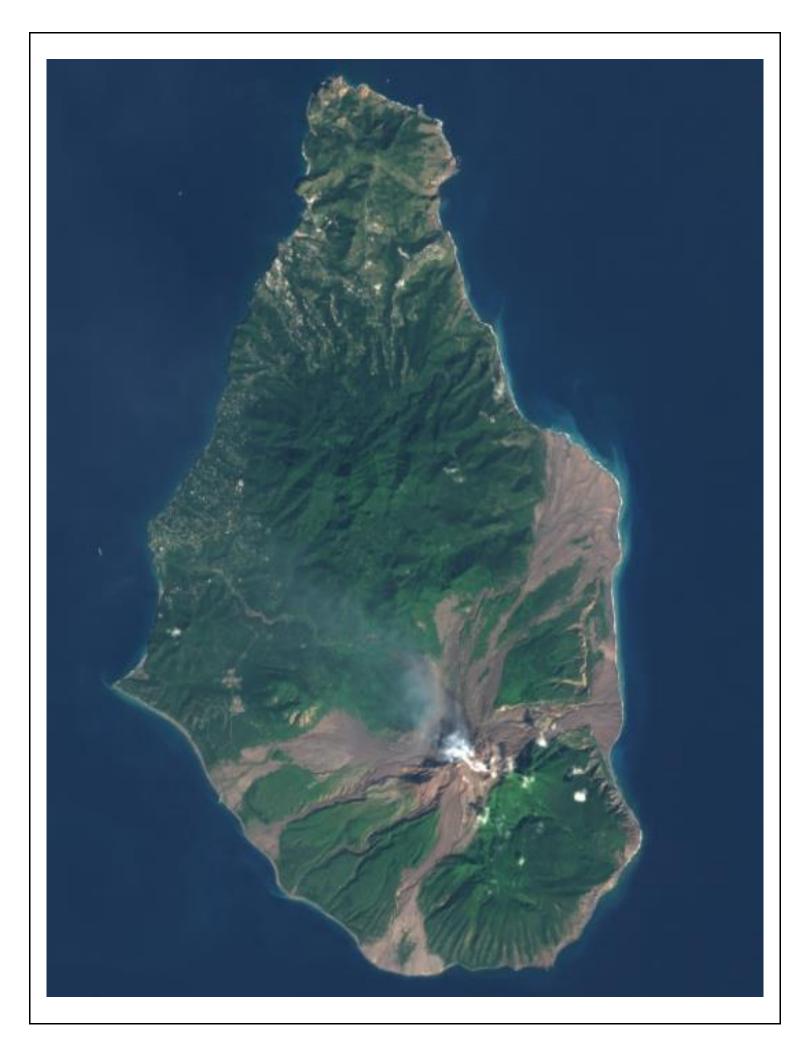
Montserrat

General Background

Montserrat, a pear-shaped island in the Lesser Antilles chain is a British Overseas Territory of the United Kingdom. It is nicknamed the 'Emerald Isle of the Caribbean' in part because of its resemblance to coastal Ireland and also its formerly large population of people who originated from Ireland. It is situated between 16° 45 minutes North and 62° 12 minutes West and located about 27 miles (43 km) southwest of Antigua and about 30 miles (50 km) northwest of the French territory, Guadeloupe. Montserrat, pre-volcanic activity was officially recorded at 39.5 square miles (102.3 square kilometers) but an increase in sedimentary deposits from the onset of the volcanic crisis has resulted in an expansion of the island. An exclusion zone was imposed in the southern two thirds of the island (see hazard level map in annex) due to the ongoing volcanic activity and dome stability.

Montserrat has a rich diversity of flora and fauna and its rugged landscape is shaped by three mountainous areas – the Silver Hills, the Centre Hills, and the Soufriere Hills which are cut by narrow valleys referred to locally as ghauts. The Silver Hills, located in the north, and the Centre Hills comprises the largest remnant of Montserrat's native forest. Chances Peak in the Soufriere Hills was the highest point in Montserrat at 3002 feet until the mid-1990's when volcanic eruptions dramatically altered the landscape.

The island is sub-divided into three parishes – St. Peters, St. Georges, and St. Anthony. The former capital Plymouth, on the southwest coast was located in the parish of St. Anthony. This parish along with St. Georges was destroyed by the eruptions of the Soufriere Hills Volcano. All settlement was subsequently relocated to the parish of St. Peters, which covers approximately one third of the total land mass of the island. Currently, the de facto capital is Brades and surrounding areas where most government services and commercial activities are found. As at the 2018 Intercensal Count and Labour Force Census, Montserrat's total population stands at 4,649, with a non-institutional population (private households) of 4,566.

The population as at the 2018 Intercensal Count and Labour Force Census, comprises mainly of African descent (86.2 percent) with a small number of other ethnicities and mixed descent. The official language of Montserrat is English, but most Montserratians speak a native patois. The main religious dominations are Anglican, Pentecostal, Seventh Day Adventist and Roman Catholic, with a percentage distribution of 17.7 percent, 16.1 percent, 15 percent and 11.4 percent respectively.

Montserrat is a self-governing overseas territory within the Commonwealth. The island's head of state is the British Monarch and is represented by an appointed Governor. The premier, who is the head of the government, is an elected member of the nine-seat Legislative Assembly and is appointed by the Governor. The Legislative Assembly includes two ex-officio members – the Financial Secretary and the Attorney General. The government is elected for a five-year term.

Acknowledgements

Front Page Photo Credits
- Ian Gerald (Dry Waterfall)
- Veta Wade (Turtle)
- Unknown (Little Bay Sunset)

Satellite Imagery of Montserrat

- RE-SAT Energy Analytics Platform (Institute for Environmental Analytics – IEA)

1	## <u>Population and Housing</u>

2	## <u>Tourism</u>

3 Environmental Health and Water

4 Weather

5 Natural and Environmental Disasters

6 Energy, Minerals and Transport

7 Agriculture and Land Use

8 Coastal and Marine Resources

9 Forestry and Biodiversity

Annex

1 - Population and Housing

Photo Credit: Maldrick Weekes

This section presents data on population, population growth, and housing.

Population

Population growth rate is calculated based on decennial censuses. The population decreased by 8.33 percent in 1991 from 1980, an average annual decrease of 0.75 percent. The population further decreased in 2001 from 1991 by 57.79 percent. The decrease in population was a result of the Soufriere Hills Volcano eruption which caused mass emigration from 1997 onwards. The effects of the volcanic crisis are still being manifested in the decrease in population as a further decline was seen in the population in the 2018 Intercensal Count & Labour Force Census. Montserrat does not have a rural or urban setting hence data are not disaggregated using these two variables.

Population Density

Population Density is the ratio between the total population and the total land area. This is calculated by dividing the total population by the total land area. Montserrat's official land area pre volcanic activity was recorded at 39.5 square miles[1]. Since the onset of the volcanic crisis, persons have settled in the northern part of the island, covering 15.5 square miles[1] of inhabitable unrestricted land space. Based on figures from the last census (2018) there are approximately three hundred persons per square mile (15.5 sq. mi) in Montserrat (Table 1.4)

Housing

As per Population Censuses, a "household" or a "housing unit" is defined as a socio-economic unit consisting of individuals who live together whether related to each other or not and who make common provisions for food or other essentials for living. Households can be either one person or multi-person households.

The average household size on Montserrat is approximately two persons (Table 1.5). The average household size is determined by dividing the enumerated population by the number of households. An analysis of data for the last three censuses indicates that the number of housing units increased in 2011 from 2001 by 12.15 percent, from 2082 units in 2001 to 2335 units in 2011 but decreased in 2018 from 2011 by 3.6 percent to 2251 units. Over the three census periods, one-person household units were the most common type accounting for 49.2 percent in 2001, 49.1 percent 2011, and 47.2 percent in 2018.

Note to Readers –

Unrestricted Land Space – Inhabitable areas inclusive of unrestricted zones A & B and all areas north of these along with daytime entry zone F. (see hazard level map in annex)
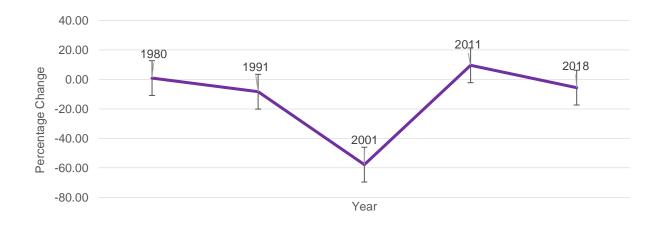
[1] – Government Information System (GIS)

Table 1.1 – Population Growth Rate 1980,1991,2001,2011,2018

Year	Population*	Percentage Change
1980	11,606	1.29
1991	10,639	-8.33
2001	4,491	-57.79
2011	4,922	11.16
2018	4,649	-6.87

Source: Statistics Department Montserrat, Ministry of Finance & Economic Management
1980, 1991, 2001 & 2011 – Population and Housing Census
2018 – Intercensal Count & Labour Force Census

*Total Population – consists of persons in private households and institutions.

Chart 1.1 – Population Growth Rate 1980,1991,2001,2011,2018

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Table 1.2 - Average Household Size 1980,1991,2001,2011,2018

Year	Population*	No. of Households	Avg. HH Size
1980	11,606	3,708	3.13
1991	10,639	3,855	2.76
2001	4,303	2,082	2.07
2011	4,775	2,335	2.04
2018	4,566	2,251	2.03

Source: Statistics Department Montserrat, Ministry of Finance & Economic Management
1980, 1991, 2001 & 2011 – Population and Housing Census
2018 – Intercensal Count & Labour Force Census

*Enumerated Population – consists of persons only in private households

Chart 1.2 - Average Household Size 1980,1991,2001,2011,2018

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Table 1.3 - Household size by number of persons 2001,2011,2018

No. of Persons	2001	%	2011	%	2018	%
One Person	1,024	49.2	1,146	49.1	1,063	47.2
Two Persons	464	22.3	538	23.0	570	25.3
Three Persons	272	13.1	297	12.7	283	12.7
Four Person	176	8.5	185	7.9	203	9.0
Five Persons	86	4.1	118	5.1	86	3.8
Six Person	36	1.7	32	1.4	30	1.3
More than Six Persons	24	1.2	19	0.8	14	0.6
Total	**2082**	**100.0**	**2335**	**100**	**2251**	**100.0**

Source: Statistics Department Montserrat, Ministry of Finance & Economic Management
2001 & 2011 – Population and Housing Census
2018 – Intercensal Count & Labour Force Census

Chart 1.3 - Household size by number of persons 2001,2011,2018
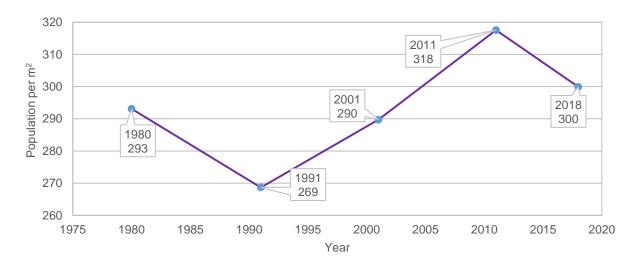
Table 1.4 – Population Density 1980, 1991, 2001, 2011, 2018

Year	Population	Density
1980	11,606	293*
1991	10,639	269*
2001	4,491	290**
2011	4,922	318**
2018	4,649	300**

Source: Statistics Department Montserrat, Ministry of Finance & Economic Management
1980, 1991, 2001 & 2011 – Population and Housing Census
2018 – Intercensal Count & Labour Force Census

* Population Density calculated using Montserrat's official land area pre-volcanic activity of 39.5 sq. mi
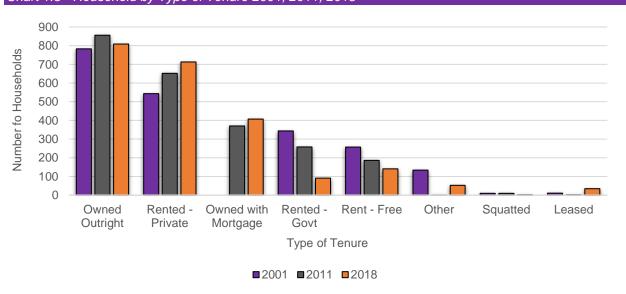
** Population density calculated to reflect occupation of the inhabitable unrestricted land space post -
   volcanic activity of 15.5 sq. mi (Source – GIS Department), in the northern part of the island (see hazard
   level map in annex).

Chart 1.4 – Population Density 1980, 1991, 2001, 2011, 2018

Table 1.5 – Household by Type of Tenure 2001, 2011, 2018

Ownership	2001	2011	2018
Owned Outright	783	856	800
Rented - Private	543	652	704
Owned with Mortgage	0	370	405
Rented - Government	344	258	91
Rent - Free	257	186	140
Other	134	1	48
Squatted	10	10	2
Leased	11	2	35

Source: Statistics Department Montserrat, Ministry of Finance & Economic Management
1980, 1991, 2001 & 2011 – Population and Housing Census
2018 – Intercensal Count & Labour Force Census

Chart 1.5 - Household by Type of Tenure 2001, 2011, 2018

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2 - Tourism

This section provides information on visitor arrivals to Montserrat.

A total of 20,956 persons visited Montserrat in 2019, a 14.28 percent increase from 2018 also representing the highest number of visitors over the five-year period. Of this figure, 10,402 persons were classified as tourists, a 1.66 percent increase from 2018, and 2100 excursionists a 4.42 percent decrease from 2018. There was an increase in cruise and yacht passengers in 2019. 2017 saw the lowest yacht arrivals over the five-year period and in that same year, cruise passengers recorded the highest arrivals over that same period (Table 2.1 and 2.2).

Over the years, the figures show that the preferred mode of travel to Montserrat (Tourists and Excursionists) was by sea. In 2016, a significant decline of sea travel to Montserrat was recorded, possibly due to the unavailability of the ferry services for almost half the year (Chart 2.2).

Visitors from the Caribbean, particularly the OECS Territories, the United States of America and the United Kingdom dominated the local market (Table 2.3). Caribbean residents (OECS, Rest CARICOM, Rest Caribbean) visited Montserrat from 2015 – 2019 with a percentage distribution of 38.2, 35.4, 36.7, 39.9, 39.9, respectively. In 2015 and 2016, there were more visitors from the United States, than the United Kingdom but from 2017 – 2019 the number of visitors from the United Kingdom exceeded the numbers from the United States, maintaining a second position of origin of visitors to the island. A deeper analysis of visitors from the Caribbean

reveal that the majority of Caribbean residents originated from Antigua and Barbuda and St Kitts. From 2015 – 2019 visitors from these two neighboring islands represented a percentage distribution of 51, 54, 58, 51, 57 and 12, 10, 10, 17, 11 respectively.

In 2019 69 percent of all visitors stayed in private homes. This compares to 60 percent in 2018. There was a decrease in hotel, villa and guest house stays in 2019 from 2018, but an increase of 277 or 69 percent in the number of persons staying in apartments.

Note to readers

Visitor – Any person who travels outside of their usual place of residence for a period not exceeding 12 months and whose main purpose of visit is other than the exercise of an activity remunerated from within the country visited.

Tourist – A visitor who spends over 24 hours in a private or collective accommodation in the country visited.

Excursionist – A visitor who does not spend the night in a private or collective accommodation. Visitor stays less than 24 hours in the country visited.

(Definitions – Caribbean Tourism Organization – CTO)

Table 2.1 – Visitor Arrivals by Type of Visitor, Annually 2015 - 2019					
	2015	**2016**	**2017**	**2018**	**2019**
Visitors	15,090	15,361	19,521	18,338	20,956
Air	4,414	6,506	4,520	4,691	4,326
Sea	10,676	8,855	15,001	13,647	16,630
Tourists	8,944	8,734	9,539	10,232	10,402
Air	4,108	6,039	4,120	4,417	3,996
Sea	4,836	2,695	5,419	5,815	6,406
Excursionists	1,740	1,225	1,903	2,197	2,100
Air	306	467	400	274	330
Sea	1,434	758	1,503	1,923	1,770
Cruise Passenger	2,591	3,596	7,128	4,294	6,821
Sea	2,591	3,596	7,128	4,294	6,821
Yacht Arrivals	1,815	1,806	951	1,615	1,633
Sea	1,815	1,806	951	1,615	1,633

Source: Statistics Department Montserrat, Ministry of Finance & Economic Management

Chart 2.1 – Visitor Arrivals by Type of Visitor, Annually 2015 – 2019

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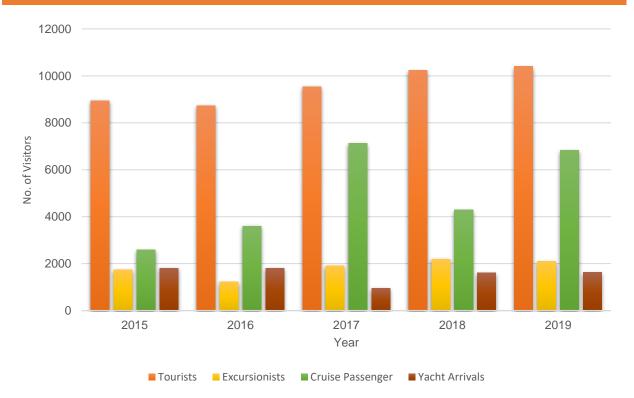
Chart 2.2 – Visitor Arrivals by Mode of Transport, Annually 2015 – 2019

Table 2.2 – Visitor Arrivals - Annual Growth Rate 2015 - 2019

	2015	2016	2017	2018	2019
Visitors	15,090	15,361	19,521	18,338	20,956
Air	4,414	6,506	4,520	4,691	4,326
Sea	10,676	8,855	15,001	13,647	16,630
Percentage Change (Annual)		*1.80*	*27.08*	*-6.06*	*14.28*
Tourists	8,944	8,734	9,539	10,232	10,402
Air	4,108	6,039	4,120	4,417	3,996
Sea	4,836	2,695	5,419	5,815	6,406
Percentage Change (Annual)		*-2.35*	*9.22*	*7.26*	*1.66*
Excursionists	1,740	1,225	1,903	2,197	2,100
Air	306	467	400	274	330
Sea	1,434	758	1,503	1,923	1,770
Percentage Change (Annual)		*-29.60*	*55.35*	*15.45*	*-4.42*
Cruise Passenger	2,591	3,596	7,128	4,294	6,821
Sea	2,591	3,596	7,128	4,294	6,821
Percentage Change (Annual)		*38.79*	*98.22*	*-39.76*	*58.85*
Yacht Arrivals	1,815	1,,806	951	1,615	1,,633
Sea	1,815	1806	951	1,615	1633
Percentage Change (Annual)		*-0.50*	*-47.34*	*69.82*	*1.11*

Chart 2.3 – Visitor Arrivals - Annual Growth Rate 2015-2019

Chart 2.3 – Visitor Arrivals - Annual Growth Rate 2015-2019

Legend: Total Visitors, Tourists, Excursionists, Cruise Passengers, Yacht Arrivals

Data labels:
- 2016: 1.80, -2.35, -29.60, 38.79, -0.50
- 2017: 27.08, 9.22, 55.35, 98.22, -47.34
- 2018: -6.06, 7.26, 15.45, -39.76, 69.82
- 2019: 14.28, 1.66, -4.42, 58.85, 1.11
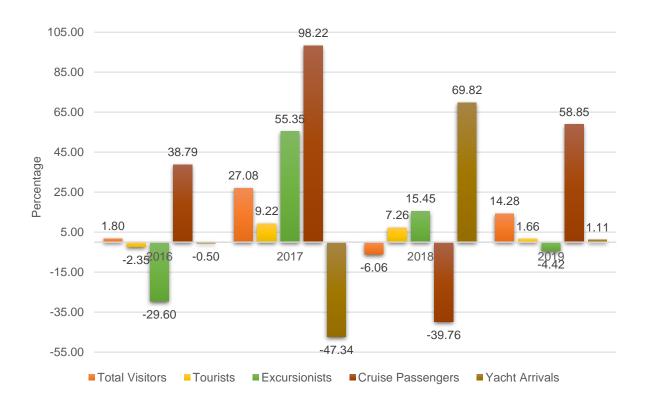
Table 2.3 – Visitors* by Country of Origin 2015 – 2019

	2015	2016	2017	2018	2019
OECS	2,856	2,506	3,211	3,710	3,736
Rest CARICOM	676	563	624	793	754
Rest Caribbean	546	461	366	461	496
USA	2,713	2,672	2,844	2,782	3,010
Canada	618	567	734	875	691
Latin America	67	49	83	107	85
United Kingdom	2,705	2,591	3,089	3,235	3,230
Rest Europe	363	405	371	363	357
Other	140	145	120	103	143
Total	**10,684**	**9,959**	**11,442**	**12,429**	**12,502**

Source: Statistics Department, Montserrat, Ministry of Finance & Economic Management
*Tourists and Excursionists only

Chart 2.4 - Visitors by Country of Origin 2019

Canada
5%

Rest CARICOM
6%

Rest Caribbean
4%

Rest Europe
3%

Other
1%

Latin America
1%

OECS
30%

United Kingdom
26%

USA
24%
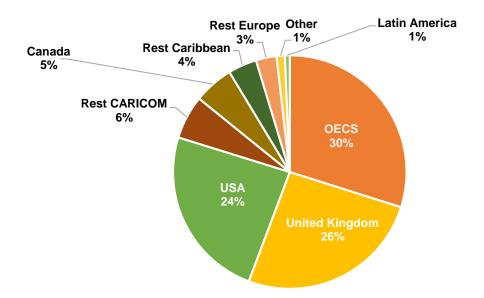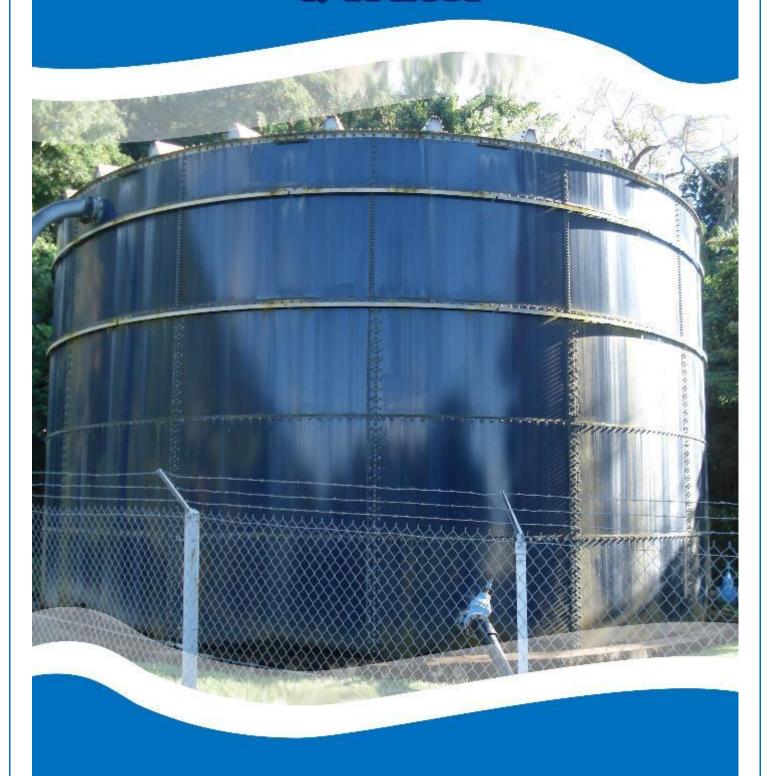
Table 2.4 – Tourist Arrivals by Place of Stay, Annually 2015 - 2019					
	2015	**2016**	**2017**	**2018**	**2019**
Private Home	5,213	5,636	5,605	6,144	7,157
Hotel	721	682	790	887	744
Guest House	1,933	1,606	2,175	2,173	1,352
Apartment	330	576	558	400	677
Villa	665	198	365	596	428
Bed & Breakfast	52	36	46	32	40
Other	30	0	0	0	4
Total	**8,944**	**8,734**	**9,539**	**10,232**	**10,402**

Source: Statistics Department, Montserrat, Ministry of Finance & Economic Management

Chart 2.5 - Tourist Arrivals by Place of Stay, Annually 2015 - 2019

3 - Environmental Health & Water

Salem Reservoir

Photo Credit: Government Information System (GIS)

This section provides data on Environmental Health and Water.

Environmental Health

Environmental Health is the field that monitors and addresses those physical, chemical and biological factors external to a person and all the related factors impacting behaviours.

Over the three-year period 2015 – 2017, the number of environmentally related diseases decreased from 440 cases in 2015 to 289 cases in 2017. Of those reported, gastroenteritis and respiratory infections were most common. Gastroenteritis is the inflammation of the gastrointestinal tract – the stomach and small intestines. The number of reported cases of gastroenteritis increased in 2017 from 2016 by 21 cases or a 26 percent change. Acute respiratory infections represented 57.8 percent in 2017 and 57.6 percent in 2016 of reported cases of environmentally related diseases (Table 3.1).

Water

An important basic need is access to safe drinking water. As at September 2018, households reported approximately 99% coverage of access to water supply in their homes, either inside or outside their dwellings (Table 3.2 and 3.3). In 2019, 78.6 percent of water consumption (metered) was from domestic consumers followed by commercial consumers at 17.6 percent (Table 3.4) and in that same year each person used approximately 46 gallons of water daily (Table 3.5).

Water Supply

The overall supply of raw water from six springs surrounding the Centre Hills is adequate to meet the current demands of Montserrat. However,

water storage capacity continues to be a challenge. There is an urgent need for storage capacity to be increased to provide a minimum of a 5-day supply in the case of natural disasters disrupting the quality and quantity of the springs[1].

Over the five-year period, the Killie Crankie Spring (Montserrat's main spring) in Waterworks and Lawyers Spring in Woodlands produced the most water. In 2019, the Killie Crankie Spring accounted for 30 percent, and the Lawyers Spring accounted for 23 percent of the total annual production. The 'bulk consumption' represents water collected from the sources (springs), treated to W.H.O standards and transmitted to the customer base through the distribution network. Table 3.9 shows monthly bulk consumption over the five-year period, with March accounting for the highest consumption in 2018 and 2019.

Wastewater Management

Most houses, offices and public buildings in Montserrat use individual septic tanks and soakaways, with just three main areas being on communal system – Lookout, Drummonds and Davy Hill. The Montserrat Utilities Limited (MUL) complies with both World Health Organization (W.H.O) being 30mg/L and its own self-imposed guidelines for effluent quality before discharging wastes into the environment, of 10mg/L.

Map 3.1 shows the existing water network and communal wastewater facilities.

[1] – Montserrat Utilities Limited – Water Division

Communicable Diseases	2015	2016	2017
Gastroenteritis	297	85	106
Ciguareta Poisoning	19	5	9
Acute Respiratory Infection	110	185	167
Influenza	0	39	0
Viral Hepatitis B	10	3	4
Chicken Pox	3	1	1
Other	1	3	2
Total	440	321	289

Source: Ministry of Health & Social Services - Glendon Hospital, Records

Chart 3.1 - Number of Reported Cases of Environmentally Related Disease 2015 - 2017

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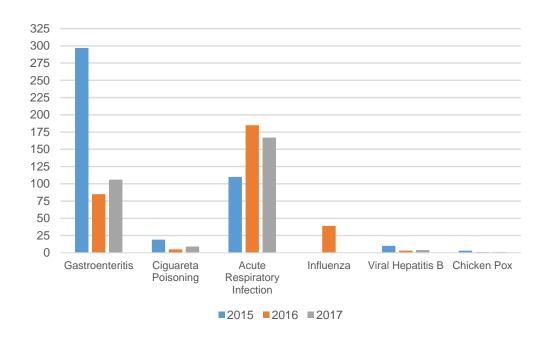
Table 3.2 – Water Supply by Type, 2001, 2011, 2018

Water supply type	2001	2011	2018
Public piped into dwelling	1,759	2,242	2,208
Public piped into yard	210	52	20
Other / Not Stated	113	41	23

Source: Statistics Department Montserrat, Ministry of Finance & Economic Management
2001 & 2011 – Population and Housing Census
2018 – Intercensal Count and Labour Force Census

Table 3.3 – Water Supply by Type – Percentage Distribution 2001, 2011, 2018

Water supply type	2001	2011	2018
Public piped into dwelling	84.49	96.02	98.09
Public piped into yard	10.09	2.23	0.89
Other / Not Stated	1.20	0.26	1.02

Table 3.4 – Annual Water Consumption ('000 Gls) by type of Consumer 2015 - 2019

Yearly Total Consumption ('000 Gls)	2015	2016	2017	2018	2019
Domestic	77,361	73,457	74,403	76,572	76,633
Commercial	15,809	18,349	17,260	21,101	17,204
Building	8,562	7,151	6,160	4,169	1,127
Street Pipes	542	672	368	379	451
Own Use	457	720	892	555	235
Water Truck	0	3	0	0	0
Fire Hydrant	1,860	1,860	1,860	1,705	1,860
Total	**104,591**	**102,212**	**100,943**	**104,481**	**97,510**

Table 3.5- *Per Capita Water Consumption,* Domestic *2015 - 2019*

	Domestic Consumption (Gls)	Population*	Per Capita Use/day Gls
2015	77,361	4,801	44.15
2016	73,457	4,742	42.44
2017	74,403	4,768	42.75
2018	76,572	4,667	44.95
2019	76,633	4,519	46.46

Source: Montserrat Utilities Limited
* Mid-year Population Estimates
Per Capita Use (Daily) - (Domestic Consumption/Population)/365*1000

Chart 3.2 – *Domestic Water Consumption and Per Capita Use 2015 - 2019*
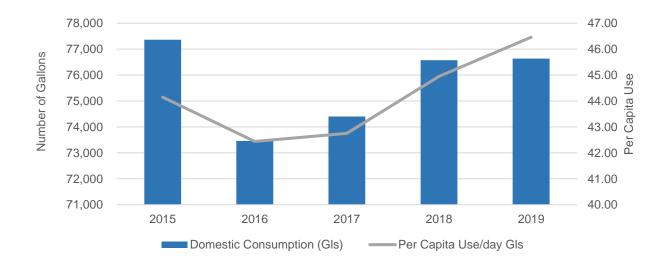
Table 3.6- Annual Spring Production, 2015 - 2019

	2015	2016	2017	2018	2019
Killie Crankie	48,944,580	33,268,620	49,064,000	52,867,400	52,859,060
Lawyers	40,261,400	33,171,700	36,159,500	43,284,500	40,906,500
Hope	31,925,300	25,220,700	24,087,740	27,312,550	27,827,100
Olveston	26,208,200	20,775,800	21,975,300	26,378,100	23,505,080
Quashie	14,455,600	14,123,800	15,044,500	15,294,300	14,879,900
Forgathy	5,910,040	4,368,670	5,358,680	4,077,960	4,440,600
Wells	9,417,210	52,214,240	26,042,990	18,900,250	14,316,440
Total	**177,124,345**	**183,143,530**	**177,732,710**	**188,115,060**	**178,734,680**

Source: Montserrat Utilities Limited, Water Division

Table 3.7 – Monthly Spring Production 2015 – 2019 (Imperial Gallons)

	2015	2016	2017	2018	2019
January	16,211,670	14,910,820	14,694,770	15,093,630	15,588,370
February	15,463,990	13,988,480	13,639,220	13,937,170	14,047,790
March	16,598,290	15,464,350	16,828,050	18,221,570	16,796,720
April	14,455,700	14,868,090	14,352,960	16,980,140	14,956,700
May	15,098,680	14,893,840	14,205,810	16,872,320	14,892,440
June	13,643,550	14,874,010	14,028,550	15,586,200	15,061,800
July	13,642,880	15,725,960	13,528,190	14,992,160	14,750,570
August	13,571,760	14,519,670	13,499,070	14,774,010	14,747,680
September	14,953,600	15,543,570	14,219,610	14,973,820	13,742,490
October	14,458,390	16,310,700	16,677,050	15,273,100	15,837,070
November	13,491,160	16,166,570	15,684,820	15,221,620	13,481,330
December	15,532,660	15,877,470	16,374,610	16,189,320	14,831,720
Total	**177,122,330**	**183,143,530**	**177,732,710**	**188,115,060**	**178,734,680**

Source: Montserrat Utilities Limited, Water Division
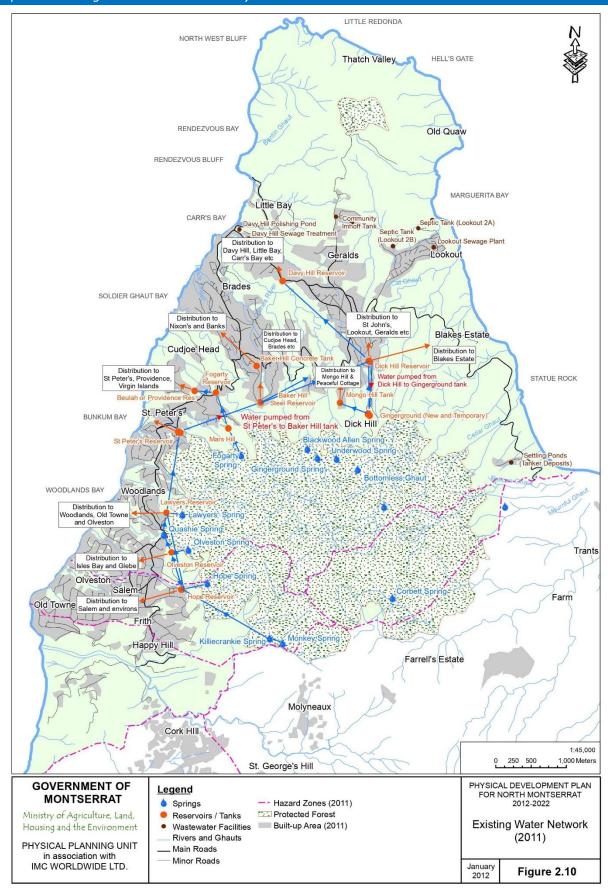
Table 3.8 – Annual Bulk Consumption by Area – 2015 - 2019					
	2015	**2016**	**2017**	**2018**	**2019**
Hope	17,329,100	17,568,500	3,196,380	11,402,410	10,088,000
Dick Hill	49,632,670	46,797,590	47,788,470	51,798,820	50,096,450
Baker Hill	30,498,700	39,789,910	40,923,330	42,124,860	38,264,230
Lawyers	35,382,490	58,562,200	33,047,700	33,493,100	33,437,200
Olveston	8,173,700	8,034,700	14,640,900	8,226,800	9,553,200
Mars Hill	6,176,470	-	2,786,930	1,235,790	1,228,280
Total	**147,193,130**	**170,752,900**	**142,383,710**	**148,281,780**	**142,667,360**

Source: Montserrat Utilities Limited, Water Division

Table 3.9 – Bulk Consumption by Area – Monthly 2015 - 2019					
	2015	**2016**	**2017**	**2018**	**2019**
January	11,128,780	12,254,970	11,747,120	12,094,780	12,166,300
February	9,813,510	11,358,700	11,446,250	11,400,600	10,968,890
March	12,203,210	12,849,660	13,154,900	14,852,780	13,118,230
April	12,035,730	11,969,500	10,902,180	12,623,290	11,588,480
May	14,420,560	11,444,620	11,142,910	11,992,990	11,405,740
June	13,459,740	12,229,360	10,735,390	12,618,690	12,707,980
July	13,538,450	12,410,280	10,997,830	12,385,490	12,307,020
August	13,225,410	11,914,510	10,363,660	11,505,150	12,175,240
September	12,249,600	37,313,390	11,565,770	11,195,290	10,998,250
October	11,626,270	12,626,610	12,295,840	12,538,970	11,981,180
November	10,982,390	12,166,400	13,484,230	12,150,410	10,799,510
December	12,509,480	12,214,900	14,547,630	12,923,340	12,450,540
Total	**147,193,130**	**170,752,900**	**142,383,710**	**148,281,780**	**142,667,360**

Source: Montserrat Utilities Limited, Water Division

Map 3.1 – Existing Water and Communal Systems Network

LITTLE REDONDA

NORTH WEST BLUFF

Thatch Valley

HELL'S GATE

RENDEZVOUS BAY

Old Quaw

RENDEZVOUS BLUFF

MARGUERITA BAY

Little Bay

CARR'S BAY

Community Imhoff Tank

Septic Tank (Lookout 2A)

Davy Hill Polishing Pond
Davy Hill Sewage Treatment

Septic Tank (Lookout 2B)

Lookout Sewage Plant

Distribution to Davy Hill, Little Bay, Carr's Bay etc

Geralds

Lookout

SOLDIER GHAUT BAY

Brades

Davy Hill Reservoir

Distribution to St John's, Lookout, Geralds etc

Blakes Estate

Distribution to Nixon's and Banks

Distribution to Cudjoe Head, Brades etc

Distribution to Blakes Estate

Cudjoe Head

Baker Hill Concrete Tank

Dick Hill Reservoir

STATUE ROCK

Distribution to St Peter's, Providence, Virgin Islands

Fogarty Reservoir

Distribution to Mongo Hill & Peaceful Cottage

Water pumped from Dick Hill to Gingerground tank

Beulah or Providence Res

Baker Hill Steel Reservoir

Mongo Hill Tank

BUNKUM BAY

St. Peter's

Gingerground (New and Temporary)

Settling Ponds (Tanker Deposits)

St Peter's Reservoir

Mars Hill

Water pumped from St Peter's to Baker Hill tank

Dick Hill

Blackwood Allen Spring
Underwood Spring

Fogarty Spring

Gingerground Spring

Bottomless Ghaut

WOODLANDS BAY

Woodlands

Lawyers Reservoir

Distribution to Woodlands, Old Towne and Olveston

Lawyers' Spring

Quashie Spring

Olveston Spring

Trants

Distribution to Isles Bay and Glebe

Olveston Reservoir

Corbett Spring

Farm

Olveston

Salem

Hope Spring

Old Towne

Distribution to Salem and environs

Hope Reservoir

Frith

Happy Hill

Killiecrankie Spring

Monkey Spring

Farrell's Estate

Molyneaux

Cork Hill

1:45,000

0 250 500 1,000 Meters

St. George's Hill

Legend

- Springs
- Reservoirs / Tanks
- Wastewater Facilities
- Rivers and Ghauts
- Main Roads
- Minor Roads
- – – Hazard Zones (2011)
- Protected Forest
- Built-up Area (2011)

PHYSICAL DEVELOPMENT PLAN FOR NORTH MONTSERRAT 2012-2022

Existing Water Network (2011)

January 2012

Figure 2.10

4 - Weather

This section provides data on the climate of Montserrat.

The climate of Montserrat is considered tropical rainforest (Af), according to the Köppen-Geiger climate classification.

Annual precipitation averages 1,300 mm at the John A. Osborne Airport, with significantly greater quantities in the Centre Hills region. The wet season spans May to November, where the monthly average is approx. 130 mm. The dry season runs from February to April with February being the driest month.

There is little seasonal variation in temperature. Average temperatures range from lows of 20–24 °C (68–75 °F) to highs of 27–31 °C (81–88 °F). The warmest period is from June to November, which is also the hurricane season.

Rainfall and Rain days

- Over the five-year period, 2015 – 2019, 2017 saw the most rainfall of 1586.8 mm.
- The least amount of rainfall (721.9 mm) occurred in 2015. This was likely due to the effects of an El Niño Event – a climate pattern in the Pacific Ocean, which has global impacts on weather patterns. However, in August 2015 there was a recorded 147.9 mm of rainfall, the highest for the year, a result of the passage of Tropical Storm Erica.
- The driest month over the past five years was March with an average of 45.5 mm of rainfall.
- September 2017 recorded 302.4 mm of rainfall, contributed by the torrential rainfalls from a very active hurricane season, particularly hurricanes Irma and Maria during that month.
- November 2016 saw above average rainfall of 390.5 mm, likely due to the cessation of the 2015/2016 El Niño Event.

- 2019 saw a decrease in rainfall by 14.4% from 2018.
- In 2019, the month with the most rain days was July (27) and the month with the least rain days was June (15). The month with the most rainfall was September (185.4 mm) and the least rainfall in June (24.7 mm).

Temperature

- Over the past five years, from 2015 – 2019, January was recorded as the coolest month with an average daily air temperature of 25 °C (77.0 °F), while August and September were recorded as the hottest months with an average daily air temperature of 28 °C (82.4 °F).
- September recorded the highest mean temperature (28.3 °C / 82.9 °F) in 2019, while February recorded the lowest mean temperature (24.8 °C / 76.6 °F) in that same year.

Humidity

The average relative humidity over the five-year period 2015 – 2019 was 79%.

- 2015 recorded the lowest relative humidity (72%) while 2017 recorded the highest (83%).
- In 2019, the lowest average relative humidity was recorded in April and October (77%), while the highest was recorded in May.

Table 4.1 – Total Rainfall (mm) and Rain Days 2015 - 2019

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
2015	Rain Days	19	20	17	19	7	20	21	21	10	18	25	27	224
	Rainfall	34.6	70.5	34.3	53.3	3.2	29.6	15.9	147.9	31.5	116.7	125.6	61.0	724.1
2016	Rain Days	20	15	18	14	23	14	23	13	20	15	29	24	228
	Rainfall	47.8	57.2	66.5	111.2	99.9	88.6	165.5	131.6	94.5	44.9	395.4	105.0	1408.1
2017	Rain Days	20	18	25	16	18	20	21	21	17	22	14	22	234
	Rainfall	78.9	19.4	60.0	52.6	241.0	183.9	129.1	182.1	326.4	210.6	58.5	80.5	1623
2018	Rain Days	24	24	12	21	27	17	24	21	22	16	26	27	261
	Rainfall	116.2	75.5	26.7	50.1	98.8	26.3	89.8	147.9	95.5	117.3	261.7	97.9	1203.7
2019	Rain Days	24	24	19	22	23	15	27	25	22	19	22	22	264
	Rainfall	81.0	32.2	39.9	37.1	91.2	24.7	129.7	141.7	185.4	42.6	113.2	111.8	1030.7

Source: John A Osborne Airport Meteorological Services

Chart 4.1 – Total Rainfall (mm) and Rain Days 2015 - 2019
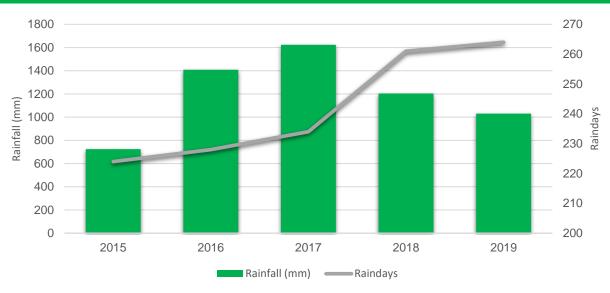
Table 4.2 – Average Air Temperature (Degrees Farenheit) 2015 - 2019

	2015	2016	2017	2018	2019	Average
January	77.5	77.2	77.1	77.4	75.7	77.0
February	77.5	77.7	77.8	76.2	76.6	77.2
March	78.4	77.4	78.0	77.9	77.5	77.8
April	78.6	79.5	78.6	78.9	78.4	78.8
May	80.8	81.3	80.3	79.1	79.2	80.1
June	81.1	80.8	81.4	80.9	81.3	81.1
July	81.5	81.7	81.9	81.0	82.8	81.8
August	82.2	82.4	83.9	81.4	82.6	82.5
September	82.2	82.6	81.7	81.7	82.9	82.2
October	82.4	83.1	81.3	81.0	82.8	82.1
November	79.9	80.4	80.4	79.0	80.8	80.1
December	78.3	78.8	78.8	77.8	79.5	78.6
Yearly Average	**80.0**	**80.2**	**80.1**	**79.4**	**80.0**	**80.0**
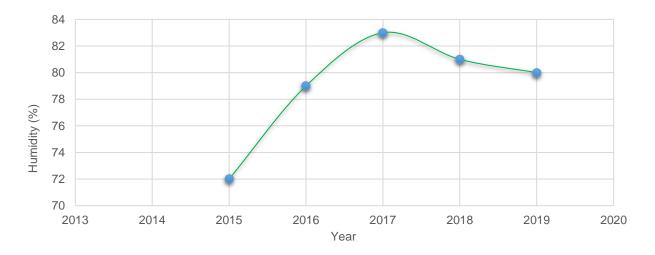
Source: John A Osborne Airport Meteorological Services
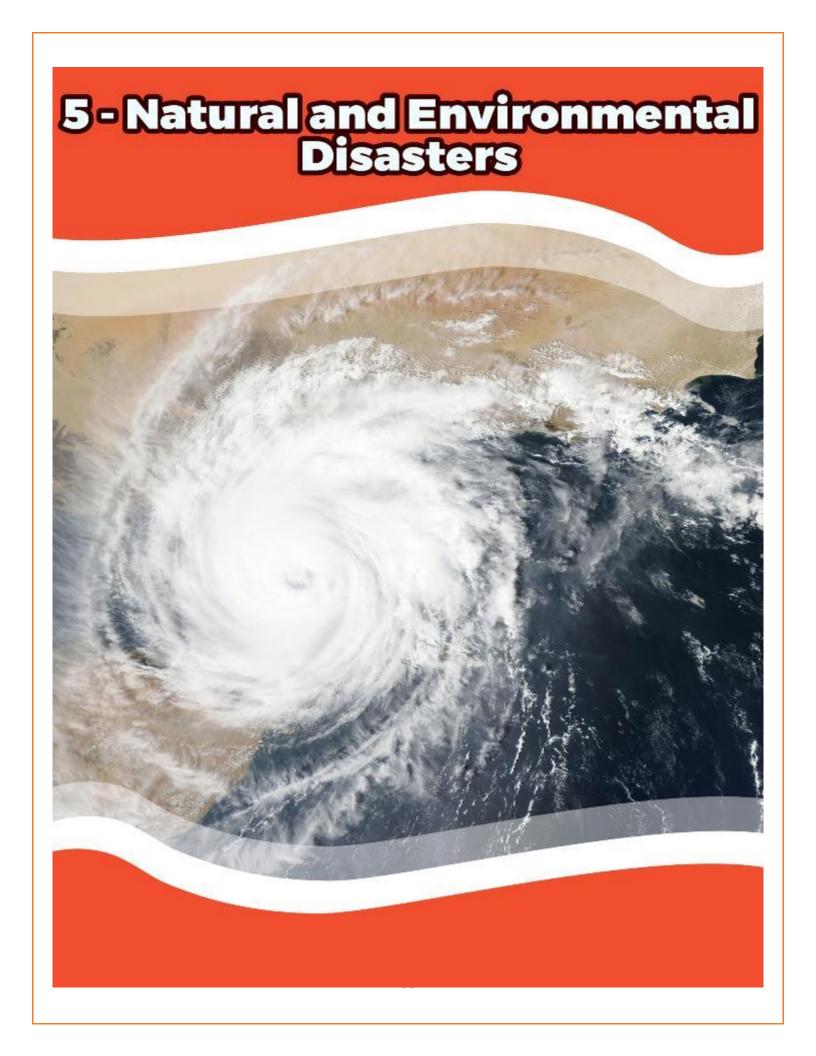
Table 4.3 – Mean Relative Humidity (%) 2015 - 2019

	2015	2016	2017	2018	2019
January	73	74	79	82	81
February	73	76	78	77	80
March	68	77	80	78	78
April	71	80	82	78	77
May	69	80	83	81	83
June	71	78	84	80	83
July	72	79	84	82	80
August	73	79	85	81	82
September	70	79	86	83	80
October	75	79	85	83	77
November	75	82	84	86	80
December	75	83	82	80	81
Average	**72**	**79**	**83**	**81**	**80**

Source: John A Osborne Airport Meteorological Services

Chart 4.2 – Mean Relative Humidity (%) 2015 - 2019

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5 - Natural and Environmental Disasters

This section provides data on natural and environmental disasters.

Natural Disasters

The occurrence of natural disasters affecting Montserrat in the past five years was rare. In September 2017, the region was impacted to varying degrees by Hurricanes Maria and Irma, Montserrat less so. During the passage of Hurricane Maria there was a reported 105 persons in shelters in Montserrat. There were no reported significant damages or impact on critical facilities by Hurricane Maria and there were minimal damages to commercial or residential buildings. While there were no disruptions to the water supply, there was a week-long island wide power disruption.

Fires
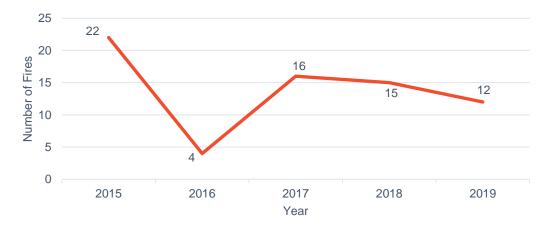
Over the five-year period 2015 – 2019, the number of reported fires did not exceed twenty two (22). Majority of reported incidences were bush fires. The year 2015 had the most recorded bush fires of twenty-two (22) followed by 2017 with sixteen (16) bush fires. There were only twelve (12) reported cases of fires in 2019, which comprised of nine bush fires and three vehicle fires (Table 9.1).

Table 9.1 - Incidence of Fire by Type - 2015 - 2019

Year	Bush Fires	Vehicle Fires	Structure	Other	Total
2015	22	0	0	0	22
2016	4	0	0	0	4
2017	16	0	0	0	16
2018	11	2	2	0	15
2019	9	3	0	0	12

Source: Royal Montserrat Fire and Rescue Services

Chart 9.1 - Incidence of Fire by Type - 2015 - 2019

6 - Energy, Minerals and Transport

This Section presents data on electricity consumption, fuels and mineral imports, renewable energy and vehicle imports and registration.

Electricity and Electricity Consumption

- As at the 2018 Intercensal Count and Labour Force Census, 98.4 percent of households on Montserrat had electricity coverage, this represents a 12 percent increase over a 27 year period when compared to 1991 of 86.4 percent coverage (Table 6.1). The installed capacity of electricity in Montserrat is approximately 6 Megawatts (MW). During the non-festive season, the peak load is 2.1 MW and the peak periods are usually between 12 noon to 1 p.m. and in the evenings around 7.p.m. During the festive season (March and December), the peak load reaches 2.3 MW.

- In 2019, 14,173,939 kilowatt hours (kWh) of electricity was generated, a 0.58 percent increase from 2018 and 10.68 percent increase over the five-year period from 2015. 2019 also recorded the highest electricity in Kilowatt hours (kWh) generated over the last five years (Table 6.2).

- Over the three years of 2015-2017 the domestic sector was responsible for approximately 47 percent of electricity consumption but in 2019 that percentage dropped to 45.74 percent placing that category of consumption in second place to commercial consumption (46.06%) for the first time in five years (Tables 6.3 & 6.4)

- Each household[1] uses an average of 2519 kWh of electricity annually, or approximately 3.44 kWh per person of electricity daily (2019) (Table 6.6). The cost of electricity to the domestic consumer averages about US$0.37 or EC$1.00 per kWh. (Dec 2019)

- In 2019, there were 2,975 domestic consumers and 735 commercial consumers accounting for approximately 99 percent electricity consumers combined. (Table 6.7)

Fuel Imports

- There are primarily three sources of fossil fuel energy on Montserrat – Diesel, Gasoline and Liquid Propane Gas (LPG). Over the five-year period 2015 – 2019 diesel accounts for majority of fossil fuels imported and is used mainly for heavy equipment, ferry and electricity generation.

- In 2019, diesel imports decreased by 8.78 percent from 1,607,434 gallons (US) in 2018 to 1,466,249 gallons in 2019. There were also decreases in gasoline and LPG in 2019 from 2018 (Table 6.8)

Renewable Energy

- In January 2019, 824 solar panels were installed on the rooftops of three buildings in Brades (see photo on section cover page) and each panel is rated at 350 watts. The total installed capacity of the system is 250 kWac (alternating current) or 288.4 KWdc (direct current) and provides roughly 11% of the peak power demand for the island. It is anticipated that the energy produced from these panels will benefit households in the near future.

- Two wind turbines were installed at St. Georges Hill prior to the volcanic eruption. Whilst not operational, the physical structures are still evident and have resisted the harsh surrounding conditions. Although wind energy has not yet been fully re-explored, a desktop study using RE-SAT wind resource maps was conducted to determine suitable locations for the implementation of wind energy (See Map 6.1).

Vehicle Imports and Registration

- Over the five-year period 2015 – 2019, 2016 recorded the highest volume of vehicle imports with 239 vehicles a 116 percent increase from 2015 with 111 vehicles. (Table 6.10)

- 2015 recorded the least vehicle imports over the five-year period.

- Vehicle imports decreased by 36 percent in 2019 from 2018 with 120 vehicles in 2019, and 189 in 2018.

- The number of vehicles registered increased by 13.1 percent over the five year period from 2015 to 2019. (Table

- 6.12)

- There were 3,141 registered vehicles on Montserrat as at December 31 2019. In

- that same year 42.6 percent of this total (1,339) vehicles were represented by Sports

- Utility Vehicles (SUV's) 36.4 percent (1,143) cars, and 8.9 percent (280) pick-ups.

[1] – 2251 Households as at September 2018

Table 6.1 - Electricity Supply by Households 1991, 2001, 2011, 2018								
Electricity Type	**1991**		**2001**		**2011**		**2018**	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Public / Private	6,662	86.4	1,985	95.3	2,273	97.3	2,214	98.4
Other	224	2.9	73	3.5	53	2.3	8	0.3
None/Not Stated	824	10.7	24	1.2	9	0.4	29	1.3
Total	**7,710**	**100.0**	**2082**	**100.0**	**2,335**	**100.0**	**2,251**	**100.0**

Table 6.2- Total Annual Generation (kWh) 2015-2019					
	2015	**2016**	**2017**	**2018**	**2019**
Generation (kWh) (Total Annual)	12,806,784	13,537,529	13,357,222	14,092,119	14,173,939

Table 6.3 – Total Annual Consumption (kWh) by Type of Consumer - 2015-2019					
Yearly Total Consumption	**2015**	**2016**	**2017**	**2018**	**2019**
Domestic	5,504,237	5,772,821	5,653,642	5,744,375	5,671,010
Commercial	5,138,694	5,278,304	5,199,036	5,454,247	5,746,281
Industrial	31,942	106,991	73,883	63,595	4,700
Own Use	706,467	927,677	806,379	1,021,461	779,312
Streetlights	175,923	173,754	187,963	192,496	196,263
Total	**11,557,263**	**12,259,547**	**11,920,903**	**12,476,174**	**12,397,566**

Chart 6.1 – Annual Consumption and Generation - 2015 - 2019

Type of Consumer
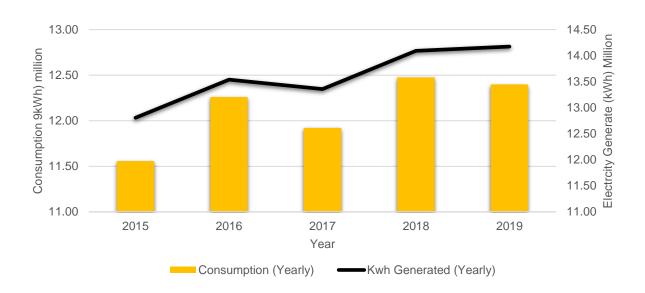
	Domestic	Commercial	Other	Total
2015	47.63	44.46	7.91	100
2016	47.09	43.05	9.86	100
2017	47.43	43.61	8.96	100
2018	46.04	43.72	10.24	100
2019	45.74	46.06	8.20	100

Source: Montserrat Utilities Limited
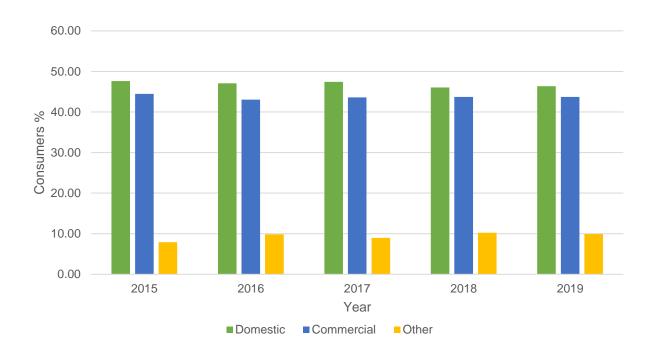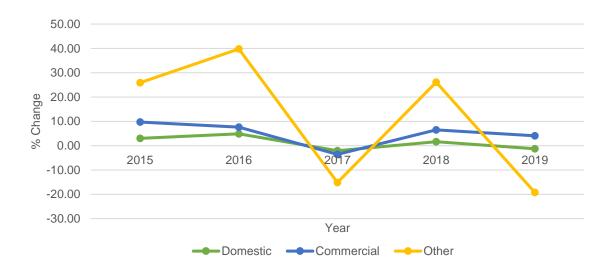
	2015	**2016**	**2017**	**2018**	**2019**
Domestic	3.02	4.88	-2.06	1.60	-1.28
Commercial	6.70	2.72	-1.50	4.91	5.35
Other	16.20	32.16	-11.60	19.60	-23.27

Table 6.6 - Per Capita Use (Daily) Domestic Consumption 2015 - 2019
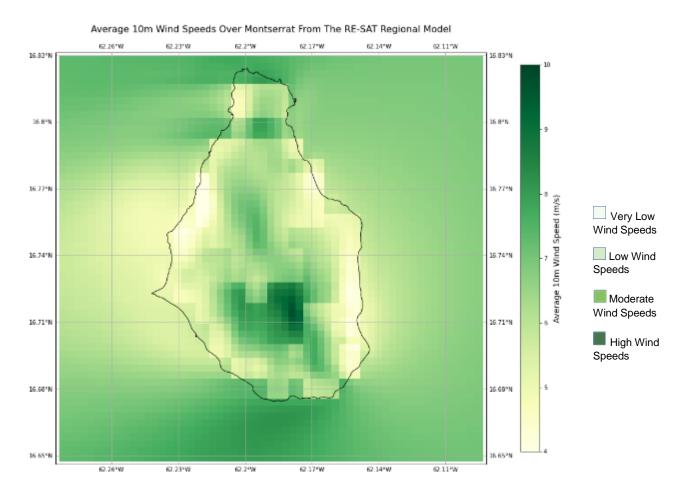
Year	Domestic Consumption	Population*	Per Capita Use/day kWh
2015	5,504,237	4,801	3.14
2016	5,772,821	4,742	3.34
2017	5,653,642	4,768	3.25
2018	5,744,375	4,667	3.37
2019	5,671,010	4,519	3.44

Source: Montserrat Utilities Limited
* Mid-year Population Estimates
Per Capita Use (Daily) - (Domestic Consumption/Population)/365

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Table 6.7 - Consumers at Year End 2015-2019

Consumers at Year End (December)	2015	2016	2017	2018	2019
Domestic	2,882	2,920	2,920	2,910	2,975
Commercial	682	712	720	721	735
Industrial	6	5	5	4	4
Own Use	14	14	14	13	13
Streetlights	20	23	24	25	25
Total	**3,604**	**3,674**	**3,683**	**3,673**	**3,752**

Source: Montserrat Utilities Limited

Average 10m Wind Speeds Over Montserrat From The RE-SAT Regional Model

Source: RE-SAT energy analytics platform, developed by the Institute for Environmental Analytics (IEA).

Map 6.1 shows the average 10m wind speed over Montserrat, for the period 2013-2018. The map was generated by the Institute for Environmental Analytics (IEA) using a high-resolution weather model and available from the RE-SAT energy analytics platform (https://www.re-sat.com/). The model developed by the IEA has been refined and validated using weather data collected from the MVO and the John Osborne Airport. The different shades of green represent the different average wind speeds that are experienced in different areas on the island. White to very light green represents very low average wind speeds whilst dark green represents the highest average wind speeds. According to the map high wind areas in Montserrat include Geralds, Lookout and Soufrière Hills.

Table 6.8 – Value of Fuel Imports (EC$) Annually 2015 - 2019

	Gasoline (US Gallons)	**Diesel (US Gallons)**	**Liquid Propane Gas (lbs)**
2015	583,408	1,304,517	686,336
2016	772,250	1,539,297	1,064,228
2017	763,648	1,548,300	623,205
2018	768,989	1,607,434	742,529
2019	717,115	1,466,249	727,566

Source: Delta Petroleum Limited

Table 6.9 - Sand and Aggregate Exports (Tonnage) Monthly 2015 - 2019

	2015	**2016**	**2017**	**2018**	**2019**
January	17,300	16,100	15,800	20,700	28,900
February	9,380	20,850	21,500	17,460	35,950
March	22,400	13,600	23,100	25,400	28,300
April	19,210	19,000	25,873	28,300	40,600
May	22,100	20,050	26,700	27,040	33,600
June	26,420	26,000	27,100	52,900	33,700
July	17,850	26,950	23,320	25,700	46,250
August	21,900	3,650	19,130	24,080	40,900
September	27,550	17,580	9,300	26,565	21,070
October	23,250	20,250	21,500	33,640	28,900
November	22,500	22,100	32,500	32,500	38,100
December	16,000	15,150	21,800	36,400	23,100
Total	**245,860**	**221,280**	**267,623**	**350,685**	**399,370**

Source: Montserrat Port Authority
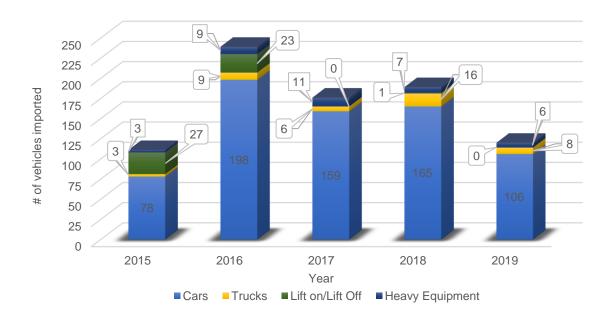
Table 6.10 - Vehicle Imports, Monthly 2015 - 2019

	2015	2016	2017	2018	2019
January	13	21	14	28	17
February	7	23	21	19	2
March	11	15	11	8	13
April	8	18	20	14	8
May	11	17	25	26	7
June	7	19	33	16	14
July	13	11	15	15	9
August	8	27	8	11	13
September	17	28	0	9	4
October	6	19	14	12	8
November	4	16	9	15	18
December	6	25	6	16	7
Total	**111**	**239**	**176**	**189**	**120**

Source: Montserrat Port Authority

Table 6.11 - Vehicle Imports by Type 2015 - 2019

	2015	2016	2017	2018	2019
Cars	78	198	159	165	106
Pick-up	3	9	6	16	8
Heavy Equipment	27	23	0	1	0
Lift on / Lift Off	3	9	11	7	6
Total	**111**	**239**	**176**	**189**	**120**

Source: Montserrat Port Authority

Chart 6.4 – Vehicle Imports by Type 2015 - 2019

Table 6.12 Registered Road Vehicles by Type of Vehicle 2015 - 2019

Type	**2015**	**2016**	**2017**	**2018**	**2019**
Cars	1,067	1,180	1,134	1,156	1,143
Pickup	264	270	276	286	280
Omnibus	131	150	162	151	168
Jeep (SUVs)	1,102	1,215	1,306	1,345	1,339
Lorries	15	23	22	26	29
Dump Truck	93	89	93	99	93
Tankers	11	13	10	8	7
Tow Tractors	6	6	6	6	7
Loaders (Mini)	8	6	6	7	5
Loaders (Large)	4	4	2	3	2
Graders	2	1	1	1	0
Rough Riders	3	1	0	0	2
Backhoes	9	10	8	8	5
Forklifts	8	6	9	6	7
Mokes	1	1	0	0	0
Motorcycle	27	37	32	30	32
Tractors	4	4	1	6	1
Road Rollers	3	3	2	2	2
Vans	20	16	17	20	19
Total	**2,778**	**3,035**	**3,087**	**3,160**	**3,141**

Source: Ministry of Communications, Works, Energy and Labour - Traffic Department

Table 6.13 Registered Road Vehicles by Category of Vehicle 2015 – 2019

Category	**2015**	**2016**	**2017**	**2018**	**2019**
Private	2,291	2,506	2,514	2,591	2,617
Hire	190	199	190	201	181
Rental	186	231	272	265	248
Government	111	99	111	103	95
Total	**2,778**	**3,035**	**3,087**	**3,160**	**3,141**

Source: Ministry of Communications, Works, Energy and Labour - Traffic Department

Chart 6.5 – Registered Road Vehicles by Category (%) – 2015 - 2019
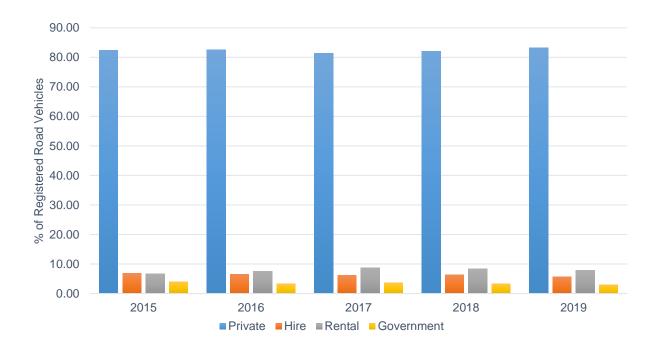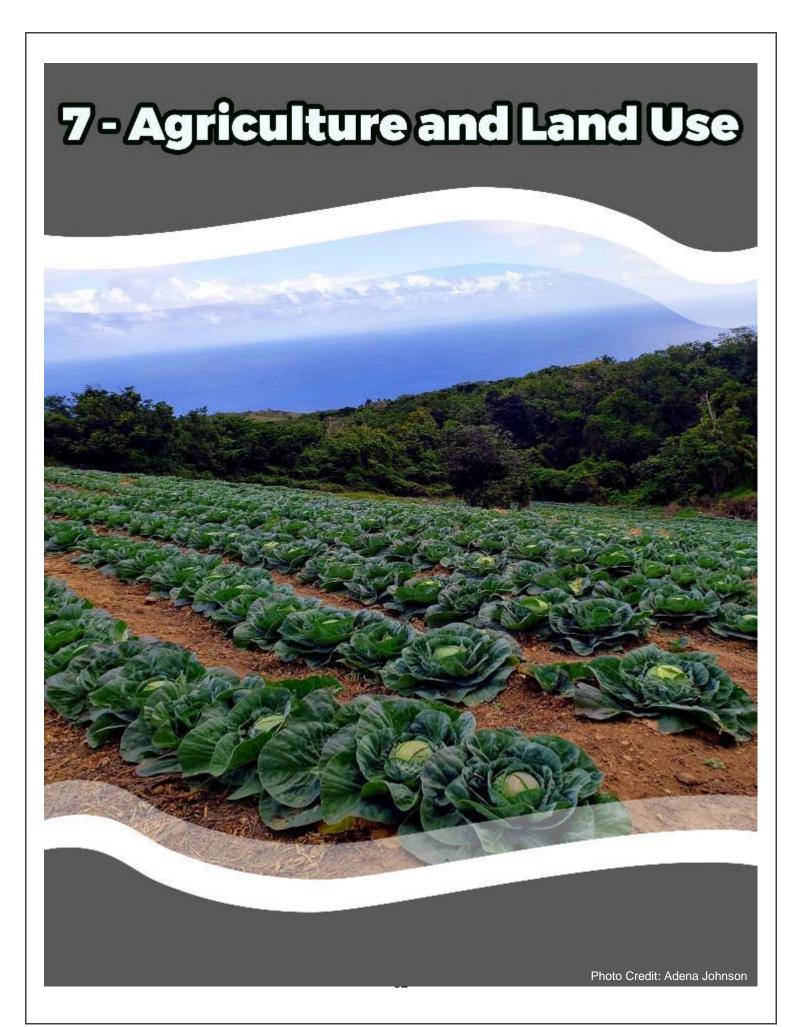
Table 6.14 - Number of licensed motor vehicles per 100 population 2015-2019

Year	Number of Vehicles Licensed	Mid-Year Pop Estimate	Vehicles per hundred persons
2015	2,778	4,801	58
2016	3,035	4,742	64
2017	3,087	4,768	65
2018	3,160	4,667	68
2019	3,141	4,519	70

Note: Vehicles per hundred persons = Number of Vehicles Licensed/Population

7 - Agriculture and Land Use

Photo Credit: Adena Johnson

This section shows Settlement Patterns and Land Use and the trends in agricultural production over the past five years.

Land Use

Results from the 2018 Intercensal Count and Labour Force Census showed that Montserrat's population of 4566 (enumerated) is spread proportionally among the main settlement areas to include Lookout, Davy Hill, St. John's, Brades, St. Peters and Salem. These areas showed rapid development over the years after the volcanic activity, particularly Lookout, which is Montserrat's most recent community, comprising of approximately 300 buildings. In Montserrat, settlement is normally along the ridge lines where the landscape is more favourable for the construction of homes. Along the west coast, are areas such as Woodlands, Olveston, Old Towne and Isles Bay, known as the Beachettes area with majority of the dwellings being villas or vacation homes.

Following the loss of the capital of Montserrat, Plymouth, Brades has developed into the main economic and commercial area of Montserrat. It is where one will find the Government Headquarters and a high concentration of shops and services.

There are not many industrial areas on Montserrat. Quarrying of sand and aggregate are located in the exclusion zone, and the Little Bay area behind the Montserrat Port Authority. A block manufacturing plant is also located in the same vicinity. The island's only bulk fuel facility is located in Carr's Bay. The only power station on Montserrat is found in Brades, in close proximity to the Government Headquarters, and mechanical workshops.

There are three main agricultural land areas in Montserrat, Upper Blakes and Dick Hill (40 acres) located in the north of the island, and the Duck Pond area, north of Salem (60 acres) above the island's only secondary educational institution. There are also smaller farm/agricultural areas across the island and many households practice backyard gardening. Map 7.1 illustrates the land patterns on Montserrat.

Pesticides and Fertilizers

- In 2019, the total value of pesticides imported into Montserrat was EC$603,813, a 7.6 percent decrease from 2018.
- Over the five-year period, 2016 had the greatest value of imports with a value of $670,817 a 13.3 percent increase from 2015. (Table 7.1)
- The value of imported fertilizers in 2019 decreased by 32.5 percent from EC$78,613 in 2018 to EC$53,034. (Table 7.2)

Livestock Production

- There was a significant decrease of total livestock production in 2019 in comparison to the previous years (Table 7.4).
- In 2019 beef, mutton/goat and pork all had over 50 percent decline in production from 2018 while chicken had a 44 percent decrease.
- Over the five-year period pork production was the most dominant followed by poultry.
- In 2019 poultry represented 39 percent (34,767 pounds) of the livestock production, pork 25 percent (22,300 pounds), mutton/goat 24 percent (21,800 pounds) and beef 12 percent (10,300 pounds).

Agricultural Produce

- Table 7.5 shows agricultural production over the last five-year period 2015 – 2019. The most prevalent crops produced were Bananas, Plantains and Sweet Potatoes.
- In 2019, 15,378 pounds of Bananas were produced, 10583 pounds of plantains and 16,194 pounds of sweet potatoes.
- There was a decline in banana production in 2015 and 2018. Sweet potatoes increased by 193 percent in 2019 from 2018, the biggest crop production increase for that period.

Map 7.1 – Land Use Patterns in Montserrat

GOVERNMENT OF MONTSERRAT

Ministry of Agriculture, Land, Housing and the Environment

PHYSICAL PLANNING UNIT in association with IMC WORLDWIDE LTD.

Legend

- —— Main Roads
- —— Minor Roads
- —— Rivers and Ghauts
- —·— Hazard Zones (2011)
- Protected Forest
- Resi High Density
- Resi Medium Density
- Resi Low Density
- Commercial
- Government
- Agriculture
- Education
- Health
- Social Care
- Community, Recreation, Sport
- Religious
- Industrial
- Vegetation

PHYSICAL DEVELOPMENT PLAN FOR NORTH MONTSERRAT 2012-2022

Existing Land Use (2011)

January 2012

Figure 2.4

Table 7.1 - Value of Imported Pesticide by Type (EC$) 2015 - 2019					
Pesticides	**2015**	**2016**	**2017**	**2018**	**2019**
Insecticides	238,832.8	277,092.1	250,185.7	249,560.3	260,092.3
Fungicides	122,869.1	134,399.7	135,988.4	126,763.1	143,549.1
Herbicides	21,962.8	25,402.0	38,568.2	43,885.1	13,894.8
Disinfectants	182,238.5	170,502.2	140,699.5	147,473.6	148,002.3
Rodenticides	12,903.4	25,400.2	32,397.2	51,408.7	15,106.7
Other	13,506.8	38,020.6	29,152.9	34,539.5	23,168.3
Total	**592,313.3**	**670,816.8**	**626,991.8**	**653,630.3**	**603,813.4**

Source: Montserrat Customs and Revenue Services

Table 7.2 - Value of Imported Fertilizers by Type (EC$) 2015 - 2019					
Fertilizers	**2015**	**2016**	**2017**	**2018**	**2019**
Animal/Vegetable	0	0	503.5	1491.3	301.3
Nitrogenous	12,796.5	6,595.8	405.0	479.09	30,133.6
Phosphate	873.9	178.5	3,254.5	0	62.3
Potash Fertilizers	913.8	0	0	1,394.4	14,328.1
Other Fertilizers	45,318.7	63,679.6	39,753.8	75,248.0	8208.4
Total	**59,902.9**	**70,453.9**	**43,916.8**	**78,612.8**	**53,033.7**

Source: Montserrat Customs and Revenue Services

Table 7.3 – Egg Production Monthly – 2015 – 2019 (dozens)

	2015	**2016**	**2017**	**2018**	**2019**
January	3,858	3,500	3,600	2,376	4,039
February	2,670	3,268	3,461	2,576	3,562
March	3,462	3,643	5,023	3,136	4,101
April	3,339	3,269	2,670	3,169	3,389
May	3,125	3,283	3,575	2,490	2,581
June	2,823	3,403	3,365	2,395	2,394
July	3,432	3,245	3,078	2,180	2,864
August	3,525	2,733	3,140	2,003	2,892
September	3,577	1,927	1,982	2,837	2,522
October	4,379	2,294	452	2,579	n/a
November	3,051	2,192	2,283	3,190	n/a
December	3,389	2,778	1,817	3,530	n/a
Total	**36,253**	**40,629**	**35,534**	**34,444**	**28,344**
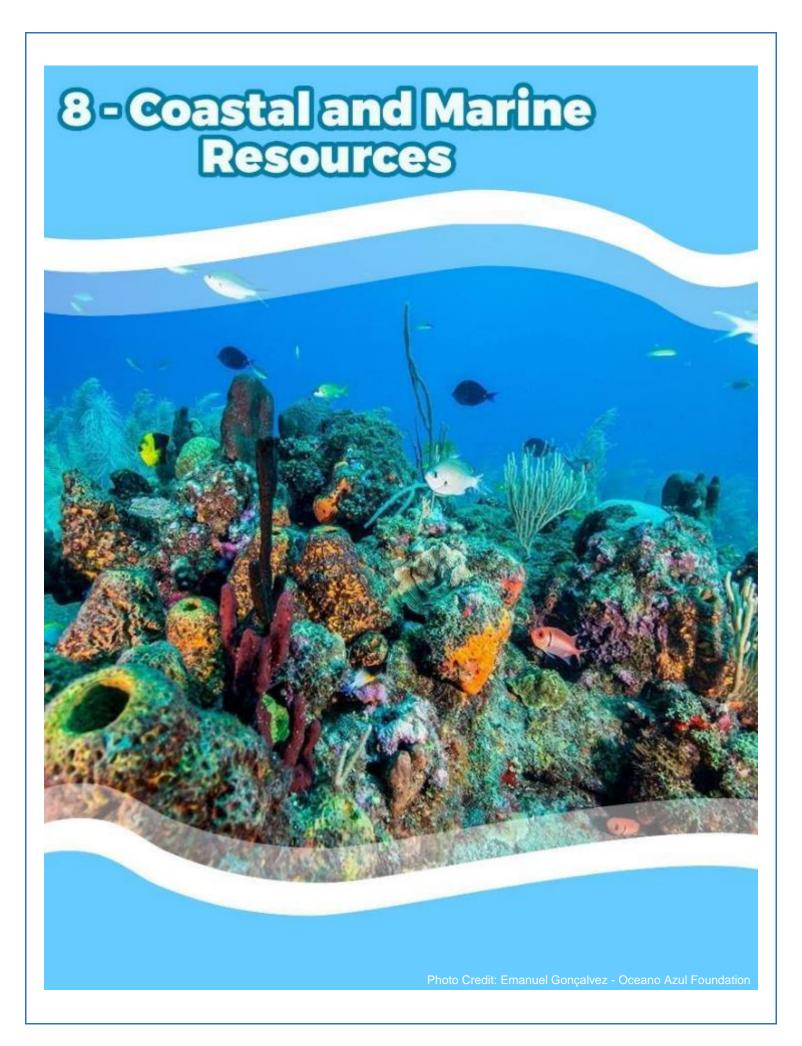
Source: Ministry of Agriculture, Lands, Housing & the Environment

Table 7.4 – Livestock Production (lbs.) Annually 2015 - 2019

	2015	**2016**	**2017**	**2018**	**2019**	**Total**
Beef	35,920	33,170	20,840	21,560	10,300	**121,790**
Mutton/Goat	52,100	48,000	49,700	47,400	21,800	**219,000**
Pork	43,250	60,400	63,800	48,300	22,330	**238,080**
Poultry	43,178	54,716	50,855	41,148	34,767	**224,663**
Total	**174,448**	**196,286**	**185,195**	**158,408**	**89,197**	**803,533**

Source: Ministry of Agriculture, Lands, Housing & the Environment

Table 7.5 - Agricultural Production (lbs.) Annually 2015 - 2019

	2015	**2016**	**2017**	**2018**	**2019**
Banana	10,200	19,189	22,186	11,285	15,378
Breadfruit	1,400	4,067	4,844	1,444	952
Broccoli	225	697	209	50	65
Cabbage	3,050	3,529	1,370	8,901	10,811
Carrots	3,510	12,478	4,191	539	7,321
Cauliflower	0	0	178	153	0
Christophene	75	439	0	495	0
Corn	1,526	2,828	1,701	1,423	200
Cucumber	1,974	4,708	1,902	1,561	1,650
Dasheen	900	5,167	1,488	2,095	3,268
Egg Plant	193	2,716	1,828	2,054	1,330
Ginger	130	345	100	0	0
Hot Pepper	0	0	0	0	40
Lettuce	2,427	2,297	995	1,507	3,195
Okra	2,219	1,910	1,621	1,096	1,320
Onions	1,195	3,703	396	0	3,067
Pachoi	1,167	1,119	604	588	370
Papaya	350	607	631	621	506
Peanuts	0	225	50	0	0
Pineapple	0	0	0	0	2,016
Plantain	7,000	15,664	9,617	10,091	10,583
Pumpkin	4,079	9,346	5,087	2,386	3,608
Seasoning Pepper	1,098	3,819	1,196	2,203	3,327
Spinach	1,186	902	195	302	243
Squash	0	100	150	0	0
String Beans	1,383	3,428	1,760	869	1,094
Sweet Potato	4,946	9,827	4,924	5,510	16,194
Sweet Pepper	2,218	3,458	981	2,600	1,195
Tomato	3,051	3,656	701	4,000	1,147
Watermelon	0	291	0	350	107
White Potato	0	0	0	0	0
Yams	229	999	78	841	590
Corillae	485	75	0	0	50
Avocado	800	1,697	1,677	1,172	1,170
Limes	295	981	454	234	499
Thyme	75	148	0	117	0
Haitie	1,161	1,563	2,045	1,364	1,441
Spring Onions	175	0	0	0	0
Trible	175	147	252	0	0
Bora	0	168	110	237	0
Cassava	435	3,925	5,908	1,704	2,116
Chive	75	0	0	53	184
Sorrel	780	802	332	146	350
Total	**60,187**	**127,020**	**79,761**	**67,991**	**95,387**

Source: Ministry of Agriculture, Lands, Housing & the Environment

8 - Coastal and Marine Resources

This section provides data on Coastal and Marine Resources.

Threatened and Protected Marine Life

Table 8.1 shows marine species found in Montserrat's waters that have been classified as critically endangered or endangered on the International Union for Conservation of Nature (IUCN) red list.

Fisheries

Table 8.2 shows fish landings by type over the five year period 2015 – 2019. Fish landings are determined by the weights received from sample vessels and the figures are based on the Little Bay Catch Site only. Reef fish are the most common type of fish catch. These include species such as the snapper, red hind and butter fish. In 2019, the landing quantity dropped to 21,972 pounds from 29,066 pounds in 2018. Coastal pelagics also are common for fish landings and include locally coined gar and ballahoo. In 2019, there were 12,134 landing pounds of coastal pelagics, a 63 percent decrease from 2018 and the lowest recorded for the past five years. Ocean pelagics are not a very common catch although showing an increase over the years. These include the likes of the Wahoo, Mahi Mahi, King Fish and Tuna. From 2015 – 2019, there has been a 474 percent increase (560 pounds in 2015 to 3,220 pounds in 2019) of ocean pelagics. The decrease in fish landings in 2019 could be as a result of the decrease in fishing trips (Table 8.2) in that same year.

Table 8.1 – Critically Endangered and Endangered Marine Species in Montserrat

Species	Common Name	IUCN Red List Status
Acropora cervicornis	Staghorn coral	Critically Endangered
Etermochelys imbricata	Hawksbill turtle	Critically Endangered
Sphyrna mokarran	Squat-headed hammerhead shark	Critically Endangered
Carcharhinus longimanus	Oceanis Whitetip shark	Critically Endangered
Epinephelus striatus	Nassau grouper	Critically Endangered
Pristis pectinata	Smalltooth sawfish	Endangered
Millepora striata	Fire Coral	Endangered
Montastraea annularis	Boulder star coral	Endangered
Montastraea faveolata	Mountainous star coral	Endangered
Chelonia mydas	Green turtle	Endangered
Thunnus thynnus	Atlantic bluefin tuna	Endangered
Anguilla rostrata	American eel	Endangered
Balaenoptera borealis	Sei Whale	Endangered

Source: IUCN Red List
A Review of the Ecology and Economics of Montserrat's Marine Resources, Waiit Institute

Table 8.2 – Fish Landings by Type and Quantity (lbs), Annually 2015 - 2019

Type of Fish	2015	2016	2017	2018	2019
Reef Fish	37,561	38,537	31,827	29,066	21,972
Ocean Pelagics	560	2,035	2,159	2,693	3,220
Coastal Pelagics	30,406	26,752	23,166	32,965	12,134
Shark	87	594	245	409	609
Turtle	0	0	0	70	0
Conch	135	0	0	0	0
Lobster	11	465	410	442	369
TOTAL	**68,749**	**67,918**	**57,807**	**65,204**	**38,303**
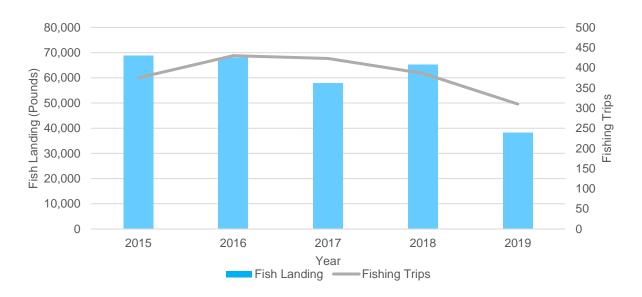
Source: Ministry of Agriculture, Lands, Housing & the Environment - Fisheries Division

Table 8.3 – Number of Fishing Trips, Annually 2015 - 2019

Year	Fishing Trips
2015	375
2016	430
2017	423
2018	386
2019	310

Source: Ministry of Agriculture, Lands, Housing & the Environment - Fisheries Division

Chart 8.1 – Fish Landing (lbs) and Fishing Trips 2015 – 2019

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9 - Forestry and Biodiversity

Life on Land
Sustainable Development GOAL #15

Protect , restore and promote sustainable
use of terrestrial ecosystems,sustainably
managed forest, combat desertification and
halt and reverse land degradation
and halt biodiversity loss.

Photo Credits: Nia Golden
Tevez Aymer
Agnaleszka Ogrodowczyk
Andrew McRob

This section provides information on Forestry and Biodiversity.

The natural vegetation of Montserrat is that of tropical forest which ranges from a dry tropical forest in the lowlands to montane elfin forests at the highest peaks. Montserrat's total forest area is 21.82 square miles (sq. mi), which represents 55% of Montserrat's total land area (Table 9.1 and Chart 9.1). The Centre Hills, Montserrat's only recorded protected forest area, and the Silver Hills Forest Reserve, cover 11 percent of the total land area and 30 percent of the land area in the north[1]. The Centre Hills comprises of the largest remaining forest area (2745 acres)[2], where native and non-native tress are mixed – the result of early agricultural ventures. The Silver Hills Forest Reserve covers 63 acres[2] of forest and is surrounded by a complex mosaic of habitat and human activity. Its coastal cliffs support the breeding population of migratory (sea) birds. There are currently no known wetlands on the island which has resulted in the decline of attraction of seasonal birds. Foxes Bay Bird Sanctuary, which was destroyed largely by heavy ash fall, and Piper's Pond in Carr's Bay were the last known wetlands on Montserrat.

Biodiversity refers to the variety of life, including the number of species, life forms, genetic types, and habitats and biomes (which are characteristic groupings of plant and animal species found in a particular climate). The importance of biodiversity in Montserrat is evaluated in terms of abundance of species in a particular area, the number of species that are unique to a particular area (endemism) and the threat to each species.

Montserrat's ecosystem has been drastically transformed from since the arrival of the early European settlers. A walk through the Centre Hills will show evidence of its cultivated history. Forest trees were cleared during the plantation era making way for the production of sugar and charcoal, and for timber. Eventually, the majority of the main forest areas were reverted to secondary forests.

Montserrat is home to a number of endemic and regional restricted range plants and animals; that is species which are unique to the island. To date only the Centre Hills has been fully assessed and it is home to a variety of flora and fauna, including all but one of its endemic species. The Centre Hills, as assessed by Sanders 2006[3], qualifies as an 'Important Bird Area (IBA)' as it supports a significant grouping of 'restricted range (bird)

species'. The Montserrat Oriole, the island's national bird, once classified as Critically Endangered by the International Union for Conversation of Nature (IUCN) Red List has now downgraded to the vulnerable level due to the reduction of volcanic activity and the implementation of a species monitoring action plan over the years hence increasing the population (Table 9.2). There are six species of reptiles unique to Montserrat to include the Montserrat galliwasp, a rarely sighted lizard (Table 9.3). There are three known endemic plant species on Montserrat – the Montserrat Orchid, the Pribby, and the *xylosma serrata* which is suspected to be extinct (Table 9.4).

The bat fauna of Montserrat has an impressive ten species (Table 9.5) and they specialize in a range of different foods. The white-line bat is considered to be an endangered species[4] and the yellow-shouldered bat once considered endangered is now at the 'near-threatened' status (IUCN Red List). Bats play an important role in our ecosystem. Some plants depend partly or wholly on bats to pollinate their flowers or spread seeds, these include plants such as mango and banana. Bats also help with pest control by eating insects. Bats are known as *keystone species*[4] because of their ability to forage over wider areas in the forest hence making their seed dispersal greater, especially after natural disasters such as hurricanes helping to regenerate forest areas.

Note to Readers

Land Area - Land area is the area in square kilometres/miles of the land-based portions of standard geographic areas.
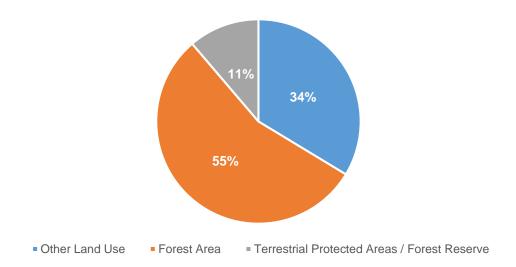
Protected Area - A protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. (IUCN Definition 2008)

[1] – Physical Development Plan 2012 – 2022

[2] – Government Information System

[3] – Important Bird Areas in the United Kingdom Overseas Territory, Sarah Sanders (2006)

[4] – Montserrat – A Guide to the Centre Hill

Table 9.1 – Forest Area and Protected Biodiversity Area as Proportion of Total Land Area	
Total Land Area	39.5 sq. mi
Other Land Use	13.33 sq. mi
Forest Area	21.82 sq. mi
Terrestrial Protected Area / Forest Reserve	4.41 sq. mi

Source: Physical Planning Unit - Government Information System

Chart 9.1– Percentage Distribution - Forest Area and Protected Biodiversity Area as Proportion of Total Land Area

- Other Land Use - Forest Area - Terrestrial Protected Areas / Forest Reserve

It should be noted that a large proportion of Montserrat is covered by Pyroclastic flows and other volcanic deposits. This increase in sedimentation has resulted in an expansion of the island. Prior to the volcanic activity, 71% of the island was covered with forest. In addition, the ratio of areas protected to maintain biodiversity to the area in the safe zone (North Montserrat – 15.5 sq mi) is 1:5 (Source – GIS Department Physical Planning Unit)

Table 9.2 - Occurrence of Restricted Range Bird Species in Montserrat		
Name	**Scientific Name**	**IUCN Status**
Montserrat Oriole	*Icterus oberi*	Vulnerable
Forest Thrush	*Cichlherminia Ilherminieri*	Globally Threatended - Vulnerable
Bridled-Quail Dove	*Geotrygon mystacea*	Least Concern
Purple-throated Carib	*Eulampis jugularis*	Least Concern
Green-throated Carib	*Eulampis holosericeus*	Least Concern
Antillean Crested Hummingbird	*Orthorhyncus cristatus*	Least Concern
Lesser Antillean Flycatcher	*Myiarchus oberi*	Not Listed
Brown Trembler	*Cinclocerthia ruficauda*	Least Concern
Scaly-breasted Thrasher	*Margarops fuscatus*	Least Concern
Pearly-eyed Thrasher	*Margarops fuscus*	Least Concern
Lesser Antillean Bullfinch	*Loxigillia noctis*	Least Concern

Source - Important Bird Areas in the United Kingdom Overseas Territories
        IUCN Red List

The bird community of Montserrat is typical of the Lesser Antilles. Species such as pigeons and doves are ubiquitous in all habitats of Montserrat, whereas species such as owls, woodpeckers and parrots are absent. Majority of resident birds feed on insects, small seeds nectar and small vertebrates. The passage of migratory species on Montserrat is perhaps under recorded as they are normally unobtrusive and their calls are less familiar to residents and observers.

The Montserrat Oriole is the island's only endemic bird. It is found in the mesic and wet forest areas. It is recorded to have a small population with a recorded 400-700[1] pairs, majority of which are in the Centre Hills. While natural disasters such as hurricanes continue to be a natural feature for Caribbean Islands, they pose a major threat to the Montserrat Oriole. If these disasters occur in close space, coupled with anthropogenic pressures then the oriole is clearly vulnerable to extinction.

The Forest Thrush, a forest interior species, is restricted to Montserrat, Guadeloupe, Dominica and St Lucia and is globally threatened due to the vast decline in recent years. Once thought to be common in Guadeloupe and St Lucia it is now very rare in these two places. It is suspected that Montserrat may be the species stronghold giving us the responsibility to ensure its protection. The Lesser Antillean flycatcher is a rare species on Montserrat with an unclear status and is occasionally detected in the lowland dry forest. Bird species such as the scaly-naped pigeon, zenaida dove, Antillean Crested Hummingbird, Scaly-breasted thrasher, pearly eyed thrasher and bananaquit appear to be the most common species on Montserrat.

Unlike many forests around the world, Montserrat's protected forest areas are presently not extensively threatened by potential development. Residents are cognizant of the importance and value of the forests, especially for its economic value for tourism, agriculture (watershed protection) and cultural benefits. The real threat to Montserrat's ecosystem is from invasive alien species which are being carefully managed to ensure sustainability of bird fauna in Montserrat.

[1] – A Biodiversity Assessment of Centre Hills – Richard P. Young

Local Name	Latin Name	IUCN Status	
Mountain Chicken	*Leptodactylus fallax*	Critically Endangered	
Montserrat Galliwasp	*Diploglossus montisserrati*	Critically Endangered	**
Montserrat Ameiva; ground lizard	*Pholidoscelis pluvianotatus*	Near Threatened	**
Montserrat Skink	*Mabuya montserratae*	Critically Endangered	
Montserrat Worm Snake	*Antillotyphlops monastus*	Near Threatened	
Tree Lizard, Green Lizard	*Anolis lividus*	Not Listed	**
Coffin Borer	*Typhlops monastus monastus*	Not Listed	**
Black Snake	*Alsophis antilllensis manselli*	Not Listed	**
Gecko	*Sphaerodactylus fantasticus ligniservulus*	Not Listed	**

Table 9.3 - Amphibians and Reptiles of Montserrat - Endangered /Threatened Species / Endemic to Montserrat

Source - IUCN Red List

** Endemic to Montserrat

There is a recorded three species of Amphibian and eleven terrestrial reptiles on Montserrat, although it is believed that of these species, five were introduced (imported). The reptile and amphibian species of Montserrat are similar to that of the Lesser Antilles region. There are six species / subspecies endemic to Montserrat to include the Montserrat Galliwasp, Montserrat Ameiva or ground lizard, Montserrat Tree Lizard, the coffin Borer (Montserrat blind snake), the Black Snake and the Southern Leeward Dwarf Gecko. Some species are not very known or quite often seen to include the Montserrat Blind Snake and the Galliwasp but others such as the tree lizard and marine toad (crapaud) are quite abundant across the habitats.

The Mountain Chicken, *Leptodactylus fallax*, is a huge frog that lives in the forests and as its name indicates has been traditionally used as a food source (once the national dish of Dominica). Montserrat now supports most of the remaining population of the Mountain Chicken, following its extinction on all other islands except Dominica, and is listed as critically endangered on the IUCN Red List. The vast decline in numbers of the Mountain Chicken in Dominica over the years was due to the chytrid fungus. In Montserrat, initially, the population of the Mountain Chicken was affected by the volcanic eruptions, the ashes destroying the wet forest and this frog species. Recently, surveys have revealed that the fungus has been spreading through the island and resulted in a high mortality rate in the frog population. Since then, the Mountain Chicken Recovery Program by the Darwin Initiative has geared to promote healthy populations among the frog species.

The Montserrat Galliwasp, a large skink-like lizard and the only representative of the Anguidae in the Lesser Antilles is endemic to Montserrat. Listed as critically endangered on the ICUN Red List, it is extremely rare with inconspicuous sightings, and at one point was considered to be extinct especially after the disastrous Soufriere Hills Volcano Eruption. There have only been a few sightings in the Centre Hills area, particularly in the Woodlands Springs Area suggesting that the range is highly restricted. The Galliwasp is considered to be nocturnal and semi-fossorial, that is more active at nights and often times digging and living underground.

Amphibians and reptiles in Montserrat face a common threat quintessential to the rest of the Caribbean. The negative pressures of invasive mammals such as rats and goats, and habitat destruction for agriculture or development can significantly impact the population of these species. Amphibians in addition face an even greater threat from the ash falls from the Soufriere Hills volcano due to their permeable skin[2].

[2] – Montserrat – A guide to Centre Hills

Table 9.4- Plants on Montserrat - Endangered / Threatened		
Local Name	**Latin Name**	**IUCN Status**
Pribby	*Rondeletia buxifolia Vahl*	Critically Endangered **
Montserrat Orchid	*Epidendrum montserratense* Nir.	Critically Endangered **
No Local Name	*Xylosma serrata Urb.*	Suspected Extinct **
Red Cedar	*Cedrela odorata L.*	Vulnerable
West Indian Mahogany	*Swietenia mahagoni* (L.) Jacq	Near Threatened

Source - Montserrat - A guide to the Centre Hills / IUCN Red List

** - Endemic to Montserrat

Montserrat, unlike the other Caribbean Islands have received little botanical exploration. It was only in 1979 that Mr. Richard Howard produced an extensive checklist of the flora of Montserrat as part of his work The Flora of the Lesser Antilles (1979), which is perhaps the most comprehensive botanical inventory of Montserrat. The plant inventory of Montserrat is approximately one thousand species, majority of which are recorded to be found in the Centre Hills area, a forest which comprises of a myriad of habitats supporting a range of plants. Howard's work shows that Montserrat is home to seventy-eight plant species, of these, three are endemic to the island, seventy are endemic to the Lesser Antilles, and five exceed the Lesser Antilles but restricted to only a small area outside of this group of islands.

Of the three species endemic to the island, two are easily seen along the Blackwood Allen and Underwood Trails[2], the Pribby (*Rondeletia buxifolia Vahl*) and the Montserrat Orchid (*Epidendrum montserratense Nir.*). The Pribby is a small shrub with slender arching branches and prefers and edge habitat, being found outside the edge of the Centre Hills forest reserve. Its status as recognized by the IUCN is critically endangered. It has been observed that a significant population of this plant had been lost due to clearance of forest habitat for development. The Montserrat Orchid is a small bulb-like thickened plant and is found growing on the branches of large trees. It is also listed as critically endangered. The *xylosma serratum* is a small tree that has only been recorded from one site in Montserrat – The Great Alps in the South Soufriere Hills. The site has since been destroyed by the pyroclastic flows of the 1995-1997 volcanic eruptions. This plant species is now suspected to be extinct. It should be noted however that the habitats of Centre Hills are similar to that of the Great Alps and although explorations have failed to find this species there is a likelihood that the species exists in the Centre Hills Forest area.

The real threat to the flora of Montserrat are mainly from feral mammals such as pigs and rats due to uprooting of vegetation (to pigs) and loss of seeds (by rats). Additionally, the impact of invasive species continue to be a concern for conservation as more than one hundred and fifty alien species have been identifed in the Centre Hills area to include the *spathoglottis plicatta* and the guava and the Australian Pine outside of the Centre Hills forest reserve.

While we acknowledge the threats to the flora of Montserrat, the more cognizant we become of the habitats and forest areas, we will gain a greater appreciation of its value, ensuring sustainability for the future Montserrat's flora.

[2] – Montserrat – A guide to Centre Hills

Table 9.5 - Bats of Montserrat		
Name	**Scientific Name**	**IUCN Status**
Jamaican Fruit Bat	*Artibeus jamaicensis*	Lower Risk (Least Concern)
Tree bat	*Ardops nichollsi*	Lower Risk (near threatened)
Lesser Antillean Fruit Bat	*Brachyphylla cavernarum*	Lower Risk (Least Concern)
White-line Bat	*Chiroderma improvisum*	Endangered
Yellow-shouldered Bat	*Sturnira thomasi*	Near Threatened
Long-tongued Bat	*Monophyllus plethodon*	Lower Risk (Least Concern)
Fishing Bat	*Noctilio leporinus*	Lower Risk (Least Concern)
Funnel-eared Bat	*Natalus stramineus*	Lower Risk (Least Concern)
Brazilain free-tailed bat	*Tadarida brasiliensis*	Lower Risk (near threatened)
Velvety House Bat	*Molussus molussus*	Lower Risk

Source - Montserrat - A guide to the Centre Hills
IUCN Red List

The number of species of bats found on an island is linked to the size of the island, the distance from the source and the diversity of the available habitats. The bat fauna on islands north of Guadeloupe is similar irrespective of rainfall and habitat diversity. Montserrat has a simple bat fauna consisting of one piscivore, one omnivore, one nectarivore, four frugivores and three insectivorous species[3]. Montserrat's bat fauna (ten species) falls above the regression line in relation to other islands of similar size. It is postulated that the bat diversity in Montserrat is due to its downwind position and proximity to Guadeloupe, a larger more diverse island with twelve bat species[3]. Additionally, Montserrat's tall mountains and landscape and the fact that it is not as developed as other countries as a tourist destination and has not suffered much of land development all contribute to its diverse bat fauna.
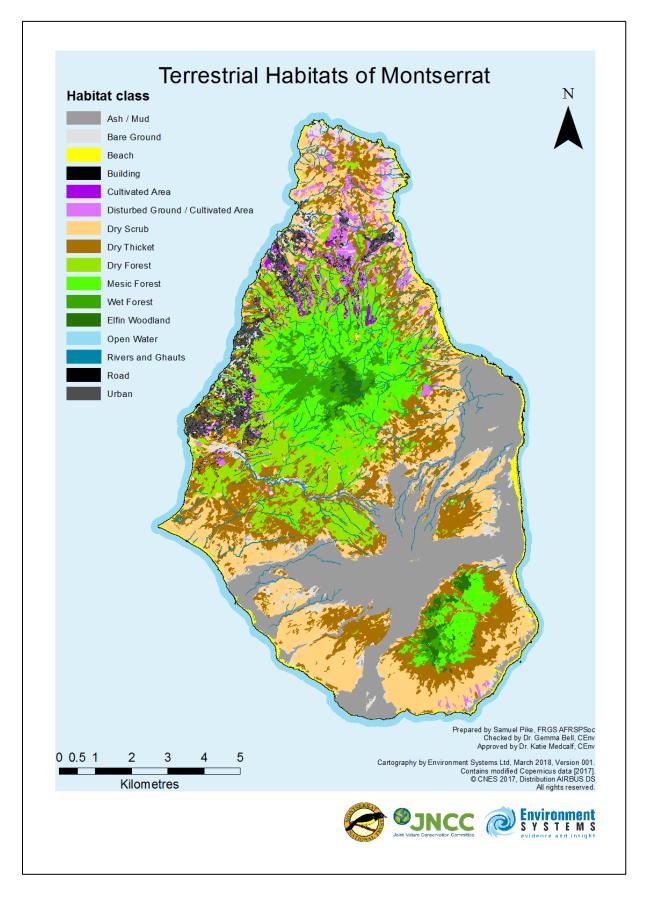
Montserrat is home to one near threatened bat species – the yellow-shouldered bat (*Sturnira thomasi*) and one endangered, the White-line bat (*Chiroderma improvisum*). The yellow-shouldered bat is only known from Montserrat and Guadeloupe. The sub-species population on the island (*Sturnira thomasi vulcanesis*) is unique to Montserrat and has been named after the volcano. It has been recorded with certainty only on three occasion in Montserrat. It is thought to
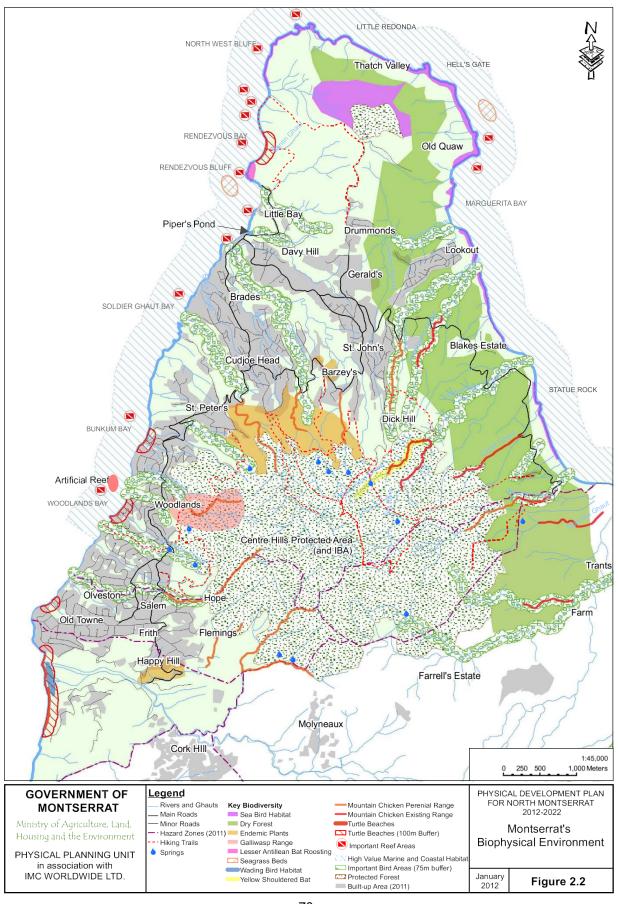
be mainly frugivorous (fruit-eating) and is found in deep-well rooted protect ghauts on the windward side of the island[2]. There is little data on the white-lined bat because of its extreme rarity. These bats generally inhabit deeper parts of the forest making it difficult to conduct a comprehensive study on them and like the yellow-shouldered bat is also a fruit-eating species.

Bats on Montserrat are currently threatened by a number of activities. Volcanic activity still poses threats to the bat population as it has in the past, destroying a number of sites in the south of Montserrat. Presently, a cave in the Little Bay area houses an approximately 5000-6000 bats of the Lesser Antillean Fruit Bat species (*Brachyphylla cavernarum*) and potential development of this area is likely to endanger this colony. Caribbean islands are subjected to meterological extremes and Montserrat is of no exception. Hurricanes pose a yearly threat that can devastate the landscape hence destroying habitats.

Given their importance to the functioning of forests, a continuing monitoring of the bat fauna on Montserrat to produce a more representative sample is anticipated.

[2] – Montserrat – A guide to Centre Hills

[3] - Bats of Montserrat: Population Fluctuation and Response to Hurricanes and Volcanoes, 1978-2005

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Map 9.1 - Terrestrial Habitats of Montserrat

Terrestrial Habitats of Montserrat

Habitat class

- Ash / Mud
- Bare Ground
- Beach
- Building
- Cultivated Area
- Disturbed Ground / Cultivated Area
- Dry Scrub
- Dry Thicket
- Dry Forest
- Mesic Forest
- Wet Forest
- Elfin Woodland
- Open Water
- Rivers and Ghauts
- Road
- Urban

N

0 0.5 1 2 3 4 5

Kilometres

Prepared by Samuel Pike, FRGS AFRSPSoc
Checked by Dr. Gemma Bell, CEnv
Approved by Dr. Katie Medcalf, CEnv

Cartography by Environment Systems Ltd, March 2018, Version 001.
Contains modified Copernicus data [2017].
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Joint Nature Conservation Committee

Environment
SYSTEMS
evidence and insight

Map 9.2 - Montserrat's Bio-Physical Environment

GOVERNMENT OF MONTSERRAT

Ministry of Agriculture, Land, Housing and the Environment

PHYSICAL PLANNING UNIT
in association with
IMC WORLDWIDE LTD.

Legend

Rivers and Ghauts
Main Roads
Minor Roads
Hazard Zones (2011)
Hiking Trails
Springs

Key Biodiversity
Sea Bird Habitat
Dry Forest
Endemic Plants
Galliwasp Range
Lesser Antillean Bat Roosting
Seagrass Beds
Wading Bird Habitat
Yellow Shouldered Bat

Mountain Chicken Perenial Range
Mountain Chicken Existing Range
Turtle Beaches
Turtle Beaches (100m Buffer)
Important Reef Areas
High Value Marine and Coastal Habitat
Important Bird Areas (75m buffer)
Protected Forest
Built-up Area (2011)

PHYSICAL DEVELOPMENT PLAN
FOR NORTH MONTSERRAT
2012-2022

Montserrat's
Biophysical Environment

January 2012 | **Figure 2.2**

Annex

Hazard Level Map

Hazard Level 3

A
B
F
T
C
V
E
W

Daytime transit

Access Restrictions

Unrestricted - Ashfall and lahars can be significant hazards in all areas, and require appropriate precautions.

Daytime access – Access is permitted from 6:30 am until 5:30 pm. Access gates will be locked at all other times.

Daytime access to some areas - Areas will be defined depending on state and location of the volcanic activity.

Daytime transit - Boats permitted to travel through the MEZ without stopping from 6:30 am until 5:30 pm.

Controlled access - No access without approval from NDPRAC. Approval considered on a case-by-case basis. Gates will be locked at all times.

Essential workers - No access apart from MVO and associated staff. Access for essential maintenance only with approval from NDPRAC. Gates will be locked at all times.