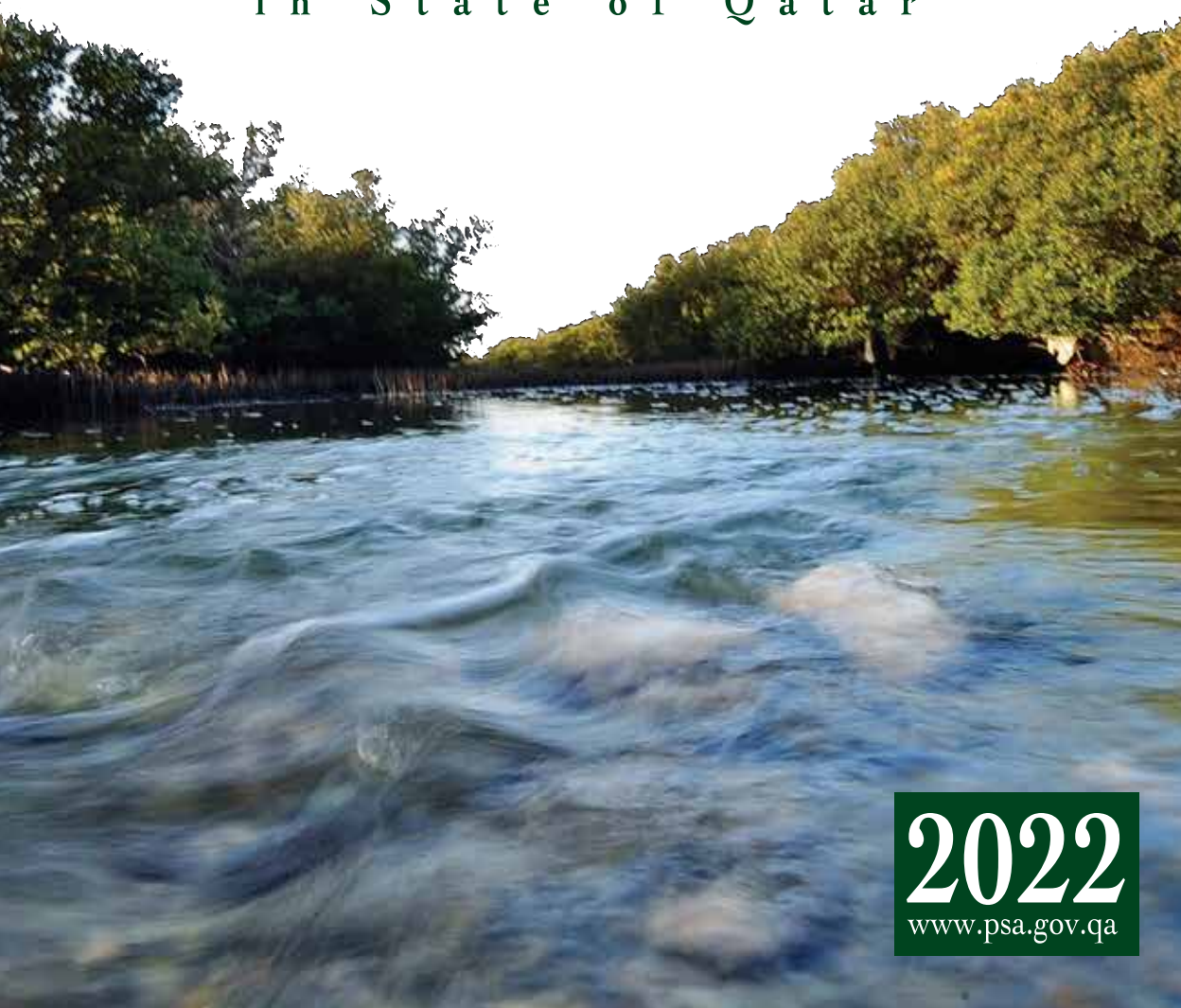
جهاز التخطيط والإحصاء
Planning and Statistics Authority

Environmental Statistics

in State of Qatar



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In the State of Qatar 2020

June 2021

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Preface

The Planning and Statistics Authority (PSA) is pleased to present its Fifth Environment Statistics Report 2020. The scope of environment statistics includes the media of the natural environment (air/climate, water, land/soil), flora and fauna found within these media and human settlements.

Since the Environment Statistics are multi-disciplinary and multi-sourced and are collected following various approaches, they are considered as a necessary database for the development of environment indicators that serve multiple purposes such as the objectives of the National Environment Strategy. They also contribute to more than 60% of the 2030 SDGs, as well as competitiveness indicators and other regional and international requirements. The Environment Statistics are the core of the environment accounts which measure the impact of economy on the environment as well as the goods and services the environment provides free of charge to the economy and communities. These ecosystem services include the provision of natural resources (e.g. fish, water and soil) and recreational services for the purpose of sports, tourism and leisure.

The environmental development, being the fourth pillar of QNV 2030 articulated in the 1st National Development Strategy 2011-2016 and 2nd National Development Strategy 2018-2022, emphasizes the importance of integrated programs that are based on modern and comprehensive environment statistics to inform about the quality and availability of natural resources, human activities and natural incidents affecting the environment, the impacts of such activities and incidents, and the social response to these impacts so as to reduce overexploitation of resources and damage to the environment as a result of rapid population and economic growth. This in turn leads to pollution of air and water resources, depletion of groundwater, disruption of ecosystems and subsequent loss of biological species and biodiversity, and increased problems arising from misuse of land, as well as issues related to energy use and climate change.

The PSA receives environmental data from several sources, such as the ministries and relevant government agencies and institutions .In order to provide these basic environmental data and indices in conformity with international standards to serve planners, workers, researchers and those interested in the environment, there must be a coordination between relevant ministries and institutions. Such coordination has become very important to resolve environmental issues in this regard, and to create an updated environmental database to act as a national reference based on the latest international standards, and a reliable source for environment information, in order to take knowledge-based

decisions, and to provide the public with a comprehensive report on the state of the environment .

The report is prepared based on Qatar Environment Statistics National Framework emanating from the UN Environment Statistics Framework, and the DPSIR framework. This framework consists of the driving forces affecting the environment and the pressures generated by the needs of these forces (population and economy) on the environment, state of the environment in light of these resulting pressures and impacts to meet such needs, and the role of the government and various sectors in protecting and managing the environment.

This report shows the significant progress made by the State of Qatar in response to the challenges reflected in the environmental change, both in the state of natural assets and the quality of environmental conditions and services, resulting from pressures caused by the population and economic growth. The response came in different aspects, such as the provision of financial and human resources, environmental education and legislative structures needed to protect and manage the environment.

Moreover, the report highlights the need to improve the quality of comprehensive data and to bridge data gaps (such as the data related to solid waste, biodiversity, emission of greenhouse gases, expenditures on environment protection and environment labor force) in close collaboration with all key stakeholders, both government and non-government .All the statistics included in this report will be available on PSA website.

The Planning and Statistics Authority avails this opportunity to extend its sincere thanks and appreciation to all ministries, government departments and public and private institutions that have contributed to the statistical information in this report. The PSA anticipates that those interested in this field will provide their objective and constructive observations that can contribute to the development and improvement of future issues of this report, and improve the quality of environment statistics in Qatar.

Dr. Saleh M. Al-Nabit
President of the Planning and Statistics Authority

Contents

Introduction

Qatar National Vision QNV 2030 pays special attention to the environment pillar, which is unparalleled in many Middle Eastern countries. It accords equal importance to the environmental development pillar with the rest of QNV's four pillars; human development, social development and economic development.

The Environment Statistics Report reflects PSA's effectiveness in publishing updated comprehensive environment statistics that serve as a national reference and an index of measurement of the environment sector's national strategy, which is the executive tool of QNV 2030. The report also helps in the establishment of a national environment database that serves as a beacon for researchers, planners, academics and entrepreneurs .

Objectives of the Environment Statistics Report:

1. Provide statistical data on various environment elements and their distribution in Qatar, and monitor the environment indicators in terms of the state of the environment and the impact on the environment, among others.
2. Combine planning tools with the environment statistical indicators.
3. Monitor the value of Qatar's contributions and assistance to preserve the global environment.
4. Measure goods and services provided by the environment to the economy, and measure the impact of the economy on the environment.
5. Increase community awareness of the importance of preserving the environment, and support efforts to protect the environment.
6. Provide data on available and stocked natural resources and the safe extraction of those resources.
7. Provide data on environment pollutants by types, sources and impact on the environment.
8. Provide information about the responses and actions taken to protect the environment in Qatar.
9. Contribute to the provision of data for indicators of environmental sustainable development goals, especially in the second and third levels, which still require effort and work at the level of methodologies and availability of data sources.

The report comprises five chapters as follows-:

Chapters of the Report	Scopes
1. Environment indicators in the 2030 Sustainable Development Goals	1. Summary of the environment indicators in the 2030 Sustainable Development Goals
2. Driving Forces	1. Geographical and natural characteristics of the State of Qatar 2. Population indicators 3. Economic indicators

Chapters of the Report	Scopes
3. Pressure on the Environment	1. Land use 2. Water demand 3. Power generation 4. Means of transport 5. Completed buildings' connection with public utilities 6. Residential units' connection with public utilities 7. Wastewater from urban areas
4. State of the environment and impact on the environment	1. Climate, lunar/solar eclipse and earthquakes 2. Biodiversity 3. Water resources 4. Solid waste 5. Hazardous waste 6. Energy consumption 7. Air quality 8. Greenhouse gases 9. Ozone depleting substances 10. Diseases related to environmental pollution
5. Response activities for environment protection and management	1. Spending on environment protection 2. Workers, volunteers and trainers in various environmental programs 3. Environmental compliance activities 4. Sustainability assessment and green buildings 5. Environmental awards 6. National authorities and institutions that publish sustainability reports 7. Scientific research, projects and academic program research on various environmental activities 8. Environmental legislation, laws and international agreements 9. New projects subject to environmental impact assessment 10. Environmental education 11. Environmental Investment (green economy) 12. Preparedness for natural disasters

Environment Data Sources

The environment statistics data is obtained from several sources: administrative records of data producing entities, general censuses and specialized environmental surveys.

1. Data of Administrative Records from Environment-Protection Authorities

The environment statistics are collected from various environment-related ministries and government institutions and administrations based on their competence, and from private organisations and associations working in the field of environment. They are also collected from various statistical departments within the PSA, such as the Information Systems Dept. These public and private institutions concerned with the environment are contacted and visited in order to provide updates on environmental data and information and to clarify emerging requirements from these institutions.

2. General Census

The data on completed buildings and residential units connected to public utilities (water, electricity and sewage network) are collected through the general census which is conducted every 10 years.

3. Specialized Environmental Surveys

The environment data and information are collected through pre-prepared questionnaires that target several public and private agencies concerned with the environment. The District Cooling Survey was carried out targeting national private and public entities in various economic sectors which apply district cooling system for their own use or other entities that apply district cooling system to provide cooling service for their customers.

This report targets decision-makers and program planners working in environment-related government agencies and institutions, universities and scientific research centers, various media, environment protection and conservation activitists, and environment-related regional and international organizations.

Chapter One
The Environment Indicators in the 2030 Sustainable Development Goals

The Environment Indicators in the 2030 Sustainable Development Goals

This chapter includes the prominent environmental indicators of the State of Qatar in the sustainable development goals, which highlight the progress made over the years for the demographic, economic, educational and other intersections.

1. Summary of the Environment Indicators in the 2030 Sustainable Development Goals

1-4-1 Proportion of population living in households with access to basic services

Table (1.1): Proportion of population living in households with access to basic services (2016-2020)

Basci Services	2030 SDG Indicator	Unit	2016	2017	2018	2019	2020	Goal by 2030
Drinking water service	6.1.1 6.2.1	%	100%	100%	100%	100%	100%	100%
Sanitation service		%	100%	100%	100%	100%	100%	100%
Hygiene facilities		%	100%	100%	100%	100%	100%	100%
Electricity	7.1.1 7.2.1	%	100%	100%	100%	100%	100%	100%
Clean fuel		%	100%	100%	100%	100%	100%	100%
Mobility	9.1.1 11.2.1	%	100%	100%	100%	100%	100%	100%
Solid waste collection	11.6.1 12.4.2 12.5.1	%	100%	100%	100%	100%	100%	100%
Liquid waste collection		%	100%	100%	100%	100%	100%	100%
Healthcare	3.7.1 4.1.1 1.c.9 17.6.1 17.8.1	%	100%	100%	100%	100%	100%	100%
Education		%	100%	100%	100%	100%	100%	100%
Broadband Internet		%	100%	100%	100%	100%	100%	100%
Telecommunications		%	100%	100%	100%	100%	100%	100%
Transport routes	9.1.1	%	100%	100%	100%	100%	100%	100%
Banking services	8.10.1 8.10.2	%	100%	100%	100%	100%	100%	100%
Total population with access to all services		%	100%	100%	100%	100%	100%	100%

Source: PSA

1-4-2 Proportion of total adult population with secure tenure rights to land, (a) with legally recognized documentation and (b) who perceive their rights to land as secure, by sex and type of tenure.

Table (1.2): Number and percentage of adult owners (18 years and above) by sex (2016-2019)

Ownership Type	Nationality	Sex	Age Group	Unit	2016	2017	2018	2019
Individual Ownership	Qataris	Male	18 years and above	Number	6160	5292	6071	5994
		Female	18 years and above	Number	3313	3333	3467	3861
		Total	18 years and above	Number	9473	8625	9538	9855
	Non-Qataris	Male	18 years and above	Number	83	73	87	88
		Female	18 years and above	Number	119	136	114	129
		Total	18 years and above	Number	202	209	201	184
	Total	Male	18 years and above	Number	6243	5365	6158	6049
		Female	18 years and above	Number	3432	3469	3581	3990
		Total	18 years and above	Number	9675	8834	9739	10039
Collective ownership that includes owners, heirs, orphans, establishments and others	Qataris	Joint ownership by both sexes	18 years and above	Number	117	126	87	104
	Non-Qataris	Joint ownership by both sexes	18 years and above	Number	16	11	9	6
	Total	Joint ownership by both sexes	18 years and above	Number	133	137	96	110
Individual Ownership	Qataris	Male	18 years and above	%	7.8	6.4	7.2	6.9
		Female	18 years and above	%	3.9	3.7	3.8	4.1
		Total	18 years and above	%	5.7	5.0	5.4	5.4
	Non-Qataris	Male	18 years and above	%	0.00	0.00	0.00	0.00
		Female	18 years and above	%	0.03	0.04	0.03	0.03
		Total	18 years and above	%	0.01	0.01	0.01	0.01
	Total	Male	18 years and above	%	0.4	0.3	0.3	0.3
		Female	18 years and above	%	0.8	0.7	0.7	0.8
		Total	18 years and above	%	0.4	0.4	0.4	0.4
Collective ownership that includes owners, heirs, orphans, establishments and others	Qataris	Joint ownership by both sexes	18 years and above	%	0.1	0.1	0.0	0.1
	Non-Qataris	Joint ownership by both sexes	18 years and above	%	0.0	0.0	0.0	0.0
	Total	Joint ownership by both sexes	18 years and above	%	0.0	0.0	0.0	0.0
Gender Parity Index	Qatari individual ownership			Male / Female	0.50	0.58	0.53	0.59
	Non-Qatari individual ownership			Male / Female	6.75	8.54	5.61	9.76
	Total individual ownership			Male / Female	2.19	2.52	2.13	2.35

Source: Ministry of Justice and PSA calculations.

1-5-1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population.

Table (1.3): Number of people infected, recovered and deaths attributed to Coronavirus in 2020

Date	Unit	Type of Danger	Number of Deaths	Number of Recoveries	Number of injuries	Number of Deaths & Injuries
29 Feb–31 Mar 2020	Number	Coronavirus	**2**	**62**	**781**	**783**
1 - 30 April 2020	Number	Coronavirus	**8**	**1310**	**12628**	**12636**
1 - 31 May 2020	Number	Coronavirus	**28**	**28918**	**43501**	**43529**
1 - 30 June 2020	Number	Coronavirus	**75**	**51274**	**39178**	**39253**
1 - 31 July 2020	Number	Coronavirus	**61**	**25813**	**14607**	**14668**
1 - 31 August 2020	Number	Coronavirus	**23**	**8290**	**8083**	**8106**
1 - 30 Sep 2020	Number	Coronavirus	**17**	**7032**	**6982**	**6999**
1 - 31 Oct 2020	Number	Coronavirus	**18**	**6884**	**6796**	**6814**
1 - 30 Nov 2020	Number	Coronavirus	**5**	**6507**	**6277**	**6282**
1 - 31 Dec 2020	Number	Coronavirus	**8**	**5332**	**5001**	**5009**
Total	Number	Coronavirus	**245**	**141422**	**143834**	**144079**
Indicator	Per 100,000 population		**8.6**	**-**	**5075.9**	**5084.5**

Source: Ministry of Public Health and PSA calculations.

1-5-2 Direct economic loss attributed to disasters in relation to gross domestic product (GDP)

Table (1.4): Direct economic loss attributed to disasters in relation to GDP (2014-2020)

Indicator	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Direct economic loss attributed to disasters in relation to GDP	%	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	Reduce

Source: PSA

1-5-3 Countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030

Table (1.5): Availability of national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction (2014-2020)

Indicator	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Availability of national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction	Yes=1 No=0	1	1	1	1	1	1	1	1

Source: Ministry of Interior

1-5-4 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies

Table (1.6): Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies (2014-2020)

Statement	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies *	Number	1	1	1	1	1	1	1	-
Total number of local governments	Number	1	1	1	1	1	1	1	-
Indicator	%	100%	100%	100%	100%	100%	100%	100%	100%

*Note: Doha is considered the State Central Government.

Source: Ministry of Interior

3-9-2 Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All (WASH) services)

Table (1.7) Mortality rate per 100,000 population by cause of death (2014-2020)

Cause of Death	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Unsafe water	Per 100,000 population	0	0	0	0	0	0	0	Reduce
Unsafe sanitation	Per 100,000 population	0	0	0	0	0	0	0	Reduce
Lack of cleaning supplies	Per 100,000 population	0	0	0	0	0	0	0	Reduce
Total	Per 100,000 population	0	0	0	0	0	0	0	Reduce

5-a-1 (a) Proportion of total agricultural population with ownership or secure rights over agricultural land, by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure

Table (1.8): Proportion of population with ownership or secure rights over agricultural land, by sex (2014-2020)

Sex	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Male	%	100%	100%	100%	100%	100%	100%	100%	100%
Female	%	100%	100%	100%	100%	100%	100%	100%	100%
Total	%	100%	100%	100%	100%	100%	100%	100%	100%
Gender Parity Index		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table (1.9): Proportion of female population with ownership or secure rights over agricultural lands, by type of land, type of tenure, owner's nationality and sex for the age group (18 years and above) (2017-2020)

Type of Land	Type of Tenure	Nationality	Sex	Age Group	Unit	2017	2018	2019	2020
Agricultural land (farms)	Individual ownership	Qataris	Male	18 years +	Number	1037	1000	655	892
		Qataris	Female	18 years +	Number	119	98	127	85
		Qataris	Total	18 years +	Number	1156	1098	782	977
	Collective ownership	Qataris	Total	18 years +	Number	154	150	462	246
Livestock ranches (Izbaas)	Individual ownership	Qataris	Male	18 years +	Number	5559	…	1012	5584
		Qataris	Female	18 years +	Number	969	…	114	975
	Collective ownership	Qataris	Total	18 years +	Number	6528	…	1126	6556
		Qataris	Total	18 years +	Number	2	…	128	2

Type of Land	Type of Tenure	Nationality	Sex	Age Group	Unit	2017	2018	2019	2020
Share of owners or rights holders in agricultural lands (farms)	Individual ownership	Qataris	Male	18 years +	%	**1.26**	**1.19**	**0.75**	**1.00**
		Qataris	Female	18 years +	%	**0.13**	**0.11**	**0.13**	**0.09**
		Qataris	Total	18 years +	%	**0.68**	**0.62**	**0.43**	**0.52**
	Collective ownership	Qataris	Total	18 years +	%	**0.09**	**0.09**	**0.25**	**0.13**
Share of owners or rights holders in livestock ranches (Izbaas)	Individual ownership	Qataris	Male	18 years +	%	**6.77**	**...**	**1.16**	**6.24**
		Qataris	Female	18 years +	%	**1.09**	**...**	**0.12**	**3.50**
		Qataris	Total	18 years +	%	**3.81**	**...**	**0.62**	**3.50**
	Collective ownership	Qataris	Total	18 years +	%	**0.001**		**0.07**	**0.00**
Gender Parity Index for Agricultural Land						**0.11**	**0.10**	**0.19**	**0.10**
Gender Parity Index for Farmland						**0.17**	**...**	**0.11**	**0.17**

…: unavailable.

Ranch (Izbaa): is every building constructed to manage and practice activities related to livestock, plants or both. The building is usually built on relatively limited areas and is equipped to take care of animals, grow plants or both for a non-commercial purpose. These activities are often practiced therein for personal interests (definition source: PSA)

Source: Ministry of Municipality and Environment and PSA calculations.

5-a-2 Countries where the legal framework (including customary law) guarantees women's equal rights to land ownership and/or control

Table (1.10) Availability of legal framework that guarantees women's equal rights to land ownership and/or control by sub-indicator according to FAO questionnaire (2016-2019)

Description	Unit	2016	2017	2018	2019
Sub-Indicator (a)					
Q: A1 Is joint registration of land compulsory for married couples? (Scenario 1)	**Yes = 1 No = 0**	**0**	**0**	**0**	**0**
Q: A2 Is joint registration of land compulsory for unmarried couples? (Scenario 2)	**Yes = 1 No = 0**	**0**	**0**	**0**	**0**
Q: A3 Is joint registration of land encouraged through economic incentives for married couples? (Scenario 3)	**Yes = 1 No = 0**	**0**	**0**	**0**	**0**
Q: A4 Is joint registration of land encouraged through economic incentives for unmarried couples? (Scenario 4)	**Yes = 1 No = 0**	**0**	**0**	**0**	**0**
Q: A5 Is joint registration of land compulsory or encouraged through economic incentives?	**Yes = 1 No = 0**	NA	NA	NA	NA
Sub-Indicator (b)					
Q: B1 Does the legal framework require the consent of one of the spouses for land	**Yes = 1 No = 0**	**0**	**0**	**0**	**0**

Description	Unit	2016	2017	2018	2019
transactions? (Scenario 1)					
Q: B2 Does the legal framework require the consent of one of the spouses/partners for land transactions? (Scenario 2)	Yes = 1 No = 0	**0**	**0**	**0**	**0**
Q: B3 Does the legal and policy framework require consent of one of the spouses for land transactions?	Yes = 1 No = 0	**NA**	**NA**	**NA**	**NA**
Sub-Indicator (c)					
Q: C1 Do sons and daughters have equal inheritance right? (Scenario 1a)	Yes = 1 No = 0	**0**	**0**	**0**	**0**
Q: C2 Do sons and daughters have inheritance right with equal shares (Scenario 1b)	Yes = 1 No = 0	**0**	**0**	**0**	**0**
Q: C3 Do living male and female spouses/partners have equal right to inherit a share of the deceased husband/partner's estate? (Scenario 2a)	Yes = 1 No = 0	**0**	**0**	**0**	**0**
Q: C4 Do living male and female spouses/partners have equal right to use the family home for life? (Scenario 2b)	Yes = 1 No = 0	**0**	**0**	**0**	**0**
Q: C5 Does the legal and policy framework support equal inheritance rights for women and girls?	Yes = 1 No = 0	**NA**	**NA**	**NA**	**NA**
Sub-Indicator (d)					
Q: D1 Does the legal framework provide for the allocation of financial resources to Increase women's ownership and control over land?	Yes = 1 No = 0	**0**	**0**	**0**	**0**
Q: D2 If your answer to Question D1 is "No", please provide official national statistical data confirming the achievement of at least 40% of women's ownership and/or control over land (for example, data on SDG 5-a-1 or 2-4-1) so that the sub-indicator is considered available.		**See data table (1.9)**	**See data table (1.9)**	**See data table (1.9)**	**See data table (1.9)**
Q: D3 Does the legal and policy framework provide for allocation of financial resources to increase women's ownership and control over land?	Yes = 1 No = 0	**NA**	**NA**	**NA**	**NA**
Sub-Indicator (e)					
Q: E1 Does the constitution recognize customary law? (Scenario 1a)	Yes = 1 No = 0	**NA**			
Q: E3 Does the legal or policy framework recognize customary land tenure? (Scenario 2a)	Yes = 1 No = 0	**NA**			
Q: E5 In the legal systems that recognize the possession of customary land, does the law explicitly protect women's rights to land?		**NA Because customary law/land tenure is not recognized or non-existent**			
Sub-Indicator (f)					
Q: F1 Does the legal and policy framework provide quotas for women's participation in land management and administrative institutions?	Yes = 1 No = 0	**0**	**0**	**0**	**0**
Q: F2 if your answer to Question F1 is "No", please provide official national statistical data confirming the achievement of at least 40% of women's ownership and/or control over land (for example data on SDG 5-a-1 or 2-4-1) so that the sub-indicator is considered available.		**See data table (1.9)**	**See data table (1.9)**	**See data table (1.9)**	**See data table (1.9)**
Q: F3 Does the legal and policy framework require women's participation in land management and		**NA**	**NA**	**NA**	**NA**

Description	Unit	2016	2017	2018	2019
administrative institutions?					
Indicator's Final Results					
Sub-Indicator (a)	Yes = 1 No = 0	**0**	**0**	**0**	**0**
Is joint registration of land compulsory or encouraged through economic incentives?	Yes = 1 No = 0	**0**	**0**	**0**	**0**
Sub-Indicator (b)	Yes = 1 No = 0	**0**	**0**	**0**	**0**
Does the legal and policy framework require consent of one of the spouses for land transactions?	Yes = 1 No = 0	**0**	**0**	**0**	**0**
Sub-Indicator (c)	Yes = 1 No = 0	**0**	**0**	**0**	**0**
Does the legal and policy framework support equal inheritance rights for women and girls?	Yes = 1 No = 0	**0**	**0**	**0**	**0**
Sub-Indicator (d)	Yes = 1 No = 0	**NA**	**NA**	**NA**	**NA**

6-1-1 Proportion of population using safely managed drinking water services.

Table (1-11): Proportion of population using safely managed drinking water services (2014-2020)

Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
%	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: KAHRAMAA

6-2-1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water.

Table (1.12): Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water (2014-2020)

Description	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Sanitation services	**%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Hand washing facilities with soap and water (hygiene)	**%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Proportion of the population that practices open defecation	**%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**

Source: Ashgal

6-2-2 Proportion of wastewater safely treated

Table (1.13): Wastewater statistics, by treated water, type of treatment used, reuse and percentage of wastewater treatment (2016-2020)

Description	Characteristics	Unit	2016	2017	2018	2019	2020
Amount of collected wastewater		Million m3 per year	**209.5**	**231.5**	**257.8**	**278.2**	**291.5**
Treated wastewater by type of treatment	**Primary treatment - mechanical**	Million m3 per year	**0**	**0**	**0**	**0**	**0**
	Secondary treatment	Million m3 per year	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**
	Tertiary treatment (disinfection)	Million m3 per year	**49.1**	**51.6**	**48.2**	**52**	**45.3**
	Tertiary treatment (nitrogen and phosphorous removal)	Million m3 per year	**160.2**	**179.7**	**209.3**	**225.9**	**246**
	Total	Million m3 per year	**209.7**	**231.7**	**257.9**	**278.3**	**291.7**

Description	Characteristics	Unit	2016	2017	2018	2019	2020
Percentage of wastewater treated in wastewater plants		%	**99.1**	**98.9**	**99.4**	**99.6**	**99.7**
Sewage water is not collected in the sewage network and is discharged without treatment		Million m3 per year	**1.9**	**2.4**	**1.6**	**1**	**0.8**
Sewage sludge production		Tons of dry solids per year	**41,550.9**	**41,554.1**	**37,687.6**	**39,096.1**	**40,959.7**
Use of treated wastewater for agricultural irrigation	**Agricultural irrigation**	Million m3 per year	**61.7**	**69.5**	**79.7**	**86.1**	**89**
	Irrigation of green areas	Million m3 per year	**42.5**	**61**	**71.2**	**76.6**	**86.6**
	Injection into underground tanks	Million m3 per year	**60.4**	**63.9**	**66.9**	**79.7**	**78.1**
	Discharge in lakes	Million m3 per year	**39.2**	**33.8**	**38.2**	**33**	**32.3**
	Discharge in the sea	Million m3 per year	**0.7**	**0.5**	**0.5**	**0.7**	**0.1**

Source: Ashgal and PSA calculations

6-4-1 Change in water-use efficiency over time.

Table (1.14): Water use efficiency by sectors (2016-2019)

Variable	Sector	Unit	2016	2017	2018	2019
Amount of water used	Agriculture	Million m3 per year	**291.82**	**299.64**	**309.97**	**316.4**
	Industry	Million m3 per year	**24.08**	**11.8**	**25.78**	**34.18**
	Commerce	Million m3 per year	**195.53**	**57.68**	**25.8**	**85**
	Total	Million m3 per year	**511.43**	**369.12**	**361.55**	**435.58**
Value added at constant prices 2018 = 100	Agriculture	Million QR	**1,044**	**1,259**	**1,457**	**1,499**
	Industry	Million QR	**404,877**	**399,921**	**402,950**	**397,269**

Variable	Sector	Unit	2016	2017	2018	2019
	Commerce	Million QR	179,624	182,748	186,751	192,005
	Total	Million QR	585,546	583,927	591,158	590,773
Water use efficiency	Agriculture	QR per m3	3.6	4.2	4.7	4.7
	Industry	QR per m3	16813.8	33891.6	15630.3	11622.9
	Commerce	QR per m3	918.7	3168.3	7238.4	2258.9
	Total	QR per m3	1,144.92	1,581.94	1,635.07	1,356.29
Rate of change in water use efficiency	Agriculture	Rate	-	17%	12%	1%
	Industry	Rate	-	102%	-54%	-26%
	Commerce	Rate	-	245%	128%	-69%
	Total	Rate	-	38%	3%	-17%

The industrial sector: includes the following economic activities (electricity, gas, water supply, sewage and waste management, mining and quarrying, manufacturing and construction).

The commercial sector: includes the following economic activities (wholesale and retail trade, transport and storage, accommodation services, financial and insurance, real estate and private household activities, as well as employers and production activities that are not distinct from private families).

Source: PSA, Kahramaa and Ashgal.

6-4-2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources.

Table (1.15): Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (%) (2015-2020)

Description	Unit	2015	2016	2017	2018	2019	2020
Indicator	%	%229	%320	%229	%247	%280	%396

Source: Kahramaa

6-5-1 Degree of integrated water resources management implementation (0-100).

Table (1.16): Degree of integrated water resources management implementation (0-100) (2016-2020)

Description	Unit	2016	2017	2018	2019	2020	Goal by 2030
Enabling environment	Degree	55	55	55	60	80	100
Establishments and companies	Degree	100	100	100	90	94	100
Management tools	Degree	79	87.5	87.5	90	88	100
Finance	Degree	85	85	85	85	100	100
Degree of integrated water resources management implementation (0-100)	Degree	80	82	82	81	90.5	100

Source: Kahramaa

6-b-1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management.

Table (1.17): Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management (2014-2020)

Description	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Number of local administrative units with local participation policies and procedures	Number	2	2	2	2	2	2	2	-
Total number of local administrative units in the country	Number	2	2	2	2	2	2	2	-
Indicator	%	100	100	100	100	100	100	100	100

Source: KAHRAMAA and Ashgal

7-1-1 Proportion of population with access to electricity services.

Table (1.18): Proportion of population with access to electricity services (2014-2020)

Type of Service	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Indicator	%	100	100	100	100	100	100	100	100

Source: KAHRAMAA and Ashgal

7-1-2 Proportion of population with primary reliance on clean fuels and technology.

Table (1.19): Proportion of population with primary reliance on clean fuels and technology (2014-2020)

Type of Service	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Clean Fuel	%	100	100	100	100	100	100	100	100
Clean Technology	%	100	100	100	100	100	100	100	100

7-2-1 Renewable energy share in the total final energy consumption.

Table (1.20): Renewable energy share in the total final electricity consumption (total electricity consumption by different sectors) 2015-2017. Total final electricity consumption (2015-2020)

Type of Service		Unit	2015	2016	2017	2018	2019	2020	Goal by 2030
Sector	Loss of transport and distribution		2,474,889	2,532,392	2,694,696	2,786,404	2,772,002	2,774,269	-
	Electricity consumption at generation plants		2,647,006	2,641,801	2,831,204	3,258,544	3,440,493	3,433,881	-
	Electricity consumption in industrial sector		11,886,696	12,026,249	11,261,941	12,197,379	12,124,082	10,464,179	-
	Domestic electricity consumption		24,490,670	25,107,915	32,095,345	32,765,544	31,536,113	33,802,149	-
	Total consumption (A)		39,024,372	39,775,965	46,188,490	44,962,923	44,015,730	43,527,946	-
Production	Total net output of the network		N.A.	40,135,345	43,459,957	45,065,903	46,434,716	45826447	-
	Total electricity production		41,499,260	42,306,607	45,554,730	47,912,684	49,872,690	49258957	-
Quantity of renewable energy produced by type	The sun	Megawatt per year	6	8	10	5	7	8	Increase
	Waste incineration	Megawatt per year	40	40	40	40	41	41	Increase
	Total (B)	Megawatt per year	46	48	50	45	48	49	Increase
Total renewable and non-renewable electricity consumption		Megawatt per year		39,024,418	46,188,540	44,962,968	44,015,778	49,259,006	-
Renewable energy share in the total final electricity consumption (total consumptions)		%		0.0001%	0.0001%	0.0001%	0.0001%	0.0001%	Increase

Source: KAHRAMAA and PSA calculations.

7-a-1 International financial flows to developing countries in support of clean energy research and development and renewable energy production, including in hybrid systems.

Table (1.21): Value of Development Assistance for SDG 7 (2015-2017)

SDG	SDG Title	Unit	2015	2016	2017	Goal by 2030
7	Clean and affordable energy	QR	197,054,879	79,284,884	623,031,444	Increase
		US$	54,135,956	21,781,562	171,162,485	Increase

Source: Ministry of Foreign Affairs

9-1-1 Proportion of the rural population who live within 2 km of an all-season road.

Table (1.22): Proportion of population who live within 2 km of an all-season road (2014-2019)*

Description	Unit	2014	2015	2016	2017	2018	2019	Goal by 2030
Indicator	%	100	100	100	100	100	100	100

*There are no rural areas in Qatar

Source: PSA

11-1-1 Proportion of urban population living in slums, informal settlements or inadequate housing.

Table (1.23): Proportion of urban population living in slums, informal settlements or inadequate housing (2014-2020)

Description	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Percentage of people living in slum households	%	0%	0%	0%	0%	0%	0%	0%	0%
Percentage of people living in inadequate housing	%	0%	0%	0%	0%	0%	0%	0%	0%

Source: PSA

11-3-1 Ratio of land consumption rate to population growth rate.

Table (1.24): Area of consumed lands, number of population, annual growth rates and general average of the index (2014-2020)

Description	Unit	2014	2015	2016	2017	2018	2019	2020
Area of cosumed land	Km2	779	858	1026	1193	1251	1394	1430
Number of population	Number	2,216,180	2,437,790	2,617,634	2,724,606	2,760,170	2,799,202	2,833,679
Population growth rate to land consumption rate	Rate		10%	20%	16%	5%	11%	3%
Population growth rateper year	Rate		10%	7%	4%	1%	1%	1%
General Index	Rate		1.01	2.65	3.98	3.72	8.08	2.10

*The area of urban lands for the year 2016 was estimated by the PSA

Source: Ministry of Municipality and Environment and PSA

11-5-1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population .

Table (1.25): Number of infections, recoveries and deaths attributed to Coronavirus in 2020

Date	Unit	Type of Danger	Number of Deaths	Number of Recoveries	Number of injuries	Number of Deaths & Injuries
29 Feb–31 Mar 2020	Number	Coronavirus	2	62	781	783
1 - 30 April 2020	Number	Coronavirus	8	1310	12628	12636
1 - 31 May 2020	Number	Coronavirus	28	28918	43501	43529
1 - 30 June 2020	Number	Coronavirus	75	51274	39178	39253
1 - 31 July 2020	Number	Coronavirus	61	25813	14607	14668
1 - 31 August 2020	Number	Coronavirus	23	8290	8083	8106
1 - 30 Sep 2020	Number	Coronavirus	17	7032	6982	6999
1 - 31 Oct 2020	Number	Coronavirus	18	6884	6796	6814
1 - 30 Nov 2020	Number	Coronavirus	5	6507	6277	6282
1 - 31 Dec 2020	Number	Coronavirus	8	5332	5001	5009
Total	Number	Coronavirus	245	141422	143834	144079
Indicator	Per 100,000 population		8.6	-	5075.9	5084.5

Source: Ministry of Public Health and PSA calculations.

11-5-2 Direct economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters.

Table (1.26): Value of direct economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters (2014-2020)

Description	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Value of losses	QRs	0	0	0	0	0	0	0	Reduce
	USD	0	0	0	0	0	0	0	Reduce
Number of disruptions	No.	0	0	0	0	0	0	0	Reduce

Source: Ministry of Interior

11-6-1 Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities.

Table (1.27): Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities (2014-2020)

Description	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Quantity of urban solid waste regularly collected and with adequate final discharge	Metric Ton	9,896,221	7,674,367	8,394,793	8,156,591	6,598,691	7,648,844	10,303,367	-
Percentage of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated in cities	%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Ministry of Municipality and Environment

11-6-2 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities

Table (1.28): Air quality for particulate matter levels (PM10) by location (2014-2019)

Location	Pollutants	Unit	2014	2015	2016	2017	2018	2019
Aspire Zone	PM10	Text	Normal	Normal	Normal	Normal	Normal	Clean
Qatar University	PM10	Text	Normal	Below Normal	Normal	Normal	Below Normal	Normal
Corniche	PM10	Text	Normal	Normal	Normal	Normal	Below Normal	Normal

Source: Ministry of Municipality and Environment

* Annual limit was considered to be the indicator description "normal"

Description of the air pollution index

Clean	*0 - 50*	*Limited pollution*	*151 - 200*
Normal	*51 -100*	*pollution*	*201 - 300*
Below normal	*101 -150*	*Severe pollution*	*301 - 500*

11-7-1 Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities

Table (1.29): Average share of the area that is open space for public use for all of total built-up area in cities, by sex and age groups (2015)

Index		Unit	2015
Sex	Male	%	**20.0**
	Female	%	**7.1**
	Total	%	**27.1**

Index		Unit	2015
Age	Less than 15	%	**4.0**
	15-24	%	**3.8**
	25 +	%	**19.3**
	Total	%	**27.1**
Gender Parity Index			**0.36**

* The open space area was allocated to population according to their relative distribution by sex and age groups, so that the share of each population segment of the area is equivalent to its demographic weight.

Source: PSA, Land Use Survey and Census 2015

Table (1.30): Percentage of open spaces in public areas to the total built-up area (2015)

Built-up buildings Unit	Percentage of open spaces in public areas to the total built-up area %	Total area of open spaces in public areas (km 2)	Population number in the geographic range No.	Total Built-up buildings (km 2)
Doha	**23.51**	**40.08**	**587,058**	**170.47**
Al Rayyan	**33.00**	**103.04**	**969,880**	**308.50**
Al Wakra	**25.73**	**34.50**	**253,184**	**134.06**
Umm Slal	**23.95**	**49.64**	**130,269**	**207.30**
Al Khor	**25.00**	**6.12**	**92,615**	**24.11**
Al Shamal	**25.00**	**2.47**	**6,053**	**9.99**
Dukhan	**32.00**	**0.56**	**6,749**	**1.71**
Mesaieed	**15.00**	**6.69**	**37,662**	**45.35**
Lusail	**28.00**	**7.55**	**1,338**	**26.87**
Al-Sheehaniya	**29.24**	**7.98**	**132,388**	**27.29**
Total	**27.06**	**258.63**	**2,217,196**	**955.65**

Source: PSA, Land Use Survey and Census 2015.

11.b.1 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030.

Table (1.31): Qatar's adoption and implementation of national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction (2014-2020)

Indicator	Unit	2014	2015	2016	2017	2018	2019	2020
Qatar's adoption and implementation of national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction	Yes = 1 No = 0	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Note: 1 = YES, 0 = NO

Source: Ministry of Interior

11-b-2 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies.

(Table 1.32): Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies (2014-2020)

Description	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Number of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies*	Number	1	1	1	1	1	1	1	-
Total number of local governments	Number	1	1	1	1	1	1	1	-
Indicator	%	100%	100%	100%	100%	100%	100%	100%	100%

* Note: Doha is a central government

Source: Ministry of Interior

12-3-1 Global Food Loss Index and Food Waste Index.

a. Crop Loss

Table (1.33): Quantity of crop loss by type of crop (2016-2019)

Type of Crop	Unit	2015	2016	2017	2018	2019
Tomato	Million QR	6.0	7.0	7.5	4.5	4.8
Cucumber	Million QR	6.1	7.0	7.5	2.9	3.5
Squash	Million QR	3.9	2.6	3.1	3.1	1.1
Cantaloupe	Million QR	0.7	3.8	3.9	2.0	1.4

Source: Ministry of Municipality and Environment

Table (1.34): Quantity of crop loss by type of crop (2016-2019)

Type of Crop	Unit	2016	2017	2018	2019
Tomato	Ton	1409	964	1497	1615
Cucumber	Ton	452	585	967	1135
Squash	Ton	332	216	549	222
Cantaloupe	Ton	...	...	...	...

…: Unavailable

Source: Ministry of Municipality and Environment

b. Hifz Alnaema Center

Table (1.35): Number of beneficiaries of Hifz Al Naema Project (2014-2020)

Indicator	Unit	2014	2015	2016	2017	2018	2019	2020
Number of beneficiaries of Hifz Al Naema Project	Number	378,000	638,133	486,202	372,409	468,581	431,359	204،153

Source: Hifz Al Naema Center

Table (1.36): Donations of food, beverage and supplies for Hifz Al Naema Project (2015-2020)

Donor	Unit	2015	2016	2017	2018	2019	2020
Quantity of donated food and supplies	Kg	714,078	566,626	419,617	516,213	364,987	102,077
Quantity of donated beverages and supplies	Liter	19,685	10,606	37,355	61,122	658,581	94,306

Source: Hifz Al Naema Center

c. Non-Compliant Imported Food

Table (1.37): Quantity of imported food destroyed under destruction requests/certificates of non-compliance with specifications (2015-2019)

Food Item	Unit	2015	2016	2017	2018	2019
Fat and oils	Kg	48,962	11,088	5,932	2,200	2,700
Meat	Kg	18,788	27,606	12,443	12,165	8,748
Poultry	Kg	343,510	142,846	261,199	7,337	5,886
Fish	Kg	11,587	13,640	15,300	9822	650
Canned food	Kg	281,030	337,332	228,528	168,061	86,507
Fruits and vegetables	Kg	234,449	272,809	172,832	373,349	2,190,416
Dairy products	Kg	49,785	34,635	95,222	53,485	5,150
Dry food	Kg	52,544	126,218	55,325	59,492	37,569
Eggs	Kg	5,700	30,972	22,680	130	18,000
Healthy water	Kg	45,438	24,933	16,590	6,160	4,809
Food variety	Kg	114,821	110,339	154,692	58,006	701,885
Total	Kg	1,206,614	1,132,418	1,040,743	752,225	3,065,020

Source: Ministry of Public Health

12-4-1 Number of parties to international multilateral environmental agreements on hazardous waste, and other chemicals that meet their commitments and obligations in transmitting information as required by each relevant agreement.

Table (1.38): Environmental agreements related to waste of hazardous materials and other chemicals (1995-2017)

Agreement	Logo	Year	Remarks
Basel Convention on Control of Transboundary Movements of Hazardous Waste and their Disposal	BASEL CONVENTION	1995	Each state party to this agreement is obligated to submit a national plan to eliminate Persistent Organic Pollutants (POPs) and reduce their risks. The State of Qatar has submitted a national implementation plan to eliminate Persistent Organic Pollutants (POPs) in accordance with Article 7 of the agreement and is currently working to update its new plan in 2020. It also requires each state party to submit periodic national reports every four years to the secretariat of the convention, regarding the measures taken to implement the provisions of the convention, and the achievements, challenges and obstacles in this regard. Qatar participated in the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, Rotterdam Convention and Stockholm Convention in Geneva.
Stockholm Convention on Persistent Organic Pollutants	Stockholm Convention	2001	
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	Rotterdam Convention	2004	
Minamata Convention on Issues Concerning Mercury Pollution in Air, Soil and Water،		2017	Regarding the Minamata Convention, Qatar is participating in international meetings on "mercury" for the celebration of the entry into force of the Minamata Convention on Mercury1 .
Montreal Protocol on Substances that Deplete the Ozone Layer		1987	Qatar has fulfilled its commitments to implement the Montreal Protocol on Substances that Deplete the Ozone Layer, 31 years after the declaration of this Protocol in Montreal, Canada. On 22 January 1996, the State of Qatar had acceded to the Vienna Convention for the Protection of the Ozone Layer of 1985, Montreal Protocol on Substances that Deplete the Ozone Layer of 1987 and London and Copenhagen Amendments. On 29 January 2009 the State ratified the Montreal and Beijing Amendments to the Montreal Protocol. Achievements in the issuance of several legislations and laws to implement the aforementioned conventions, noting that within the framework of the state's commitment to protect the ozone layer: 1- Law No. 21 of 2007 on the Control of the Ozone-Depleting Substances was issued, which was recently updated by Law No.19 of 2015 issuing the Unified Law (Regulation) of GCC on Control of Substances that Deplete the Ozone Layer. This law aims to regulate the import, re-export, transport, and storage of devices, equipment, and products that have been monitored and complete disposal of these substances and replacement of them with safe alternatives. 2- State of Qatar periodically reports to the Secretariat of the Convention and the Multilateral Fund Secretariat of the total and sectoral consumption of each substance. In turn, the Ministry cooperates with State bodies concerned with monitoring imports and exports of ozone depleting Hydrochlorofluorocarbons (HCFCs).

(1) Al-Arab Newspaper https://www.alarab.qa/story/1260295/Qatar-participates-in-international-meetings-regarding-mercury

Agreement	Logo	Year	Remarks
			3- It also monitors their illegal trade practices, tighten market controls, and hold training programs for various stakeholders. 4- With regards to executive plans, a national strategy has been put in place to deal with the mentioned Hydrochlorofluorocarbons (HCFCs) which runs till 2030, in compliance with the regulatory limits adopted by the Montreal Protocol. The State of Qatar's consumption to these materials includes two main sectors: the foam industry sector and the refrigeration and air conditioning industry and services sector.2

12-4-2 Hazardous waste generated per capita; and proportion of hazardous waste treated, by type of treatment.

Table (1.39): Hazardous waste generated per capita (kg/year) (2014-2019)

Indicator	Unit	2014	2015	2016	2017	2018	2019	Goal by 2030
Hazardous waste generated per capita	kg/year	**35.2**	**32.5**	**15.4**	**22.6**	**0.3**	**0.1**	Lower to minimum

Source: PSA, Environment Statistics Bulletin

12-5-1 National recycling rate, tons of material recycled.

Table (1.40): Solid waste recycled (2014-2020)

Indicator	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Solid waste recycled	Ton	**17,514**	**69,748**	**53,384**	**42,116**	**37,379**	**5,603**	**4,069**	Increase

Source: Ministry of Municipality and Environment

12-6-1 Number of companies publishing sustainability reports.

Table (1.41): Total companies that adopt sustainable practices or social responsibility approach or publish the Sustainability Report or Social Responsibility Report (2019)

Type of Report	Type of Company	Unit	2019	Goal by 2030
Sustainability or Social Responsibility Report	Large-sized companies	No.	**32**	Increase
	Small and medium-sized companies	No.	**138**	Increase
	Total	No.	**170**	Increase
Total targeted companies	Large-sized companies	No.	**32**	Increase
	Small and medium-sized companies	No.	**138**	Increase
	Total	No.	**170**	Increase

Note: Limited to companies that submit an operating permit issued by the Ministry of Municipality and Environment

Source: PSA and Qatar Stock Exchange

(2)https://www.al-watan.com/news-details/id/155112/-The-municipality-celebrates-the-International-Day-to-protect-the-ozone-layer

Table (1.42): Companies that Publish Environmental, Social, and Corporate Governance Reports, (ESG) 2016-2020

Company	Unit	2016	2017	2018	2019	2020
Doha Bank	%	...	97%	100%	100%	14%
Qatar and Oman Investment Company	%	...	97%	97%	…	…
Qatar International Islamic Bank	%	...	92%	92%	76%	…
Aamal Company	%	...	86%	92%	92%	97%
Qatar National Bank	%	...	92%	100%	100%	3%
Qatar Commercial Bank	%	...	…	…	100%	
Ooredoo						81%

Note: The initiative was launched in 2017

…: Not available

Source: Qatar Stock Exchange

Link https://qse.arabsustainability.com/ara

12-8-1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment.

Table (1.43): Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment (2014-2020)

Description		Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Global citizenship education	National education policies	Text (Yes\No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Curricula	Text (Yes\No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Teacher education	Text (Yes\No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Student assessment	Text (Yes\No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education for sustainable development (including climate change education)	National education policies	Text (Yes\No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Curricula	Text (Yes\No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Teacher education	Text (Yes\No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Student assessment	Text (Yes\No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

13-1-1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population.

Table (1.44): Number of infections, recoveries and deaths attributed to Coronavirus in 2020

Date	Unit	Type of Danger	Number of Deaths	Number of Recoveries	Number of injuries	Number of Deaths & Injuries
29 Feb–31 Mar 2020	Number	Coronavirus	**2**	**62**	**781**	**783**
1 - 30 April 2020	Number	Coronavirus	**8**	**1310**	**12628**	**12636**
1 - 31 May 2020	Number	Coronavirus	**28**	**28918**	**43501**	**43529**
1 - 30 June 2020	Number	Coronavirus	**75**	**51274**	**39178**	**39253**
1 - 31 July 2020	Number	Coronavirus	**61**	**25813**	**14607**	**14668**
1 - 31 August 2020	Number	Coronavirus	**23**	**8290**	**8083**	**8106**
1 - 30 Sep 2020	Number	Coronavirus	**17**	**7032**	**6982**	**6999**
1 - 31 Oct 2020	Number	Coronavirus	**18**	**6884**	**6796**	**6814**
1 - 30 Nov 2020	Number	Coronavirus	**5**	**6507**	**6277**	**6282**
1 - 31 Dec 2020	Number	Coronavirus	**8**	**5332**	**5001**	**5009**
Total	Number	Coronavirus	**245**	**141422**	**143834**	**144079**
Indicator	Per 100,000 population		**8.6**	**-**	**5075.9**	**5084.5**

Source: Ministry of Public Health and PSA calculations.

13-1-2 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030.

Table (1.45): Qatar adopts and implements national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030 (2014-2020)

Indicator	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Qatar adopts and implements national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction	1=yes 0= No	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Note: 1 = YES, 0 = NO

Source: Ministry of Interior

13-1-3 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies.

Table (1.46): Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies (2014-2020)

Indicator	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies	%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Ministry of Interior.

13-2-1 Number of countries with nationally determined contributions, long- term strategies, national adaptation plans and adaptation communications, as reported to the UNFCCC secretariat .

Table (1.47): Policies and strategies that increase the nation's ability to adapt to the harmful effects of climate change, enhance resilience to climate change and reduce greenhouse gas emissions (2014-2020)

Indicator	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Extent to which institutions are able to adapt to and transfer technology	Yes = 1 No = 0	1	1	1	1	1	1	1	1
Extent to which individuals are able to adapt to and transfer technology	Yes = 1 No = 0	1	1	1	1	1	1	1	1
Extent to which development plans are available to build the capabilities of institutions and individuals to adapt to and transfer technology	Yes = 1 No = 0	1	1	1	1	1	1	1	1

Note: 1 = Yes, 0 = No

Source: Ministry of Municipality and Environment

Table (1.48): International environmental agreements related to climate change by date of signature (1987-2017)

International Environmental Agreements	Date of Signature
UNFCCC	22/1/1996
Kyoto Protocol	11/1/2005
Vienna Convention for the Protection of the Ozone Layer.	22/1/1996
The Montreal Protocol on Substances that Deplete the Ozone Layer	28/8/1987
Paris Agreement	23/6/2017

Source: Ministry of Municipality and Environment

13-3-1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment.

Table (1.49): Measures that have integrated climate change mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula (2014-2020)

Description	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Primary Stage	Yes = 1 No = 0	1	1	1	1	1	1	1	1
Preparatory Stage	Yes = 1 No = 0	1	1	1	1	1	1	1	1
Secondary Stage	Yes = 1 No = 0	1	1	1	1	1	1	1	1
Tertiary	Yes = 1 No = 0	1	1	1	1	1	1	1	1

13.a.1 Amounts provided and mobilized in United States dollars per year in relation to the continued existing collective mobilization goal of the $100 billion commitment through to 2025.

Table (1.50): Amounts provided and mobilized in US dollars per year in relation to the continued existing collective mobilization goal of the $100 billion commitment through to 2025 for 2019

Indicator	Unit	2019	Goal By 2030
Value	USD	100m	100b

14-1-1 (a) Index of coastal eutrophication; and (b) plastic debris density.

Table (1.51): Concentration of natural nutrients in Qatari coastal waters by location (2020)

Nutrients	Practical Salinity Unit (PSU)	Nitrite	Nitrate	Silicate	Phosphate	Suspended Solids
Unit		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Maximum allowed nationally	33 - 45	35.0	100.0	900.0	30.0	30.0
Khor Al Udeid	56.44	0.97	16.21	166.47	4.92	15.58
Mesaieed	50.00	2.61	29.69	110.29	3.89	11.40
Al Wakra	43.69	1.33	11.18	81.81	5.61	11.55
Ras Abu Fontas	43.75	2.00	18.67	100.64	5.35	12.05
Doha	43.09	1.25	40.76	330.65	4.70	14.45
Al Khor	45.95	3.01	15.84	100.72	7.51	12.40
Al Dhakhira	45.70	1.39	10.98	95.04	5.13	12.80

Nutrients	Practical Salinity Unit (PSU)	Nitrite	Nitrate	Silicate	Phosphate	Suspended Solids
Unit		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Ras Laffan	42.31	0.65	30.99	42.42	4.43	10.30
Ras Rokn	44.95	1.66	20.11	36.83	4.47	10.25
Dokhan	59.92	1.10	6.79	160.66	4.41	13.80
Salwa	NM	NM	NM	NM	NM	NM

ND: Not detected

NM: Not measured

Source: Ministry of Municipality and Environment.

(b) Plastic Debris Density

Table (1.52): Marine debris and waste quantities by type in tons (2014 -2020)

Year	Unit	Wood Residues	Coastal Waste	Total	Goal by 2025
2014	Ton	65	550	1,815	Reduce
2015	Ton	40	500	2,140	Reduce
2016	Ton	…	3,650	3,650	Reduce
2017	Ton	…	3,650	3,650	Reduce
2018	Ton	12	2,816	2,828	Reduce
2019	Ton	258	1,638	1,896	Reduce
2020	Ton	78	1,860	1,938	Reduce

Source: Ministry of Municipality and Environment.

14-2-1 Proportion of national exclusive economic zones managed using ecosystem-based approaches.

Table (1.53): Proportion of economic zones managed using ecosystem-based approaches (2014-2020)

Description	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Proportion of economic zones managed using ecosystem-based approaches	%	100	100	100	100	100	100	100	100

Source: Ministry of Municipality and Environment

14-3-1 Average marine acidity (pH) measured at agreed suite of representative sampling stations.

Table (1.54): Average marine acidity (pH) measured at agreed suite of representative sampling stations (2014-2020)

Description	Unit	2014	2016	2017	2018	2019	2020	Nationally Allowed Limit	Goal by 2030
Khor Al Udeid	PH	ND	8.0	7.7	7.9	8.2	8.08	6.5 - 8.3	Reduce
Mesaieed	PH	6.5	8.1	8.1	8.1	8.1	8.24	6.5 - 8.3	Reduce
Al Wakra	PH	7.2	NM	8.1	7.6	8.3	8.29	6.5 - 8.3	Reduce
Ras Abu Fontas	PH	6.8	8.0	NM	7.9	8.0	8.15	6.5 - 8.3	Reduce
Doha	PH	ND	8.0	8.0	8.0	7.8	8.09	6.5 - 8.3	Reduce
Al Khor	PH	ND	8.1	7.8	8.2	8.2	8.13	6.5 - 8.3	Reduce
Al Dhakhira	PH	ND	8.1	7.8	8.1	8.2	8.14	6.5 - 8.3	Reduce
Ras Laffan	PH	ND	8.0	7.9	8.2	8.2	8.20	6.5 - 8.3	Reduce
Ras Rokn	PH	ND	8.1	7.8	8.4	8.2	8.07	6.5 - 8.3	Reduce
Dokhan	PH	-	8.1	7.9	7.7	8.2	8.05	6.5 - 8.3	Reduce
Salwa	PH	-	7.9	7.8	7.7	NM	NM	6.5 - 8.3	Reduce

ND: Not detected

NM: Not measured

According to Qatari Law No. 3 of 2005, the maximum permissible limit for average acidity is 6.5 - 8.3 grams per liter.

Source: Ministry of Municipality and Environment

14-4-1 Proportion of fish stocks within biologically sustainable levels.

Table (1.55): Proportion of fish stocks within biologically sustainable levels (2014-2020)

Indicator	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Proportion of fish stocks within biologically sustainable levels	%	76	68	80	59	81	85	90	100

Source: Ministry of Municipality and Environment

14-5-1 Coverage of protected areas in relation to marine areas.

Table (1.56): Coverage of protected areas in relation to marine areas (2016-2020)

Description	Unit	2016	2017	2018	2019	2020	Goal by 2030
Area of marine reserves	Km2	720	720	720	720	720	-
Coverage of protected areas in relation to marine areas	%	6.2	6.2	6.2	6.2	6.2	10.0%

Source: Ministry of Municipality and Environment

14-6-1 Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing.

Table (1.57): Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing (2015-2019)

Indicator	Unit	2019 - 2015
Qatar's progress in the implementation of international instruments aiming to combat illegal, unreported and unregulated fishing	Text	Qatar's fishing fleet is of a traditional type and operates only in Qatari territorial waters. The State does not have vessels operating outside territorial or international waters. In addition, the State's fishing ports have not received any fishing vessels operating outside Qatar's territorial waters.

Source: Ministry of Municipality and Environment

14-7-1 Sustainable fisheries as a proportion of GDP in small island developing States, least developed countries and all countries.

Table (1.58): Sustainable fisheries as a proportion of GDP in small island developing states, least developed countries and all countries (2014-2016)

	Unit	2014	2015	2016
Indicator	%	**0.12**	**0.16**	**0.19**

Source: PSA

14.b.1 Degree of application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small□scale fisheries.

Table (1.59): Progress made by Qatar in the application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fisheries (2015-2019)

Unit	2015	2016	2017	2018	2019
Text	• Continue to implement Law No. 4 of 1983 on exploitation and protection of living aquatic resources in Qatar.	• Minister of Municipality issued Resolution No. 274 on the export of fish.	• Continue to implement Law No. 274 on the export of fish.	• Continue to implement Law No. 4 of 1983 on exploitation and protection of living aquatic resources in Qatar.	• Continue to implement Law No. 4 of 1983 on exploitation and protection of living aquatic resources in Qatar.
Text	• Continue to implement the Ministerial Resolution No. (22) of 2011 on the regulation of crab fishing.	• Continue to implement Law No. 4 of 1983 on exploitation and protection of living aquatic resources in Qatar.	• Continue to implement Law No. 4 of 1983 on exploitation and protection of living aquatic resources in Qatar.	• Continue to implement the Ministerial Resolution No. (22) of 2011 on the regulation of crab fishing.	• Continue to implement the Ministerial Resolution No. (22) of 2011 on the regulation of crab fishing.

Unit	2015	2016	2017	2018	2019
Text	• Minister of Environment issued Resolution No. (55) on the regulation of kingfish fishing.	• Continue to implement the Ministerial Resolution No. (22) of 2011 on the regulation of crab fishing.	• Continue to implement the Ministerial Resolution No. (22) of 2011 on the regulation of crab fishing.	• Continue to implement the Minister of Environment's Resolution No. (55) on the regulation of kingfish fishing.	• Continue to implement the Minister of Environment's Resolution No. (55) on the regulation of kingfish fishing.
Text	• Minister of Environment issued Resolution No. (86) on the regulation of the practice of some fishing work.	• Continue to implement the Minister of Environment's Resolution No. (55) on the regulation of kingfish fishing.	• Continue to implement the Minister of Environment's Resolution No. (55) on the regulation of kingfish fishing.	• Continue to implement the Minister of Environment's Resolution No. (86) on the regulation of the practice of some fishing work.	• Continue to implement the Minister of Environment's Resolution No. (86) on the regulation of the practice of some fishing work.
Text	• Organizing periodic monthly meetings of the Committee for Living Aquatic Resources, which includes representatives from all fisheries stakeholders.	• Continue to implement the Minister of Environment's Resolution No. (86) on the regulation of the practice of some fishing work.	• Continue to implement the Minister of Environment's Resolution No. (86) on the regulation of the practice of some fishing work.	• Organizing periodic monthly meetings of the Committee for Living Aquatic Resources, which includes representatives from all fisheries stakeholders.	• Organizing periodic monthly meetings of the Committee for Living Aquatic Resources, which includes representatives from all fisheries stakeholders.
Text		• Organizing periodic monthly meetings of the Committee for Living Aquatic Resources, which includes representatives from all fisheries stakeholders.	• Organizing periodic monthly meetings of the Committee for Living Aquatic Resources, which includes representatives from all fisheries stakeholders.		• Issuance of Ministerial Resolution No. 69 of 2019 on the conditions and controls of the amateur fisher
Text					• Issuance of Ministerial Resolution No. 69 of 2019 on the conditions and controls of the amateur fisher

Source: Ministry of Municipality and Environment

15-1-1 Forest area as a proportion of total land area.

Table (1.60): Forest area as a proportion of total land area (2010 and 2015)

Description	Unit	2010	2015	Goal by 2030
Mangrove Area	km2	7	9	Increase
Area of Qatar with islands	km2	11,627.04	11,627.04	Increase
Ratio of forests to land	%	0.06	0.08	Increase

Source: Ministry of Municipality and Environment

Source: PSA

15-1-2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type.

Data for this indicator is not available.

15-3-1 Proportion of land that is degraded over total land area.

Table (1.61): Area of degraded land by degradation level in km2 (2005)

Description	2005
Total area of degraded land	10619
Moderate above average	275
Below average	2797
A little above average	5696
A little below average	802
Way above average	833
Way below average	216

Source: Ministry of Municipality and Environment

15-4-1 Coverage by protected areas of important sites for mountain biodiversity.

This indicator does not apply to the State of Qatar.

15-4-2 Mountain Green Cover Index

This indicator does not apply to the State of Qatar.

15-5-1 Red List Index.

Table (1.62): Red List Index (2015-2017)

Indicator	2015	2016	2017	Goal by 2030
Red List Index	0.84	0.84	0.83	Reduce
Red List Index (Upper limit)	1	1	1	-
Red List Index (Lower limit)	0	0	0	.

Note: Value of the Red List Index ranges from (0). All species are classified as "of least interest", (1) all species are classified as "extinct".

Source: Ministry of Municipality and Environment

Target (15-6): Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed .

15-6-1 Number of countries that have adopted legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits.

Table (1.63): Adoption of legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits (2014-2020)

Indicator	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
Adoption of legislative frameworks	Yes = 1 No = 0	1	1	1	1	1	1	1	1
Adoption of administrative frameworks	Yes = 1 No = 0	1	1	1	1	1	1	1	1
Adoption of policies	Yes = 1 No = 0	1	1	1	1	1	1	1	1
Joining the International Treaty on Plant Genetic Resources for Food and Agriculture	Yes = 1 No = 0	1	1	1	1	1	1	1	1
Joining Nagoya Protocol	Yes = 1 No = 0	1	1	1	1	1	1	1	1
Qatar has legislative, administrative and policy frameworks or measures that are reported through the electronic reporting system on compliance with the International Treaty on Plant Genetic Resources for Food and Agriculture.	Yes = 1 No = 0	1	1	1	1	1	1	1	1
Qatar has legislative, administrative, and policy frameworks or measures that are reported through the Information Exchange Center on Access to Genetic Resources and Benefit Sharing.	Yes = 1 No = 0	1	1	1	1	1	1	1	1

Note: 1 = Yes, 0 = No

Source: Ministry of Municipality and Environment

15-7-1 Proportion of traded wildlife that was poached or illicitly trafficked.

Table (1.64): Proportion of traded wildlife that was poached or illicitly trafficked (2015-2019)

Description		Unit	2015	2016	2017	2018	2019	Goal by 2030
Traded Wildlife	Legally	Number	2,704	4,299	2,840	10743	989	Increase
	Illicitly	Number	9	10	3	12	6	Reduce
	Total	Number	2,713	4,309	2,843	10755	995	-
Proportion of traded wildlife that was illicitly trafficked			0.3%	0.2%	0.1%	0.1%	0.6%	0.0%

Source: Ministry of Municipality and Environment and PSA calculations.

15-8-1 Proportion of countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species.

Table (1.65): Availability of relevant national legislation and adequately resourcing the prevention or control of invasive alien species (2014-2020)

Description	Unit	2014	2015	2016	2017	2018	2019	2020	Goal by 2030
National legislation for the prevention or control of invasive alien species	Yes = 1 No = 0	1	1	1	1	1	1	1	1
Provide necessary funds for the applicable procedure	Yes = 1 No = 0	1	1	1	1	1	1	1	1

Note: 1 = Yes, 0 = No

15-c-1 Proportion of traded wildlife that was poached or illicitly trafficked.

Table (1.66): Proportion of traded wildlife that was poached or illicitly trafficked (2015-2019)

Description		Unit	2015	2016	2017	2018	2019	Goal by 2030
Traded Wildlife	Legally	Number	2,704	4,299	2,840	10,743	989	Increase
	Illicitly	Number	9	10	3	12	6	Reduce
	Total	Number	2,713	4,309	2,843	10,755	995	-
Proportion of traded wildlife that was illicitly trafficked		%	0.3%	0.3%	0.2%	0.1%	0.1%	0.0%

Source: Ministry of Municipality and Environment and PSA calculations.

Chapter Two
The Driving Forces

The Driving Forces

This chapter includes key economic, demographic and social developments in Qatar. It also includes changes in lifestyle accompanying these developments, especially in recent years, and the subsequent construction boom, and the unprecedented increase in the number of population in the state. This chapter highlights some demographic and economic indicators. The population development is the main driver that affects the rapid evolution and change in land use and urban, industrial and agricultural expansion.

1. General Information about the State of Qatar

1.1 Geographic Location

The State of Qatar lies between latitudes `27 24° and `10 26° north of the equator and longitudes 45` 50° and `40 51° east of Greenwich line. Qatar is a peninsula situated in the middle of the west coast of the Arabian Gulf and extends northward into the Arabian Gulf waters.

1.2 Area

Qatar is about 160 km long from the south to the far north and about 89 km wide from east to west. Its total area is about 11,627 square kilometers.

Map 1.1: Topography of Qatar by height above the Earth's surface and sea depth (meters)

Source: GIS Network – Qatar

Table 2.1: Area of the State of Qatar (km2) by General Census Years 1986-2015

Year	Area (km2)
1986	11,475
1997	11,532
2004	11,508
2010	11,607
2015	11,627

Source: PSA, Census results

1.3 Qatari Islands

Scientifically speaking, an island is a piece of land surrounded by water from all sides, regardless whether this water is sea, lake, river or ocean. Islands are formed in several ways; namely tectonic, volcanic or they emerge as a result of coastal erosion, ice, coral accumulation or sedimentation. Islands are usually classified into continental islands and oceanic islands. Qatar has a number of islands, including Halul, Shraouh, Ashat, Al Bashiriyah, Al Safliyah, Al Aaliyah and Rukn.

Table (2.2): Qatari islands by area and distance from coast line (km)

Island	Area (km)	Distance from Coast Line (km)
Halul	1.5	90.0
Al Aalyah	1.8	7.0
Al Safliyah	1.0	5.0
Shraouh	1.0	63.0
Ashat	6.0	10.0
Al Bashiryah	5.0	1.5
Rukn	1.4	2.0
Banana	0.1	3.2
Al-Khor (Bin Ghannam)	0.2	1.0
Pearl	5.3	0.5
Al-Nakheel	0.04	0.9
Total	**23.34**	**184.1**

Source: GIS Network – Qatar

1.4 Qatar's Surface and Topography

Qatar Peninsula is made up of a rocky flat surface peppered with some hills that reach a height of 100 meters above sea level. The bulk of the State is a sand desert clothed with short shrubs that are covered with sand and unstable pebbles. One can notice the moving sand dunes, which are around 40 meters high, in the southern part of the

State, and in the northeastern coast near Ras Laffan. The northern part of the State is relatively low, gradually increasing to rise toward the west and southwest.

1.5 Climate in Qatar

The climate of Qatar is of a desert nature with high temperatures especially in the summer. The mean high temperatures in the summer are characterized with a relatively high humidity, especially in coastal areas. Winter in Qatar is warm in general with a drop in temperatures to low levels from time to time. Qatar suffers from scarcity of rainfall throughout the year.

1.6 Administrative Divisions of Municipal Boundaries in Qatar

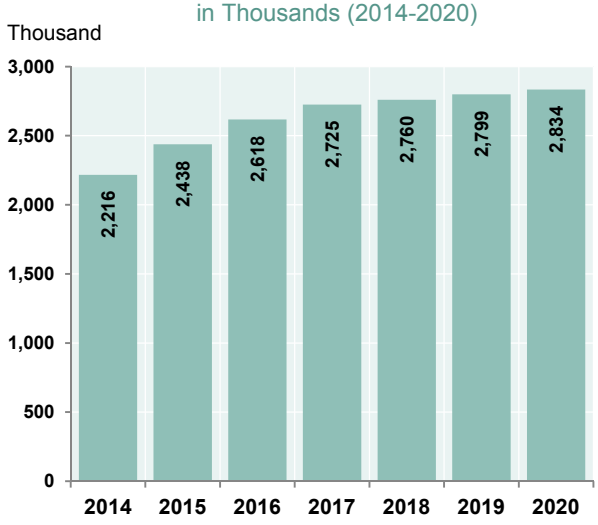
The administrative boundaries of municipalities are divided into eight municipalities, namely; Doha, Al Rayyan, Al Wakra, Umm Slal, Al Khor, Al Shamal, Al Dhaayin and Al Shihaniyah. Al Shihaniyah Municipality is the largest municipality areawise (28% of total area), whereas Doha Municipality is the smallest (1.2% of total area).

2. Population Indicators

2.1 Population of Qatar

The estimates of population of the State of Qatar amounted to two million eight hundred thousand people in 2019. The figure below shows an increase in population during previous years, with an annual growth rate of 4% between 2014 and 2020.

Figure 2.1: Mid-Year Population Estimates in Thousands (2014-2020)



2.2 Annual Population Growth Rate

Monitoring population growth rates is very crucial as the increase or decrease affects the demand for natural resources, electricity, water and economy. This is in addition to the expected amounts of consumption of food commodities and waste resulting from the daily consumption.

Table 2.3: Population and Annual Population Growth Rate 2014-2020

Description	Mid-year population
2014	2,216,180
2015	2,437,790
2016	2,617,634
2017	2,724,606
2018	2,760,170
2019	2,799,202
2020	2,833,679
Annual Population Growth Rate 2014 & 2020	4%

Source: PSA, Mid-Year Population Estimates

Source: PSA, Annual Statistics Abstract, Chapter of Population Statistics

2.3 Population Density

In the administrative division of municipal boundaries, Al Shihaniyah Municipality comes first in terms of area by 28.5% of total area of Qatar, whereas Doha Municipality comes last with 1.2% of total area. Concerning the distribution of population by municipalities, Doha Municipality comes first (39.8% of total population), and it has the highest rate of population density (4,353 persons per km2). The lowest number of population rate by municipalities is in Al Shamal Municipality by 0.4% of total population, with a population density of 10 persons per km2.

The statistics indicate a six-fold increase in population density rate between the censuses in 1986 and 2015, from 32 persons per km2 in Census 1986 up to 207 persons per km2 in Census 2015. We also find that the population density rate doubled during the last two censuses in 2010 and 2015, from 146 to 207 persons per km2.

Map 2.1: Population Density, 2015 Census

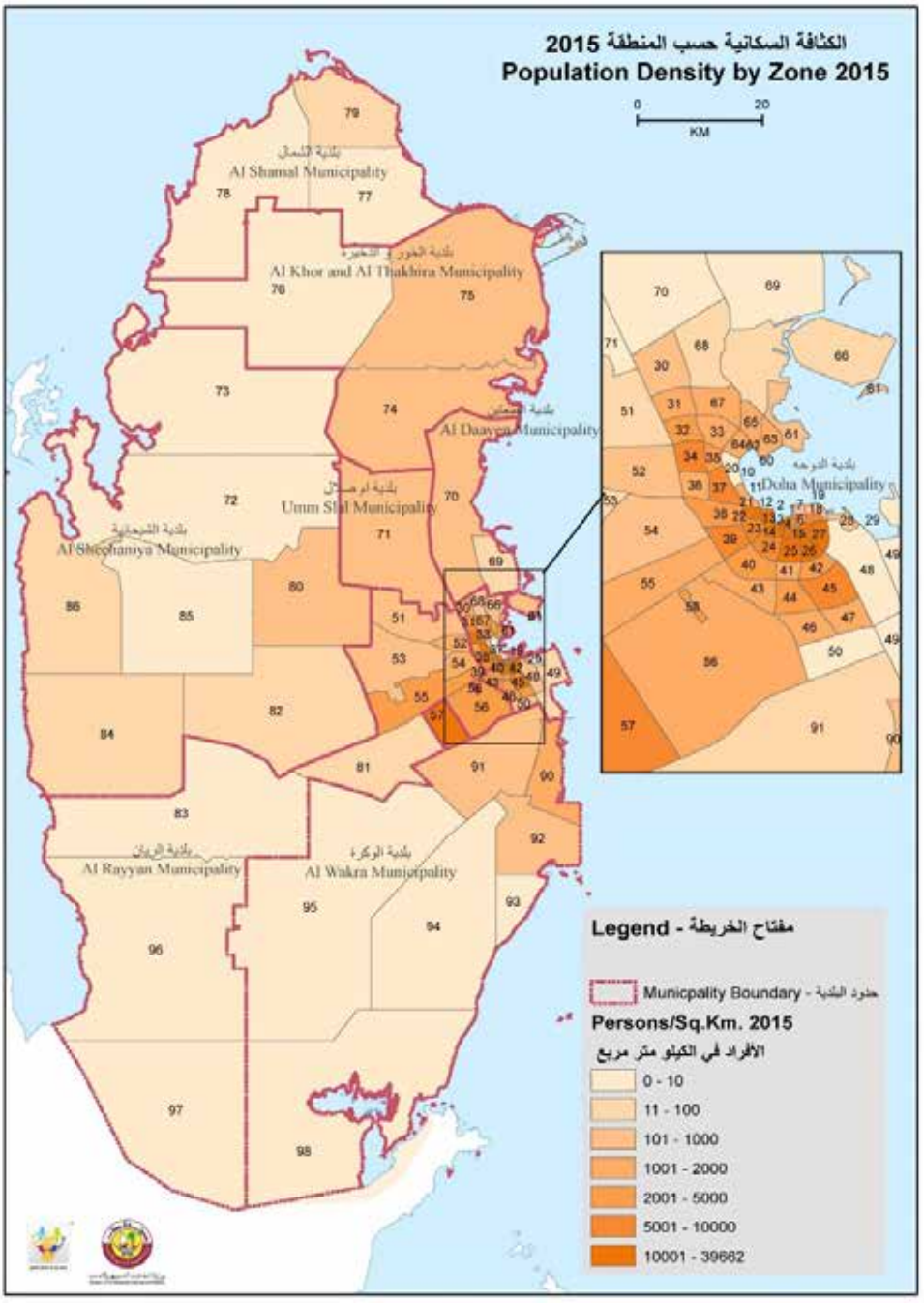


Table 2.4: Population by Municipality and Density (person/km2), Census 2015

Municipality	Area (km2)	Population	Population Density (person/km2)
Doha	219.7	957,457	4353.5
Al Rayan	2450.1	605,712	247.2
Al Wakra	2577.6	299,037	116.0
Umm Salal	318.4	90,835	285.3
Al Khor	1602.2	202,031	126.1
Al Shamal	859.9	8,794	10.2
Al Dhaayin	290.2	54,339	187.2
Al Shihaniya	3308.9	187,571	56.7
Total	11627.0	2,404,776	206.8

Source: PSA, Simplified Population Census 2015

Table 2.5: Population and Population Density (person/km2) by Census Years 1986-2015

Year	Population	Area of Qatar (km2)	Population Density (person/km2)
1986	369,079	11,475	32
1997	522,023	11,532	45
2004	744,029	11,508	65
2010	1,699,435	11,607	146
2015	2,404,776	11,627	207

Source: PSA, Population, Housing and Establishments Census

3. Economic Indicators

GDP growth is linked to the growth of goods and services, the demand for which has increased in Qatar, especially in recent times. In 2020, however, the annual growth rate of demand for these goods and services declined by -0.6% over the period 2014-2020. Compared to 2019, the annual growth rate of demand for goods and services declined by -3.6% in 2020.

The statistics show a growth in the agriculture, forestry and fishery activities in 2020 compared to 2014 by 0.3%, whereas the average growth rate of these activities reached 20% over the period 2014-2020.The second highest change was in construction and building sector, reaching 12% in 2020 compared to 2014, with an annual growth rate of 8%. In the same context, the growth rate in financial activities and storage activities increased by 8% in 2020 compared to 2014 with an annual growth rate of 6% during the period 2014-2020.

Table 2.6: GDP (at current prices), average annual per capita GDP growth rate, Consumer Price Index, inflation rate in Qatar and growth of GDP by economic activity (at constant prices 2013=100), 2014-2020

Indicator	2014	2015	2016	2017	2018	2019	2020
GDP at current prices (million QR)	750,658	588,733	552,305	568,401	667,339	641,991	525,657
GDP at constant prices (million QR)	619,861	649,325	669,221	659,199	667,339	671,932	648,027
GDP growth rate at current prices by economic activity (%)	3.8	21.6	-6.2	6.2	13.8	-3.8	-18.1
GDP growth rate at constant prices by economic activity (%)	5.3	4.8	3.1	-1.5	1.2	0.9	-3.5
Average and annual growth rate of per capita GDP at current prices (%)	-6	-29	-13	2	12	-5	...
Consumer Price Index (base year 2018=100)	95.69	97.35	99.63	99.89	100.0	99.11	96.55
Per capita GDP at current prices (thousand QR)	339	242	211	215	242	229	188
Inflation rate in the country 2014-2019 at current prices (%)	3	2	3	0	0	-1	...

* Data for previous years has been updated from the source

Source: PSA, Economic Statistics Bulletin, Chapter of National Accounts.

Table 2.7: Percentage distribution of GDP growth by economic activity at constant prices (base year 2018=100), 2014-2020

	Economic Activity	2014	2015	2016	2017*	2018**	2019**	2020**	Annual Growth Rate 2014 -2020
1	Agriculture, Forestry and Fishery	0.1	0.1	0.2	0.2	0.2	0.2	0.3	20.1
2	Mining and quarrying	40.4	40.1	39.7	38.8	38.7	38.0	38.7	-0.7
3	Manufacturing	7.2	7.6	7.7	7.7	8.2	8.0	7.8	1.3
4	Electricity, gas, steam, HVAC, water supply, drainage, waste management and treatment activities	0.8	0.8	0.8	0.9	0.8	1.0	0.8	0.0
5	Construction	7.7	9.3	11.9	12.1	12.3	12.1	12.1	7.8
6	Wholesale and retail trade and repair of motor vehicles and motorcycles	7.8	8.3	7.4	7.3	7.4	7.4	7.0	-1.8
7	Transport and storage	3.2	3.3	3.6	3.6	3.9	4.2	2.9	-1.6
8	Accommodation and food service activities	0.8	0.8	0.8	0.8	0.8	0.9	0.7	-2.2
9	Information and Communications	1.3	1.5	1.4	1.4	1.4	1.4	1.6	3.5
10	Finance and insurance activities	6.0	6.5	7.1	7.4	7.3	7.5	8.5	6.0
11	Real estate activities	5.0	5.5	5.8	6.1	6.3	6.5	6.7	5.0
12	Professional, scientific and technical activities, and administrative and support service activities	2.8	3.1	3.2	3.2	3.1	3.1	1.9	-6.3
13	Public administration and compulsory social security	6.6	7.1	6.9	6.1	7.2	7.6	1.1	-25.8
14	Education	1.7	1.8	1.9	1.9	1.7	1.7	1.2	-5.6
15	Health and social work activities	1.6	1.8	2.2	2.2	1.7	2.1	1.7	1.0
16	Arts, entertainment, leisure and other service activities	1.2	1.3	1.3	1.4	1.2	1.3	1.0	-3.0
17	Indirectly measured financial services	-2.9	-3.1	-3.4	-3.8	-3.9	-4.1	-4.5	7.6
18	Import duties	0.4	0.3	0.2	0.1	0.3	0.5	0.5	3.8
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-

Source: PSA, Economic Statistics Bulletin, Chapter of National Accounts.

(1) Includes not-for-profit organizations

*Revised figures

**Preliminary estimates

Chapter Three
Pressure on the Environment

Pressure on the Environment

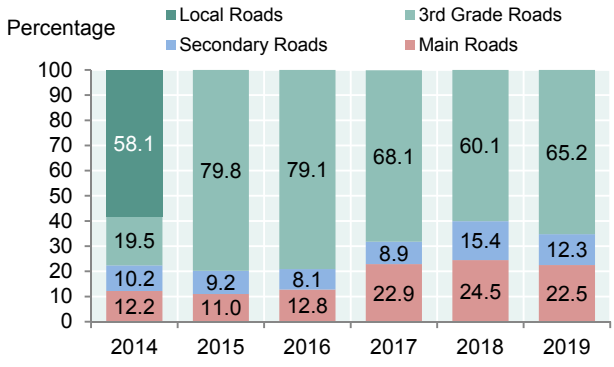
This chapter covers aspects of pressure on the environment resulting from meeting the different needs of population and economic developments and the subsequent developments in lifestyles, which in turn add to the pressure on the environment through increased emissions, waste and consumption of environment resources, such as water. It also covers the pressures on land use in various types and some of the demands of these requirements, such as the use of pesticides and fertilizers in agriculture. This chapter also includes the proportion of houses connected to sewage networks, the amount of pressure resulting from the environmental services and containment of pollutants, such as wastewater.

1. Land Use

1.1 Road Lengthes

The land use indicators meet the important basic information required by governments, policy-makers, researchers, analysts and civil society organizations. Land use is a unique environmental source that defines the space in which economic activities and environmental processes occur. Land cover and land use are closely correlated, where land cover refers to the vital aspect of land cover, while land use refers to the function represented by the land use .

Figure 2.1: Percentage Distribution of Road Lengths by Road Type 2014 - 2019



The population and economic growth relies on transport of all kinds. Transport, in turn, requires passages and routes that take out areas from the state land to meet the growing needs of population and economy. Meeting these needs leads to an increased demand for transport. Many studies have linked the economic growth to increased demand for transport and the accompanying repercussions on the environment, including the construction of roads and increased land use for this purpose.

The 2019 statistics for the road lengths show that the total road lengths reached 2,224 km. In terms of road lengths by type of road, the main road lengths reached 500 km, with an annual growth rate of 94% during the period 2014-2019, and 3rd grade road

lengths reached 1,450 km, with an annual growth rate of 32% for the same period. Secondary road lengths also increased to 274 km with an annual growth rate of 56% during the same period.

In terms of the relative importance of road lengths in Qatar, Figure 2.1 above on relative distribution of road lengths by road type (2014-2019) illustrates that 3rd grade roads had the lion's share of road lengths in 2014, amounting to 88.5% of total road lengths of all types, compared to 65.2% in 2019. Also in 2019, main roads ranked in second place of relative importance with 22.5%, followed by secondary roads with 12.3%.

Table 3.1: Road lengths by road type (km) 2014-2019

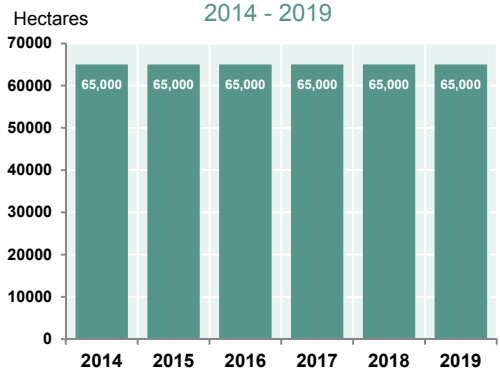
Road Type	2014	2015	2016	2017	2018	2019	Annual Growth Rate 2015 & 2019
Main Roads	18	67	126	309	389	500	94%
Secondary Roads	30	56	80	120	245	274	56%
3rd Grade Roads	368	487	781	919	954	1450	32%
Total	416	610	987	1348	1588	2224	40%

Source: PSA, Annual Statistical Abstract, Chapter of Transport Statistics.

1.2 Annual and Perennial Crops Area

The increase in cultivated area is directly linked to the increase in population and economic prosperity, which in turn puts pressure on environmental resources through the consequences on the environment to provide agricultural requirements of water resources, which are already scarce in Qatar. In addition, this creates pressure on groundwater reserves as a result of over pumping, and pressure on the environment as a result of pesticide use in agricultural production.

Figure 3.2: Total arable land area 2014 - 2019



In 2019, the percentage of uncultivated arable land area was 80.1% of total arable land, while the percentage of cultivated land area was 19.9% of total arable land. It is noted that the percentages are almost constant over the past few years.

Figure 3.3: Percentage distribution of agricultural use area 2014 - 2019

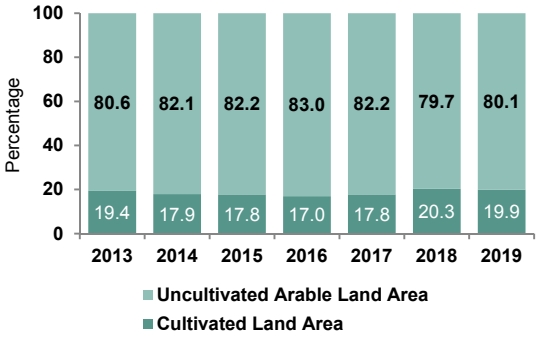


Table 3.2: Arable land area by type (hectare) 2014-2019

Year	Cultivated Land Area						Un-Cultivated Land Area	Total Arable Land
	Grain	Vegetables	Fruits	Palm	Green Fodder	Total		
2014	379	2,681	205	2,290	6,108	11,663	53,337	65,000
2015	308	2,105	192	2,300	6,666	11,571	53,429	65,000
2016	294	2,140	245	2,407	5,935	1,1021	53,979	65,000
2017	277	2,159	230	2,341	6,583	1,1590	53,410	65,000
2018	267	2777	85	2418	7656	13203	51797	65,000
2019	153	2832	149	2153	7620	12907	52093	65,000
Annual Growth Rate 2014 & 2019	-17%	1%	-6%	-1%	5%	2%	0%	0%

Source: PSA, Annual Statistical Abstract, Chapter of Agricultural Statistics.

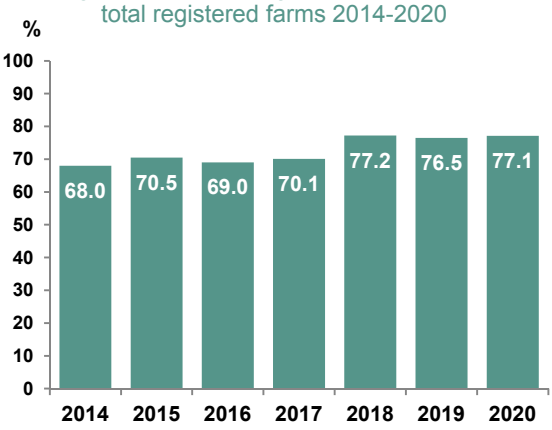
1.2.1 Crop Area in Cultivated Land

The statistics indicate that the green fodder cultivated land area was the largest of total cultivated land in 2019, with an area of 7,620 hectares at a relative importance of 59% of total cultivated area, followed by followed by vegetable area by 2,832 hectares at a relative importance of 21.9%, followed by palm tree area by 2,153 hectares at a relative importance of 16.7%, followed by grain area by 153 hectares at a relative importance of 1.2%, and finally the fruit tree area by 149 hectares at a relative importance of 1.15%.

1.2.2 Farms

The table indicates that the registered farms in Qatar amounted to 1,244 farms in 2020, with an area of 51,000 hectares. As for active farms, they reached 959 farms, with an area of 41,000 hectares.

Figure 3.4: Percentage of active farms of total registered farms 2014-2020



In terms of distribution of farms by municipality and farm type, we notice that Al Khor Municipality took the lead in farm area, occupying 37.5% of total farm area in Qatar in 2019, followed by Al Rayyan Municipality by 33.5%. The least farm area was in Doha Municipality with 0.1% only. This percentage is expected in Doha Municipality as a result of the pressure of urban sprawl accompanied by roads, constructions and facilities at the expense of the sustainable land distribution.

The 2020 statistics indicate that there were 512 crop farms, 26 livestock farms, 682 mixed crop-livestock farms and 24 other farms.

Table 3.3: Agricultural Land Uses (Hectare, Number, Percentage) 2014-2020

Description	2014	2015	2016	2017	2018	2019	2020	Annual growth rate 2014 & 2020
Total arable area (hectare)	65,000	65,000	65,000	65,000	65,000	65,000	65,000	0%
Number of registered farms	1,282	1,290	1,307	1,310	1,220	1,245	1,244	-1%
Total registered farms area	47,116	47,470	49,878	49,988	50,346	50,723	51,036	%1
Total arable area of registered farms	28,270	28,482	29,927	29,992	30,207	30,434	30,622	%1
Number of active farms	872	910	902	916	942	952	959	2%
Total active farms area	35,862	36,631	36,426	36,750	40,690	41,038	40,957	2%
Total arable area of active farms	21,517	21,979	21,856	22,050	24,414	24,623	24,574	2%
Crop area of exposed crops in active farms	11,030	11,571	10,777	11,340	12,872	12,388	13,002	3%
Total crop area of active farms	11,217	11,805	11,021	11,589	13,203	12,897	13,647	3%
Farm condensation degree%	52.1	53.7	50.4	52.6	54	52	56	1%

Source: Ministry of Municipality and Environment, Annual Bulletin of Crops Area and Production.

Table 3.4: Number and area of farms (Hectare) by type and municipality 2019

Municipality	Crops		Livestock		Mixed		Others*		Total	
	Number of Farms	Area (Hectare)	Number of Farms	Area (Hectare)	Number of Farms	Area (Hectare)	Number of Farms	Area (Hectare)	Number of Farms	Area (Hectare)
Doha	5	58.5	0	0	0	0	0	0	5	58.5
Al-Rayan	178	10457.7	11	433.2	230	5969	8	126.1	427	16986
Al Wakra	44	2593.3	2	848.1	27	616.4	10	1559	83	4213.7
Umm Slal	64	2094.8	1	66.1	88	3492.5	0	0	153	5653.4
Al Khor	123	4815.8	6	1318.8	216	12857.8	2	25.9	347	19018.3
Al Shamal	63	772.4	5	29.8	88	1940.4	3	14.9	159	2757.9
Al Dhaayin	35	619.6	1	17.6	33	1395.6	1	1.9	70	2034.7
Total	512	21412.1	26	2713.6	682	27272.1	24	324.7	1244	50722.5

* Others (recreational, fishery, bees, neglected)

Source: Ministry of Municipality and Environment, Annual Bulletin of Crops Area and Production

1.3 Annual and Perennial Crops Quantity

With 629,000 tons, the green fodder production dominated the agricultural production in 2019 by 62.2%, followed by milk and dairy products with 200,000 tons at a relative importance of 20.1%, followed by vegetables with 91,000 tons at a relative importance of 9.2%, followed by fruits and dates with 26,000 tons at a relative importance of 2.7%, followed by meat production with 33,000 tons at a relative importance of 3.3%, followed by fish with 17,000 tons at a relative importance of 2.1%, followed by egg production with 8,000 tons at a relative importance of 1.7%, and finally comes grain production with 1,000 tons at a relative importance of 1.011% (see Table 3.5 below).

Table 3.5: Agricultural production by food groups (tons) 2014-2019

Food Group	2014	2015	2016	2017	2018	2019	Change rate 2014 & 2019
Grain	2,455	1,613	1,377	1,377	2,309.3	1,011	-16%
Green Fodder	496,136	541,957	483,210	534,515	639,878.1	629,199	5%
Fruits and Dates	28,244	28,339	29,794	28,975	29,276.8	26,400.7	-1%
Vegetables	50,648	58,077	53,596	55,579	74,650	914,705	78%
Meat	15,401	16,541	25,988	24,805	36,036	32,555	16%
Milk and Dairy Products	90,803	79,804	62,061	56,146	226,408	199,926	17%
Eggs	4,338	4,522	4,962	5,753	8,372	7,943	13%
Fish	16,213	15,202	14,513	15,358	14,665	16,938	1%
Total	704,238	746,055	675,501	722,508	1,031,595.20	1,828,677.7	21%

Source: Ministry of Municipality and Environment, Annual Bulletin of Crops Area and Production .

1.4 Food Self-Sufficiency

The population food security statistics indicate that food self-sufficiency stood at 16% in 2019, at an annual growth rate of 3% from 2014. A fluctuation in the index of food self-sufficiency ratios in Qatar was observed over the period (2014-2019).

With regard to self-sufficiency by food groups, the percentage of self-sufficiency in dairy products group stood at 72.8% in 2019, which is higher than the rest of food groups, followed by fish group at 32.8%, meat group at 23.8%, vegetable group at 22%, egg group at 15.8%, fruits and dates group at 9.1%, and finally came group at 0.1%. However, a lack of self-sufficiency was noticed over the years in the following food groups: legume and oilseed group, sugar and sugary products group and oil and fat group.

Figure 3.5: Percentage of self-sufficiency by food groups 2018-2019

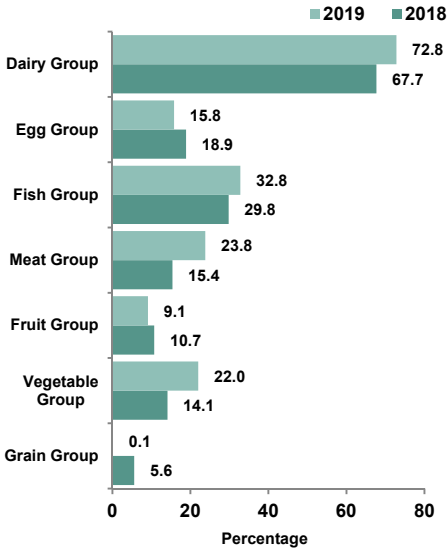


Table 3.6: Total food commodities available for consumption and percentage of self-sufficiency (ton, %) 2014-2019*

Year	Local Production (Ton)	Available for Consumption (Ton)	Percentage of Food Self-Sufficiency
2014	242,161	1,788,492	13.5
2015	260,129	2,126,244	12.7
2016	249,545	2,342,457	10.7
2017	244,038	2,114,721	11.5
2018	446,638	2,661,218	17
2019	430,565	2,740,744	16
Annual Growth Rate 2014 & 2019	%12	%9	%3

Source: Ministry of Municipality and Environment, Annual Bulletin of Agricultural Commodity Consumption .

*The data for previous years has been updated from the source

1.5 Fertilizers and Pesticides

1.5.1 Amounts of Fertilizers Used

The organic substance in compost plays an important role in the physical and chemical changes, and in the activity of soil bacteria, which is beneficial to plant. The good soil is defined as the soil that has water-holding capacity and is air-permeated, resulting in a noticeable activity of roots which in turn would help healthy and normal growth with lots of natural ingredients needed for the plant to yield a good harvest and increase the crop. Nitrogen and natural potassium both provide the plant with nutrition when needed, and they do not dissolve in soil water. Compost is the fertilizers that contain, wholly or partially, nutrients of the soil in the shape of animal or vegetable organic compounds. The organic matter is the main component that needs to be in the soil to ensure a sustainable yield. The sandy soil in arid and semi-arid environments contains very little or no organic matter.

In terms of soil relation to the environment, the compost undoubtedly improves the properties of the soil, retains water, activates the beneficial bacteria and is free of weeds and harmful bacteria. The statistics indicate that the volume of fertilizers used in 2015 amounted to 22 tons of heat-treated compost.

Table 3.7: Amount of fertilizers used by type of fertilizer (ton) 2014-2015

Type of Fertilizer	2014	2015
Soft Compost	0	0
Rough Compost	0	0
Poultry Manure	0	0
Heat-Treated Compost	0	22
Total	0	22

* No updated data from source

Source: Ministry of Municipality and Environment

1.5.2 Amount of Imported Pesticides

In order to meet the population growth which is pressing on the environment in terms of increased demand for agricultural products to provide necessary food, the agricultural policies have adopted the intensive agriculture pattern which requires a number of measures, including the use of pesticides. Pesticides are used in Qatar for agricultural purposes (such as insecticides, fungicides and herbicides) to protect the palm trees and parks from insects and to combat insects in government buildings and private housing. The massive use of pesticides has serious implications on the environment and on the ecosystems, such as biodiversity and pollution of groundwater and public health.

Table (3.8) below shows that the amount of chemical pesticide imports increased from 52,000 kg in 2014 to 112,000 kg in 2017 (an annual growth rate of 29%).

Table 3.8: Qatar imports of chemical pesticides by type (kg) 2014-2017

Type of Imported Pesticide	2014	2015	2016	2017	Annual Growth Rate 2014 & 2017
Pesticides used for public health purposes	9,435	0	0	0	-100%
Insecticides	30,055	15,477	0	0	-100%
Fungicides	11,680	85,141	0	0	-100%
Herbicides	500	4,682	0	0	-100%
Unspecified pesticides	500	24,700	88,861	112,543	508%
Total	52,170	130,000	88,861	112,543	29%

* No updated data from source

Source: Ministry of Municipality and Environment

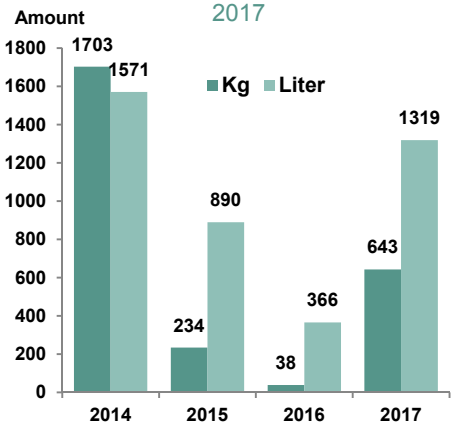
1.5.3 Pesticides used to control pests at homes and government facilities

Scientifically speaking, the pest control methods are generally divided into: natural control and applied control. The natural control includes factors that destroy or limit the spread of pests naturally without human intervention, as natural conditions reduce pests. These factors are mainly:

Nutritional factors: such as lack of food due to drought or lack of breadwinner.

- *Aerial factors: such as high or low temperature, humidity, wind and precipitation.*
- *Vital factors: such as natural enemies, e.g. predators, parasites or fungal, bacterial and viral insect diseases.*

Figure 3.6: Amount of pesticides used to control pests at homes and government facilities 2014-2017



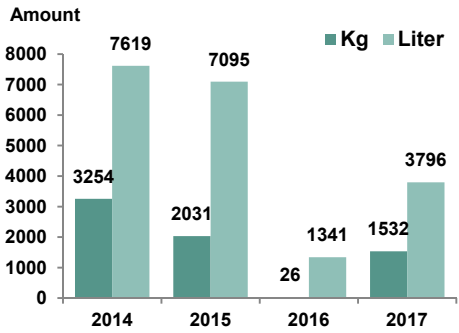
• Topographical factors: such as deserts and others.

The applied control is the human interference to apply such control when natural control fails. The community needs to control insects and rodents, such as fleas, cockroaches, rats and other pests. Figure (3.7) below shows that the pesticides used to control pests at homes and government facilities amounted to 643 kg and 1,319 liters in 2017.

1.5.4 Pesticides used to combat palm tree pests

Palm trees are exposed to various pests, such as animals, insects, fungus, bacteria, weed, etc. Pesticides are used to reduce losses caused by such pests. Statistics from Figure (3.7) show that the pesticides used to control palm pests amounted to 1,531 kg and 3,796 liters in 2017. It is also noted that the indicator of amount of pesticides used to control palm pests has declined post 2014.

Figure 3.7: Amount of pesticides used to control palm tree pests *2014-2017



1.6 Importance of agriculture, forestry and fishery sector to Qatar's economy

The weight of this sector in the Qatari economy remains limited both in terms of its contribution to GDP and job opportunities (employment), where the value added in the agriculture and fishery sector amounted to QR 1,472 million in 2019, at an annual growth rate of 11%.

The agriculture and fishery sector contributes to the creation of job opportunities through agricultural labour, where the proportion of workers in agriculture activity reached 1.5% of total labour force in 2019. We note that the number of labour force in this sector increased to 32,000 workers in 2019, the majority of whom were expatriates, with an annual growth rate of 7%.

Table 3.9: Importance of agriculture, forestry and fishery sector for Qatari economy 2014-2019*

Year	Economic sector of agriculture, forestry and fishing			Agricultural Labour Force		
	Value added in agriculture, forestry and fishery sector (million QR)	GDP at current prices (million QR)	Percentage of value added in agriculture, forestry and fishery sector of GDP%	Number of workers in agricultur, forestry and fishery sector	Total number of labour force	Percentage of workers in agriculture, forestry and fishery sector of total labour force%
2014	**869**	**764,797**	**0.11**	**23,123**	**1,689,933**	**1.37**
2015	**950**	**588,733**	**0.16**	**24,006**	**1,956,627**	**1.23**
2016	**1,016**	**552,305**	**0.18**	**24,916**	**2,052,687**	**1.21**
2017	**1,259**	**586,401**	**0.21**	**25,544**	**2,054,502**	**1.2**
2018	**1,457**	**667,339**	**0.22**	**27,907**	**2,094,647**	**1.3**
2019	**1,472**	**640,049**	**0.23**	**32,255**	**2,107,982**	**1.5**
Annual Growth Rate 2014 & 2019	**11%**	**-3%**	**16%**	**7%**	**5%**	**2%**

Source: PSA, Labour Force Sample Survey, National Accounts Statistics.

* Data for previous years has been updated from the source

1.7 Exports and imports of agricultural products

The value of exports of Qatari agricultural products amounted to QR 17 million in 2020, decreasing from the exports of 2014 by an annual growth rate of -19%. As for imports of agricultural products, their value increased steadily at an annual growth rate of 4% during this period, reaching QR 4 billion in 2020.

Table 3.10: Weight and value of agricultural product exports and imports in Qatar (tons, thousand QR) 2014-2020

Year	Agricultural Product Exports		Agricultural Product Imports	
	Weight (ton)	Value (thousand QR)	Weight (ton)	Value (thousand QR)
2014	**18,060**	**56,588**	**1,084,238**	**3,279,045**
2015	**22,587**	**61,806**	**1,295,797**	**3,369,555**
2016	**25,259**	**69,165**	**1,504,771**	**3,572,740**
2017	**14,157**	**35,316**	**1,320,720**	**3,681,524**
2018	**4,442**	**22,984**	**1,584,216**	**3,839,416**
2019	**4,115**	**14,686**	**1,784,520**	**4,116,547**
2020	**3,704**	**16,554**	**1,623,471**	**4,044,349**
Annual Growth Rate 2014 & 2020	**-23%**	**-19%**	**7%**	**4%**

Source: PSA, Foreign Trade Statistics -

*Data for previous years has been updated from the source

1.8 Livestock breeding on farms

The total number of livestock on farms amounted to 425 thousand in 2020, at an annual growth rate of 5% from 2019. Table (3.11) below shows that the annual growth rates of horse breeding on farms was high, amounting to 81% compared to the rest of the annual growth rates of livestock breeding on farms, followed by sheep (lamb) breeding at 19% from 2019.

As for the number of livestock on farms by municipality, the table shows that the number of livestock in Al Khor Municipality had the biggest share in terms of livestock breeding on farms, amounting to 192 thousand, followed by Al Rayyan Municipality with 114 thousand, followed by Al Shamal Municipality with around 48 thousand, followed by Umm Slal Municipality with nearly 48 thousand, followed by Al Dhaayin Municipality with 18 thousand and Al Wakra Municipality with about 9 thousand. It is worth mentioning that in Doha Municipality there is no livestock breeding, as farms there are allocated for permanent crop cultivation.

Table 3.11: Number of livestock on farms by type and municipality, 2019 and 2020

Description	Total Livestock	Total Livestock	Annual Growth Rate 2019 & 2020	Number of Livestock by Municipality 2020						
	2019	2020		Doha	Al Rayyan	Al Wakra	Umm Slal	Al Khor	Al Shamal	Al Dhaayin
Cow	50,656	31,873	-37%	0	7,037	444	2,210	17,666	2,944	572
Sheep (Lamb)	227,313	269,986	19%	0	65,044	3,958	25,496	128,165	34,690	12,633
Goat	81,656	73,694	-10%	0	24,233	4,491	10,382	27,147	3,393	3,048
Camel	11,935	12,351	3%	0	7,673	257	875	1,797	1,469	280
Horse	3,646	6,588	81%	0	930	41	926	999	3,229	463
Other	29,606	30,788	4%	0	8,646	179	2,029	16,460	2,429	1,045
Total	404,812	425,280	5%	0	113,563	9,370	41,918	192,234	48,154	18,041

Source: Ministry of Municipal and Environment, Annual Bulletin of Crop Areas and Production

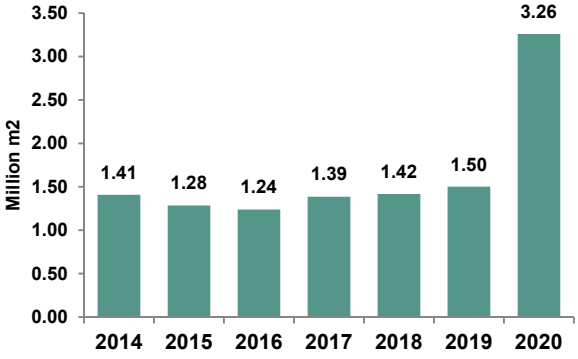
1.9 Green Spaces

1.9.1 Green Space Area

The total green space area in Qatar amounted to 3 million square meters in 2020, an annual growth rate of 15% from 2014.

In terms of relative importance of green space area by municipality in 2020, the vast share of green space area was in Al Rayyan Municipality with 67% of total green space area by municipality.

Figure 3.8: Green space area (m2) in Qatar excluding public parks 2014 - 2020



As for the annual growth rates in 2014 and 2020, the highest rate of green space area by municipality was in Al Shamal Municipality at 31%, followed by Al Rayyan Municipality at 28%.

Table 3.12: Green space area (m2) in Qatar, excluding public parks 2014-2020

Municipality	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2014 & 2020
Doha	742,229	592,229	503,543	613,241	577,500	577,500	770,928	1%
Al Rayyan	484,873	502,206	527,206	552,206	552,206	684,681	2,169,226	28%
Al Shamal	8,523	14,241	34,452	41,206	33,295	33,295	43,873	31%
Al Wakra	47,000	47,000	47,000		66,000	11,305	38,109	-3%
Umm Salal	16,700	19,000	17,250	50,000	17,250	17,250	11,500	-6%
Al Khor	72,876	72,876	84,483	17,250	140,633	140,633	134,104	11%
Al Dhaayin	35,000	36,550	23,250	112,233	29,250	34,200	89,280	17%
Al Shihaniya	…	…	…	…	…	3,282	3,282	-
Total	1,407,201	1,284,102	1,237,184	1,386,136	1,416,134	1502146	3,260,302	15%

Source: Ministry of Municipality and Environment

1.9.2 Trees, shrubs and palm trees planted in green spaces

The number of planted trees, shrubs and palm trees amounted to 18,878,378 in 2020, of which 14,894 were palm trees, 67,382 were assorted trees, 889,445 were shrubs and 17,906,657 were other types. It is noted that there was an increase in the annual growth rates of the number and area of trees, shrubs and palms from 2014.

Figure 3.9: Area of trees, shrubs and palms planted in green areas (not including public parks) 2014-2020

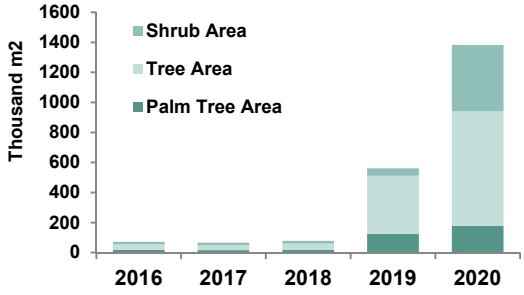


Table 3.13: Number and area of trees and planed area in green spaces in Qatar, excluding public parks (number, m2) 2014-2020*

Description		2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2014 & 2020
Number	Palm trees	11,151	10,177	9,453	8,251	12960	10,309	14,894	5%
	Trees	40,504	41,756	37,312	33,384	45941	40,566	67,382	9%
	Bushes	35,227	17,626	34,177	35,550	63062	67,534	889,445	71%
	Others	86,016	101,051	22,542	26,342	357939	712,710	18,878,378	146%
	Total	172,898	170,610	103,484	103,527	479902	831,119	19,850,099	120%
Area m2	Palm trees	24,702	20,354	18,906	16,502	146520	123,708	177,624	39%
	Trees	40,544	41,756	37,312	33,384	458870	387,858	764,140	63%
	Bushes	16,614	7,813	16,089	16,775	47671.5	49,908	441,120	73%
	Others	81,860	69,923	72,307	66,661	653061.5	561,474	1,382,884	60%

Source: Ministry of Municipality and Environment.

*Data for previous years has been updated from the source

1.10 Public Parks

1.10.1 Public Park Area

The number of public parks in the State of Qatar reached 104 in 2020, an annual growth rate of 5% from 2014, with an area of nearly 2 million square meters in 2019 and a growth rate of 9%.

In terms of the relative importance of public park area by municipality in 2020, the largest share of the public park area was in Doha Municipality, making up 49% of total area of public parks by municipality.

In terms of annual growth rates in 2014 and 2020, the municipality with the highest annual growth rates in green spaces by municipality is Al Dhaayin Municipality, with an annual growth rate of 33%.

Table 3.14: Number and area of parks by municipality 2014-2020

Description	Doha	Al Rayyan	Al Shamal	Al Wakra	Umm Slal	Al Khor	Al Dhaayin	Al Shihaniya	Total
Number of Parks									
2014	37	20	4	6	4	6	2	2	81
2015	37	22	4	6	4	7	3	2	85
2016	36	20	5	6	5	5	3	2	82
2017	34	20	5	6	5	7	4	2	83
2018	35	20	5	6	6	10	4	3	89
2019	39	20	5	6	6	19	4	3	102
2020	39	20	5	6	6	19	6	3	104
Growth rate 2014 & 2020	1%	0%	4%	0%	7%	21%	20%	7%	5%
Public Park Area m^2									
2014	419,715	310,130	97,660	62,355	23,666	293,707	14,000	23,480	1,244,713
2015	419,715	316,033	97,660	62,355	23,666	318,036	25,200	23,480	1,286,145
2016	314,715	239,784	101,216	62,355	29,654	284,200	57,000	39,549	1,128,473
2017	274,515	239,784	101,216	62,355	29,654	316,200	62,000	39,549	1,125,273
2018	529,013	239,784	98,800	62,355	53,654	354,041	62,000	53,131	1,452,778
2019	946,355	239,784	98,800	62,355	53,654	415,638	62,000	53,131	1,931,717
2020	946,255	239,784	98,800	62,355	53,654	415,638	76,000	53,131	1,945,617
Growth rate 2014 & 2019	15%	-4%	0%	0%	15%	6%	33%	15%	5%

Source: Ministry of Municipality and Environment.

*Data for previous years has been updated from the source

1.10.2 Trees, shrubs and palms planted in public parks

It is noted that the growth rate of plants in public parks increased during the period 2014-2020. With regard to the area of plants in public parks, there is an increase in the rates of the area of plants, except for the area of climbing plants, which decreased by 1%.

Table 3.15: Number of trees and shrubs in public parks during the period 2014-2020

Plants	2014	2015	2016	2017	2018	2019	2020	Change Rate 2014 & 2020
Number date palm trees	1,463	1,481	1,576	1,576	1,510	1,595	1,632	2%
Number of other plants	156,293	156,769	175,759	175,759	239,760	379,654	387,304	16%
Number of palm group	4,074	4,088	4,239	4,335	10,676	10,953	10,996	18%
Number of climbing plants	950	950	950	950	950	1,146	1,146	3%
Number of succulent plants and cacti	4,744	4,744	4,880	4,880	4,880	4,885	4,885	0%
Number of seasonal flowers	73,589	73,922	85,260	85,260	113,839	173,918	177,833	16%
Number of ground cover plants	63,625	63,720	70,940	70,940	112,423	176,666	180,401	19%
Number of bushes	39,314	39,382	42,840	42,840	34,048	40,279	42,679	1%
Number of palmate trees	861	864	903	903	1,032	1,168	1,174	5%
Number of trees	8,180	8,197	8,331	8,331	9,096	7,063	7,107	-2%

Source: Ministry of Municipality and Environment.

*Data for previous years has been updated from the source.

Table 3.16: Area of trees and shrubs in public parks (m2) during the period 2014-2020

Area of Plants M2	2014	2015	2016	2017	2018	2019	2020	Change Rate 2014 & 2020
Date palm trees	2926	2962	3152	3152	18,120	20,148	37,260	53%
Other plants	16400	16448	18578	18578	31,717	43,689	2,983,160	138%
Palm group	4648	4690	4958	4958	29,172	29,804	51,028	49%
Climbing plants	568	568	568	568	573	573	523	-1%
Succulent plants and cacti	2195	2195	2263	2263	2,326	2,341	2,627	3%
Seasonal flowers	6568	6605	7865	7865	15,980	20,605	48,682	40%
Ground cover plants	7069	7080	7882	7882	12,839	20,170	332,978	90%
bushes	19657	19691	21420	21420	19,619	22,254	86,423	28%
Palmate	1722	1728	1806	1806	8,256	9,664	13,776	41%
Trees	8180	8197	8331	8331	83,210	92,330	108,730	54%

Source: Ministry of Municipality and Environment.

*Data for previous years has been updated from the source.

2. Water Demand

Water demand is part of the pressures resulting from meeting the needs of population and economy for natural resources, including water resources. Today, water demand exceeds all previous demands, due to population growth and mobility, rising living standards, changes in food consumption habits and pressures resulting from the growing need for energy, as the relation between water and energy is interdependent.

Table 3.17: Water demand (million cubic meters per year) 2014-2020

Year	Water Demand
2014	463.4
2015	498.8
2016	522.2
2017	568.9
2018	596.2
2019	628.7
2020	653.8
Annual Growth Rate 2014 & 2020	6%

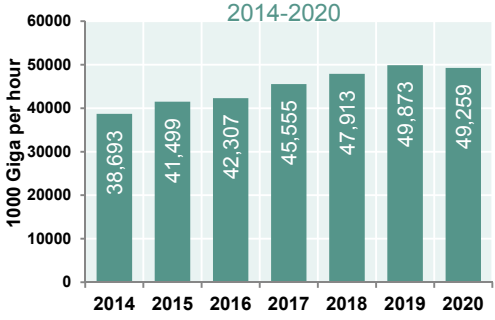
Source: KAHRMAA

Water demand in the State of Qatar reached 654 million cubic meters in 2020. Accordingly, Qatar General Electricity and Water Corporation "KAHRAMAA" has launched a national program for rationalization and energy efficiency to reduce water and electricity consumption. Qatar also seeks to enact a law for water to reduce water consumption and sustain water resources for the coming generations.

3. Power Generation

Power generation comes to meet the consumption linked to emerging needs resulting from the increase in population and economic growth, and pressures in the production of electricity and energy used for water desalination as well as fuel for vehicles and other population and economic growth requirements. The environment is being pressured by the increasing energy use, which in turn leads to more emissions released into the air and consequently causes a change in the ambient air quality and concentrations of greenhouse gases. The total amount of electricity generated reached 49 million gigawatt per hour in 2020, with an annual growth rate of 4% compared to 2014 .

Figure 3.10: Power generation per year (thousand gigawatts per hour) 2014-2020



4. Modes of Transport

Car use is linked to the needs of the population, urbanization, economic prosperity and modern massive construction. All of these aspects resulting from the driving forces of population and economic development add pressure on environmental resources. The pressure resulting from the increased number of cars in Qatar is embodied in many aspects, such as increased emissions from the combustion of the fuel used in different transport vehicles, as well as the change in land use as a result of expansion of existing roads and construction of new roads, in addition to the water

consumed in cleaning these vehicles and the resulting residuals, such as oils, batteries, tires, car bodies and discarded cars.

4.1 Cars and Motorcycles

The total number of cars and motorcycles reached 1.7 million in 2019, of which 1.4 million were government-licence cars, private cars, private transport cars and taxis.

The table shows the cumulative numbers of various modes of transport during the period 2014-2019, where other types of licences topped the list with an annual growth rate of 60% from the year 2014, followed by motorcycle licences with 15%, and then heavy equipment licences with 7%.

Table 3.18: Total cars and motorcycles by type of licence 2014-2019

Type of Licence	2014	2015	2016	2017	2018	2019	Annual Growth Rate 2014 & 2019
Government	12,902	14,128	14,895	3,531	13,608	13,503	1%
Private	780,621	850,882	908,995	955,328	998,987	998,987	5%
Private Transport	324,250	356,664	381,439	401,028	415,178	428,668	6%
Heavy Equipment	50,090	56,991	61,582	26,699	67,555	69,254	7%
Taxi	10,448	11,473	12,243	13,143	13,714	14,122	6%
Motorcycle	13,169	15,438	17,261	19,742	22,972	26,233	15%
Trailer	34,273	39,221	42,855	44,737	45,656	46,217	6%
Public Transport	2,345	2,787	2,813	2,821	2,828	2,900	4%
Other	5,396	5,396	5,396	55,704	7,317	55,816	60%
Total	1,233,494	1,352,980	1,447,479	1,522,733	1587,815	1,655,700	6%

Source: PSA, Annual Statistical Abstract – Chapter of Transport and Communications Statistics.

*Data for previous years has been updated from the source.

4.2 Registered New Cars and Motorcycles

The statistics indicate that the total number of registered new cars and motorcycles stood at 65,680 in 2019, with an annual growth rate of -10% from 2014. All types of licences showed low growth rates except for other equipment (37%) and motorcycles (11%) compared to 2014.

Table 3.19: Registered new cars and motorcycles by type of licence 2014-2019

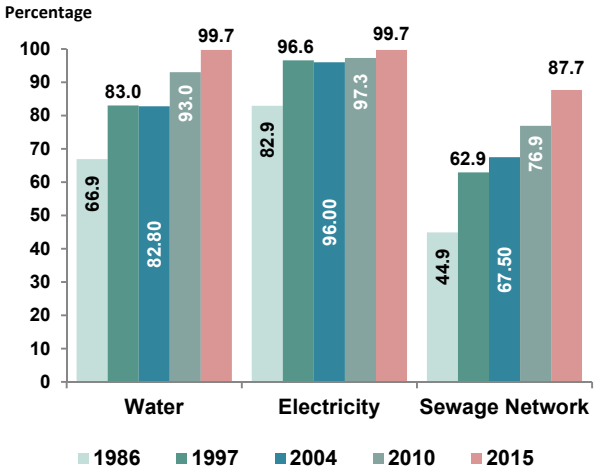
Type of Licence	2014	2015	2016	2017	2018	2019	Annual Growth Rate 2014 & 2019
Government	520	448	224	46	369	176	-19%
Private	69,479	67,447	55,964	43,868	43,659	45,979	-8%
Private Transport	29,129	31,274	23,801	18713	14,150	13,167	-15%
Heavy Equipment	4,899	6,767	4,494	3,,469	2,429	1,635	-20%
Taxi	1,328	1,024	727	876	571	385	-22%
Motorcycle	1,903	2,006	1,654	2,404	2,881	3,205	11%
Trailer	2,910	4,725	3,406	1,679	919	515	-29%
Public Transport	31	379	19	7	7	24	-5%
Other	122	581	405	435	97	594	37%
Total	110,321	114,651	90,694	68,028	65,082	65,680	-10%

Source: PSA, Annual Statistical Abstract – Chapter of Transport and Communications Statistics.

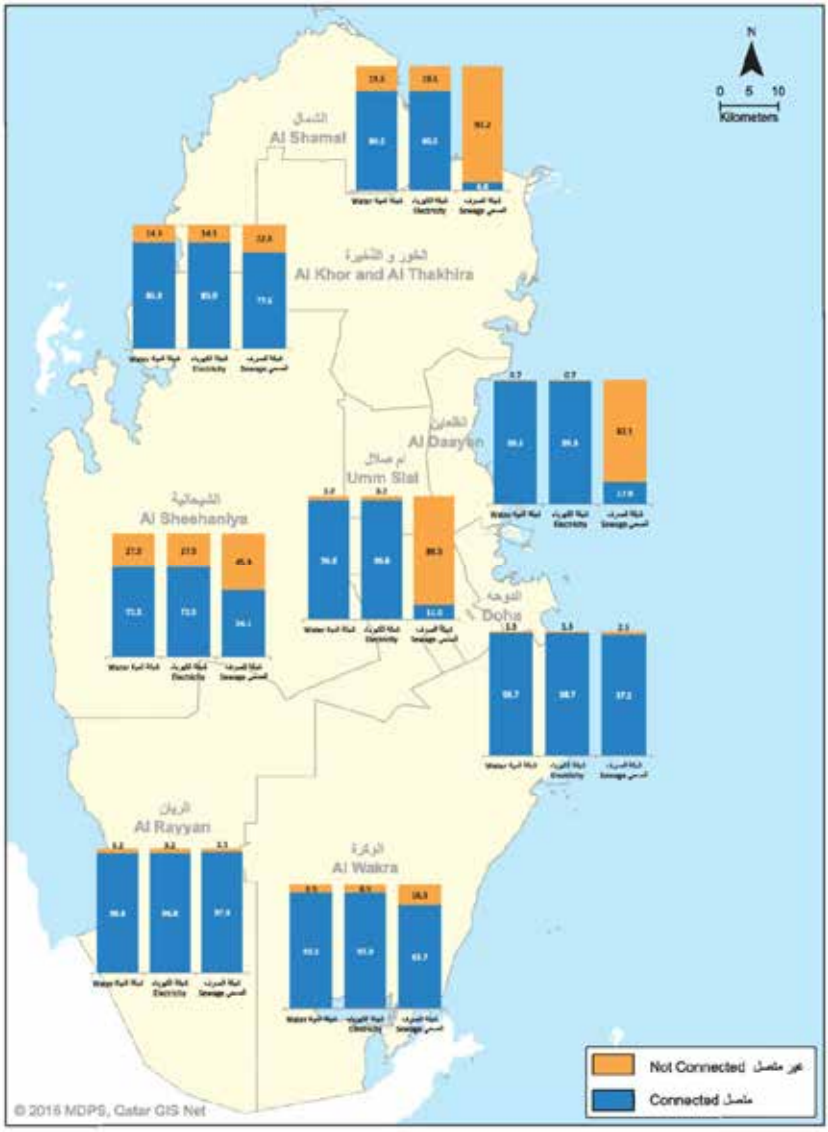
5. Completed Buildings Connected to Public Utilities

The statistics indicate a general rise in completed buildings connected to public utility networks during the years of Census 1986-2015. The index of completed buildings connected to electricity grid increased from 82.9% in 1986 to 99.7% in 2015. So is the case with the index of completed buildings connected to water network, which increased from 66.9% in 1986 to 99.7% in 2015, and the index of completed buildings connected to sewage network from 44.9 in 1986 to 87.7% in 2015. A rapid development of the curve is observed in completed buildings connected to sewage network over the years of the census from the geographical map of the distribution of completed buildings by connection to the sewerage network and municipality .As for the completed buildings not connected to sewage network, their wastewater is collected by tanks, which discharge the wastewater at the domestic wastewater treatment plants.

Figure 3.11: Percentage of completed buildings connected to public utility network by type of utility and general census years 1986-2015



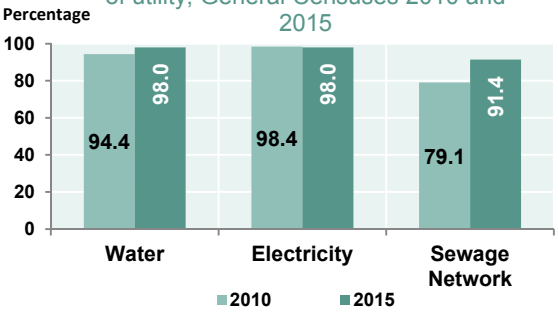
Map 3.1: Completed buildings by connection to public utilities, Census 2015



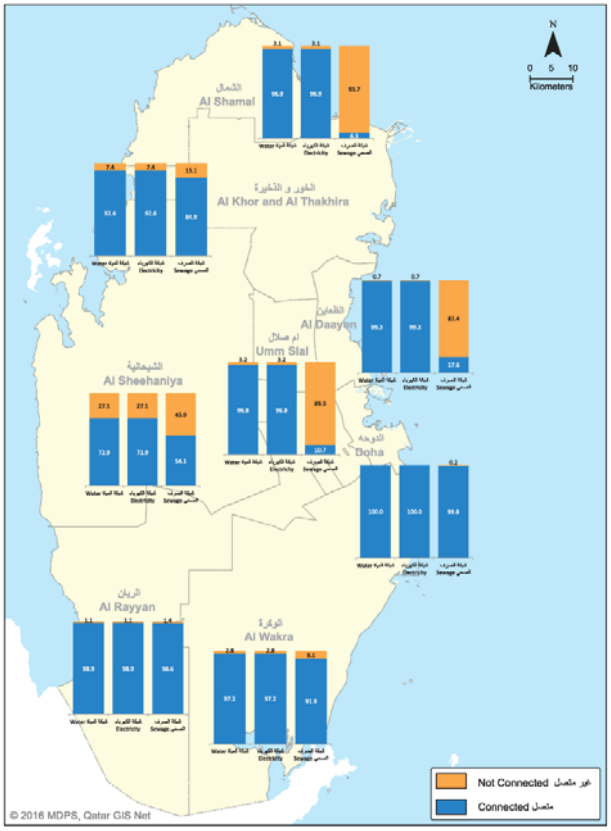
6. Housing Units Connected to Public Utilities

According to statistics from Censuses 2010 and 2015, there was a significant increase in housing units connected to sewerage network from 79.1% to 91.4%. Also, the indices of housing units connected to electricity grid and water network were high in both censuses.

Figure 3.12: Percentage of housing units connected to public utility network by type of utility, General Censuses 2010 and 2015



Map 3.2: Housing Units by Connection to Public Utilities, Census 2015



7. Urban Wastewater

This indicator is linked to the pressure caused by the use of water to meet the needs of the population, urbanization and economic prosperity. All these aspects resulting from the driving forces of population and economic development add pressure on environmental resources. The pressure resulting from the increased number of those connected to sewage network in Qatar is embodied in many aspects, such as the increasing pollution caused by wastewater discharged in the environmental resources and the potential pollution of groundwater resources, soil, coastal environment and biodiversity .

In Census 2015, the percentage of completed buildings connected to sewage network amounted to 87.7%. Over the years of censuses, an improvement was observed in index performance and the rapid rise of completed buildings connected to network. As for the residents who live in buildings not connected to sewage network, they are generally served by tankers, which transport wastewater to treatment plants, and thus the percentage of population connected to wastewater services is 100%.

With regards to housing units connected to sewage network, the results of Censuses (2010-2015) indicate that the number of these housing units increased from 204,831 (accounting for 79.1% of total housing units) in 2010 to 286,903 (accounting for 91.4% of total housing units) in 2015 .

As for housing units connected by municipality in Census 2015, the highest percentage was in Doha Municipality (99.8%), while the percentage was lower in Al Shamal, Umm Slal and Al Dhaayin Municipalities by 6.3% 10.7% and 17.6% respectively.

Figure 3.13: Percentage of completed buildings connected to public sewage network by General Census years 2010-2015

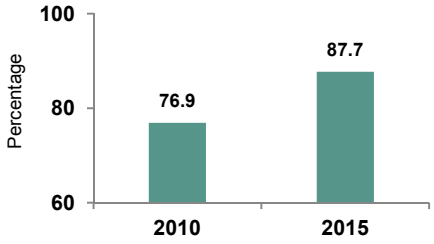


Figure 3.14: Percentage of housing units connected to public sewage network, Census 2010 & Simplified Census 2015

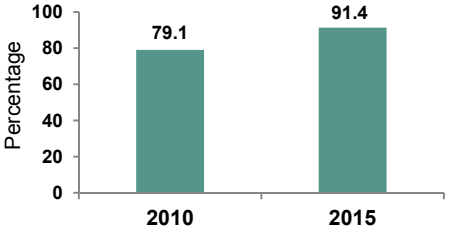
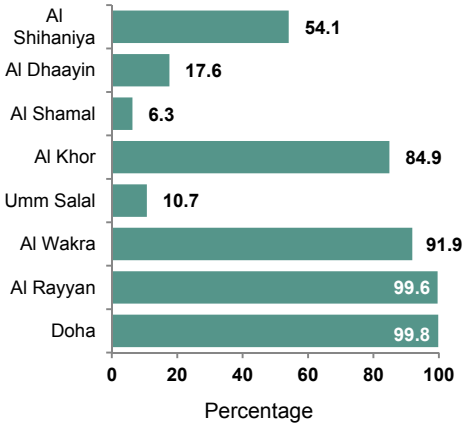


Figure 3.15: Percentage of housing units connected to public sewage network by municipality, Simplified Census 2015



Chapter Four
State of the Environment and Impact

State of the Environment and Impact

The state of the environment is linked to many aspects, whether they are natural aspects related to geographical location, nature of land, and climate and weather factors, or they are related to other factors that are mainly related to human activities and their consequences. This chapter measures the change in the state of the environment caused by pressure on various aspects of the environment. Most of these changes have negative impacts on the state of the environment and the health of ecosystems, as well as the human health. Changes increase in the state of the environment when the existing local ecosystems are fragile, limited and prone to rapid change.

As a result of the negative change on the state of the environment, this chapter also addresses the impact of this change on human health as well as the health of ecosystems, and the extent of environmental degradation caused by the change in the state of the environment, and the concomitant diseases associated with air and water pollution and food contamination. The chapter also addresses the loss of environmental resources, such as the climate in Qatar, biodiversity and depletion of environmental resources, such as water resources. This chapter further reviews each of the following topics: Qatar's climate, biodiversity, water resources use and quality, waste, energy consumption, air quality, consumption of ozone-depleting substances and diseases associated with environmental pollution.

1. Climate

The State of Qatar is characterized by a desert climate with high temperatures, especially in the summer times. The average high temperatures are linked to high relative humidity, especially in coastal areas. Qatar's winter is generally warm, and temperatures in winter fall to low levels from time to time.

The weather in Qatar is monitored by 38 stations, 2 buoys and 8 seismic stations. Table (4.1) below indicates the number and distribution of weather monitoring stations both onshore and offshore. In this report the climate statistics of five selected weather monitoring stations will be analzyed, namely; Ruwais, Dukhan, Mesaieed, Al Karanah and Doha International Airport.

Table 4.1: Number of weather monitoring stations (onshore and offshore) 2014-2020

Description	2014	2015	2016	2017	2018	2019	2020	Change Rate 2014 & 2020
Number of air monitoring stations	30	30	44	44	44	44	38	4%
Number of buoys	2	2	2	2	2	2	2	0%
Number of seismic stations	6	6	9	9	9	9	8	5%

Source: General Authority for Civil Aviation, Department of Meteorology.

1.1 Temperature

Temperature is measured in the shade and is monitored around the clock like the rest of the weather elements. The analysis includes the average annual and monthly temperatures and long-term temperatures.

1.1.1 Mean Monthly Maximum and Minimum Temperature

The maximum temperature is defined as the highest temperature recorded during the day. It is usually recorded in the middle of the day. The minimum temperature is defined as the lowest temperature recorded during the day. It is usually recorded between dawn and sunrise.

Statistics of the average monthly maximum temperatures at Hamad International Airport show that the maximum temperatures gradually rise from May to August.

Figure 4.1: Average temperatures of Hamad International Airport station by months 2020

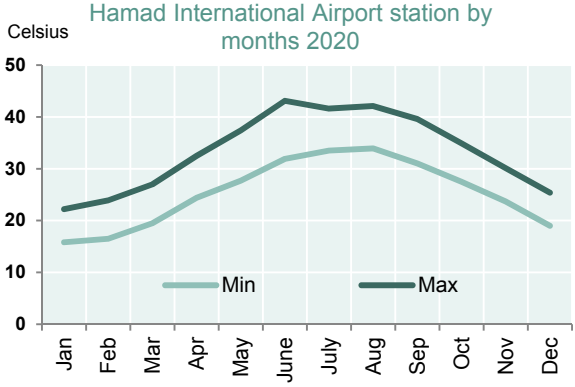


Table 4.2: Mean maximum and minimum temperatures by months at Hamad International Airport Station 2014-2020

Year		Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2014	*Min*	15.1	15.4	19.4	24.9	29.2	31.1	33.1	32.5	30.7	27.9	22.1	17.8
	Max	21.4	22.7	28.0	34.1	39.3	41.4	42.7	40.5	39.4	35.2	28.8	25.1
2015	*Min*	15.1	17.0	19.6	23.9	29.6	32.0	32.7	32.7	31.0	28.7	23.0	16.8
	Max	24.0	25.2	26.8	34.6	39.7	41.3	42.3	41.7	39.5	36.5	29.4	23.6
2016	*Min*	15.9	16.4	20.3	23.5	29.4	31.8	34.2	33.2	31.2	26.4	23.4	19.0
	Max	22.7	24.3	27.1	32.2	39.6	41.8	42.6	42.0	39.2	35.3	30.2	26.2
2017	*Min*	17.1	15.4	20.3	25.8	30.4	32.3	33.2	33.7	31.5	28.4	23.7	17.6
	Max	24.1	21.7	27.2	35.5	40.3	42.3	42.7	41.4	39.4	36.8	30.2	25.1
2018	*Min*	15.5	17.5	21.0	24.7	28.6	33.0	33.4	23.9	31.8	28.4	23.4	19.4
	Max	23.4	25.3	31.2	33.1	37.8	42.9	42.6	42.2	39.5	34.7	28.9	25.3
2019	*Min*	17.3	17.0	18.6	23.3	29.0	32.7	33.5	33.2	31.5	29.6	23.1	19.3
	Max	24.5	23.5	25.8	31.8	38.6	43.4	41.8	41.5	39.6	36.2	29.3	25.5
2020	*Min*	15.8	16.5	19.5	24.4	27.7	31.9	33.5	33.9	31.0	27.5	23.7	19.0
	Max	22.2	23.9	27.0	32.5	37.4	43.1	41.6	42.1	39.6	34.9	30.1	25.4

Source: General Authority for Civil Aviation, Department of Meteorology.

1.1.2 Average Annual Temperature

During the period 2014-2020, the mean annual temperatures recorded at selected monitoring stations alternated between 27.1◦ C and 29.1◦ C. The annual temperature at Hamad Intl. Airport station reached 29.1◦ C in 2020, which was the highest temperature among the five stations, followed by Al Karaana station reaching 28.2◦ C. The lowest annual temperature was recorded at Dukhan station reaching 27.1◦ C in 2020.

Table 4.3: Mean annual temperatures by selected monitoring stations, 2014-2020

Seleced Stations	2014	2015	2016	2017	2018	2019	2020	Change Rate 2014 & 2020
Ruwais	27.3	27.4	26.9	27.2	27.5	27.3	27.3	0%
Dukhan	27.1	27.5	26.8	27.1	27.5	27.3	27.1	0%
Mesaieed	27.9	28.4	27.3	28.0	28.3	28.2	27.9	0%
Al Karaana	27.5	28.1	27.6	28.1	28.6	28.4	28.2	0%
Doha Intl. Airport	28.8	29.0	29.2	29.5	29.5	29.3	29.1	0%

Source: General Authority for Civil Aviation, Department of Meteorology.

1.1.3 Mean Annual Maximum and Minimum Temperature

The statistics of the average maximum temperatures in the five selected weather monitoring stations show that the highest maximum temperatures were recorded in Al-Karana station, as they reached 34.8◦ Celsius. The average maximum temperature in Ruwais station was 29.7°C.

Figure 3.4 indicates the average minimum and maximum temperatures in July at Doha International Airport during the period 2014-2019 and the average long-term temperatures during the period 1962-2019. The data indicates that the highest average maximum temperature was in 2014 and 2017, reaching 43.3˚ C, while the highest average minimum temperature was in 2016 reaching 34.2˚ C. It is noted also that all average maximum and minimum temperatures for the years 2012-2019 were above the average long-term temperatures (1962-2017).

Figure 4.2: Average temperature by month and selected monitoring stations, 2020

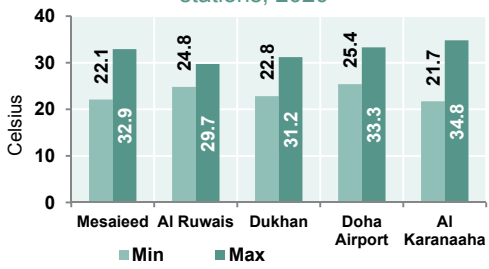


Figure 4.3: Average minimum and maximum temperatures in July at Doha Intl. Airport (2014-2019)

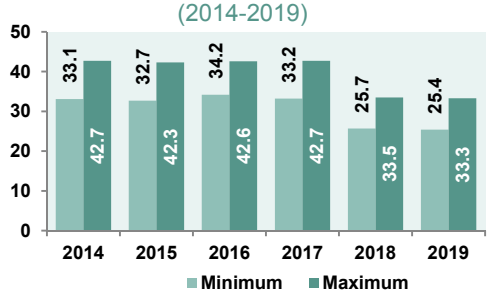


Table 4.4: Average maximum and minimum temperatures for five selected stations 2014-2020

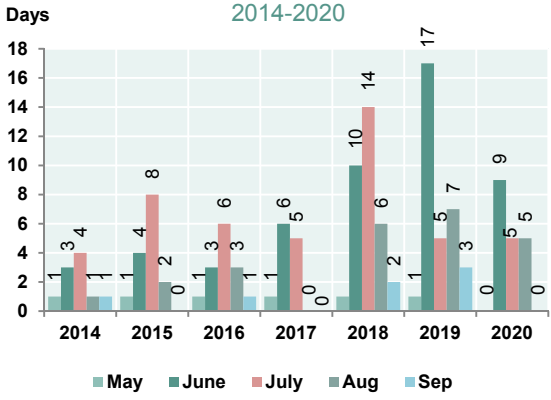
Seleced Stations	2014		2015		2016		2017		2018		2019		2020		Change Rate 2014 & 2020	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Mesaieed	21.9	33.4	22.7	33.6	21.3	32.8	22.2	33.3	22.4	33.6	22.6	33.2	22.1	32.9	0%	0%
Ruwais	24.2	30.8	24.7	30.3	24.3	29.1	24.7	29.6	25.1	29.9	25	29.6	24.8	29.7	0%	-1%
Dukhan	22.9	31.2	23	32	22.6	30.7	22.8	31.1	23.3	31.5	23.2	31.4	22.8	31.2	0%	0%
Doha Intl. Airport	25	33.8	25.2	33.9	25.4	33.6	25.8	33.9	25.8	33.9	25.7	33.5	25.4	33.3	0%	0%
Al Karaana	21	34.3	21.7	34.9	21.1	34.2	21.6	34.8	22.1	35.2	22	34.8	21.7	34.8	1%	0%

Source: General Authority for Civil Aviation, Department of Meteorology.

1.1.4 Hottest and Coldest Days

Through the statistics of the absolute minimum and maximum temperatures that were measured at the Doha International Airport station, we note that 9 June, 5 July, and 5 August are the hottest days with more than 45◦ Celsius. In comparison with the five selected stations, the stations that monitored temperatures of more than 45°C are as follows: Mesaieed station 23 days, Dukhan two days, Hamad International Airport 19 days, Al Karaana 36 days for 2020, while it was not monitored at Ruwais station.

Figure 4.4: Number of days in which temperatures were equal or above 45° C by month and year at Doha Intl. Airport 2014-2020



Note:

The coldest days, where the temperature was below 10◦ C, were recorded at Mesaieed Station 14 days, Dukhan Station 6 days, and Karaana Station 17 days, while it was not observed at Ruwais and Hamad International Airport station in 2020. January and February are considered the coldest months.

1.2 Rainfall

Rainfall is defined as precipitation of various types, such as drizzle (where the rainfall accumulating during 24 hours is less than 1 mm), as well as light, medium and heavy rain that may cause torrential rains and floods.

1.2.1 Annual Rainfall Rates

Rain in Qatar is slight and irregular, and it falls for a few days in the winter. Heavy rain may fall for short periods during the day, as in all desert areas. The annual average total rainfall at Doha International Airport station rose to 70.6 mm in 2020, while the annual rainfall level dropped at the other selected stations during the period 2014-2020. The highest annual rainfall averaged 70.6 mm at Hamad Intl. Airport, while the lowest was 34.3 mm at Dukham station in 2020.

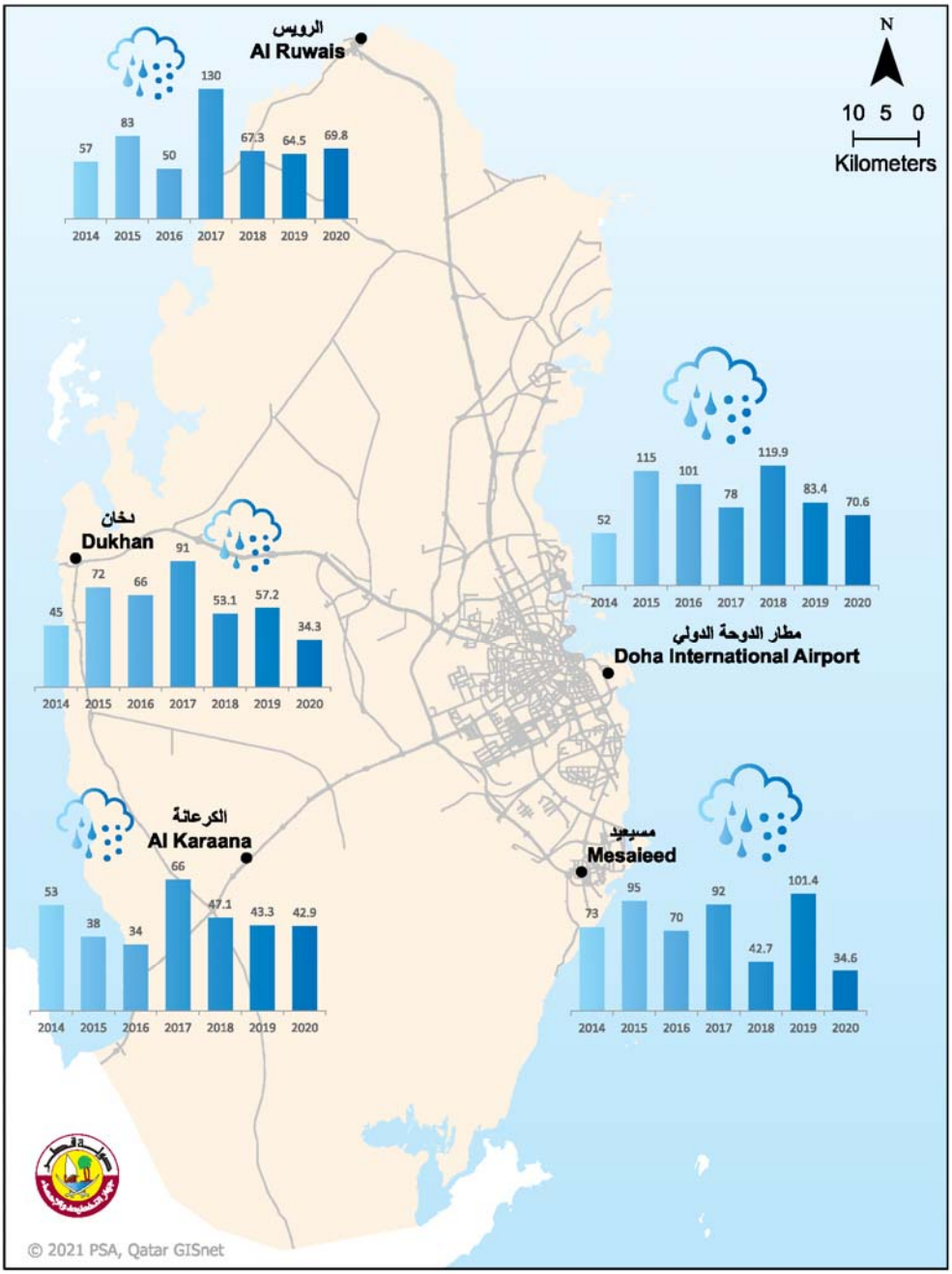
Table 4.5: Annual rainfall rates by selected monitoring stations (mm) 2014-2020

Selected Stations	2014	2015	2016	2017	2018	2019	2020	Change Rate 2014 & 2020
Mesaieed	73.0	95.1	69.7	92.2	42.7	101.4	34.6	-12%
Ruwais	56.5	82.5	49.8	129.7	67.3	64.5	69.8	4%
Dukhan	44.4	72.1	66.4	90.8	53.1	57.2	34.3	-4%
Doha Intl. Airport	55.0	115.4	101.1	78.2	119.9	83.4	70.6	4%
Al Karaana	53.2	36.0	33.6	66.0	47.1	43.3	42.9	-4%

* Data for previous years has been updated from the source.

Source: General Authority for Civil Aviation, Department of Meteorology.

Map 4.1: Average rainfall by years and selected stations (mm) 2014-2020



1.3 Relative Humidity (RH)

Relative humidity is the ratio of the partial pressure of water vapor to the equilibrium vapor pressure of water at a given temperature.

1.3.1 Averages Monthly Maximum and Minimum Relative Humidity

It is noted that the average relative humidity gradually decreased in June and rose in September 2020, as well as the minimum relative humidity .

Figure 4.5: Average maximum and minimum relative humidity by months at Doha Intl Airport Station 2020

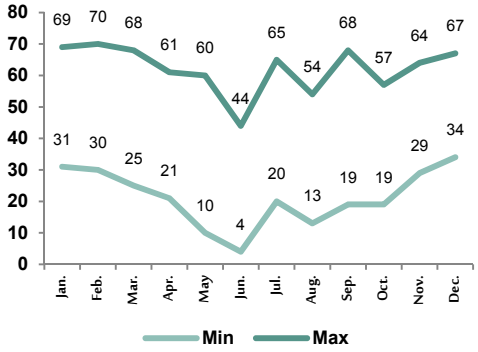


Table 4.6: Average monthly maximum and minimum humidity by months at Hamad Intl Airport Station 2014-2020

Month	2014		2015		2016		2017		2018		2019		2020		Change Rate 2014 & 2020	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Jan	53	84	39	83	38	77	38	76	26	73	30	71	31	69	-9%	-3%
Feb	41	80	38	82	31	73	41	76	29	77	33	68	30	70	-5%	-2%
Mar	32	76	38	78	31	71	32	75	15	68	26	65	25	68	-4%	-2%
Apr	22	64	16	57	18	60	15	58	17	59	19	57	21	61	-1%	-1%
May	18	59	16	55	10	51	11	51	8	48	10	50	10	60	-9%	0%
Jun	13	55	20	53	8	47	7	44	5	46	8	53	4	44	-18%	-4%
Jul	18	59	23	67	18	57	18	66	12	57	15	55	20	65	2%	2%
Aug	34	71	32	79	20	72	24	74	16	60	18	61	13	54	-15%	-4%
Sep	29	72	30	73	24	64	25	71	27	71	24	67	19	68	-7%	-1%
Oct	37	75	36	75	18	70	20	67	32	64	29	68	19	57	-11%	-4%
Nov	36	70	45	75	38	74	27	59	39	69	28	58	29	64	-4%	-1%
Dec	44	81	50	81	40	76	29	72	37	67	37	71	34	67	-4%	-3%

Source: General Authority for Civil Aviation, Department of Meteorology.

1.3.2 Annual Average Relative Humidity

The relative humidity increases in coastal areas than in internal and desert areas. In 2020, the annual average minimum relative humidity at Doha Intl. Airport station amounted to 21%, and the annual average maximum relative humidity amounted to 62%. The average minimum relative humidity ranged between 20% and 46% and the averages maximum relative humidity ranged between 62% and 80% at the five selected monitoring stations during the period 2014-2020.

Table 4.7: Annual average minimum and maximum relative humidity at selected monitoring stations 2014-2020

Month	2014		2015		2016		2017		2018		2019		2020		Change Rate 2014 & 2020	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Mesaieed	31	77	32	76	28	74	24	69	29	72	34	76	35	80	2%	1%
Ruwais	49	82	53	83	51	78	49	78	47	76	47	76	46	74	-1%	-2%
Dukhan	39	80	38	80	40	82	38	80	37	79	35	79	35	76	-2%	-1%
Doha Intl. Airport	48	79	37	74	25	66	24	66	22	63	23	62	21	62	-13%	-4%
Al Karaana	22	81	22	77	21	76	21	77	20	74	21	75	20	78	-2%	-1%

Source: General Authority for Civil Aviation, Department of Meteorology.

1.4 Atmospheric Pressure

1.4.1 Monthly Maximum and Minimum Atmospheric Pressure

Winter in Qatar witnesses averages of high atmospheric pressure unlike its high temperature summer. According to the 2020 statistics of Doha International Airport station, the maximum atmospheric pressure value was 1,028.9 HB in February, while the minimum atmospheric pressure value was 992.2 HB in July and August .

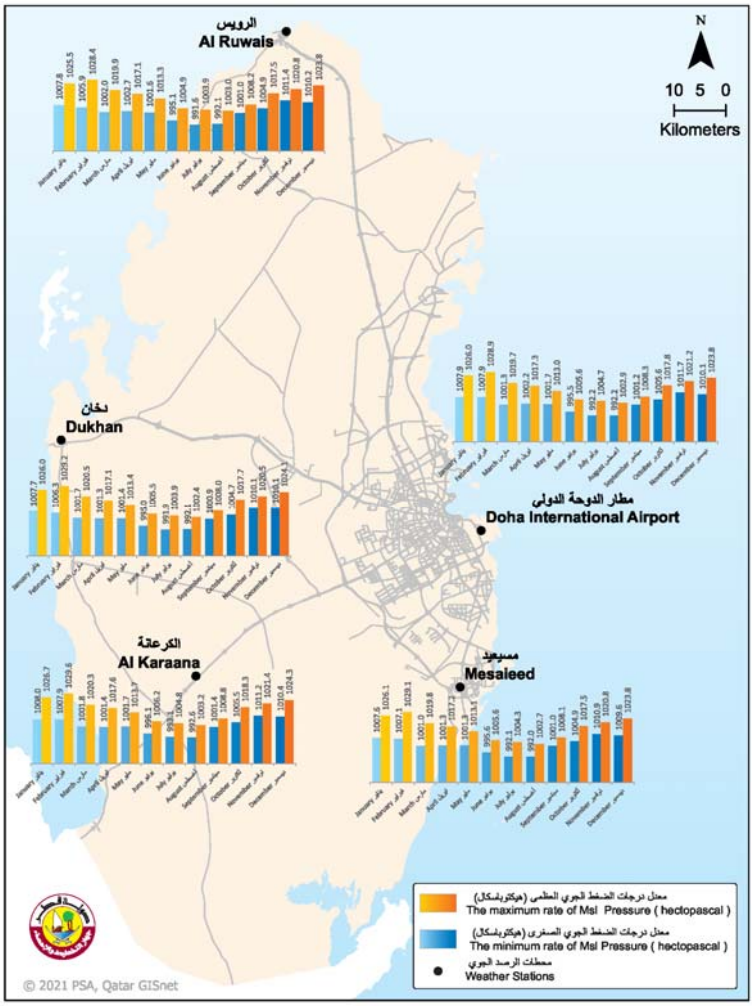
Table 4.8: Highest and lowest values of maximum and minimum atmospheric pressure (HB) by months and selected monitoring stations in 2020

Month/ Selected Stations	Doha Intl. Airport		Al Karaana		Dukhan		Ruwais		Mesaieed	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Jan	1007.9	1026.0	1008.0	1026.7	1007.7	1026.0	1007.8	1025.5	1007.6	1026.1
Feb	1007.9	1028.9	1007.9	1029.6	1006.3	1029.2	1005.9	1028.4	1007.1	1029.1
Mar	1001.3	1019.7	1001.8	1020.3	1001.7	1020.5	1002.0	1019.9	1001.0	1019.8
Apr	1002.2	1017.3	1001.4	1017.6	1001.3	1017.1	1002.7	1017.1	1001.3	1017.2
May	1001.7	1013.0	1001.7	1013.7	1001.4	1013.4	1001.6	1013.3	1001.3	1013.1
Jun	995.5	1005.6	996.1	1006.2	995.0	1005.5	995.1	1004.9	995.6	1005.6

Month/ Selected Stations	Doha Intl. Airport		Al Karaana		Dukhan		Ruwais		Mesaieed	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Jul	992.2	1004.7	993.1	1004.8	991.9	1003.9	991.6	1003.9	992.1	1004.3
Aug	992.2	1002.9	992.6	1003.2	992.1	1002.4	992.1	1003.0	992.0	1002.7
Sep	1001.2	1008.3	1001.4	1008.8	1000.9	1008.0	1001.0	1008.2	1001.0	1008.1
Oct	1005.6	1017.8	1005.5	1018.3	1004.7	1017.7	1004.9	1017.5	1004.9	1017.5
Nov	1011.7	1021.2	1011.2	1021.4	1010.1	1020.5	1011.4	1020.8	1010.9	1020.8
Dec	1007.9	1026.0	1010.4	1024.3	1007.7	1026.0	1007.8	1025.5	1009.6	1023.8

Source: General Authority for Civil Aviation, Department of Meteorology.

Map 4.2: Atmospheric Pressure by months and selected monitoring stations (HB) 2020



1.5 Wind Speed

There are two types of wind in Qatar:

- Al Shamal wind: a northern to northwesterly wind that sometimes comes loaded with dirt and dust. It is a semi-permanent wind that blows throughout the year and helps to soften the atmosphere.
- Al Kous wind: a south-western wind that causes a significant rise in temperatures (hot waves).

1.5.1 Monthly Average Wind Speed

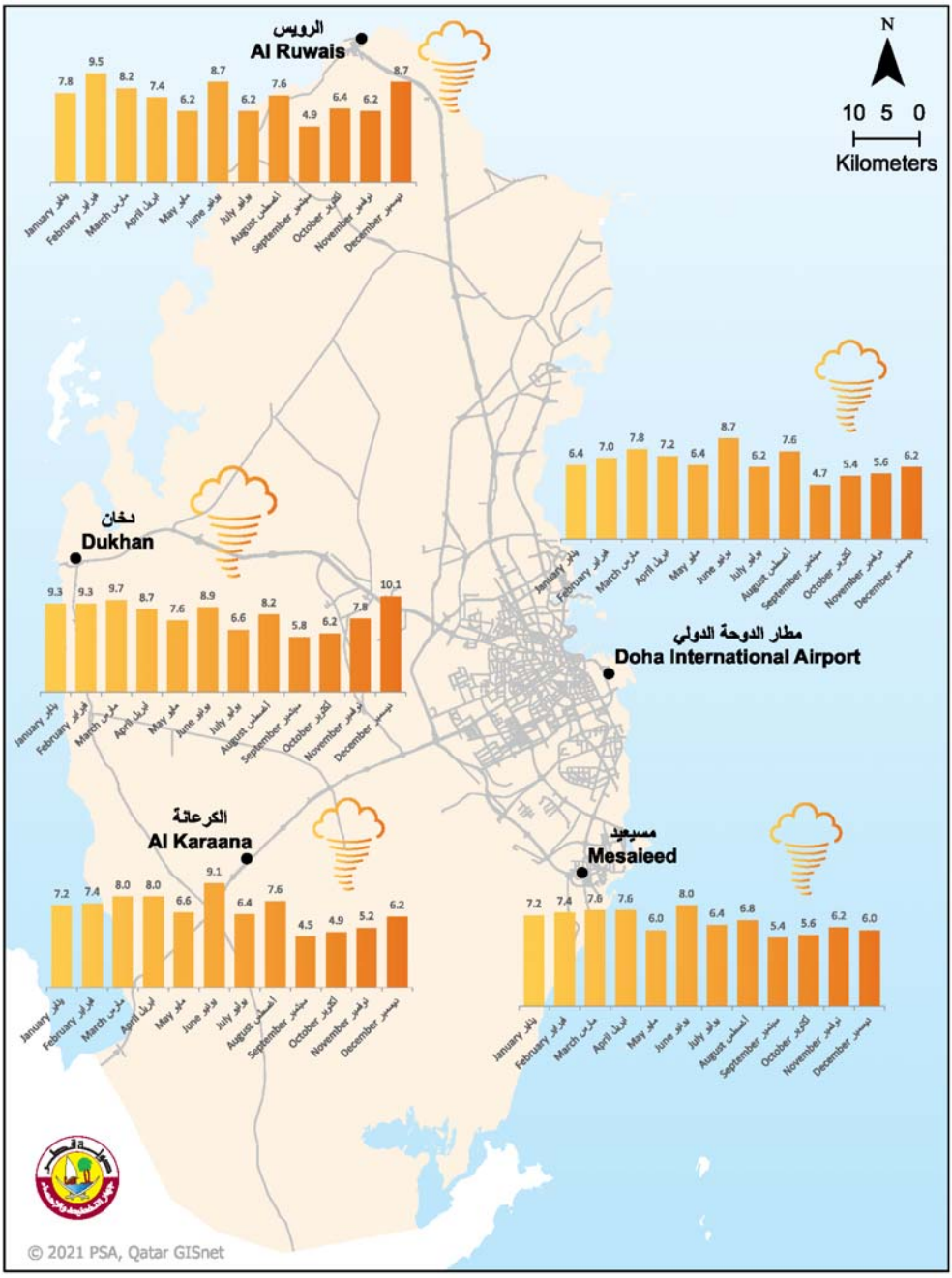
It is clear from the table the average wind speed by months and selected monitoring stations in 2020, that the highest value for the monthly average wind speed was recorded at Dukhan Station during the month of December, reaching 10.1 knots, while the lowest value for the average wind speed was recorded at Karaana Station, which is 4.5 knots during September .

Table 4.9: Average Wind speed (knots) by months and selected weather monitoring stations, 2020

Month/ Selected Stations	Doha Intl. Airport	Al Karaana	Dukhan	Ruwais	Mesaieed
Jan	7.2	7.8	9.3	6.4	7.2
Feb	7.4	9.5	9.3	7.0	7.4
Mar	7.6	8.2	9.7	7.8	8.0
Apr	7.6	7.4	8.7	7.2	8.0
May	6.0	6.2	7.6	6.4	6.6
Jun	8.0	8.7	8.9	8.7	9.1
Jul	6.4	6.2	6.6	6.2	6.4
Aug	6.8	7.6	8.2	7.6	7.6
Sep	5.4	4.9	5.8	4.7	4.5
Oct	5.6	6.4	6.2	5.4	4.9
Nov	6.2	6.2	7.8	5.6	5.2
Dec	6.0	8.7	10.1	6.2	6.2

Source: General Authority for Civil Aviation, Department of Meteorology.

Map 4.3: Average wind speed by months and selected weather monitoring stations (knot), 2020



1.5.2 Annual Average Wind Speed

The statistics in Table (4.10) indicate that the annual average wind speed recorded at weather monitoring stations were not much different from each other.

Table 4.10: Annual average wind speed by selected weather monitoring stations 2014-2020

Selected Stations	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2014 & 2020
Mesaieed	7.3	7.5	7.0	7.2	7.0	6.9	6.7	-1%
Ruwais	6.2	6.8	8.1	8.5	8.3	8.1	7.3	3%
Dukhan	8.1	8.4	8.3	8.3	8.0	8.4	8.2	0%
Doha Intl. Airport	7.2	7.1	6.6	6.6	6.6	6.7	6.6	-1%
Al Karaana	6.4	6.8	6.6	6.4	6.8	6.9	6.7	1%

Source: General Authority for Civil Aviation, Department of Meteorology.

1.6 Sunshine

1.6.1 Daily Sunshine

The daily sunshine ranges between 8.4 to 12.1 hours according to Hamad International Airport station in 2020. The number of sunshine hours increases in hot months from June until August and then gradually decreases (12.1 - 10.5 hours).

Table 4.11: Average daily sunshine hours by month at Hamad Intl Airport Station 2014-2020

Month	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2014 & 2020
Jan	7.9	8.6	8.1	8.1	8.9	7.0	8.4	1%
Feb	9.2	9.0	9.3	6.3	8.2	8.1	9.0	0%
Mar	8.6	7.4	6.9	6.5	9.5	8.3	8.6	0%
Apr	10.2	10.2	8.4	10.4	7.8	7.7	7.1	-6%
May	10.9	10.4	10.8	10.8	9.4	9.6	11.3	1%
Jun	11.9	12.2	11.6	12.0	11.6	11.8	12.1	0%
Jul	11.1	11.3	11.0	10.8	10.6	11.2	11.2	0%
Aug	10.9	11.2	10.6	10.9	10.7	10.9	10.8	0%
Sep	10.6	9.8	10.2	10.0	10.2	10.2	10.5	0%
Oct	10.2	8.9	9.8	10.1	8.6	9.5	10.1	0%
Nov	8.8	7.9	8.5	8.9	7.7	8.7	8.8	0%
Dec	9.0	6.9	8.3	8.5	8.4	7.1	8.9	0%
Average	9.9	9.5	9.5	9.4	9.3	9.2	9.7	0%

Source: General Authority for Civil Aviation, Department of Meteorology.

1.6.2 Annual Sunshine

The statistics in the table indicate that the average annual sunshine hours at weather monitoring stations are not much different from what they are at other stations. The selected monitoring stations could not monitor the sunshine after 2015. The summer season is characterized by a higher annual number of hours, reaching 341.7 hours per year at Hamad Intl Airport, while in the winter, it reached 238.9 hours per year in 2020.

Table 4.12: Average number of sunshine hours by selected monitoring stations in summer and winter 2014-2020

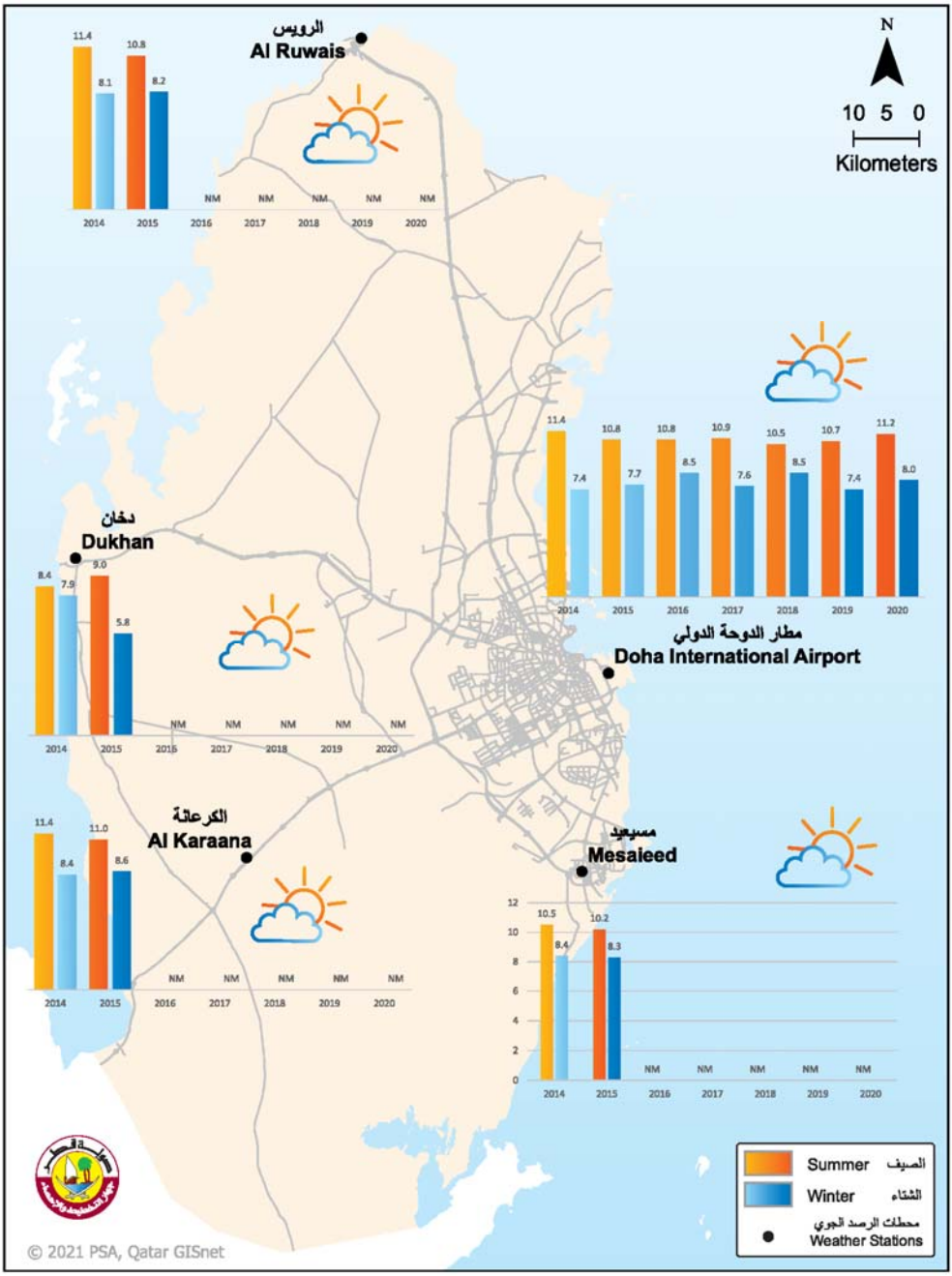
Year	Selected Stations	Summer	Wintr
2014	Mesaieed	321.5	251.9
	Ruwais	349.2	244.0
	Dukhan	256.8	236.6
	Doha Intl. Airport	348.9	222.8
	Al Karaana	349.0	252.7
2015	Mesaieed	311.7	248.5
	Ruwais	330.3	247.1
	Dukhan	275.1	247.0
	Doha Intl. Airport	329.2	229.8
	Al Karaana	335.8	259.5
2016	Mesaieed	-	-
	Ruwais	-	-
	Dukhan	-	-
	Doha Intl. Airport	331.8	259.9
	Al Karaana	-	-
2017	Mesaieed	-	
	Ruwais	-	-
	Dukhan	-	-
	Doha Intl. Airport	333.6	230.1
	Al Karaana	-	-
2018	Mesaieed	-	-
	Ruwais	-	-
	Dukhan	-	-
	Doha Intl. Airport	320.8	254.6
	Al Karaana	-	-
2019	Mesaieed	-	-
	Ruwais	-	-
	Dukhan	-	-
	Doha Intl. Airport	329.1	221.0
	Al Karaana	-	-
2020	Mesaieed	-	-
	Ruwais	-	-
	Dukhan	-	-
	Doha Intl. Airport	341.7	238.9
	Al Karaana	-	-

The summer season is from May to September. The winter season is from December to February.

PSA calculations.

Source: Public Authority for Civil Aviation - Meteorological Department.

Map 4.4: Average number of daily sunshine hours in summer and winter 2014-2020



1.6.3 Global Average Sunshine

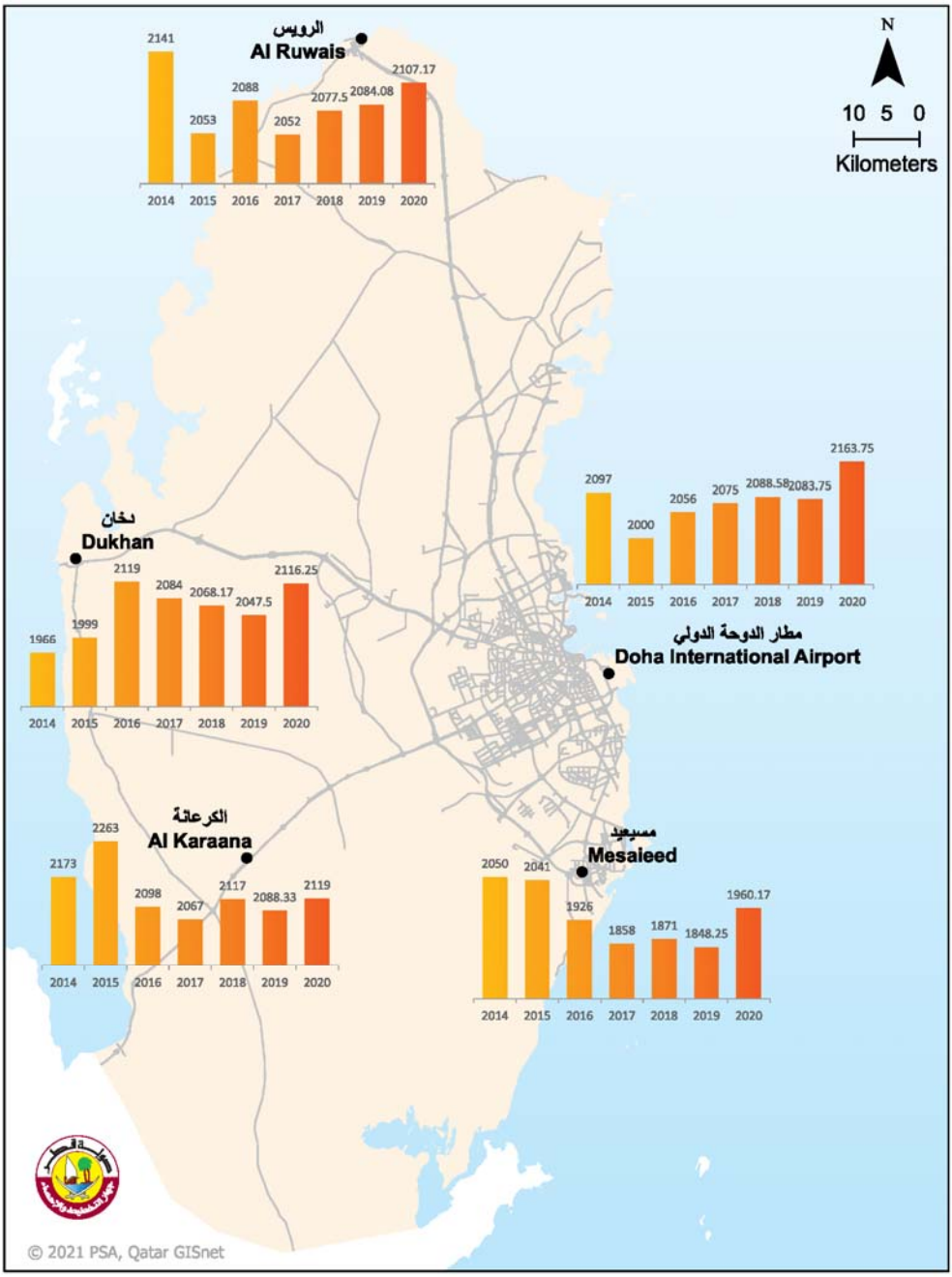
We note from the table below that the global average sunshine for Mesaieed station is the lowest compared to other selected stations in 2020.

Table 4.13: Global sunshine rate by selected stations 2014-2020

Year	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2014 & 2020
Mesaieed	2050	2041	1926	1858	1871	1848	1960	-1%
Ruwais	2141	2053	2088	2052	2078	2084	2107	0%
Dukhan	1966	2021	2119	2084	2068	2048	2116	1%
Doha Intl. Airport	2097	2000	2056	2075	2089	2084	2164	1%
Al Karaana	2173	2130	2098	2067	2117	2088	2119	0%

Source: Public Authority for Civil Aviation - Meteorological Department.

Map 4.5: Global average sunshine (Joules/cm2) 2014-2020



1.7 Lunar and Solar Eclipse

1.7.1 Lunar Eclipse

The table below indicates that there were 9 lunar eclipses during the period 2014-2020. But it did not occur in 2020. The majority of eclipses were full and visible.

Table 4.14: Number of lunar eclipses by date and type of eclipse 2014 - 2020

Year	Number of Eclipses	Date	Type of eclipse			Visible eclipse in Qatar		
			Full	Partial	Total	Visible	Unvisible	Total
2014	2	Apr - 15	1		1		1	1
		Oct - 8	1		1		1	1
2015	2	Apr - 4	1		1	1		1
		Sep - 28	1		1	1		1
2016	0							
2017	1	Aug - 7		1	1	1		1
2018	2	Jan - 31	1		1	1		1
		Jul - 27	1		1	1		1
2019	2	Jan - 21	1		1	1		1
		Jul - 16		1	1	1		1
2020	0		0	0	0	0	0	0

Source: Public Authority for Civil Aviation - Meteorological Department.

1.7.2 Solar Eclipse

The table below indicates that there were 22 solar eclipses during the period 2014-2020. In 2020, it happed twice on 21 June and 14 December. The eclipse on 21 June was annular and visible in Qatar, while on 14 December, it was full and invisible in Qatar.

Table 4.15: Number of solar eclipses by date and type of eclipse 2014 – 2020

Year	Number of Eclipses	Date	Type of eclipse				Visible eclipse in Qatar		
			Full	Visible	Annular	Total	Visible	Unvisible	Total
2014	2	Apr - 29			1	1		1	1
		Oct - 23		1		1		1	1
2015	2	Mar 20	1			1		1	1
		Sep - 13		1		1		1	1
2016	2	Mar 8 - 9	1			1		1	1
		Sep - 01			1	1		1	1
2017	2	Feb - 26			1	1		1	1
		Aug - 21	1			1		1	1
2018	3	Feb - 15		1		1		1	1
		July - 13		1		1		1	1
		Aug - 11		1		1		1	1
2019	3	Jan 6 - 7		1		1		1	1
		July - 02	1			1		1	1
		Dec - 26			1	1	1		1
2020	2	Jun - 21			1	1	1		1
		Dec - 14	1			1		1	1

Source: Public Authority for Civil Aviation - Meteorological Department.

1.8 Earthquakes

1.8.1 Recorded National Earthquakes

The table below indicates that there were 17 national earthquakes during the period 2014-2020, ranging in magnitude between 1.7 and 2.4 Richter, and ranging in depth between 1 km and 97 km, distributed according to earthquake location. It should be noted that in 2020, there were 11 earthquakes that were monitored in the center, west or north of Qatar. The depth of the earthquake was less than 5 km, and its magnitude was less than 2 Richter.

Table 4.16: Number of recorded national earthquakes by date, time, earthquake depth, magnitude and resulting effects 2014-2020.

Year	Number of recorded local earthquakes	Date	Time (Doha time)	Earthquake location	Earthquake depth (km)	Earthquake Magnitude (Richter)	Number of human losses				Material or psychological effects and resulting losses
							Deaths	Affected persons	Missing persons	Total	
2014	0	-	-	-	-	-	0	0	0	0	-
2015	0	-	-	-	-	-	0	0	0	0	-
2016	0	-	-	-	-	-	0	0	0	0	-
2017	1	Nov- 6	9:27:04	West Um Wishah	4	1.7	0	0	0	0	imperceptible
2018	2	Oct-15	10:48:47	Northeast Dukhan	64 km	2	0	0	0	0	0
		Oct-17	9:39:32	Qatar's western border with KSA	55 km	2.4	0	0	0	0	0
2019	3	Feb-25	6:02:49	Northeast Dukhan	66 km	Less than 2 Richter	0	0	0	0	0
		May-23	6:27:38	West Dukhan	97 km	Less than 2 Richter	0	0	0	0	0
		Jun-16	6:04:58	Southeast Dukhan	1 km	Less than 2 Richter	0	0	0	0	0
2020	11	Feb-25	6:11:14	Central West Qatar	Less than 5 km	Less than 2 Richter	0	0	0	0	0
		Jun-8	6:59:04	Center of Qatar	Less than 5 km	Less than 2 Richter	0	0	0	0	0
		July-29	6:29:59	Northeast Qatar	Less than 5 km	Less than 2 Richter	0	0	0	0	0
		Oct-13	6:14:48	Northeast Qatar	Less than 5 km	Less than 2 Richter	0	0	0	0	0
		Oct-25	6:40:02	Central West Qatar	Less than 5 km	Less than 2 Richter	0	0	0	0	0
		Dec-3	8:12:07	Central West Qatar	Less than 5 km	Less than 2 Richter	0	0	0	0	0
		Dec-6	7:40:32	Center of Qatar	Less than 5 km	Less than 2 Richter	0	0	0	0	0
		Dec-7	7:02:45	Central West Qatar	Less than 5 km	Less than 2 Richter	0	0	0	0	0
		Dec-7	7:42:06	Center of Qatar	Less than 5 km	Less than 2 Richter	0	0	0	0	0
		Dec-15	7:31:52	Central West Qatar	Less than 5 km	Less than 2 Richter	0	0	0	0	0
		Dec - 16	7:03:10	Central West Qatar	Less than 5 km	Less than 2 Richter	0	0	0	0	0

Source: Public Authority for Civil Aviation - Meteorological Department.

1.8.2 Recorded Regional Earthquakes

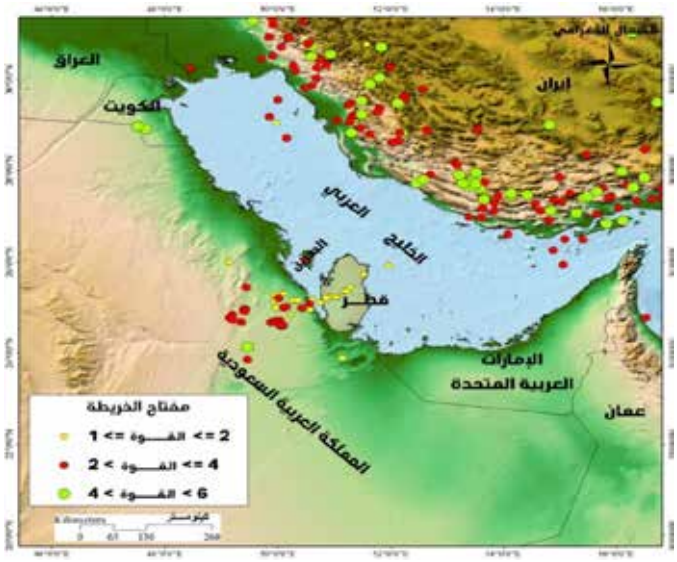
Two regional earthquakes were recorded during the period 2014-2020, one of which came from Afghanistan with a magnitude of 7.5 Richter, and a depth of 207 km, and it was felt by residents of the towers area in Doha. The other earthquake occured on the Iranian-Iraqi border with a magnitude of 7.3 and a depth of 24 km. it was slightly felt by people, and did not result in any human losses.

Table 4.17: Number of regional earthquakes recorded and felt by citizens of Qatar by date and time, epicenter of the earthquake, distance from Qatar, depth and strength of the earthquake and resulting effects 2014-2020

Year	Number of regional earthquakes felt by citizens in Qatar	Date	Time (Doha time)	Earthquake location	Distance from Qatar (km)	Depth (km)	Magnitude (Richter)	Number of human losses				Material or psychological effects and resulting losses deaths
								Deaths	Affected persons	Deaths	Affected persons	
2014	0	-	-	-	-	-	-	0	0	0	0	-
2015	1	Oct-15-26	12:09:32	Afghanistan	2029	207	7.5	0	0	0	0	Fear and panic by residents of the towers in Doha
2016	0	-	-	-	-	-	-	0	0	0	0	-
2017	1	Nov-12-17	21:18:17	Irania-Iraqi borders	1185	24	7.3	0	0	0	0	Slightly felt
2018	0	-	-	-	-	-	-	0	0	0	0	-
2019	0	-	-	-	-	-	-	0	0	0	0	-
2020	0	-	-	-	-	-	-	0	0			

Source: Public Authority for Civil Aviation - Meteorological Department.

Map 4.6: Seismic activity in the State of Qatar and near its borders 2020



Source: Public Authority for Civil Aviation - Meteorological Department.

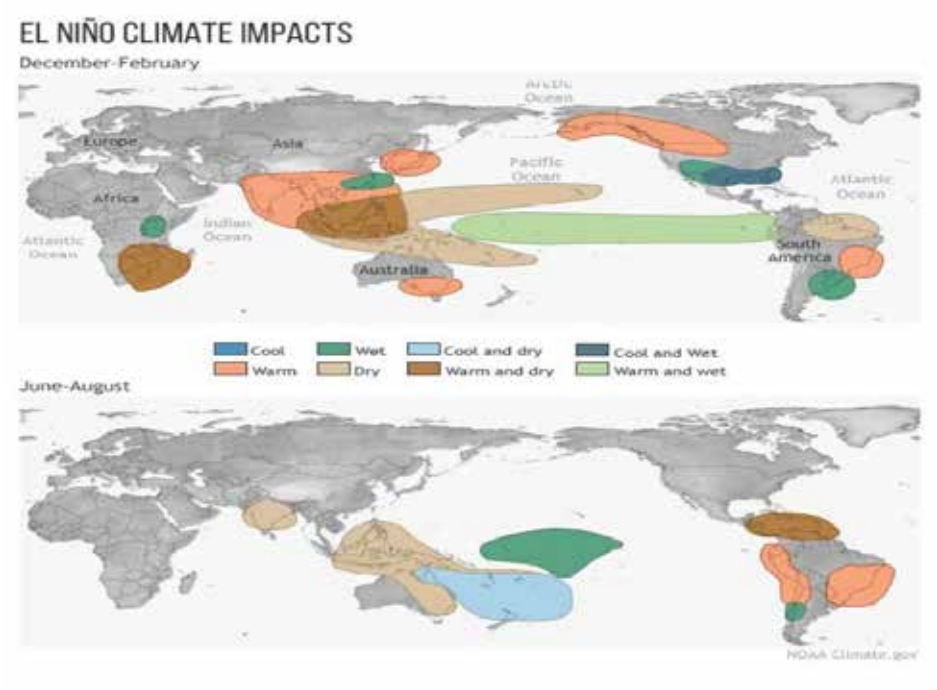
1.9 El Niño

El Niño is a natural climatic phenomenon that significantly increases the surface water temperature, especially in the period between the end of the summer and autumn. This rising water temperature causes warm streams of water in the tropics situated in the equator between the west coast of South America, the east coast of Asia and the north-east of Australia which is surrounded by the Pacific Ocean. The water moves towards the east until it reaches the coasts of Peru and Ecuador in South America, causing severe climate and environmental changes around the world. It is worth noting that this phenomenon affects the ocean every 4 to 12 years.

1.9.1 El Niño Impact on Qatar and GCC Countries

El Niño is one of the key environment indicators of the climate sector. The Map below "El Niño Climate Impacts Worldwide" shows that Qatar and the GCC countries do not fall into the main area prone to impact during El Niño, but one cannot rule out some impacts on seasonal temperatures during the occurrence of El Niño. Nevertheless, there has been no proof of El Niño impact on the State of Qatar.

Map 4.7: El Niño climate impacts worldwide



2. Biodiversity

The biodiversity indicator is linked to the accuracy of biological systems in the State. This indicator shows the level of environmental sustainability as well as to what extent the environmental policies are included in national plans .

2.1 Nature Reserves

In 2020, the number of terrestrial and marine nature reserves in the State of Qatar reached 14, with an area of 6,205 km2. As for the area of nature reserves, the results of 2020 show that the largest area was for Wadi Sultana Reserve, reaching 2,742.41 km2, and constituting 50% of the area of the natural terrestrial reserves.

The statistics in the table below indicate stability in the proportion of terrestrial reserves during the period (2014-2020) at 23.6% of total area of Qatar with islands. This is an achievement in itself, despite the rapid population growth and urbanization experienced by the State recently.

Map 4.8: Distribution of Nature Reserves in Qatar, 2020

Table 4.18: Area of nature reserves in Qatar (terrestrial and marine) (km2), 2020

Nature Reserve	Terrestrial		Marine	Total
	Reserve area (km2)	of area of Qatar with islands (%)	Reserve area (km2)	Reserve area (terrestrial and marine) (km2)
Total area of Qatar with islands	11,627.04	...	35000	46,627.04
Al Eraiq	54.76	1%	0.00	54.76
Al Thakhira	114.46	2%	179.14	293.60
Khor Al Adaid	1,291.13	24%	542.04	1,833.17
Al Rafaa	53.33	1%	0.00	53.33
Um Al Amad	5.72	0.0%	0.00	5.72
Um Qarn	24.71	0.0%	0.00	24.71
Al Sunai	3.92	0.0%	0.00	3.92
Al Reem	1,154.10	21%	0.00	1,154.10
Al Shihaniya	0.79	0.0%	0.00	0.79
Al Mashabiya	4.76	0.0%	0.00	4.76
Al Wusail	34.73	1%	0.00	34.73
Wadi Sultana	2,742.41	50%	0.00	2,742.41
Total Reserves	5,484.82	100%	721.17	6,205.99

Source: Ministry of Municipality and Environment

Table 4.19: Number and area of nature reserves (terrestrial and marine) in Qatar (km2) 2014-2020

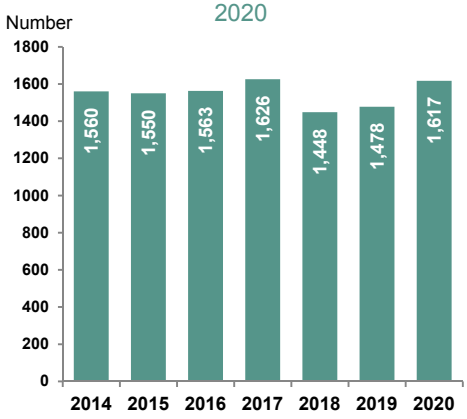
Year	Number of Terrestrial Nature Reserves	Number of Marine Nature Reserves	Total Number of Terrestrial and Marine Nature Reserves	Area of Terrestrial Nature Reserves (km2)	Area of Marine Nature Reserves (km2)	Area of Terrestrial and Marine Nature Reserves (km2)	Percentage of Terrestrial Nature Reserves to Total Area
2014	12	2	14	2,744	720	11,627	23.6
2015	12	2	14	2,744	720	11,627	23.6
2016	12	2	14	2,744	721	11,627	23.6
2017	12	2	14	2,744	721	11,627	23.6
2018	12	2	14	2,742	721	11,627	23.6
2019	12	2	14	2,742	721	11,627	23.6
2020	12	2	14	2,742	721	11,627	23.6
Annual Growth Rate 2014 & 2020	0%	0%	0%	0%	0%	22%	115%

Source: Ministry of Municipality and Environment

2.2 Arabian Oryx in Nature Reserves

The Arabian Oryx is classified as endangered species and is listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). It was extinct in the wild by the early 1970s when the last one of its kind was killed in the Empty Quarter desert at Omani- Saudi border, but was saved and bred in zoos and private reserves, and was reintroduced into the wild in 1980s. However, the success of this process has been uneven 3.

Figure 4.6: Number of Arabian Oryx in Nature Reserves 2014-2020



Qatar has been paying special attention to protect and breed these animals in large fenced reserves where they can live and move around freely. Statistics indicate that the number of Arabian Oryx in terrestrial nature reserves increased to 1,617 in 2020, at an annual growth rate of 1% .The Arabian Oryx is distributed in 16 terrestrial nature reserves, and the maximum number is in Farm No. (279) and Al Mashabiya reserve, which, in 2020, accommodated more than half the number of Arabian Oryx in Qatar (i.e. 70% of total Arabian Oryx in nature reserves).

Table 4.20: Total number of Arabian Oryx by location (2014-2020)

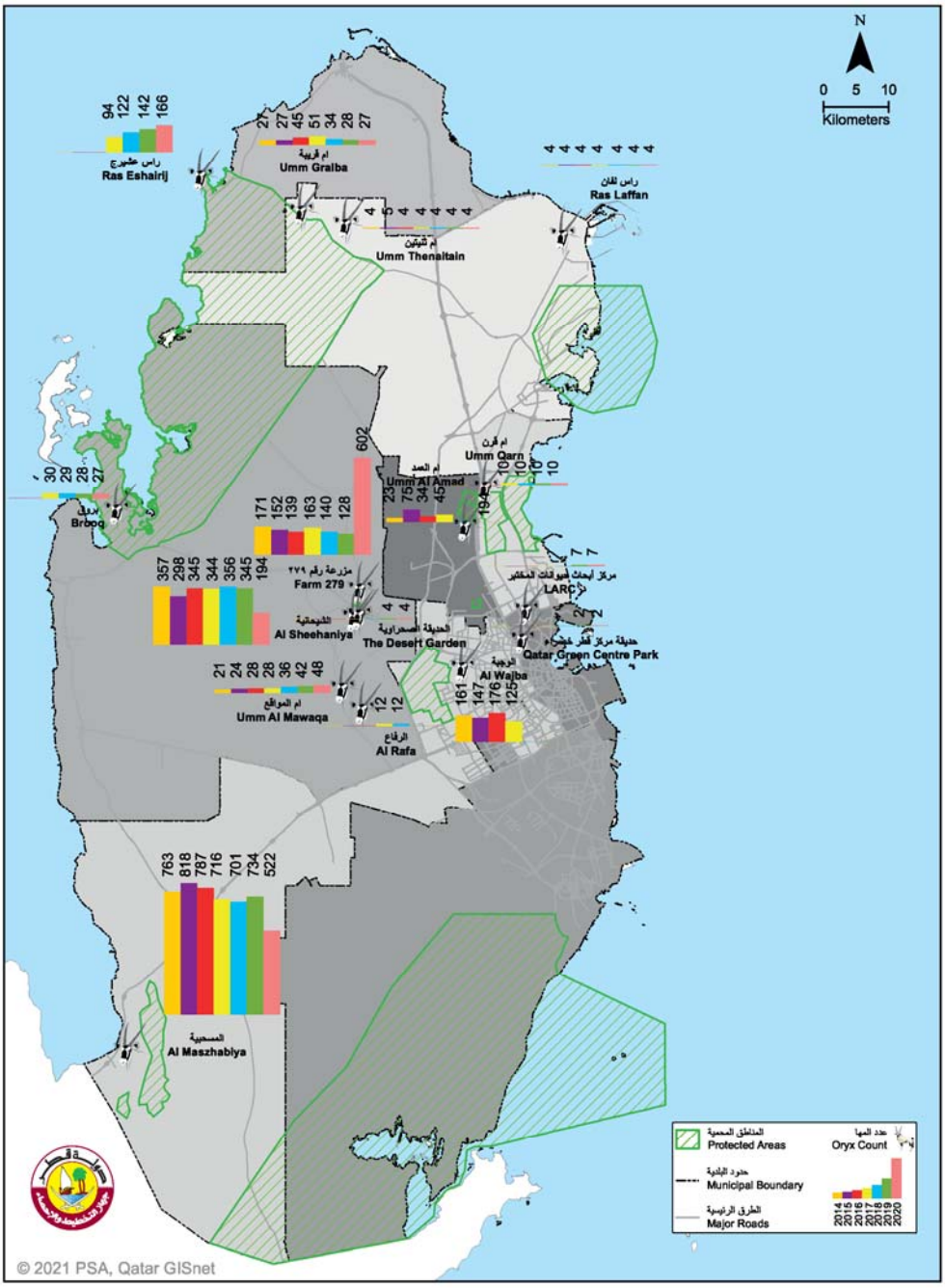
Location	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2014 & 2020
Al Shihaniya	357	298	345	344	356	345	194	-10%
Al Mashabiya	763	818	787	716	701	734	522	-6%
Desert Park	0	0	0	0	0	4	4	-
Al Wajba	161	147	176	125	0	0	0	-100%
Green Qatar	0	0	0	0	0	2	2	-
Animal Research Center	0	0	0	0	0	7	7	-
Umm Thanyatain	4	5	4	4	4	4	4	0%
Umm Qariba	27	27	45	51	34	28	27	0%
Umm Al Mawaqi	21	24	28	28	36	42	48	15%
Ras Laffan	4	4	4	4	4	4	4	0%
Farm No. (279)[2]	171	152	139	163	140	128	602	23%
Umm al-Amad	23	75	34	45	0	0	0	-100%
Ushairij	...	...	...	94	122	142	166	-
Al Rifaa	...	...	...	12	12	0	0	-
Umm Qarn	...	...	...	10	10	10	10	-
Burouq	...	...	...	30	29	28	27	-
Total	1,531	1,550	1,562	1,626	1,448	1,478	1,617	1%

:…Unavailable

Source: Ministry of Municipality and Environment

(3) Wikipedia the free encyclopedia
https://en.wikipedia.org/wiki/%D8%A8%D8%A7_%D8%B9%D8%B1%D8%A8%D{A%D8%A9

Map 4.9: Number of Arabian Oryx in different nature reserves 2014-2020



2.3 Endangered Species

In 2017, the number of terrestrial flora and fauna amounted to 965 species, while the number of marine flora and fauna amounted to 853 species. The statistics in the table below indicate the following:

- There are two species of extinct terrestrial flora, 14 endangered species and 171 rare and threatened species.
- With regards to marine flora and fauna, there are 6 endangered species, 22 rare and threatened species and 7 near-threatened species.

Table 4.21: Number of registered species by type (terrestrial and marine) and risk of extinction, 2017

Type of Species	Extinct	Endangered	Rare/ Threatened	Near-Threatened Species	Total Registered Species
Terrestrial flora and fauna	2	14	171	0	965
Marine flora and fauna	0	6	22	7	853

Source: Ministry of Municipality and Environment

The statistics in Table (4.22) of terrestrial flora and fauna by species and risk of extinction in 2017 show that 4 out of 422 terrestrial flora in Qatar are endangered. There are also 2 extinct species and 5 endangered species out of 322 species of wild birds registered in Qatar.There is one endangered species and 5 threatened species out of 6 species of terrestrial mammals.

Table 4.22: Number of terrestrial flora and fauna by species and risk of extinction, 2017

Status of Species	Flora	Fungus	Mammals	Amphibians	Reptiles	Birds	Invertebrates
Extinct	0	0	0	0	0	2	0
Endangered	4	0	5	0	0	5	0
Threatened/Rare	0	0	1	0	0	0	170
Total No. of registered species	422	142	6	1	29	322	228

Source: Ministry of Municipality and Environment .

The statistics in the table below of marine flora and fauna by species and risk of extinction, indicate that there are 7 near-threatened species, 2 threatened species, and one endangered species out of 57 species of fish registered in Qatar. There are also 4 endangered species and 11 threatened/rare species out of 15 species of marine mammals. However, there is only one endangered species and 9 threatened/rare species out of 15 species of marine birds .

Table 4.23: Number of marine flora and fauna by species and threat of extinction, 2017

Status of Species	Flora	Fish	Mammals	Amphibians	Birds	Reptiles
Extinct	0	0	0	0	0	0
Endangered	0	1	4	0	1	0
Threatened/Rare	0	2	11	0	9	0
Near-threatened	0	7	0	0	0	0
Total No. of registered marine species	402	57	15	379	15	20

Source: Ministry of Municipality and Environment.

2.4 Fish Stocks

The Environment statistics aim to provide statistical data on aquatic resources, including fish stocks in view of its importance for the development of sustainable fisheries industry procedures. The National Development Strategy of the State of Qatar 2018-2022 emphasized the need to have sustainable fish resources and monitor poaching which represents an environmental and food supply threat, in order to preserve and increase fish stocks, enforce effective laws and provide support for local aquaculture breeding farms.

The proportion of fish stocks within a biologically sustainable level is also linked to Goal 14 /Target 14/ Indicator 4 (14.4.1) of the 2030 SDGs on the sustainable protection and exploitation of marine resources to achieve sustainable development. The proportion of fish stocks within safe biological limits is defined as the proportion of fish stocks or species that is being exploited within the maximum sustainable biological productivity.

Figure 4.7: Amount of Fish Catch in Qatar (metric tons) 2014 - 2020

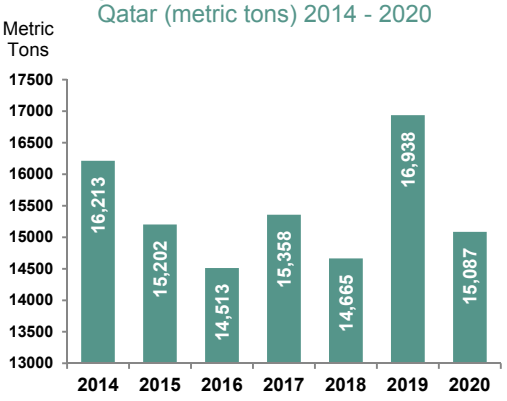
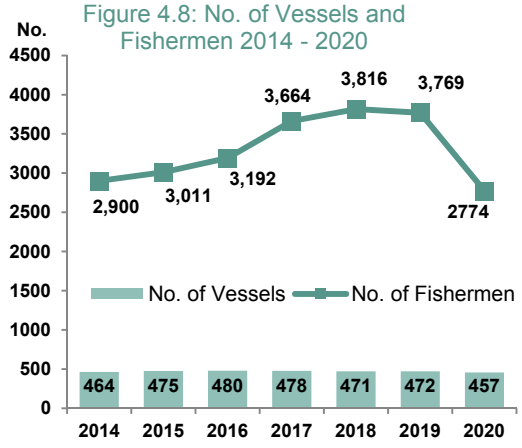


Figure 4.8: No. of Vessels and Fishermen 2014 - 2020



It is worth mentioning that the United Nations Convention on the Law of the Sea (UNCLOS III) entered into force in 1994, and was ratified by the State of Qatar on 9

December 20024 . The convention also includes sustainability indicators relating to fishing (see UN Statistics Division 2013):

- Yield-related indicators: catches.
- Fishing capacity-related indicators: Fishing effort and intensity.

2.4.1 Amount of fish catch and number of fishing vessels and fishermen

The statistics indicate that the total amount of fish catch decreased to 15,000 metric tons in 2020. The statistics also indicate that the number of fishermen has decreased to 2,774.

Table 4.24: Amount of fish catch and number of fishing vessels and fishermen 2014-2020

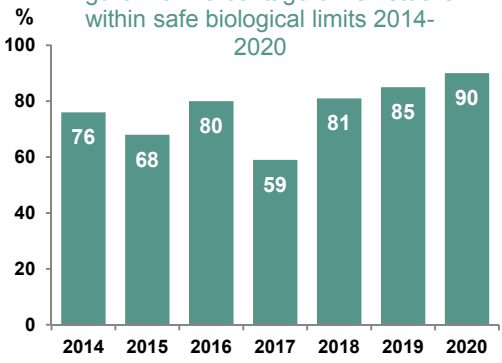
Year	Fish Catch (metric tons)	No. of Fishing Vessels	No. of Fishermen
2014	16,213	464	2,900
2015	15,202	475	3,011
2016	14,513	480	3,193
2017	15,358	478	3,664
2018	14,665.0	471	3,816
2019	16,938.2	472	3,769
2020	15087	457	2774
Annual Growth Rate 2014 & 2020	-1%	0%	-1%

Source: Ministry of Municipality and Environment and PSA calculations.

2.4.2 Percentage of Fish Stocks

The percentage of fish stocks within safe biological limits is defined as the proportion of fish stocks or fish species being exploited within the maximum level of sustainable biological productivity. The figure indicates that the percentage of fish stocks within safe biological limits increased to 90% in 2020.

Figure 4.9: Percentage of fish stocks within safe biological limits 2014-2020



(4) UNCLOS ،http://treaties.un.org/pages/ViewDetailsIII.aspx?&src=TREATY&mtdsg_no=XXI~6&chapter=21&Temp=mtdsg3&lang=en

2.4.3 Exploitation Rate

The table of fishing by exploitation rate indicates that the over-exploitation rate amounted to 6,238 tons of fish and marine life. The average amount of fish catch for the category of maximum exploitation reached 1,274 tons, while the exploitation of its catch was sustainable, as it reached 4,315 tons in 2020.

From the figure of the relative distribution of fishing by exploitation rate 2014-2020, we find that the highest percentage of maximum exploitation was in 2015, amounting to 34.1%, while the lowest percentage of maximum exploitation was in 2017, amounting to 1.1%. As for sustainable exploitation, the highest percentage of sustainable exploitation occured during the period 2018-2020, reaching 38.1%, 34.8% and 28.6%, respectively .

Figure 4.10: Fish catch by exploitation rate (metric tons) 20144-2020

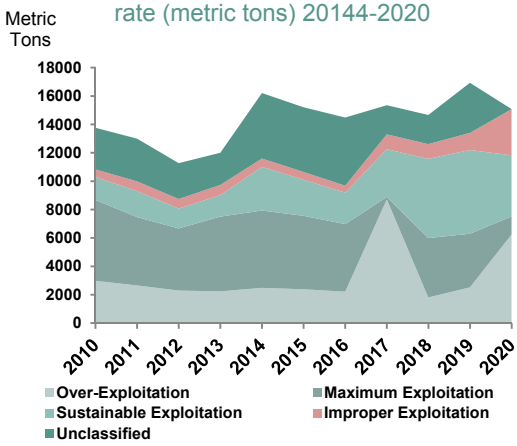


Figure 4.11: Percentage distribution of fishing by exploitation rate, 2014-2020

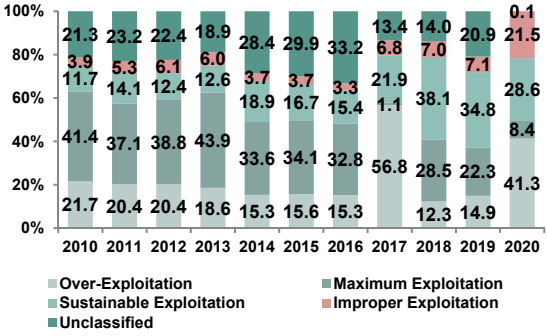


Table 4.25: Fishing by exploitation rate (tons) 2014-2020

Year	Over-Exploitation	Maximum Exploitation	Sustainable Exploitation	Improper Exploitation	Unclassified	Total
2014	2,488	5,449	3,071	593	4,612	16,213
2015	2,379	5,181	2,536	556	4,550	15,202
2016	2,218	4,754	2,224	483	4,804	14,483
2017	8,720	171	3,356	1,052	2,059	15,358
2018	1,808	4,185	5,585	1,030	2,057	14,665
2019	2,523	3,777	5,897	1,205	3,537	16,938
2020	6238	1274	4315	3247	14	15,087
Annual Growth Rate 2014 & 2020	17%	-22%	6%	33%	-62%	-1%

Source: Ministry of Municipality and Environment

2.4.4 Fishing Effort

It is clear from the table that the fishing effort decreased, as the share of catch per vessel reached 33 tons in 2020 with a growth rate of -1% from 2014. The share of fish catch per fisherman also decreased to 5 tons in 2020 at an annual growth rate -3% from 2014.

Figure 4.12: Average annual fish catch per vessel and fisherman, 2014-2020

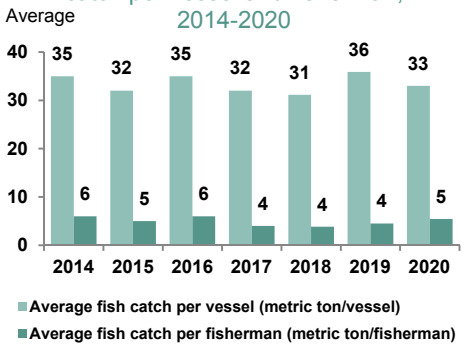


Table 4.26: Fishing Effort 2014 - 2020

Year	Average amount of fish catch per fishing vessel (metric tons per vessel)	Average amount of fish catch per fisherman (metric tons per fisherman)	Average number of fishermen per fishing vessel (fisherman per fishing vessel)
2014	35	6	6
2015	32	5	6
2016	35	6	7
2017	32	4	8
2018	31	4	8
2019	36	4	8
2020	33	5	6
Annual Growth Rate 2014 & 2020	-1%	-3%	0%

Source: Ministry of Municipality and Environment and PSA calculations.

2.4.5 Vessels

The statistics on artisanal fishing vessels in Qatar indicate that they reached 478 vessels in 2020. It should be noted that Al Khor City scored the highest share of the number of artisanal fishing vessels, amounting to 248 vessels (i.e. 54% of total artisanal fishing vessels) at an annual growth rate of 2% from 2014, while the annual growth rate of the number of artisanal fishing vessels declined in Doha and Al Wakra and to 100% and -2%, respectively.

Table 4.27: Number of artisanal fishing vessels by coastal areas 2014-2020

Year	Doha	Al Khor	Al Wakra	Al Shamal	Total
2014	19	214	191	40	464
2015	17	234	179	45	475
2016	17	236	182	45	480
2017	5	236	187	50	478
2018	20	244	167	40	471
2019	19	250	164	39	472
2020	0	248	170	39	457
Annual Growth Rate 2014 & 2020	-100%	2%	-2%	0%	0%

Source: Ministry of Municipality and Environment

2.4.6 Sailors

According to the statistics in the table below, the number of sailors in artisanal fishing amounted to 2,774 sailors in 2020, at an annual growth rate of 1% from 2014. The statistics indicate an increase in the number of sailors in Al Khor City, amounting to 1,505 sailors, at an annual growth rate of 2% from 2014, while the number of sailors dropped in both Doha, Al Wakra and Al Shamal at a rate of -100%, -2% and -3% respectively.

Table 4.28: Number of sailors in artisanal fishing by coastal areas, 2014-2020

Year	Doha	Al Khor	Al Wakra	Al Shamal	Total
2014	95	1,367	1,148	290	2,900
2015	104	1,408	1,186	313	3,011
2016	123	1,489	1,257	324	3,193
2017	40	1,786	1,529	309	3,664
2018	42	1,859	1,591	324	3,816
2019	42	1,836	1,571	320	3,769
2020	0	1,505	1,032	237	2,774
Annual Growth Rate 2014 & 2020	-100%	2%	-2%	-3%	-1%

Source: Ministry of Municipality and Environment

2.5 Fish Farming

At present, there are development projects to increase fish stocks, and achieve self-sufficiency in fish. These projects fall under the National Development Strategy 2018-2022 for natural resources, which includes two core programs; first program aims to improve fisheries production technique, which is based primarily on setting up a comprehensive national plan for the development of fish farming in Qatar to meet the growing market needs of fish, which cannot be met by fish production from fisheries, as it already reached its maximum limit of exploitation. The second program reviews and strengthens legislations relating to the exploitation of fishery resources, and is based primarily on the actions and measures that will protect and develop aquatic resources and exploit them in proper ways in order to increase fish stocks, especially in terms of preventing poaching and reducing practices that threaten the marine environment and fisheries in the State. According to statistics in the below table below, the amount of the culture of Nile tilapia reached 22 metric tons in 2020. It is of importance to encourage private sector investment in the field of fish farming and aquaculture, which provides strategic stocks to meet Qatar population needs of food in the wake of the shrinking surplus of fish production in recent years and the significant increase in the population as a result of the major economic and urban boom witnessed in Qatar.

Table 4.29: Fish farming (tons) 2014-2019

	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2020 - 2014
Fish Farming*	56	10	10	10	2	22	22	-14%

* Nile tilapia fish

Source: Ministry of Municipality and Environment

2.6 Exports and Imports of Fish, Crustaceans, Molluscs and Others

The statistics indicate an increase in the amount of fish and crustaceans imported to Qatar, reaching nearly 30 million kg worth of QR 342 million in 2020, while the amount of exported fish reached approximately 64 thousand kg worth of QR 341 million. The annual growth rate of exported fish decreased by -37% compared to 2014.

Figure 4.13: Volume of exports and imports of fish, crustaceans, molluscs and other aquatic invertebrates (million kgs), 2014-2019

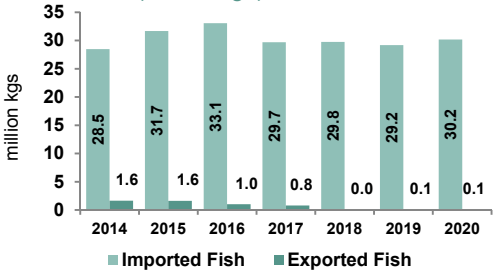


Table 4.30: Volume and value of Qatar exports and imports of fish, crustaceans, molluscs and other aquatic invertebrates (kg, QR) 2014-2019

Year	Imports		Exports	
	Volume of Imported Fish (kg)	Value of Imported Fish (QR)	Volume of Exported Fish (kg)	Value of Exported Fish (QR)
2014	28,484,450	235,587,753	1,641,466	5,444,664
2015	31,678,827	279,612,419	1,613,719	6,233,648
2016	33,062,305	286,222,113	1,025,838	4,623,943
2017	29,679,972	295,792,142	796,232	3,278,230
2018	29,757,732	340,197,368	37,598	554,270
2019	29,177,491	364,445,510	86,379	525,596
2020	30,174,189	342,592,373	64,506	341,510
Annual Growth Rate 2014 - 2020	1%	6%	-42%	-37%

Source: PSA, Statistical Abstract, Chapter of Foreign Trade Statistics

2.7 Sea Turtle Nests

Statistics indicate that the total number of monitored sea turtle nests amounted to 193 nests in 2020, the majority of which are concentrated in Fuwairit, Al Ghariyah and Umm Tais Island. Furthermore, the number of live hatching turtles reached 9,416 turtles, with a success rate of hatching turtle eggs that reached 90% in 2020.

Table 4.31: Total number of registered sea turtle nests by location, 2014-2020

Location	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2020 2014-
Ras Laffan	147	68	42	42	40	46	30	-23%
Fuwairit	25	31	32	52	56	32	61	16%
Al Maroona	0	0	0	4	5	7	13	-
Ras Rukn Island	27	10	7	43	13	17	20	-5%
Umm Tais Island	29	6	10	24	4	53	26	-2%
Shraouh Island	6	6	8	3	0	1	2	-17%
Halul Island	92	97	61	40	0	33	0	-100%
Al Ghariya	19	3	4	0	24	23	41	14%
Total	345	221	164	208	142	212	193	-9%

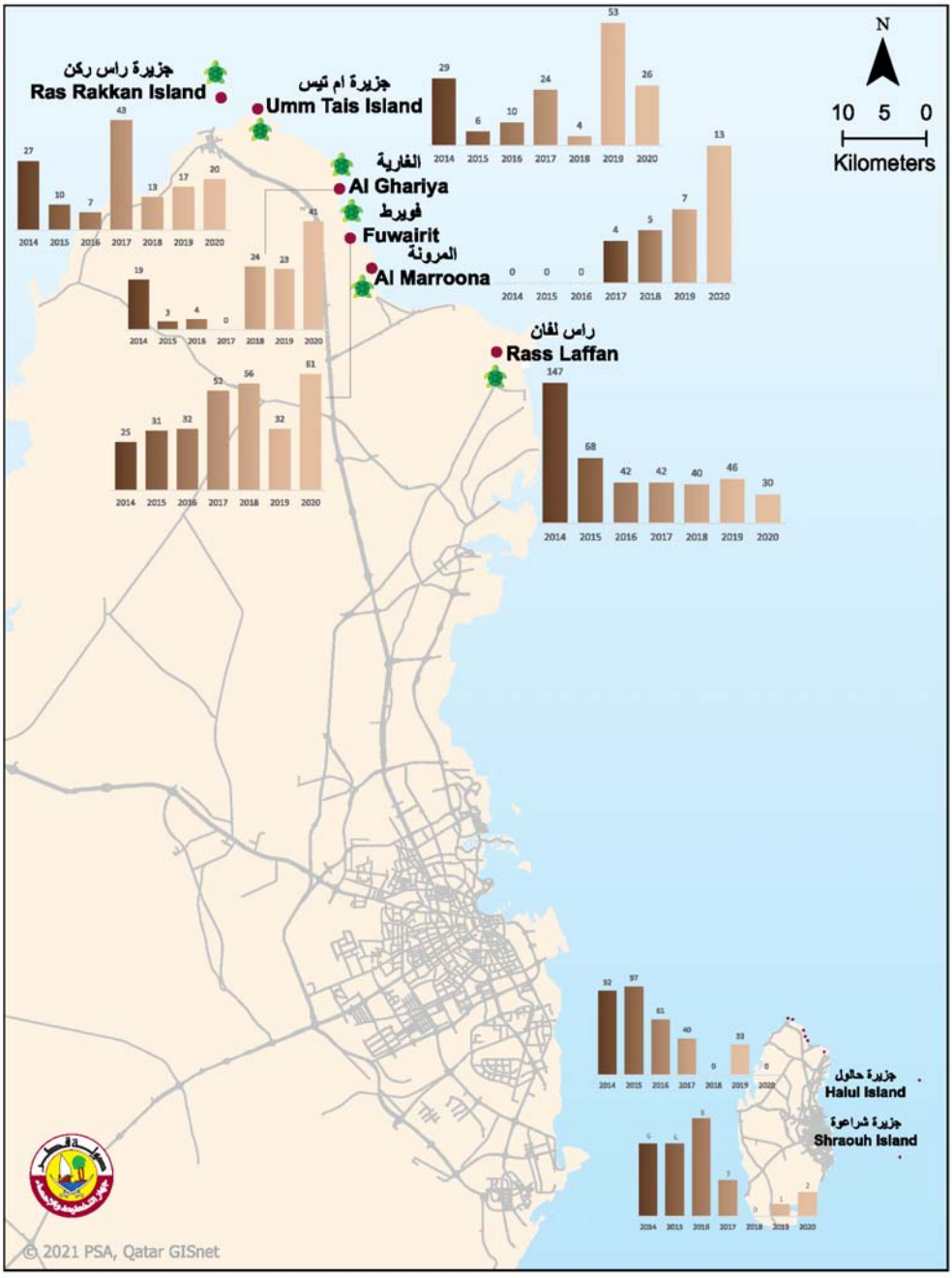
Source: Ministry of Municipality and Environment

Table 4.32: Number of live hatching turtles and hatching success rate, 2014-2020

Location	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2020 2014-
Number of live hatching turtles	22,066	14,135	10,489	2,814	5,037	5,706	9,416	-13%
Hatching success rate	83.1	38.8	84.4	73.5	80.0	82.0	90.0	1%

Source: Ministry of Municipality and Environment

Map 4.10: Number of sea turtle nests, 2014-2020



3. Uses and Types of Water Resources

Water is at the core of national and international priorities, mainly in the countries suffering from natural water resource shortage, e.g. the State of Qatar. This priority is manifested in the relationship of water to Qatar's National Development Strategy. Qatar is among the world's least countries with natural freshwater resources, i.e. annual production rate. The groundwater resources did not exceed 73.8 million m3, rainfall (long-term annual average 1998-2017) amounted to 71.6 million m3, and annual inflows of groundwater from Saudi Arabia reached 2.2 million m3. It is clear from statistics that the annual safe water abstraction level should not surpass 55.8 million m3, after calculation of the outflow of water from aquifers into the sea, and deep saline reservoirs, which amount to 18 million m3 annually. Therefore, the annual renewable safe water abstraction (water balance) represents 47.5 million m3.

Table 4.33: Natural Water Balance of Aquifers in Qatar (Average Annual Values 1998-2019)

Balance item	Million m3/year	Source
1- Recharge of aquifers from rainfall	64.8	Ministry of Environment (long-term annual average 1998-2017)
2- Inflows from Saudi Arabia	64.8	Agriculture and Water Research Management (2006) (long-term annual average)
3- Total water renewable resources (safe groundwater abstraction level) = (1) + (2)	18.0	
4- Flowing out groundwater reservoirs into the sea and deep saline reservoirs	46.8	Ministry of Environment (long-term annual average 1998-2017)
5- Annual average of water balance (net and safe renewed yield on an annual basis) 5 = (3) – (4)	64.8	

Source: Ministry of Municipality and Environment

In reality, however, groundwater abstraction ratio is 4 times higher than the safe yield (250 million m3/year) which leads to groundwater depletion and leakage of seawater and deep saline groundwater into aquifers, and therefore leading to salinity increase and concentration of dissolved solids. In addition, high salinity and dissolved solids concentrations may render water unsafe for drinking or even agricultural purposes.

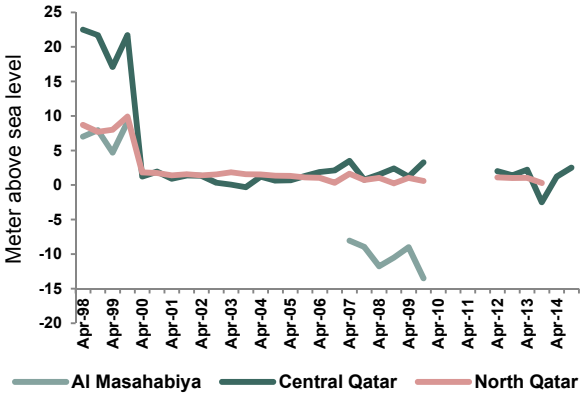
Shortage of water resources, harsh climate conditions, polluted groundwater, inappropriate agricultural patterns, improper agricultural practices, over grazing, and lack of socio-economic development lead altogether to water deterioration and desertification. In turn, the problem of desertification will aggravate due to the accumulation of salinity year after year, causing soil deterioration and making it infertile, which is the main reason for abandoned farms. Such deteriorated soil exists in farms in vicinity of coasts owing to the impact of high saline irrigation water, or on inland farms where solid soil is exposed to salinity.

(5) Does not include return flow from irrigation.

3.1 Groundwater Quality and Quantity

Groundwater depletion can be monitored through the changes at groundwater levels and quality of water. Overexploitation of groundwater may lead to leakage of seawater and deep saline groundwater into aquifers, and therefore leading to salinity increase and concentration of dissolved solids. In addition, high salinity and dissolved solids concentrations could render water unsafe for drinking or even agricultural purposes. To clarify the groundwater deterioration level, we will tackle groundwater levels and salinity (electrical conductivity), and total dissolved solids in the main aquifers in Qatar.

Figure 4.14: Aquifers Levels in North Qatar , Central Qatar, and Al-Mashabiya (average of entire available observations) (meter above sea level) 1998-2014



Source: Kahramaa, and PSA calculations.

Groundwater quality is based on the Ministry of Municipality and Environment's groundwater network control program, which has featured 3,585 samples taken from 295 wells since April 1998. It is noteworthy that some monitored groundwater wells include saline groundwater owing to their proximity to the sea or to their depth. To evaluate the trend of aquifers, the arithmetic mean (50%) was used instead of the mean value, taking into account that the impact of the single extreme values might be ignored (as the very highly monitoring results in a single well among several aquifers).

There is a reliable time series for some aquifers' levels from April 1998 up to September 2014. Figure below shows the average aquifers levels in the north and center of Qatar, and in Al-Mashabiya. Thus, we find that aquifers levels in north Qatar showed a declining trend (0.3 meter above sea level in 2014). As for the aquifers' levels located in Central Qatar, they change over time, and no important trend manifests in the long run (mean value). During the short period of observation over Al-Mashabiya, it is clear that the trend is descending. The monitored mean level reached 14 meters below sea level in Al-Mashabiya area.

It is worth mentioning that most groundwater abstractions (230 million m3 in 2017) are directed for agricultural purposes; i.e. 85% of total abstracted groundwater, whereas the remaining proportion is allocated for domestic, municipal and industrial uses by 20 million m3.

Table 4.34: Quantity of Abstracted Groundwater by Sector of Use (million m3/year) 2014-2019

Year	Total abstracted groundwater (million m3)	Uses of groundwater			
		farms	municipal	domestic	industrial
2014	250.3	230	10.4	9.7	0.2
2015	250.0	230	20.0		
2016	250.0	230	20.0		
2017	250.0	230	20.0		
2018	250.0	230	20.0		
2019	250.0	230	20.0		

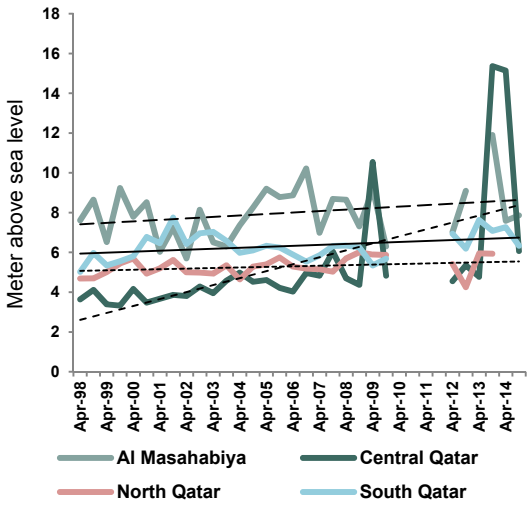
Source: Ministry of Municipality and Environment – KAHRAMAA

3.1.1 Average salinity

Table and Figures present average salinity measured in electrical conductivity (dS/m), and dissolved solids (per ppm) for four aquifers in Al-Mashabiya, South Qatar, Central Qatar and North Qatar.

It is clear that during the period 1998-2014, the four aquifers were categorized as being of medium salinity with increasing salinity level. According to the available data, the dissolved solids were slightly decreasing in Al-Mashabiya, North Qatar, and South Qatar.

Figure 4.15: Trend of Electrical Conductivity in Selected Aquifers (Mean) 1998-2014



As for the aquifers with highest salinity (average of electrical conductivity and dissolved solids) in 2014, they are located in Wadi Al-Ariq, Al-Mashabiya and South Qatar.

Figure 4.16: Trend of TDS in selected Aquifers (median) 1998-2014

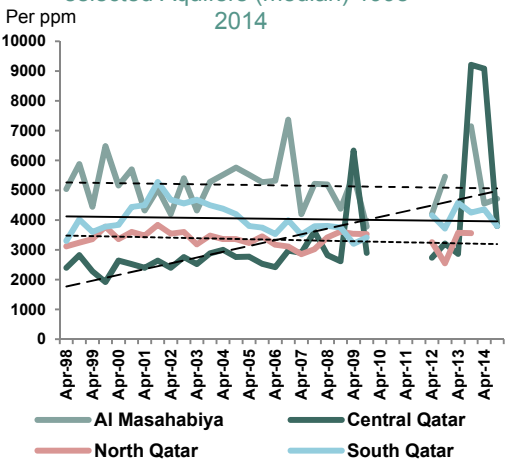


Figure 4.17: Electrical conductivity in September 2014 (average of all wells per Aquifer)

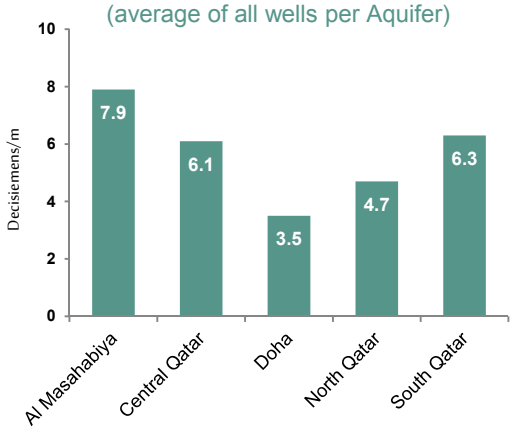


Table 4.35: Salinity in aquifers monitored from 1998 to 2014: maximum and minimum mean values (average of all aquifers and monitoring period) and their trends

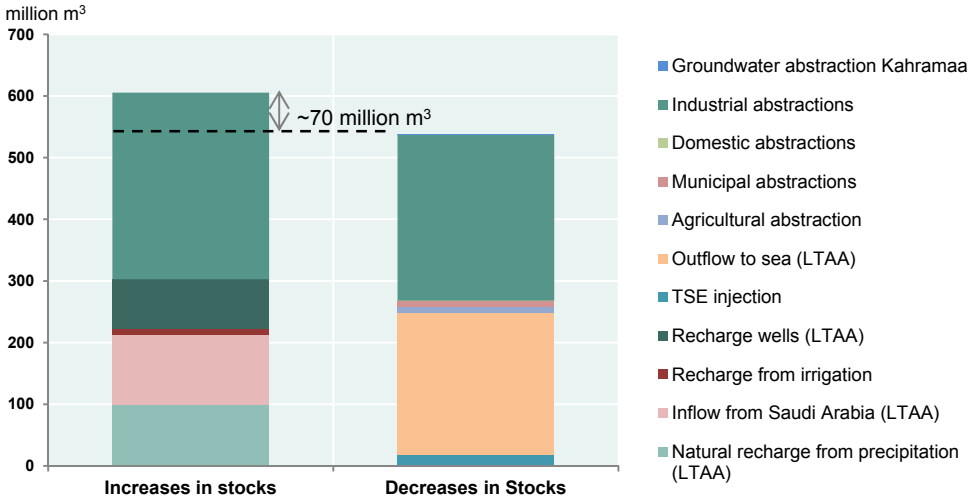
Aquifer	Electrical Conductivity (dS/m)		Dissolved solids (per ppm)		FAO Classification	Salinity Tendency (1998 –2014)
	Minimum	Maximum	Minimum	Maximum		
Al-Mashabiya	**5.70**	**11.91**	**3,780**	**7,368**	High salinity	Increasing
North Qatar	**4.25**	**6.01**	**2,550**	**3610**	High salinity	Not found
Central Qatar	**3.32**	**15.36**	**2420**	**9210**	Moderate salinity	Increasing
South Qatar	**5.03**	**7.75**	**3,205**	**4580**	Moderate salinity	Not found

Source: Kahramaa, and PSA calculations

3.1.2 Water Balance

Figure below shows the latest annual average of groundwater balance (long-term annual average of natural water balance and figures of the artificial balance items of 2019). The long-term renewable natural water resources are estimated at around 99.10 million m3 per year from recharge due to rainfall. The mentioned natural recharge sources account for 33% of annual additions to aquifers. As for the remaining proportion of annual additions to aquifers, it accounts for 67% due to artificial recharge processes (recharge of wells), and injection of treated wastewater and irrigation return flow.

Figure 4.18: Water Balance (Long-term Annual Average) 2019

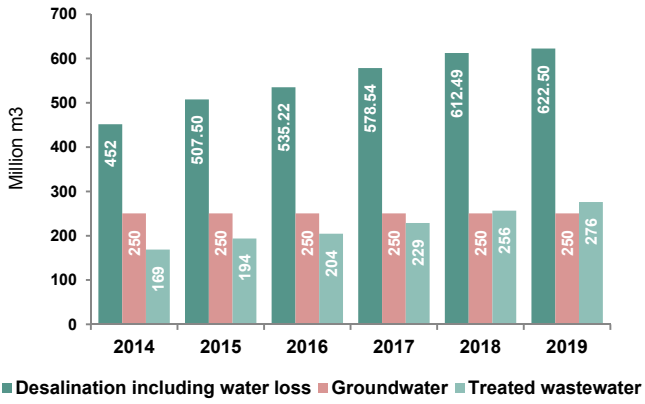


Source: Ministry of Environment, Kahramaa, and Ashghal – Data compiled by PSA

3.2 Water Abstraction and Uses

3.2.1 Water Production

Figure 4.19: Water available for use (after loss) by type of water (million m3) 2014-2019



The figure shows the water available for use for 2019 that highlights the increasing demand for water owing to the population and economic growth in Qatar. To meet this growing demand, desalination and groundwater abstraction are overexploited beyond their safe yield. Thus, total water available for use (including desalinated water, groundwater, and reused wastewater) amounted to 1149 million m3. Desalinated water production (after loss) constituted 54% (622.5 million m3), groundwater 22% (250 million m3), and treated wastewater 24% of total water available for use. The current groundwater abstraction ratios are 5 times higher than renewable natural water, and over 90% of this water is used in agriculture.

Comparing the production of desalinated water after loss during the period (2014-2019), the findings showed 6% rise in the annual growth rate of desalinated water production in 2019 compared to 2014. Water service subscribers increased by 7%

during the same period, while real water loss slumped to -3% in 2019, in line with Qatar's NDS goals aiming to reduce water loss by a growth rate.

Table 4.36: Water production and real loss (million m3, %) 2014-2020

Year	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate -2020 2014
Desalinated water (Mm3) including loss	482.2	533	557	602	637	648.44	673.457	6%
Desalinated water (Mm3) excluding loss	451.8	507.5	535.22	578.54	612.49	622.5	634.25	6%
Real loss (Mm3)	30.4	25.5	21.78	23.46	24.51	25.94	39.21	4%
Real loss (%)	6.30%	4.27%	4.04	4.01	4.00%	3.97%	5.82%	-1%
Number of desalinated water consumers (water service subscribers)	262,018	277,433	296846	310034	329,832	363,338	382,932	7%

Source: Kahramaa

3.2.2 Water Uses

The water available for use is composed of desalinated seawater, treated wastewater, and abstracted groundwater. In 2018, the total water available for use amounted to 1,145.36 million m3, of which 56% was desalinated seawater, 22% was abstracted groundwater, and 22% was treated wastewater.

In 2018, over 11.4% of available water for use was not used because it was lost during transport (2.1%), discharged into wastewater lagoons (3.3%), discharged into the sea (0.05%) or injected into deep aquifers (6%).

Since 2008, total water withdrawn from aquifers remained unchanged at 250 million m3 annually, i.e. over 5 times higher than theoretical maximum sustainable abstraction. 92% of abstracted groundwater is used for agriculture purposes, whereas 8% is allocated for domestic, municipal, and industrial uses.

In 2018, around 59% of treated wastewater was directly reused for agriculture and green space irrigation, while about 15% was discharged into wastewater lagoons and the sea and was no longer available for further use. In addition, 26% of treated wastewater was injected into deep aquifers.

Assumptions and Clarifications on Statistics:

1. Industrial uses of water: data are provided by QP HSE Sustainable Development Industry Reporting initiative (published by the Ministry of Energy and Industry in 2013), in which 30 companies were listed (91% of invited companies). The report is assumed to include the water uses mentioned by Kahramaa, and provided for industries, whereas the production of the desalinated water took place in the industrial cities, and the quantity of 2011 was used as estimations for the period 2012-2018.

2. Commercial uses include supplies from Kahramaa to large industrial complexes.
3. No data are available for cost-free water uses. However, they were computed by PSA as follows: water production minus water loss, minus cost-free water uses. Cost-free water was considered as being utilized for private home uses.

In 2018, total water used in Qatar (after deducting water loss quantities from the public network estimated at 24.51 million m3) amounted to 1080.54 million m3. The largest share is directed for private domestic uses at 266 million m3, followed by agriculture by 309 million m3, government uses at 122 million m3, and commercial activities at 25.8 million m3, and finally industries at 25.8 million m3. As for the key sources of water used in agriculture, they are as follows: 230 million m3 of groundwater (74%) and 79.67 million m3 of treated wastewater (26%).

Figure 4.20: Water use by sector and water source, not including water wasted in transportation (million cubic meters) 2018

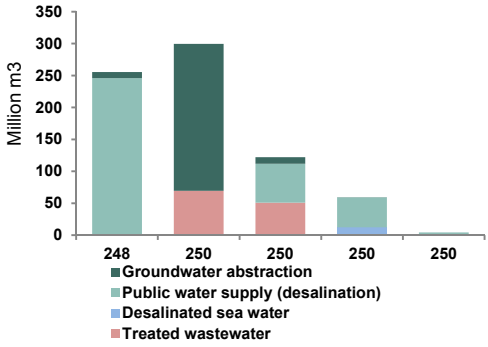


Figure 4.21: Percentage distribution of water available for use in 2018

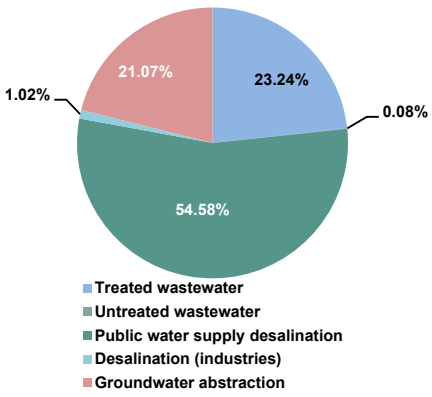
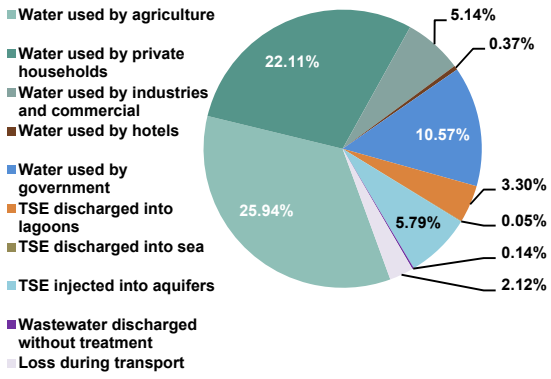


Figure 4.22: Percentage of water use and loss in 2018



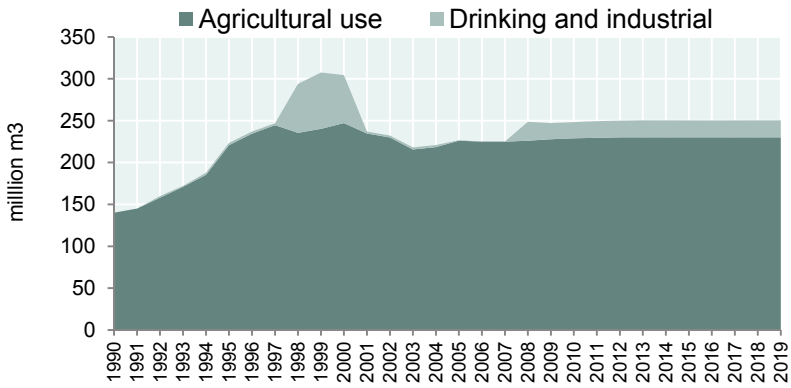
The table below presents the full balance of water uses in Qatar in 2018. The Table indicates that a large proportion of usable water is still not exploited, such as treated wastewater discharged by injection into deep aquifers, wastewater lagoons and the sea (11.98%), or amounts of drinking water lost during transport (2.8%).

Table 4.37: Water Use Balance (mm3) 2018

Statement	Amount of water likely to be available for use	Amount of used water and losses	Remarks
Amount of distilled water	**637**		Volume of water received from Kahramaa
Amount of extracted fresh groundwater	**250.28**		It includes data on agricultural, municipal, domestic and industrial wells for 2014.
Amount of treated wastewater	**256.48**		Amount of wastewater discharged from urban wastewater treatment plants.
Amount of untreated wastewater	**1.62**		Untreated wastewater discharged into industrial basins.
Total amount of water available for use	**1145.37**		Amount of water available before water loss.
Amount of untreated wastewater		**1.62**	
Total distilled water losses		**24.51**	Total water losses.
Amount of treated wastewater discharged into industrial basins		**38.16**	
Amount of treated wastewater discharged into the sea		**.55**	
Amount of treated wastewater injected into deep aquifers		**66.89**	
Amount of water used in the agricultural sector		**309.97**	Groundwater and treated wastewater.
Amount of water used in the industrial sector and commercial activities		**51.58**	Amount of water supplied by industrial wells and amount of water provided by KAHRAMAA including large industrial complexes and hotels.
Amount of water used in the domestic sector		**266**	Amount of water provided by KAHRAMAA and from domestic and municipal wells.
Amount of water used in the government sector		**122.01**	Amount of water provided by KAHRAMAA and amount of treated wastewater for irrigation of green spaces.
Total amount of water used and losses		**881.28**	

Source: Ministry of Municipality and Environment, Kahramaa and Ashghal. Data compiled by PSA

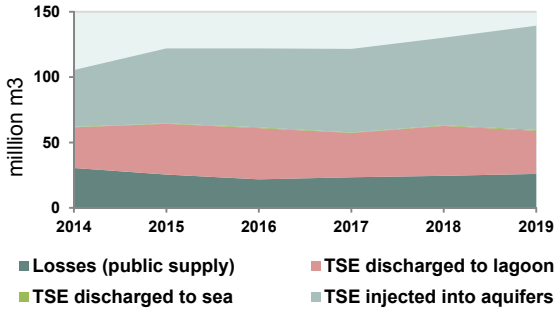
Figure 4.23: Groundwater abstraction 1990-2019



The figure below shows the abstracted groundwater from 1990 to 2019. Annual abstraction rate has stabilized at the level of 250 million m3, i.e. 5 times the water balance (the long-term annual average). Over those years, agriculture had the largest share of abstracted water (92% in 2019).

the figure below indicates the amounts of water loss and unused treated wastewater during the period (2014-2019). The figure shows that water loss caused by public water supplies network, and treated wastewater discharged into lagoons increased slightly. Treated wastewater, which is discharged into the sea, is considered as insignificant.

Figure 4.24: Unused water and treated wastewater injection 2014 - 2019



The design capacity of wastewater treatment increased to 966 million m3/day in 2019, and the treated wastewater production doubled 11 times from 169 million m3/day in 2014 to 276 million m3/day in 2019. Agriculture had the largest share in the treated wastewater use (31.2% in 2019), followed by government uses (for green space irrigation; 27.8%). In 2019, 12% of the treated wastewater was discharged into wastewater lagoons, and therefore became no longer available for further use. Also, 28.9% of the treated wastewater was injected into deep aquifers, and less than 0.3% of the treated wastewater was discharged into the sea.

Figure 4.25: Use and discharge of treated wastewater 2019

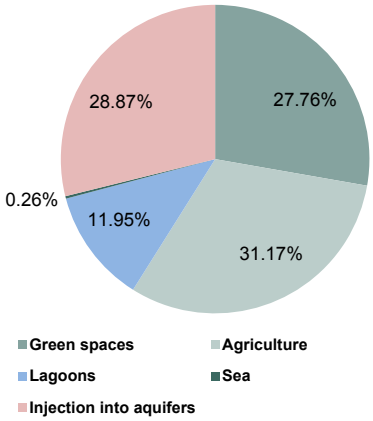
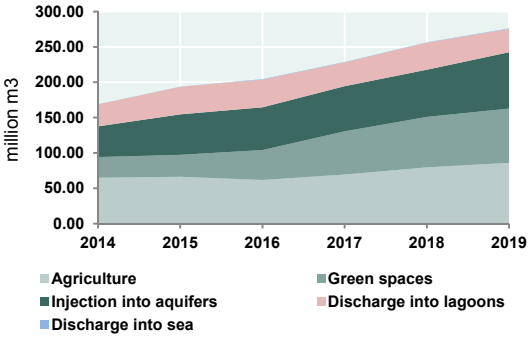


Figure 4.26: Use and discharge of treated wastewater 2014 - 2019

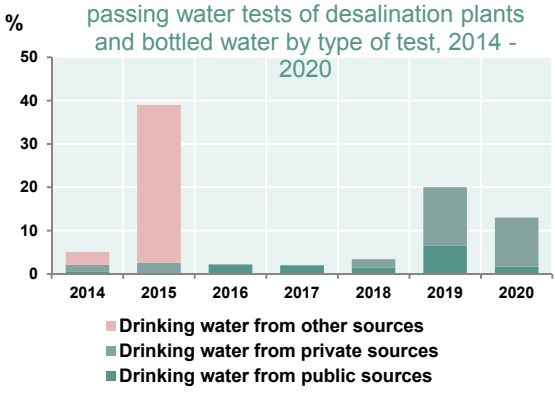


3.3 Fresh Water Quality

Water quality is monitored by the Ministry of Public Health, a regulatory body that provides Qatar's population with its needs as per the national and international health standards. Table below shows drinking water quality according to bacteriological tests of drinking water samples by municipality and source in 2019.

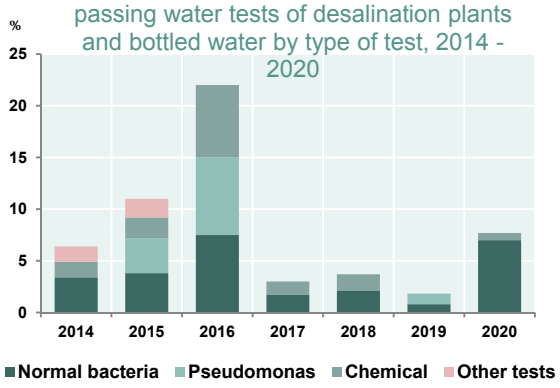
Figure (4.27) on the results of bacteriological tests of drinking water samples by source during the period (2014-2019) indicates that all samples taken from public water sources, i.e. government agencies, were compatible. In most years, the incompatibility rate was zero, same as in 2015. However, in 2016 and 2017 the incompatibility rate was almost 2% and 7.1% in 2020. Moreover, the percentage of incompatible samples taken from private water sources, i.e. the samples taken from the end of KAHRAMAA network (water service provider) in private sources in 2020 amounted to 11.3%, while the average rate during the years 2014-2018 was 2.5%. In addition, the results of drinking water tests during the years 2014-2019 indicate the majority of incompatible samples were from other sources, which mainly include farms, where samples were taken from water wells there. Such water is untreated and highly saline, which makes it incompatible with specifications. In general, the proportion of incompatible drinking water samples from all sources increased from 27.5% in 2012 to 34.6% in 2020.

Figure 4.27: Percentage of samples passing water tests of desalination plants and bottled water by type of test, 2014 - 2020



It is clearly noted that the percentage of incompatible samples, taken from desalination water plants, mineral water and bottled water in 2015, were distributed over four tests during the period (2014-2020). In the remaining years, incompatible samples were confined to “other tests” and “chemical tests”. The incompatible samples were nearly constant in “other tests”. In 2015, it reached a rate of about 1.75%. Over the period (2016-2019), the percentage of incompatible samples was equal to zero, and in 2020 it amounted to 1%, while the percentage of incompatible samples in “chemical tests” decreased from 41.5% in 2014 to 1.3% during 2020.

Figure 4.28: Percentage of samples passing water tests of desalination plants and bottled water by type of test, 2014 - 2020



The figure shows that no desalinated drinking water samples were found incompatible in “chemical and bacteriological tests” during the period 2014-2016 and 2018-202. In 2017 and 2019, however, the percentage of desalinated drinking water samples that were incompatible with standards of “chemical and bacteriological tests” was 2.5% and 2.2%, respectively. The percentage of drinking bottled water, which was incompatible with bottled water standards, reached 4.6% in 2020.

Figure 4.29: Percentage of Samples passing water tests of desalination plants and bottled water by source, 2014 - 2020

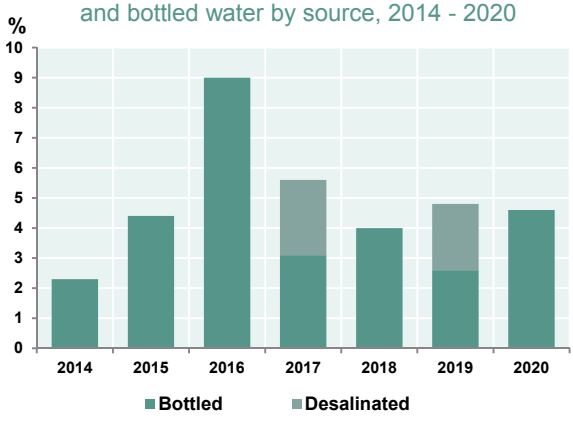


Table 4.38: Results of bacteriological tests of drinking water samples by municipality and source 2020

Municipality	Drinking Water Source					
	Public Sources			Private Sources		
	Total number of samples	Number of incompatible samples	Percentage of incompatible samples	Total number of samples	Number of incompatible samples	Percentage of incompatible samples
Doha and Al-Rayyan	184	4	2.2	1,037	134	13.0
Al-Wakra	42	1	2.4	18	2	11.0
Umm Slal	35	0	0.0	66	7	10.6
Al-Khor	17	1	5.9	27	0	0.0
Al-Shamal	20	2	10.0	3	0	0.0
Al-Dhaayin	2	0	0.0	3	0	0.0
Al-Shihaniya	9	0	0.0	6	2	0.0
Not Shown	408	4	1.0	99	3	3.0
Total	309	8	20.5	1160	145	34.6

Source: Ministry of Public Health
Public sources: public government agencies
Private sources: Kahramaa services in private sources
*: These samples are taken from water wells in farms; thus, water is untreated with high salinity, making the samples incompatible.

Table 4.39: Results of bacteriological tests of drinking water samples by month and source, 2020

Month	Drinking Water Source					
	Public Sources			Public Sources		
	Total number of samples	Number of incompatible samples	Percentage of incompatible samples	Total number of samples	Number of incompatible samples	Percentage of incompatible samples
January	65	1	1.5	154	18	11.7
February	272	0	0.0	174	14	8.0
March	196	3	1.5	135	16	11.9
April	54	0	0.0	13	0	0.0
May	0	0	0.0	0	0	0.0
June	3	0	0.0	0	0	0.0
July	48	8	16.7	8	0	0.0
August	16	0	0.0	65	9	13.8
September	17	0	0.0	135	22	16.3
October	17	0	0.0	195	34	17.4
November	15	0	0.0	222	27	12.2
December	14	0	0.0	158	2	1.3
Total	717	12	1.7	1259	142	11.3

Source: Ministry of Public Health
Public sources: public government agencies
Private sources: Kahramaa services in private sources
*: These samples are taken from water wells in farms; thus, water is untreated with high salinity, making the samples incompatible.

3.4 Quality of Wastewater Generated from Urban Areas

3.4.1 Collection of wastewater from urban areas and treatment infrastructure

The wastewater collection and infrastructure available for its treatment double the environmental benefits by reducing the transfer of contaminants into groundwater, preserving biodiversity, which might get affected by wastewater contaminants, and decreasing nutrients discharged into coastal waters, and in turn reducing coastal water pollution. Most importantly, treated wastewater is considered as an alternative source of water that reduces pressure on water resources, and contributes to their sustainability, especially in the countries that suffer from water shortage such as the State of Qatar. Such an orientation allows further reliance on water reuse in agriculture and green space irrigation, or other uses.

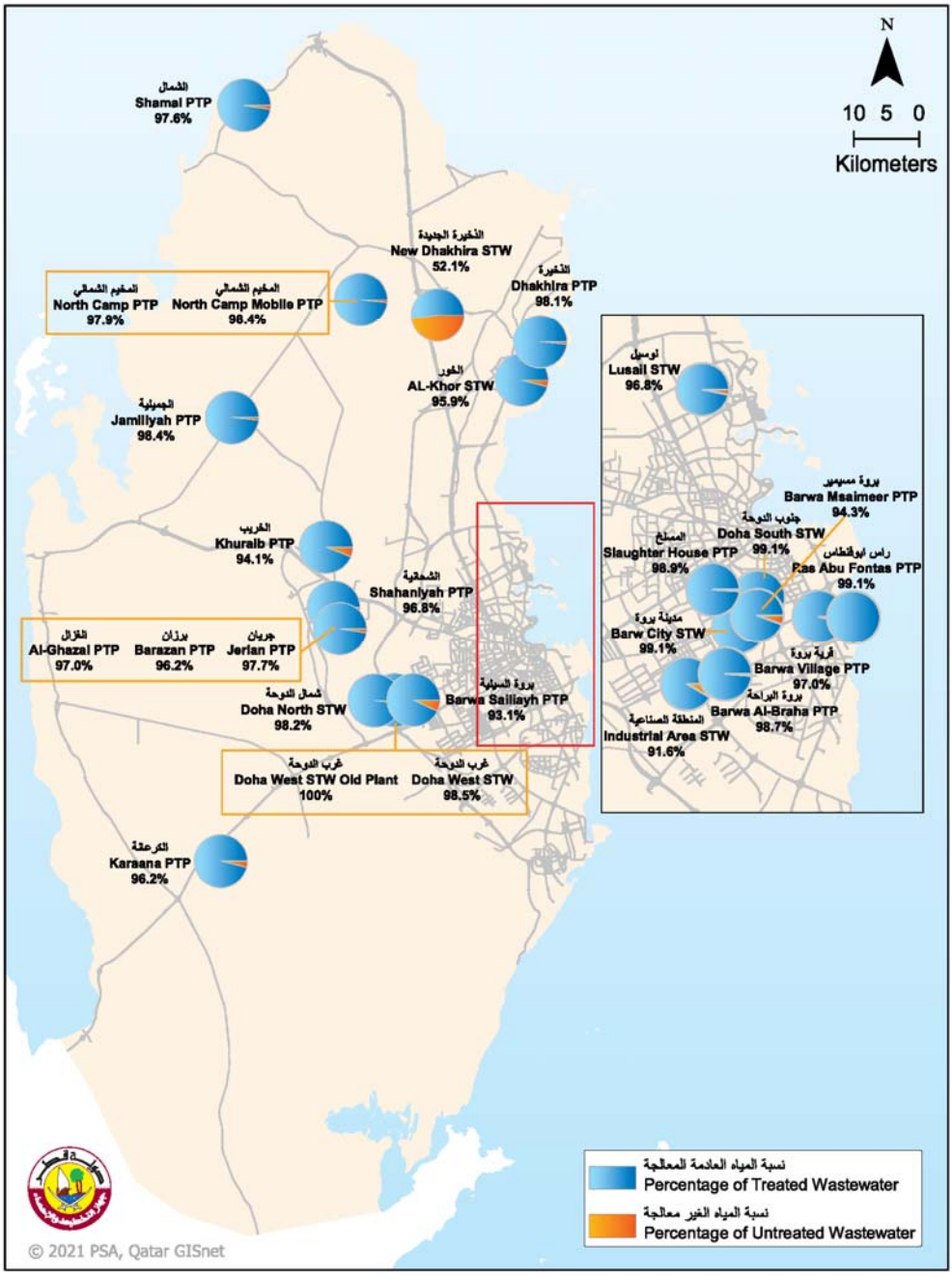
The number of wastewater treatment plants reached 27; at an annual growth rate of 3% during 2014-2020, with a design capacity of 1022 thousand m3/day in 2020. Compared to previous years, wastewater treatment plants design capacity rose by 6% during the period 2014-2020. The plants received 291 million m3 of wastewater per year, of which 285 million m3 were treated, i.e. 98% of total wastewater in 2020.

Table 4.40: Wastewater in Sewage Treatment Plants 2014-2020

Statement	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2014 - 2020
Amount of collected wastewater (1000 m3/year)	23	23	24	24	24	26	27	3%
Amount of treated wastewater (1000 m3/year)	705	809	827.4	827.9	965	966	1,022	6%
Percentage of treated wastewater of total wastewater	173,933	197,492	209,518	231,473	257,829	278,216	291,531	9%
Treated wastewater used for agriculture irrigation (1000 m3/year)	168,949	193,854	204,392	228,668	256,467	276,114	285,816	9%
Amount of treated wastewater used for green space irrigation (1000 m3/year)	97.10%	98.20%	99.1	98.9	99.4	99.6	99.7	116%
Amount of treated wastewater used for injection into aquifers (1000 m3/year)	64,920	66,289	61,699	69,508	79,669	86,056	88,957	5%
Amount of treated wastewater discharged into lagoons (1000 m3/year)	29,096	31,088	42,480	61,029	71,208	76,648	86,568	20%
Amount of treated wastewater discharged into the sea (1000 m3/year)	43,465	57,291	60,364	63,859	66,892	79,706	78,104	10%
Dry sludge from wastewater (ton per year)	31,109	38,845	39,168	33,817	38,161	33,001	32,313	1%
Sludge from wastewater (1000 m3 per year)	358	350	681	455	546	713	55	-27%
Amount of wastewater not collected in wastewater treatment plants, and discharged untreated into lagoons (million m3)	32,066	39,717	40,857	40,805	37,688	39,096	40,960	4%
Total discharge of surface groundwater into the sea (million m3 per year)	543	218	196	222	202	191	203	-15%
Amount of collected wastewater (1000 m3/year)	11,303,180	1,699,666	1941389	2441946	1,616,900	994,706	825,481	-35%
Amount of treated wastewater (1000 m3/year)	63,016,341	75,686,500	89689055	95,398,680	100,933,770	90,949,758	98,485,670	8%

Source: Public Works Authority (Ashghal)

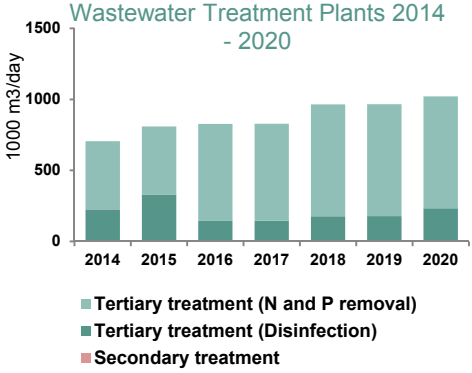
Map 4.11: Treated wastewater ratio of total wastewater by plant, 2020



3.4.2 Wastewater Treatment in Wastewater Plants by Type

There are three types of wastewater treatment in wastewater plants in Qatar: secondary and tertiary (disinfection), and tertiary (removal of nitrogen and phosphorous). Secondary treatment is defined as the removal of biodegradable organic compounds (both dissolved and suspended) and the removal of suspended solids. Typical disinfection is featured in the conventional secondary treatment. Tertiary treatment is the removal of solids that remained from the secondary treatment, and sand filtration and micro refineries are usually used. Further, tertiary treatment includes removal of nitrogen and phosphorous, as well as disinfection.

Figure 4.30: Hydraulic Design Capacity by Treatment Type at Wastewater Treatment Plants 2014 - 2020



The design capacity of wastewater treatment plants which implement secondary treatment amounted to 1.32 thousand m3/day, tertiary treatment (disinfection) to 231.3 thousand m3/day, and tertiary treatment (nitrogen and phosphorous removal) to 788 thousand m3/day for 2020.

Table 4.41: Wastewater treatment plants from urban areas, hydraulic design capacity and amount of wastewater pumped into each plant, 2020

Wastewater Treatment Plant	Type of Treatment	Hydraulic Design Capacity		Amount of Wastewater Pumped into Each Plant (1000 m3/year)
		(1000 m3/day	(1000 m3/day	
Al-Jamiliyah PTP	Secondary (sterilization)	0.54	197.1	161
AL-Kharib PTP		0.06	21.9	31
Slaughterhouse PTP		0.18	295.65	74
Ras Abu Fontas PTP		0.54	197.1	110
Total		1.32	711.75	376
Al Thakhira PTP	Tertiary (disinfection) Tertiary (N & P removal)	3.2	1168	1430
Al Khor PTP		9.72	3547.8	6707
Al-Shamal PTP ([4])		0.6	219	261
Barwa Al Baraha PTP		12	4380	4033
Barwa City STP		15	5475	2687
Barwa Musaimeer PTP		1.5	547.5	337
Barwa Al Siliayah PTP		1.5	547.5	305
Barwa Village PTP		1	365	201
Doha West Old STP		54	19710	2093
Industrial Area STP		60	21900	22375
Al Ghazal PTP		0.44	160.6	132.3
Al Shihaniyah		1.345	490.925	617
Al Karaana		10	3650	2840
Jaryan [(3)]		0.25	91.25	85.7
Al Shamal Camp mobile [(3)]		1	365	332
Al Thakeera new (PTP) [(7)]		56.2	20513	443
Barazan [(6)]		3.3	1204.5	237
Al Shamal Camp		0.245	89.425	149
Total		231.3	84424.5	45265
Doha North STP	Secondary (sterilization)	244	89060	46195
Doha South STP		204	74460	84072
Lusail		60	21900	14757
Doha West STP [(2)]		280	102200	100939
Total		788	287620	245963
Total [(5)]		1020.62	372756.25	291604

(2) The design capacity of the plant was raised in 2018.

(3) Jaryan plant and the North Camp mobile plant started work in 2019.

(4) The plant was upgraded with tertiary treatment (nitrogen and phosphorus removal) in 2018

(5) Total does not include the Slaughterhouse Plant

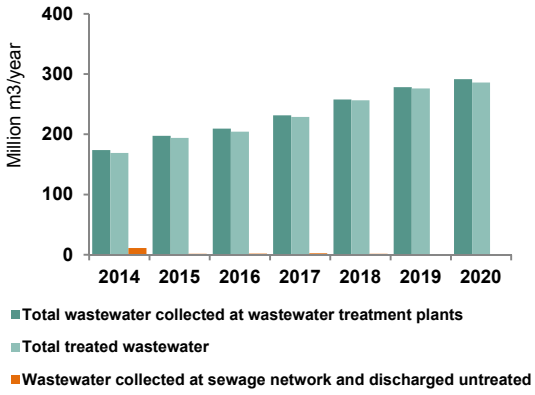
(6) Umm Salal station has stopped working since 2018

Source: Public Works Authority.

3.4.3 Urban Wastewater Treatment, Discharge and Quality

In 2020, total urban wastewater (excluding Industrial Area) attained 291 billion m3, of which 98% was treated in wastewater treatment plants. Organic pollution (BOD and COD) has been removed by over 95% most of the time. In 2020, 98.9% of BOD and 96.4% of COD were removed in urban wastewater treatment plants (26 plants).

Figure 4.31: Collected wastewater, treated wastewater and discharged untreated wastewater (million m3/year) 2014-2020

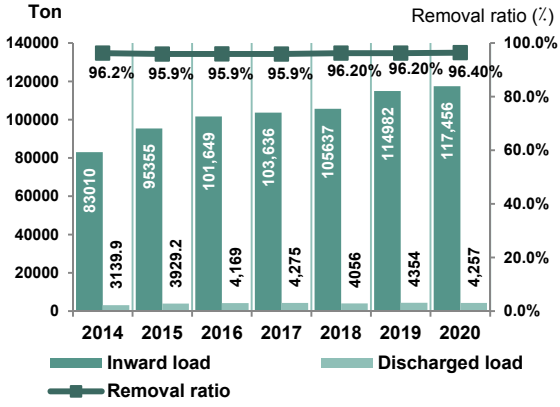


Doha West Plant is Qatar's largest urban wastewater treatment plant. It achieves high removal ratios of BOD, COD, nitrogen and phosphorous. In 2020, over 99 million m3 of wastewater were treated (35% of total urban wastewater in Qatar). In Doha West Plant, 99% of BOD, 96.3% of COD, 80.96% of overall nitrogen and 80% of overall phosphorous were removed.

Since 2014, over 91% of urban wastewater has been treated in treatment plants. In 2019, treatment increased to 98% of total wastewater, and around 825 million m3 were collected via tankers, were discharged in Al-Karaana wastewater lagoon (this water is not often produced by residential units).

Statistics show that organic pollution in terms of COD was removed at over 96.4% until 2020. During the period 2014-2020, COD collected amount increased to 117 metric tons in 2020.

Figure 4.32: Treatment efficiency at urban wastewater treatment plants by COD (ton, %) 2014-2020



During the period 2014-2020, BOD was highly removed, and it exceeded 98.9%. BOD quantities collected increased to 46 metric tons in 2020.

Figure on removal of BOD5, COD, and overall nitrogen and phosphorous in Doha West Plant during the period 2014-2020, indicates that the phosphorous removal rate decreased to 80% in 2020, while the nitrogen removal rate increased to 80.7% during the same period.

Figure 4.33: Treatment efficiency at urban wastewater treatment plants by BOD (ton, %) 2014-2020

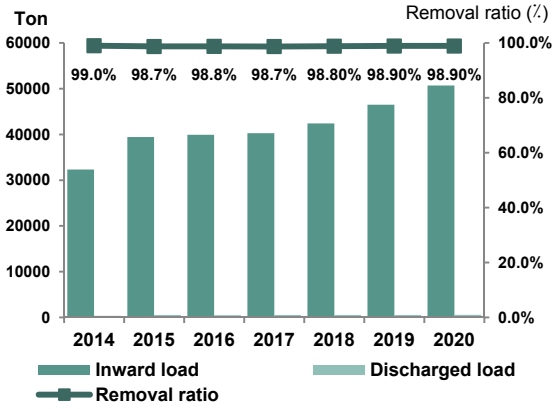
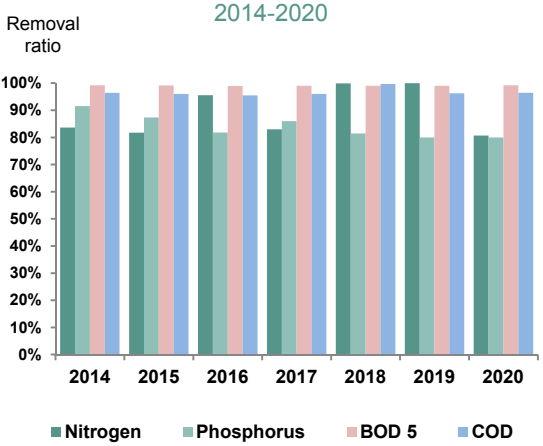


Figure 4.34: Removal ratios of BOD5, COD, total N and P at Doha West Wastewater treatment Plant 2014-2020



3.4.4 Wastewater Quality

3.4.4.1 Public Works Authority Tests

In 2020, the Public Works Authority took samples of treated wastewater in sewage treatment plants to conduct detailed tests on fecal coliform bacilli. Statistics indicate that there were incompatible samples in all plants in 2020. Also, the results of samples for parasitic tests (protozoa) indicated that there were no samples incompatible to the specifications approved by the plants.

Referring to the tests conducted by Ashghal on the concentration of inward and outward pollutants from wastewater treatment plants, the violations of the specifications of the samples taken from the plants reached 2% in 2020 by plant and non-conformity to specifications in 2020.

Table 4.42: Detailed and specialized results of bacteriological and parasitic tests for treated wastewater by treatment plant, 2020

Plant	Detailed Tests by Fecal Coliform Bacilli/ 100 Ml of Sample					Parasites Tests (Protozoa)		
	Total No. of Samples	Compatible Samples		Incompatible Samples		No. of Samples	Incompatible Samples	
		No.	%	No.	%		No.	%
Doha South	179	150	84%	29	16%	12	0	0%
Doha West	496	496	100%	0	0%	12	0	0%
Doha West (Old)	13	13	100%	0	0%	140	NA	NA
Industrial Area	179	176	99%	0	1%	NA	0	0%
Doha North	212	212	100%	0	0%	12	0	0%
Lusail	65	65	100%	0	0%	213	0	0%
Barwa City	31	31	100%	0	0%	55	0	0%
Barwa Musaimeer	30	30	100%	0	0%	6	0	0%
Barwa Al-Siliyyah	41	41	100%	0	0%	6	0	0%
Barwa Village	36	36	100%	0	0%	9	0	0%
Barwa Al-Baraha	35	35	100%	0	0%	7	0	0%
Al-Khor	25	25	100%	0	0%	7	0	0%
Ras Abu Fontas	30	30	100%	0	0%	9	0	0%
Al-Shihaniyah	42	42	100%	0	0%	6	0	0%
Al-Thakhira	19	19	100%	0	0%	8	0	0%
New Al-Thakhira	46	46	100%		0%	8	0	0%
Jamiliyah	20	20	100%	0	0%	46	0	0%
Al Shamal Camp	20	20	100%	0	0%	9	0	0%
Al-Shamal	20	20	100%	0	0%	9	0	0%
Al-Kharib	20	20	100%	0	0%	9	0	0%
Al-Karaana	48	48	100%	0	0%	9	0	0%
Al-Ghazal	27	27	100%	0	0%	6	0	0%
Barzan	41	41	100%	0	0	9	0	0%
Jaryan	32	32	100%	0	0%	7	0	0%
Total	1727	1695	98%	31	2%	620	0	0%

Source: Public Works Authority (Ashghal)

3.4.4.2 MoPH Tests

The Ministry of Public Health (MoPH), in controlling the quality of treated wastewater by source used for irrigation at Corniche area during the period 2010-2018, adopted WHO's standards related to microorganisms, and FOA's standards related to heavy metals.

Statistics on the results of detailed and specialized bacteriological and parasitic tests of treated wastewater by treatment plant indicate that all samples taken from the monitored plants were compatible. The Ministry of Public Health, as a regulatory body, conducts such tests to monitor the quality of treated wastewater.

It is clear that the treated wastewater samples monitored in the Corniche area conformed to international standards of the detailed fecal coliform bacilli tests, with the exception of 2016, where the percentage of samples that were incompatible to standards amounted to 6%. In 2017 and beyond, no irregularities were recorded, thus the quality of treated wastewater used for irrigation conforms to the highest international standards.

Table 4.43: Results of detailed and specialized bacteriological and parasitic tests of treated wastewater by treatment plant 2016-2020

Year	Plant	Detailed Tests by Fecal Coliform Bacilli/ 100 Mi of Sample			Parasites Tests (Protozoa)		
		Total No. of Samples	Incompatible Samples		Total No. of Samples No.	Incompatible Samples	
			No.	%		No.	%
2016	Doha South	366	0	0.0%	na	na	na
	Doha West	52	0	0.0%	52	0	0.0%
	Doha North	366	0	0.0%	366	0	0.0%
	Total	784	0	0.0%	418	0	0.0%
2017	Doha South	365	0	0.0%	6	0	0.0%
	Doha West	56	0	0.0%	61	0	0.0%
	Doha North	365	0	0.0%	365	0	0.0%
	Total	786	0	0.0%	432	0	0.0%
2018	Doha South	2	0	0.0%	2	0	0.0%
	Doha West	2	0	0.0%	2	0	0.0%
	Doha North	2	0	0.0%	2	0	0.0%
	Total	6	0	0.0%	6	0	0.0%
2019	Doha South	4	0	0.0%	4	0	0.0%
	Doha West	4	0	0.0%	4	0	0.0%
	Doha North	4	0	0.0%	4	0	0.0%
	Total	12	0	0.0%	12	0	0.0%
2020	Doha South	1	0	0.0%	1	0	0.0%
	Doha West	1	0	0.0%	1	0	0.0%
	Doha North	1	0	0.0%	1	0	0.0%
	Total	3	0	0.0%	3	0	0.0%

Source: Ministry of Public Health

Table 4.44: Quality of treated wastewater by test source, use, and type of tests (Corniche) 2014-2020

Year	Corniche (irrigation of green spaces and trees)								
	Detailed tests of fecal coliform bacilli			Parasite tests (Protozoa)			Other tests		
	Compatible samples	Incompatible samples	Percentage of incompatible samples	Compatible samples	Incompatible samples	Percentage of incompatible samples	Compatible samples	Incompatible samples	Percentage of incompatible samples
2014	...	...	...	...	...	...	...	...	...
2015	...	...	...	...	...	...	...	...	...
2016	**34**	**2**	**6%**	**11**	**0**	**%0.0**	**11**	**0**	%0.0
2017	**32**	**0**	**0.0%**	**12**	**0**	**%0.0**	**12**	**0**	%0.0
2018	**13**	**0**	**0.0**	Not tested			None		
2019	**24**	**0**	**0.0**	No parasitic tests for Corniche samples			None		
2020	**7**	**0**	**0.0**	No tests for parasitic contaminants			No other tests		

Source: Ministry of Public Health

4. Treated Solid Waste and Waste Management

Waste is defined as unwanted materials generated by daily human activity, such as domestic, municipal and various industrial activities. Waste represents a burden on environment and is considered harmful to public health. Municipal waste is not considered dangerous, does not cause hazardous environment problems and is easy to dispose of safely. The government pays special attention to waste management and treatment, in view of its keenness to reduce waste effects on health, maintain civilized look of the State, and promote waste reduction practices, in light of Qatar's increasing economic growth in diverse sectors such as construction and demolition, industry, trade, and agriculture.

4.1 Waste facilities and annual waste quantity

The 2020 statistics indicate that there are four waste transfer stations in Al-Khor, Dukhan, Doha South, and Doha West; two waste landfills in Umm Al-Afai, and Mesaieed; two waste dumps in Umm Thanyatain and Rawdat Rashed; and one domestic solid waste management center in Mesaieed. The total amount of solid waste in Qatar reached about 10 million tons during 2020, with an annual growth rate of 1% during the period (2014-2020).

Table 4.45: Number of Waste Management Facilities 2014-2020

Facilities	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2014 - 2020
No. of transfer stations	4	4	4	4	4	4	4	0%
No. of landfills	2	2	2	2	2	2	2	0%
No. of dumps	1	1	2	2	2	2	2	12%
No. of waste treatment plant1	1	1	1	1	1	1	1	0%

(1) Domestic Solid Waste Management Center in Mesaieed

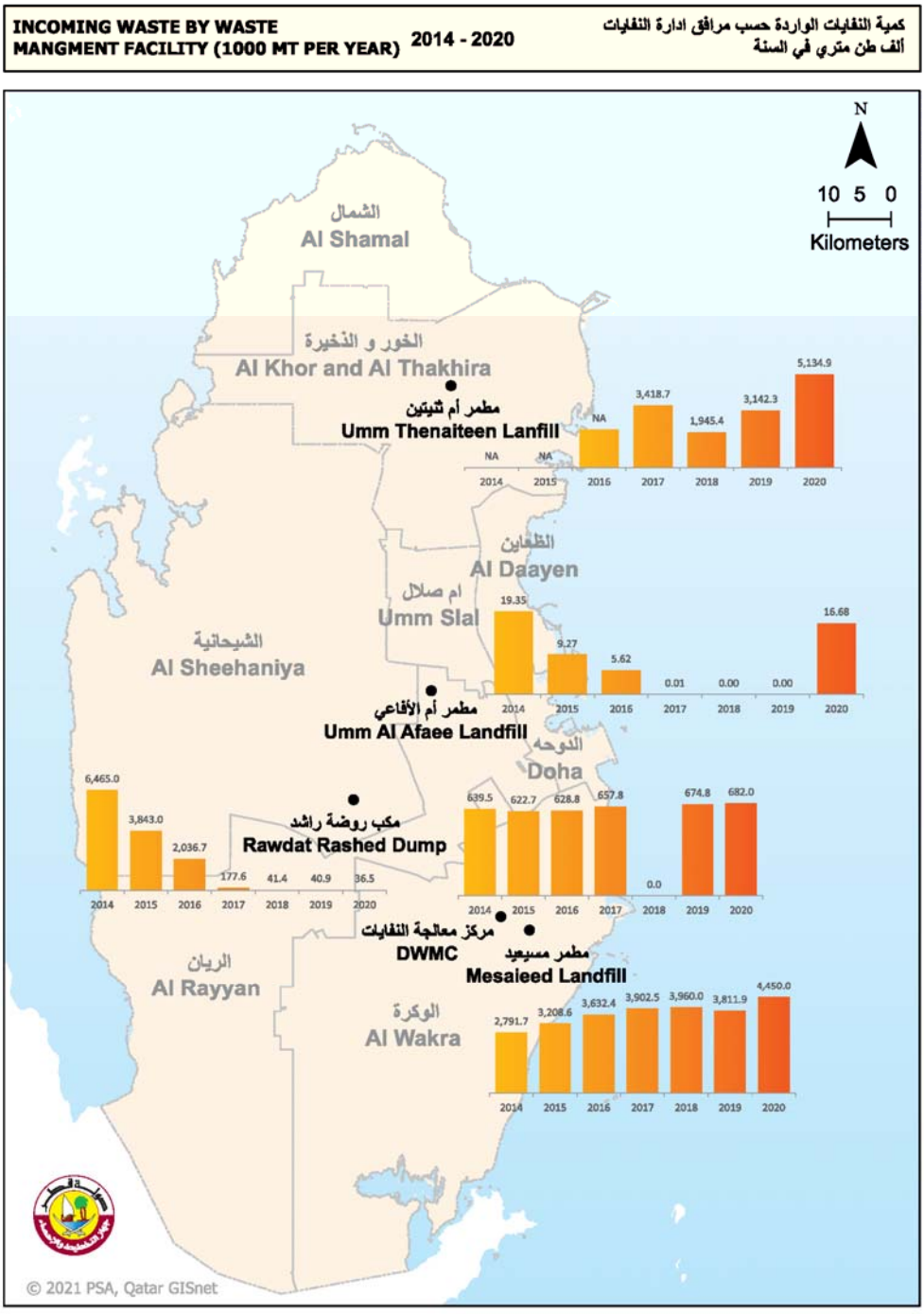
Source: Ministry of Municipality and Environment

Table 4.46: Managed Waste by Type and Waste Management Facility (ton) 2014-2020

Waste by Type	Waste Management Facility	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2014 - 2020
Domestic	Mesaieed	408,526	482,640	537,313	536,050	664,959	617,576	616,839	7%
	DSWMC	639,522	613,226	618,156	648,337	651,880	667,637	682,011	1%
	Total Domestic Waste	1,048,048	1,095,866	1,155,469	1,184,387	1,316,839	1,285,213	1,298,850	4%
Construction	Rawdat Rashid Dump/inward	6,433,372	3,806,745	1,998,853	140,402	2,010	0	0	-100%
	Rawdat Rashid Dump/treated	539,631	459,857	485,657	177,969	50,306	0	434000	-4%
	Mesaieed	622,978	469,669	548,527	533,036	1,058,918	611,006	1,181,706	11%
	Umm Thanyatain	0	0	2,096,906	3,418,673	1,945,359	3,142,310	5,134,858	
	Total Treated Construction Waste	539,631	459,857	485,657	177,969	50,306	0	434,000	-4%
	Total Inward Construction Waste	7,056,350	4,276,414	4,644,286	4,092,111	3,006,287	3,753,316	6,316,564	-2%
Bulky (2)	Mesaieed	1,747,678	2,048,954	2,333,567	2,661,504	2,198,780	2,501,528	2,400,963	5%
	Total Bulky Waste	1,747,678	2,048,954	2,333,567	2,661,504	2,198,780	2,501,528	2,400,963	5%
Tires	Rawdat Rashid Dump /inward	31,605	36,297	37,824	37,186	39,406	40,895	36,496	2%
	Rawdat Rashid Dum(/treated	18,172	12,933	17,739	15,062	27,300	18,365	13,897	-4%
	Umm Al-Afai Landfill/ treated	19,351	9,269	5,621	13	0	0	16,677	-2%
	Total Treated Tires	37,523	22,202	23,360	15,075	27,300	18,365	30,574	-3%
Other	Total Inward Tires	31,605	36,297	37,824	37,186	39,406	40,895	36,496	2%
	Mesaieed	12,540	207,367	213,022	171,912	37,379	67,892	250,494	65%
	DSWMC	0	9,468	10,625	9,491	0	0	0	-
	Total Other Types	12,540	216,835	223,647	181,403	37,379	67,892	250,494	65%
Total Treated		577,154	482,059	509,017	193,044	77,606	18,365	464,574	-4%
Total Inward		9,896,221	7,674,367	8,394,793	8,156,591	6,598,691	7,648,844	10,303,367	1%

Source: Ministry of Municipality and Environment

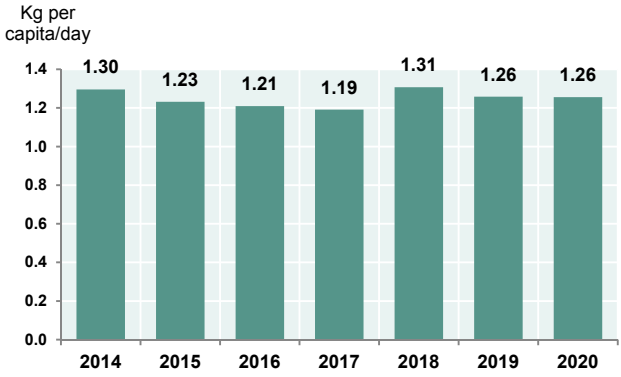
Map 4.12: Waste Generated by Waste Management Facilities (1,000 metric tons), 2014-2020



4.2 Per capita domestic waste

Figure indicates that the daily per capita generated domestic waste decreased to 1.26 kg, which is less than the target set in the National Development Strategy (1.6 kg per capita/day).

Figure 4.35: Per capita household waste production (kg per day) 2014-2020



4.3 Recycled Waste

Waste degradation over the years leads to the absorption of contaminants by water sources (underground or surface), and soil pollution, which affect food cycle and contaminate drinking water, and therefore jeopardize public safety. In addition, waste pollutes the atmosphere by emitting pollutant gases that put the health of people, plants, and living organisms at risk by affecting the respiratory system, along with the emission of unpleasant odors. Further, waste distorts the natural views and beauty of nature. From this perspective, communities have come to realize the environmental problems. Thus, taking action to recycle waste will have several benefits including the protection and preservation of natural resources, reduction of waste and providing new job opportunities.

Statistics indicate that treated waste amounted to nearly 10.3 million tons in 2020. DSWMC received 682 thousand tons, and 4 thousand tons were recycled. This quantity is considered very tiny compared to the generated, collected and treated waste. Here comes the role of the civil society's awareness regarding the importance of recycling and environment protection, encouragement of private and public sector to prepare projects that recycle all types of waste, and the importance of instilling recycling in the Qatari values and school curricula.

Table 4.47: Recycled domestic waste (ton) 2014-2020*

Particulars	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2014 - 2020
Total inward waste	9,896,221	7,683,635	8,400,414	8,156,604	6,598,691	7,648,844	10,303,367	1%
Domestic waste treated at DSWMC, Mesaieed	639,522	613,226	618,156	648,337	651,880	667,637	682,011	1%
Amount of recycled materials	17,514	69,748	53,384	42,116	37,379	5,603	4,069	-22%

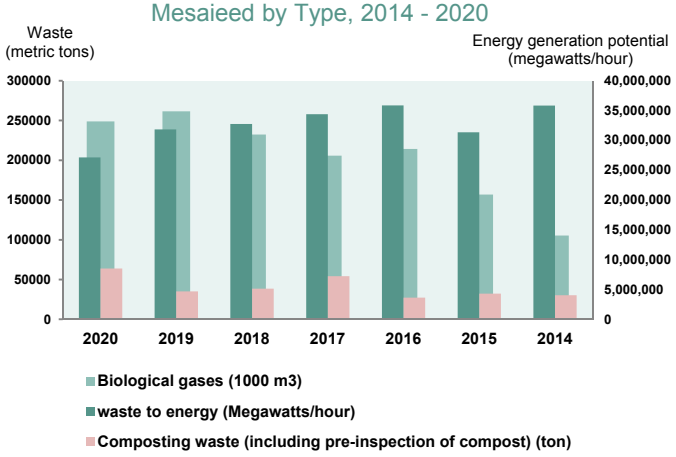
* Data for previous years has been updated from the source

Source: Ministry of Municipality and Environment

4.4 Converting Waste into Products

DSWMC in Mesaieed, in operation since 2011, is one of the largest specialized waste recycling centers in the Middle East with an area of 3 km2 near Mesaieed Industrial City, and its capacity is 2,300 tons/day. It is designed to meet all environment safety requirements in terms of recycling and production. The recycling process at DSWMC passes through five stages; the first one starts with weighing waste, and the second is about separation and recycling, while the third is waste-to-energy, and the fourth is recycling to obtain high quality liquid or solid compost. This latter is one of DSWMC's characteristics to increase green spaces.

Figure 4.36: Production Capacity of DSWMC in Mesaieed by Type, 2014 - 2020



It is noteworthy that DSWMC converts waste into energy. Most of the waste arriving at the center is recycled according to enforced regulations.

DSWMC has achieved a quantum leap in converting solid waste into energy and recyclable materials, and in producing organic compost to support agricultural sector. DSWMC generates about 269 thousand megawatts of electricity in 2020, used to operate the center itself, while part of this energy goes to government sector.

Table 4.48: Mesaieed DSWMC's Productive Capacity by Type; 2014-2020

Particulars	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2014 - 2020
Quantity of waste treated at DSWMC (ton)	639,522	622,695	628,781	657,828	651,880	667,637	682,011	1%
Composting waste produced (including compost pre-inspection) ton	63,880	35,135	38,441	54,225	27,286	32,260	30,202.30	-12%
Waste to energy (megawatts/hour)	203,628	238,670	245,552	257,890	269,051	235,149	268,776.85	5%
Biological gases (1000 m3)	14,038,060	20,920,150	28,565,520	27,437,950	30,979,910	34,874,390	33,180,890.30	15%

* Data for previous years has been updated from the source

* Data for previous years has been updated from the source

Source: Ministry of Municipality and Environment

5. Hazardous Waste

Hazardous waste is the waste that exhibits dangerous traits such as toxicity, corrosivity, reactivity, and ignitability, all of which make it harmful to environment and human health. Hazardous waste is composed of biomedical waste, in addition to the waste of industry, and oil and gas. This kind of waste includes also chemicals, acids, alkalis, contaminated soil, etc.

5.1 Hazardous waste generation from GDP

Hazardous waste generation index decreased to 0.09 metric ton per one million QR of GDP in 2019.

5.2 Per capita hazardous waste

The total per capita generated hazardous waste amounted to 28.8 kg per capita in 2020.

The recycling process of hazardous waste enables to change the characteristics and traits of hazardous waste to turn it non-or less-hazardous, and then it can be dealt with safely. Thus, it can be collected, stored and disposed of without causing harm to individuals and the environment.

Figure 4.37: Hazardous generated waste in tons per million QR of GDP; 2014-2019

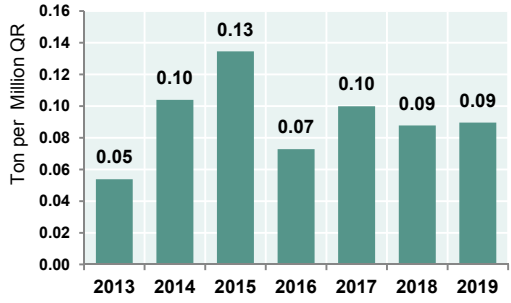
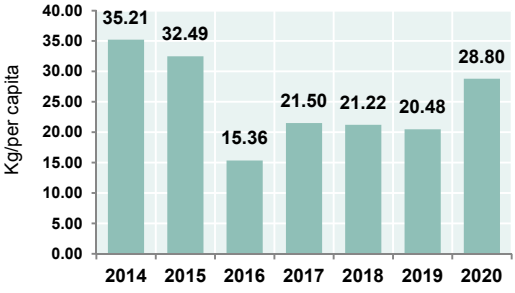
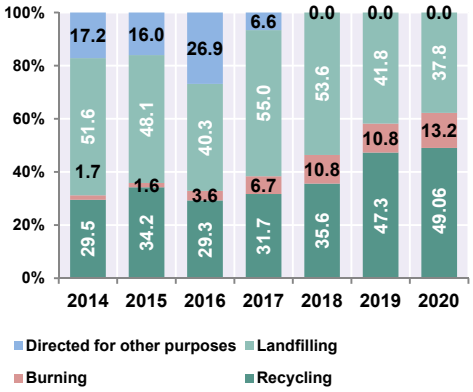


Figure 4.38: Per capita of total hazardous generated waste (kg per capita), 2014-2020



According to Figure, it was noted that in 2020, 49% of hazardous waste was disposed of by recycling, followed by 37.8% through dumping in landfills, and then 13.2% was disposed of by incineration.

Figure 4.39: Percentage distribution of hazardous waste by disposal methods 2014 - 2020



6. Energy Consumption

6.1 Value of Energy Consumption in Various Economic Sectors

In terms of the relative importance of expenditure on intermediate consumption of both electricity and water mixed in 2019, the highest share was registered for the business sector (39.1%), while the lowest was for insurance accounting for less than 2% of total expenditure on intermediate consumption of both electricity and water.

Table 4.49: Value of expenditure on electricity, fuel and oils by economic activity (thousand QR) 2014-2019

Economic Sector	Items	2014	2015	2016	2017	2018	2019	Annual Growth Rate 2014 - 2020
Banks	Electricity &water	26,992	26,818	29,483	26,119	23,325	26,126	-1%
	Fuel &oil	1,405	1,442	1,171	1,486	1,134	1,074	-5%
Insurance	Electricity &water	2,404	3,256	3,746	1,920	2,073	2,796	3%
	Fuel &oil	376	465	499	312	369	244	-8%
Energy and manufacturing	Electricity &water	6,233,543	6,108,948	6,514,278	9,394,628	9,215,745	9,836,804	10%
	Fuel &oil	3,047,582	3,161,390	3,466,842	3,694,005	5,238,993	4,563,753	8%
Wholesale and retail	Electricity &water	241,670	221,168	228,445	309,001	320,286	367,061	9%
	Fuel &oil	63,389	59,955	74,727	94,071	105,935	104,551	11%
	Electricity &water	258,063	202,336	214,907	259,968	328,074	363,077	7%
Transport and communications	Fuel &oil	80,438	114,488	119,139	161,524	191,336	215,340	22%
	Electricity &water	13,124,577	9,693,410	11,089,519	14,020,584	18,865,276	18,234,256	7%
Construction	Fuel &oil	344,776	466,682	607,371	650,114	620,327	661,073	14%
	Electricity &water	1,718,582	1,937,433	2,410,912	2,611,768	,592,638	3,486,959	15%
Business services	Fuel &oil	158,737	204,605	251,517	276,436	495,144	682,897	34%
	Electricity &water	123,374	244,206	243,893	258,991	311,244	311,551	20%
Personal social services	Fuel &oil	71,655	195,803	120,018	123,431	495,144	156,540	17%
	Electricity &water	71,739	123,279	99,883	87,514	311,244	82,101	3%
Hotels & restaurants	Fuel &oil	168,586	125,708	194,158	226,776	249,047	234,208	7%
	Electricity &water	35,844	83,080	70,880	89,718	87,496	95,365	22%
	Fuel &oil	62,696	90,577	98,510	103,182	108,017	117,188	13%

Source: PSA, Economic Statistics Bulletin

6.2 Electrical Energy Consumption

This consumption responds to the needs of the increasing population number and economic growth, which in turn causes pressure on the environment regarding the production of electricity to meet the population and economic needs. Therefore, the environment is often negatively affected due to this use, which relies on fossil fuels to generate energy. Consequently, it is necessary to alleviate the impacts on the environment through various methods, such as the increasing reliance on renewable energy sources and electricity use efficiency. Uses of energy lead to further emissions in the air, and in turn change the status of the surrounding air quality, and concentrations of greenhouse gases which cause negative impacts on human health and biological systems.

Total electricity consumption amounted to 50 million megawatts/hour in 2020, a growth rate of 4% during the period 2014-2020. Electricity consumption in the domestic sector had the highest share of total consumed electricity in 2020. It amounted to 33 million megawatts/hour, followed by the industrial sector, which consumed 10 million megawatts/hour, followed by power generation and water desalination plants at around 3 million megawatts/hour. The loss during transport and distribution of electricity reached about 3 million megawatts/hour.

Figure 4.40: Electricity consumption by sector (megawatts/hour) 2014-2020

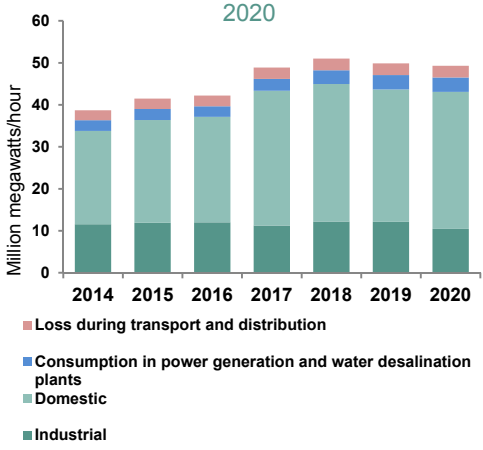


Table 4.50: Electricity consumption by sector (megawatts/hour) 2014-2020

Particulars	2014	2015	2016	2017	2018	2019	2020	Annual Growth Rate 2014 - 2020
Industrial	11,568,215	11,886,696	12,026,249	11,261,941	12,197,379	12,124,082	10,464,837	1%
Domestic	22,215,842	24,490,670	25,107,915	32,095,345	32,765,544	31,536,113	32,624,482	1%
Consumption in power generation and water desalination plants	2,567,926	2,647,006	2,532,392	2,831,204	3,258,544	3,440,493	3,433,881	56%
Loss during transport and distribution	2,340,897	2,474,889	2,532,392	2,694,696	2,786,404	2,772,002	2,774,269	3%
Total	38,692,880	41,499,261	42,198,948	48,883,186	51,007,871	49,872,690	49,258,957	4%

Source: Kahramaa – Annual Statistical Report

7. Air Quality

All living beings including humans, animals, plants and even inanimate objects interact within the atmosphere. Air and respiration are of course the main elements of life without which life becomes impossible even for minutes. Therefore, keeping air pure and unpolluted is necessary for the life and health of all.

The effects of human activities, which lead to the increase in pollutants in the environment, are manifested in the emission of pollutants into the air, water, and soil. Ambient air quality pollutants are defined as any substance that enters the air environment in quantities surpassing the minimum limit as per the approved national, regional and international standards. This substance includes sulfur dioxide, hydrogen sulfide, measured nitrogen oxides, chemo-light oxidizers (Ozone), carbon monoxide, non-methane hydrocarbons, lead components, sulphates, fluorides, ammonia, and suspended molecules that can be inhaled.

Air pollution is one of the most environmental dangers to health. By reducing air pollution, countries can alleviate the burden of diseases caused by respiratory infections, heart diseases, and lung cancer. The more air pollution is reduced, the more respiratory and cardiovascular health is improved on the long and short terms.

In 2014, the Ministry of Municipality and Environment adopted a new approach to provide data on air quality in order to respond to Qatar's National Development Strategy. It also took all measures to improve ambient air quality. The Ministry of Municipality and Environment monitors air quality at three air monitoring stations. Movenpick Station (Corniche), Qatar University Station and Aspire Zone Station:

The following criteria are used to describe the air pollution index: clean for category 0-50, normal for category 51-100, less than normal for category 101-150, limited pollution for category 151-200, pollution for category 201-300 and severe pollution for category 301-500.

The criterion "normal" was adopted as a national boundary reflecting the extent which pollution should not exceed. The following Table (3.43) shows that during the years 2018 and 2020, the values of the index did not exceed the "normal" limit of all the pollutants observed, and all were within the "clean" criterion except for nitrogen dioxide with a diameter of (NO2), which was recorded as normal in 2018 in all monitoring stations, while it was within the "clean" criterion in 2020 at all monitoring stations. Likewise, fine particulate matter 10 micrometers or less in diameter (PM10) was recorded as "normal" in 2018-2020 at all monitoring stations.

Table 4.51: Annual average air quality in Doha city by location 2018 – 2020

Pollutant	2018			2019			2020			Annual Limit *
	Aspire Zone	Qatar University	Corniche	Aspire Zone	Qatar University	Corniche	Aspire Zone	Qatar University	Corniche	
SO2	Clean	Clean	Clean	Clean	Clean	Clean	Clean	Clean	Clean	Normal
NO2	Clean	Normal	Normal	Clean	Clean	Clean	Clean	Clean	Clean	Normal
O3	Clean	Clean	Clean	Clean	Clean	Clean	Clean	Clean	Clean	Normal
CO	Clean	Clean	Clean	Clean	Clean	Clean	Clean	Clean	Clean	Normal
PM10	Normal	Less than normal	Less than normal	Clean	Normal	Normal	Clean	Normal	Normal	Normal

Source: Ministry of Municipality and Environment

* Criterion "Normal" is selected as the annual limit

Description of Air Quality Index

Clean	0-50
Normal	51-100
Less than normal	101-150
Limited pollution	151-200
Pollution	201-300
Severe pollution	301-500

Figure 4.41: Air Quality Index for all elements at Corniche Station 2020

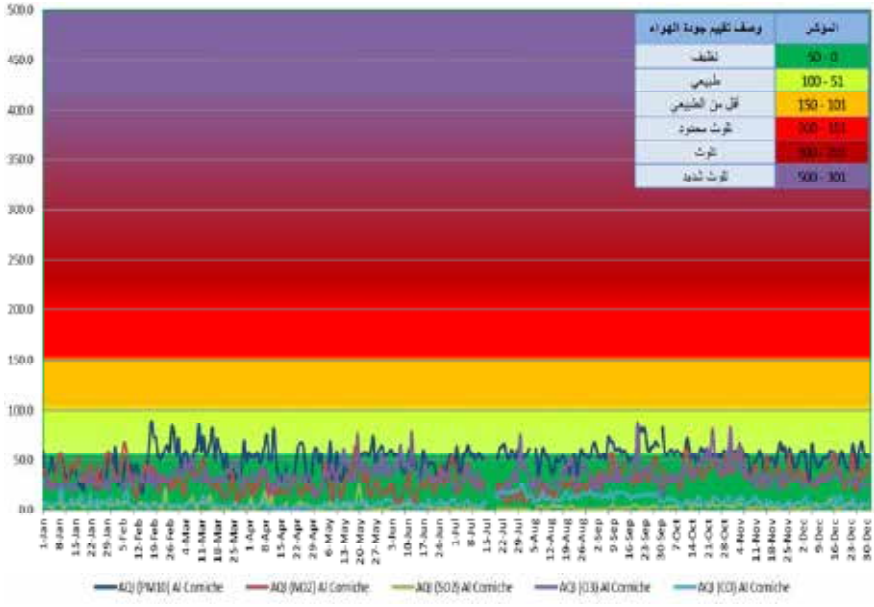


Figure 4.42: Air Quality Index for all elements at Qatar University Station 2020

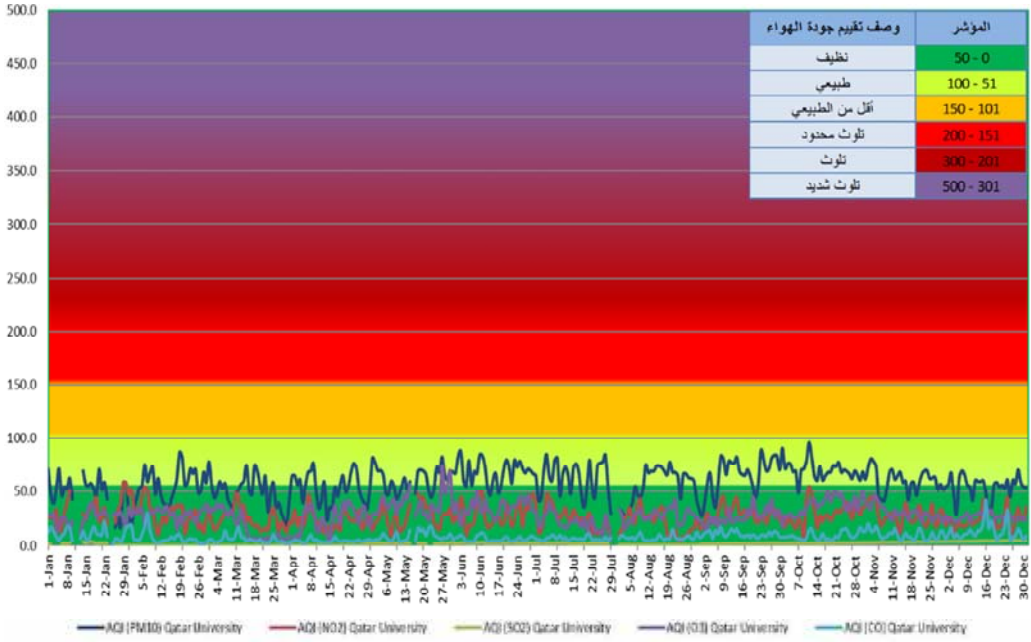
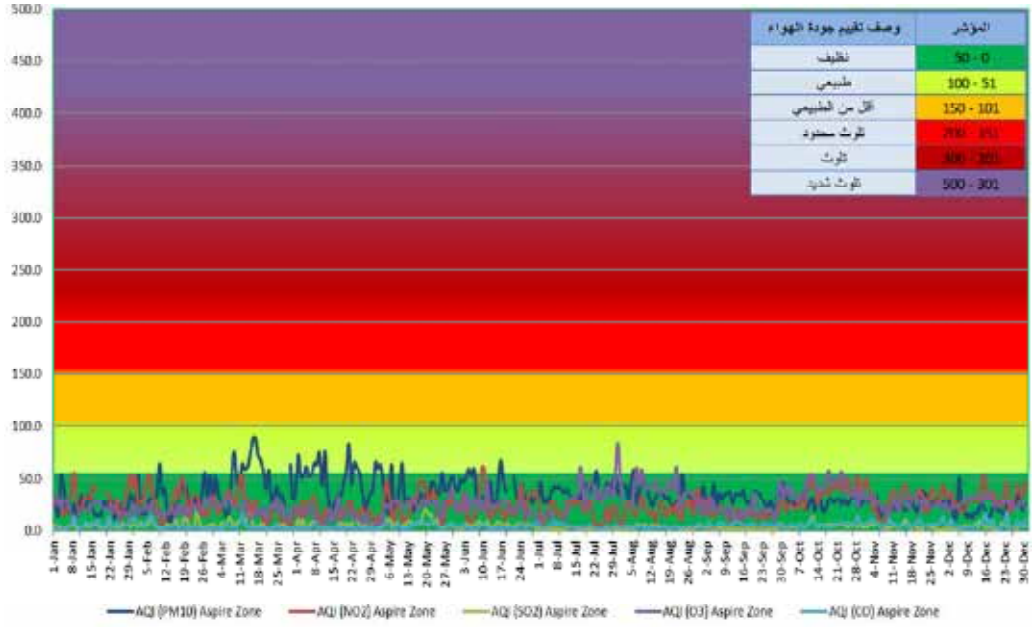


Figure 4.43: Air Quality Index for all elements at Aspire Zone Station 2020



8. Greenhouse Gases

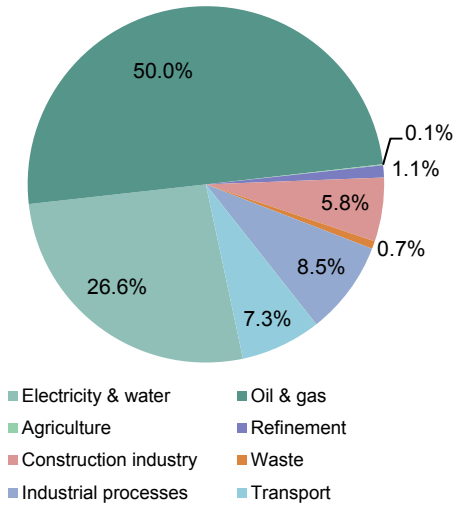
Greenhouse emissions are associated with global warming and hence climate change. These phenomena are global and transboundary. Thus, countries share a responsibility to find solutions and means to reduce the risks of global climate change. The UN Climate Change Conference held in Paris in 2015 asserted that practical solutions should be found to reduce the risks of global climate change within the cost limit that developed countries must provide to assist developing countries, as well as ensuring that the permanent supply of energy needed by human progress is not compromised. This could be implemented by managing the environmental impacts of energy supplies and diversifying access to renewable fuels, low-carbon fuels and clean energy. Not only do such solutions contribute to environment protection, but to the creation of job opportunities and new investments as well, and consequently achieve big gains in living standards.

The main six global warming gas sources:

1. CO_2.
2. CH_4.
3. N_2O.
4. PFCs.
5. HFCs.
6. SF6.

The above-mentioned greenhouse gases trap heat in the atmosphere to keep the earth warm and the climate moderate. Those gases are rather influential to global warming than being pollutants. Carbon dioxide is one of the main gases that contribute to this phenomenon. It is produced during the burning of coal, oil and natural gas in power plants, by cars and others, in addition to not being absorbed due to large-scale deforestation. Another influential gas is methane from cow breeding, landfills, mine works, gas pipelines, etc. Nitrous dioxide from fertilizers and other chemicals also contributes to heat retention. It is produced during the burning of coal, oil and natural gas in power plants, cars and others, in addition to not being absorbed by large-scale deforestation. Another influential gas is methane, which is produced from cow breeding, landfills, mine works, gas pipelines, etc. Nitrous dioxide produced from fertilizers and other chemicals also contributes to heat retention.

Figure 4.44: The largest contributions to greenhouse gas emissions in Qatar according to the First National Communication 2007



To reduce gas emissions, and alleviate and adapt with the climate change effects, the State of Qatar submitted its executive plan to the Paris Conference held in 2015. The plan entitled "Intended Nationally Determined Contributions Report" was submitted to the Secretariat of the UN Framework Convention on Climate Change under the two Decisions (1/CP.11) and (1/CP.02), in accordance with Decision (02/CP.11), and the principles and decisions of the Framework Convention on Clime Change.

From the Figure above, it is clear that the sectors contributing largely to greenhouse emissions were oil and gas, though an unofficial report released in 2015 indicates a considerable decrease in emissions by this sector. The Figure also shows that water and electricity generation came second in the production of these emissions, which is normal in a country that heavily depends on desalination that requires energy, and in turn more emissions. Therefore, not only does water use conservation preserve water resources, but it contributes to the decrease in emissions as well. In third and fourth places came industry and transport sectors at 8.5% and 7.3% respectively. Such percentages might be cut by maximizing dependence on renewable energy, increasing use of public transport and providing environment-friendly modes of transport.

9. Consumption of Ozone-Depleting Substances (ODS)

The consumption of ozone-depleting substances (ODS) is defined as the sum of the consumption of the ozone-depleting potential-weighted metric tons of all ozone-depleting substances controlled under the Montreal Protocol on Substances that Deplete the Ozone Layer. Ozone-depleting potential-weighted metric tons are metric tons of individual ozone-depleting substances multiplied by their ozone-depleting potential.Ozone-depleting substances (ODS) are defined in the Montreal Protocol as substances containing chlorine or bromine that destroy the stratospheric ozone layer which absorbs most of the biologically damaging ultraviolet radiation. The phasing out of ozone depleting substances, and their substitution by less harmful substances or new processes, are aimed at the recovery of the ozone layer. Substances controlled by the Montreal Protocol include chlorofluorocarbons (CFCs), halons, methyl bromide and hydrochlorofluorocarbons (HCFCs) among others. It should be noted that all Ozone-depleting substances (ODS) have decreased compared to 2014 and 2019.

Table 4.52: Mass of ODS consumption (metric ton), 2014-2020

Year	HCFCs 22	HCFCs 123	HCFCs 141b	HCFCs 142b	Total
2014	1495	40.98	10.05	11.98	1558.01
2015	1096.01	1.36	21.97	48.77	1168.11
2016	1066.10	36.00	15.52	37.37	1145.99
2017	1084.66	0.0	59.45	36.00	1180.11
2018	1179.00	10.88	5.44	48.00	1243.32
2019	1263.81	0.55	0.00	0.00	1264.36
Annual Growth Rate 2014-2020	-3%	-58%	-100%	-100%	-4%

Source: Ministry of Municipality and Environment

Table 4.53: ODS (by Ozone Depleting Potential ODP) according to Montreal Protocol (metric ton), 2014-2019

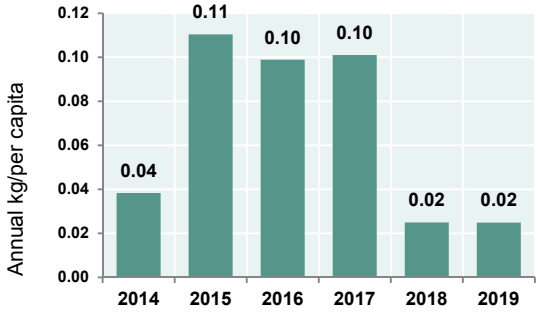
Year	HCFCs 22	HCFCs 123	HCFCs 141b	HCFCs 142b	Total
2014	82.2	0.82	1.11	0.78	84.94
2015	60.28	0.03	2.42	3.17	65.90
2016	58.64	0.00	0.72	1.71	63.5
2017	59.66	…	6.53	2.34	68.53
2018	64.87	0.22	0.60	3.12	68.81
2019	69.52	0.01	0.00	0.00	69.53
Annual Growth Rate 2014-2020	-3%	-59%	-100%	-100%	-4%

Source: Ministry of Municipality and Environment

9.1 Annual per capita ODS consumption (kg per capita/year)

The data indicate that the annual per capita ODS consumption decreased during 2019 to 0.02 kg per capita.

Figure 4.45: ODS consumption (kg/per capita), 2014-2019



9.2 Comparison of mass ODS consumption, global warming potential and ODP

The figure indicates a general slump in the mass consumption of ODS at -8% and ODP at -4%, as well as the global worming potential at -4% during 2014-2019.

Figure 4.46: Comparing ODS Mass Consumption, Global Warming Potential and ODP, 2013-2019

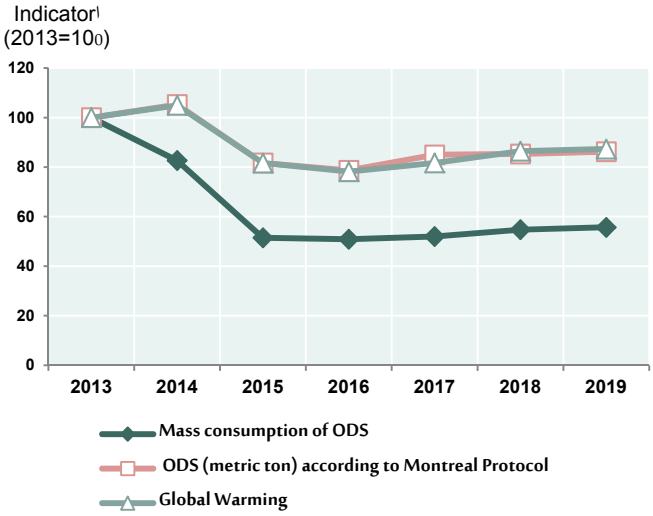


Table (4.54): Mass consumption of ozone-depleting substances, global warming potential and ozone-depleting potential 2014-2019

Year	Mass consumption of ODS	ODS (metric ton), as per Montreal Protocol	Global Warming
2014	**1,877**	**84.9**	**125,444**
2015	**1,168**	**65.9**	**97,581**
2016	**1,155**	**63.5**	**93,425**
2017	**1,180**	**68.5**	**97,620**
2018	**1,243**	**68.8**	**103,299**
2019	**1,264**	**69.5**	**104,281**
Annual Growth Rate 2014-2019	**-8%**	**-4%**	**-4%**

10. Environment Pollution-Related Diseases

Not only does environment pollution affect the health of biological systems and ecosystem in general, but it also affects the health of human being, which lives in the whole ecosystem of this universe, and depends and interacts with the biological systems related to the population, food and water environment.

10.1 Infectious and Communicable Diseases

The table below indicates the infectious and communicable diseases reported to the Preventive Health Department at the Ministry of Public Health during the period (2014-2019). It is clear that the highest annual growth rates of diseases were infectious parasitic scabies, with an annual growth rate of 30% in 2014-2019. The annual growth rate of cases of pulmonary tuberculosis was about 21%, ranking second in terms of the increase in the growth rate during the same period.

Overall, the total cases of infectious and communicable diseases reported to the Preventive Health Department during 2014-2019 increased by 13%. The total reported cases increased from 9,417 cases in 2014 to 17,348 cases in 2019. The cases of rubella decreased by 45%, while the rate of growth of the incidence of Measles cases fell by 36% during the same period.

Table 4.45: Number of Infectious and Communicable Disease Cases Reported to the Preventive Health Department, 2014-2019

Diseases	2014	2015	2016	2017	2018	2019	Annual growth rate 2014 & 2019
Typhoid/ paratyphoid	411	383	567	725	685	483	3%
Bacterial food poisoning	402	353	459	385	413	441	2%
TB	143	305	262	295	441	376	21%
Non-pulmonary TB	322	224	244	340	310	444	7%
Leprosy	44	30	25	38	19	28	-9%
Measles	46	18	30	9	2	5	-36%
Rubella	20	7	20	2	0	1	-45%
Hepatitis	1,317	619	508	1,150	1,628	1,884	7%
Mumps/parotitis	13	21	20	21	23	25	14%
Infectious diarrhea	400	0	0	887	968	668	11%
parasitic scabies	538	688	793	894	1,286	1,968	30%
Meningitis of all types	215	263	257	329	274	211	0%
Other	5,546	6,272	6,666	5,090	9,497	10,814	14%
Total	9,417	9,183	9,851	10,165	15,546	17,348	13%

Source: Ministry of Public Health

Source: PSA – Annual Statistical Abstract – Chapter of Health Service Statistics

10.2 TB Cases

The following Table shows reported TB cases by patients' country of origin during 2014-2019. TB cases amounted to 693 cases, most of whom are of Asian origin, including 170 from Nepal, 158 from India, 132 from Bangladesh, 22 from Qatar, and 175 cases from other countries. The Table also shows an increase of 8% in total cases of TB during the same period.

Table 4.56: Number of reported TB cases by Country of Nationality, 2014-2019

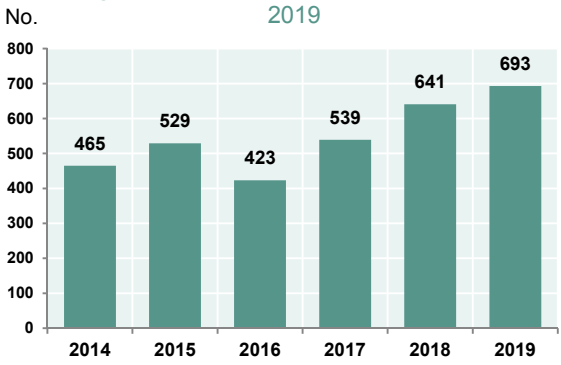
Country	2014	2015	2016	2017	2018	2019	Annual growth rate 2014-2019
Qatar	16	18	7	21	12	22	7%
KSA	0	0	1	1	7	0	-
Somalia	3	0	1	4	2	3	0%
Egypt	4	2	2	5	3	6	8%
India	100	120	98	133	136	158	10%
Pakistan	22	17	12	13	25	26	3%
Iran	1	0	0	0	1	1	0%
Bangladesh	34	53	57	81	91	132	31%
Nepal	127	143	123	162	178	170	6%
Other countries	158	176	122	119	186	175	2%
Total	465	529	423	539	641	693	8%

Source: Ministry of Public Health

Source: PSA – Annual Statistical Abstract –Chapter of Health Service Statistics

From the figure below, we notice that the highest increase was in 2019 compared to 2018, as the total reported cases from various nationalities reached 641 cases in 2018. However, in 2019, the total cases increased to reach 693 cases.

Figure 4.47: Number of TB Cases, 2014-2019



10.3 Deaths by Selected Causes

The Table below shows the number of deaths by selected causes of death during the period 2014-2019. According to statistics, the annual growth rates of death increased by 7% compared to 2014. With regards to relative importance, the respiratory system-related deaths (including pneumonia, acute LRTI, chronic lower respiratory diseases, rest of respiratory system diseases) were the highest in terms of causes of death. They made up 56% of total causes of death.

Table 4.57: Number of reported deaths by cause of death, 2014-2019

Cause of Death	2014	2015	2016	2017	2018	2019	Annual Growth Rate 2014-2019
Other gastroenteritis	1	0	4	3	5	6	43%
Other TB diseases	6	4	0	3	4	5	-4%
Blood poisoning	17	24	7	18	28	28	10%
Hepatitis	12	10	8	5	10	6	-13%
Rest of infectious and parasitic diseases	5	6	14	10	9	6	4%
Malignant tumor in the bronchus and lung	31	35	21	41	31	29	-1%
Leukemia	13	23	21	18	30	19	8%
Atherosclerosis	3	0	2	5	1	3	0%
Other circulatory system diseases	9	6	13	17	41	21	18%
flu	4	4	4	1	3	0	-100%
Pneumonia	70	50	61	79	104	97	7%
Other acute LRTI	2	4	6	4	1	1	-13%
chronic lower respiratory diseases	5	7	21	16	13	8	10%
Rest of respiratory system diseases	34	97	135	128	142	108	26%
Liver diseases	35	27	27	34	28	32	-2%
Poisoning incidence and exposure to poisonous substances	17	11	4	14	13	10	-10%
Total	264	308	348	396	463	379	7%

Source: PSA – Births and Deaths Statistics Bulletin

Chapter Five
Environment Protection and Management Response Activities

Environment Protection and Management Response Activities

This chapter focuses on the State's willingness and commitment to the protection and management of the environment, the allocation of the necessary legislative structures, the enactment of environmental laws, the creation of institutions, the allocation of financial resources, and the provision of qualified human resources capable of carrying out activities aimed at the protection and management of the environment. Moreover, the chapter sheds light on spreading the culture of environmental awareness, whether through awareness-raising activities, or through the provision of educational curricula aimed at rooting the process of environmental protection and management of today's children tomorrow's leaders.

This chapter includes expenditure on the environment protection, number of workers, volunteers, trainers, and participants in various environmental programs, environmental compliance activities, environmental legislation, laws and international conventions, new projects under assessment of their impact on the environment, environmental education, natural disaster preparedness, and environmental investment - green economy

The response comes within the last link in the analytical conceptual framework series of the driving forces model - pressure - state - impact - response, as it reflects the response of the community in its various public and private institutions and community organizations in improving the state of the environment, mitigating the effects of pressures on the environment, restoring natural resources and sustaining natural assets. The response also marks a new beginning of the cycle of Analytical Conceptual Framework series of the driving forces model by influencing dynamics to adjusting their pressures and impacts on the environment.

Qatar National Vision 2030 came as a declaration of the response of the State's different bodies to the protection and management of the environment, which is the fourth pillar of QNV2030. Besides other goals, QNV 2030 aims to establish an equilibrium between development needs and environment resources protection. To ensure the sustainability of economic growth and social wellbeing, there should be a holistic environmental vision with the priority to protect the environment resources for us and for the coming generations.

As a national commitment to protecting the environment, the State of Qatar has been providing the necessary funds for this protection and providing the tools, human resources, legislative and educational environment associated with the process of the

environment protection in a way that ensures sustainable development as well as achieves balance between the four pillars of QNV2030 in terms of the distribution of financial and human resources necessary to achieve this vision and the resulting sectoral strategies, particularly with regard to the environment protection.

This chapter reviews several aspects of Qatar's response to preserve the environment, both nationally and internationally, as Qatar has ratified several international conventions and treaties in this regard. Within this framework, the SDGs 2030 reflect and demonstrate their relevance to many environmental response and management activities undertaken by the State and its commitment to the environment protection as part of the umbrella of international community.

1. Expenditure on the Environment Protection

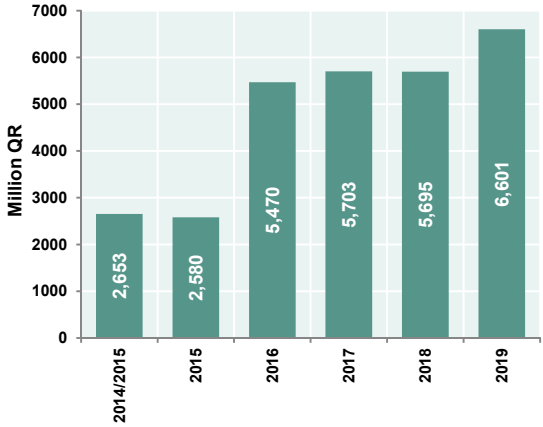
Among the important and vital response activities provided by the State and its different sectors for the environment protection and management, is the expenditure on the environment protection and management. Such expenditure is spent by the public and private sectors and households to minimize or reduce the environment pollution, rehabilitate facilities, manage the environment resources and ensure the continuity and sustainability of the environment services and goods. The national environment strategy includes programs and goals on the expenses spent on the environment protection.

The economic diversification, which is the target of several countries owing to its importance in diversifying the income sources and reducing dependence on limited resources, is related to and results from spending on the environment. In addition, a sustainable economy, able to ensure economic growth without causing harm to the environment sources, stems from spending on the environment. The economy which is environment friendly is called green economy. It is capable of attracting several investments, especially in the quasi-absence of competition when talking about local environment systems. At the same time, this kind of economy usually creates more new job opportunities than the conventional economy does.

1.1 Public Expenditure on the Environment Sector

This section features the public expenditure on the environment sector during the period 2014/15-2019. It covers the majority of items included in the budget of the Ministry of Municipality and Environment and other government counterparts in the Classification of the Functions of Government (COFOG). Figure shows the value of public expenditure on the environmental protection and management sector during the fiscal

Figure 5.1: Public expenditure on environment protection and management (million QR), 2014/15–2019



years 2014/15-2019 in million QR. It should be noted that these expenses are classified according to COFOG, and include only current expenses, salaries and wages of the Ministry of Municipality and Environment only. The process of the environment protection is distributed on various ministries and public institutions. In general, the UN Classification of Resource Use and Management Activities and Expenditure (CRUMA) should be adopted to cover various expenditures on the environment protection and management activities.

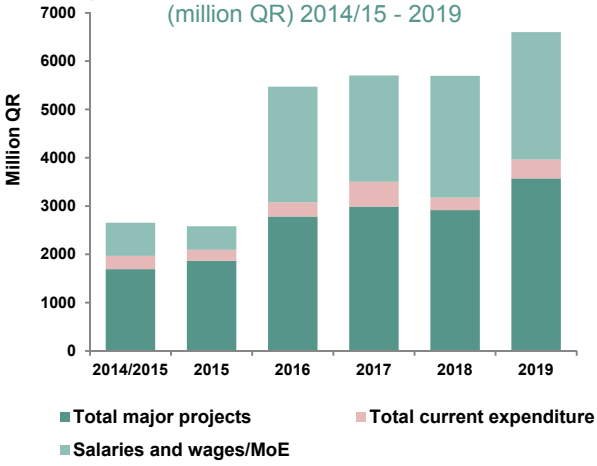
The results indicate that the value of public expenditure on the environment according to COFOG increased at an annual rate of 20% during the period 2014/15-2019. By type of expenditure, the results show that expenditure on total major projects (capital expenditure) increased at an annual rate of 16.1% during the same period, while current expenditures as an annual growth rate declined by 7.5% for the same period.

Statistics show the value of public expenditures on the environment protection and management sector by type of expenditure and the environmental field for the fiscal years 2014/15-2019.

The results indicate that the expenditure on the environment during this period amounted to about QR 28.7 billion, of which QR 15.8 billion focused on capital expenditure and major projects in the areas of sewage and waste, and on gardens and parks, an average of 55.1% of total expenditure on this sector. During the same period, approximately QR 12.9 billion was spent on current expenses, salaries and wages at an average rate of 44.9% of total expenditure on the environment sector during the fiscal years 2014/15-2019.

The Figure shows that the share of salaries and wages at the Ministry of Municipality and Environment made up an average of about 38.1% during the fiscal years 2014/15-2019, whereas the current expenditure of the same ministry constituted 2.1% of total expenditure on the environment protection (capital expenditure, current expenditure, salaries and wages). The total current expenditure on the environment protection (current expenditures of the Ministry of Municipality and Environment and other institutions concerned with the environment) during the same period amounted to QR 2.0 billion, which constituted an average of about 6.8% of total expenditure on the environment protection (capital expenditure, current expenditure, salaries and wages).

Figure 5.2; Public Expenditure on Environment Protection and Management by Type of Expenditure and Environmental Field (million QR) 2014/15 - 2019



It is clear from the results that the most capital expenditure was on sewage projects during the fiscal years 2014/15-2019. The average capital expenditure on sewage projects constituted 51.2% of the total expenditure on environmental protection (capital and current expenditure, salaries and wages) during this period. Capital expenditure on sanitation projects in 2019 accounted for 11.6% of the total expenditure on environmental protection (capital and current expenditure, salaries and wages).

Table 5.1: Public expenditure on the environment protection and management by type of expenditure and environmental field (million QR), 2014/15-2019

	2014/ 2015	2015	2016	2017	2018	2019	Annual Growth Rate 2014/15-2019
Capital Expenditure							
Waste management	76.5	63.8	26	64.9	0	0	-1
Labs, etc.	2.9	1.1	0	0.1	0	0	-1
Landscape and park protection	110	18.4	76	49.6	193.2	135	4.2
Wastewater management	1504.8	1786.1	2682	2677.5	2723	3336	17.3
Other capital expenditure	0	0	0	197.7	0	101	0
Total major projects	1694.2	1869.4	2784	2989.7	2916.1	3572	16.1
Current Expenditure							
Current expenses / Ministry of Municipality and Environment	124.2	87.2	201	193.1	0	0	-100
Waste management	93.6	65.6		120.2	118.8	225	19.2
Landscape and public park protection	55.1	71.6	40	118.4	120.5	152	22.5
Operating expenses/ sewage	0	0	52	69	6.6	4	0
Environmental activities not elsewhere classified	0	0	0	12.3	10.8	10	0
Total current expenditure	272.9	224.3	293	513	256.8	391	7.5
Salaries and wages / Ministry of Municipality and Environment	685.8	486.6	2393	2200.8	2521.9	2638	30.9
Total expenditure on the environment protection	2652.9	2580.3	5470	5703.4	5694.8	6601	20

Source: Ministry of Economy and Finance – Financial Policies Management.

1.2 Expenditure on the Environment by the Environmental Field

Expenditure is generally divided into two types: current expenditure which includes the operating and maintenance expenditure, salaries and wages; and capital expenditure which includes expenditure on projects and improvement of asset increases.

The activities of the environment protection and management are divided into several sections, based on the group of activities by the environmental field/medium, which is spent on for protection and management. These environmental fields/media consist of

different environmental aspects, such as waste management, wastewater, biodiversity, air pollution reduction, environmental research and studies, environment asset management and other environmental fields. The following table shows the expenditure on the environment by the environmental field and type of expenditure in 2019.

The results also indicated that the percentage of capital expenditures of total expenditure (current and capital) for various environmental fields, in which capital expenditure was found in addition to current expenditure, was 74.3%. With regard to the largest capital expenditure, it was on the expenditure on waste management by 46.6% of total capital expenditure, followed by capital expenditure on protection and treatment of soil and groundwater by 46.0%. Results also indicated that the percentage of current expenditure of total expenditure (current and capital) for various environmental fields was 25.7%. As for the largest current expenditure, it was on the wastewater management by 71.7% of total current expenditure, followed by current expenditure on activities of protection and treatment of soil and groundwater by 10.5% of total current expenditure.

Table 5.2: Value of Expenditure on the environment by type of expenditure and main environmental field (thousand QR), 2019

Code	Environmental Activities	Expenditure Type					%
		Current Expenditure	%	Current Expenditure	%	Overall Total Expenditure	
1	Waste management	68,901.87	5.41	5,732.48	0.16	74,634.35	1.5
2	Wastewater management	913,380.01	71.67	1,718,387.14	46.62	2,631,767.15	53.06
3	Pollution reduction	8,502.29	0.67	262,502.11	7.12	271,004.40	5.46
4	Ventilation and treatment of waste gases	10	0	0	0	10	0
5	Protection and treatment of soil and groundwater	133,689.84	10.49	1,694,475.79	45.97	1,828,165.63	36.86
6	Noise and vibration reduction	1,625.52	0.13	854.8	0.02	2,480.32	0.05
8	Biodiversity and landscape protection	6,334.00	0.5	520.9	0.01	6,854.90	0.14
9	R&D activities	28,840.87	2.26	814.5319	0.02	29,655.40	0.6
10	Environmental protection activities nec	47,916.03	3.76	725.5	0.02	48,641.53	0.98
11	Natural and desalinated water sources protection	48,631.25	3.82	0	0	48,631.25	0.98
12	District cooling activities	16,533.91	1.3	2,014.50	0.05	18,548.41	0.37
	Total	1,274,365.59	100	3,686,027.75	100	4,960,393.34	100

Source: The process of collecting data from the public entities targeted in the study

The results from table which show the sub-details of the activities of the environmental fields, where the financial expenditure was the highest, indicate that the largest total expenditure on the activities of the environment protection and management was on wastewater management by about 53% of total expenditure on various environmental fields. Based on the details of the expenditure on the sub-activities, it was found that the expenditure on wastewater treatment plants was the highest by 50% of total expenditure on wastewater management activity, amounting to QR 2.631.8 million. In second place came the expenditure on sewage networks by 49%.

Expenditure on "protection and treatment of soil and groundwater" activities came third by 37% of total expenditure on various environmental fields. The share of expenditure on the sub-activity of "Reducing the deposition of pollutants" was the largest by 62.5% of total expenditure on the protection and treatment of soil and groundwater.

The share of the "other" sub-activity was the largest, with a rate of 96.8% of the total expenditure on pollution reduction activity (protection of air, water and climate). It ranked third with a rate of 5.5% of the total expenditure on various environmental fields.

Table 5.3: Value of expenditure on the environmental by type of expenditure and environmental sub-field (thousand QR), 2019

Code	Environmental Activities	Current Expenditure	Capital Expenditure	Total Expenditure
	Wastewater Management			
2.1	Pollution prevention by adjusting the production process	**854.3**	**-**	**854.3**
2.2	Sewage networks	**561,764.80**	**732,604.90**	**1,294,369.80**
2.3	Wastewater treatment plants	**324,911.00**	**985,735.20**	**1,310,646.20**
2.4	Cooling water treatment	**1,195.10**	**-**	**1,195.10**
2.5	Procedures, control, laboratories and so on	**9,260.00**	**40**	**9,300.00**
2.7	Other activities	**15,394.80**	**7**	**15,401.80**
2	Total wastewater management expenditure	**913,380.00**	**1,718,387.10**	**2,631,767.10**
	Pollution Reduction (Protection of Air, Water and Climate)			
3.1	Pollution prevention by adjusting the production process	**1,277.60**	**75**	**1352.6**
3.2	Ambient air protection	**1,727.30**	**72**	**1799.3**
3.3	Protection of climate and ozone layer	**807.3**	**255**	**1062.3**
3.4	Procedures, control, laboratories and so on	**4,311.70**	**111**	**4422.7**
3.5	Other activities	**378.4**	**261,989.10**	**262367.5**
3	Total spending on pollution reduction protection of air, water and climate)	**8,502.30**	**262,502.10**	**271004.4**
	Protection and Treatment of Soil and Groundwater			
5.11	Comprehensive protection and treatment of soil and groundwater	**129,184.70**	**-**	**129,184.70**
5.1	Reducing the deposition of pollutants	**250**	**1,142,470.90**	**1,142,720.90**

Code	Environmental Activities	Current Expenditure	Capital Expenditure	Total Expenditure
5.3	Protection of soil from erosion and other physical degradation	250	-	250
5.5	Procedures, control, laboratories and so o	493.9	-	493.9
5.6	Facilities Rehabilitation	-	276,002.50	276,002.50
5.7	Other activities	3,511.30	276,002.50	279,513.70
5	Total expenditure on the protection and treatment of soil and groundwater	133,689.8	1,694,475.8	1,828,165.6

Source: The process of collecting data from the public entities targeted in the study

It is evident that environmental expenditures in 2019 increased by 21.2% over environmental expenditures in 2018. It is noted that expenditures on wastewater management were prevalent during the five years (2015-2019), with the largest average share with about 57.3% of total expenditures on all environmental activities over the five years. This was followed by spending on soil and groundwater protection and treatment activities, which was prevalent in the years 2017-2019, reaching an average of 26.3% of the total environmental spending on various activities during these three years.

Table 5.4: Total expenditure on the environment by environmental activity field, 2015-2019 (thousand QR)

Code	Environmental Activities	Total Expenditure (QR 1000)				
		2015	2016	2017	2018	2019
1	Waste management	20	22,045.92	133,657.72	69213.69562	74,634.35
2	Wastewater management	156,280.68	1,425,312.51	476,611.62	1,830,563.40	2,631,767.15
3	Pollution reduction	794.2585	2,285.26	24,375.83	107844.9785	271,004.40
4	Ventilation and treatment of waste gases	0	3,013.58	15,348.10	193.8	10
5	Protection and treatment of soil and groundwater	0	0	255,208.01	1090745.454	1828165.626
6	Noise and vibration reduction	0	0	14,770.55	963.72	2480.322
7	Radiation protection	280.14625	0	19.236	37.397	0
8	Biodiversity and landscape protection	0	1,589.02	138,198.74	11409.8	6,854.90
9	Research and development activities	771.91	370,326.76	296,901.27	28,439.12	29,655.40
10	Environmental protection activities nec	1,248.56	3,565.89	71,585.06	51,986.74	48,641.53
11	Natural and desalinated water source protection	0	403,695.82	204,032.03	828637.5369	48,631.25
12	District cooling activities	3,000.00	6,000.00	19,891.39	71,811.32	18,548.41
13	Monitoring and disaster reduction systems	0	0	0	0	0
Total		162,395.56	2,237,834.76	1,650,599.55	4,091,846.96	4,960,393.34

Source: The process of collecting data from the public entities targeted in the study

1.3 Environmental Expenditure on Scientific Research

Qatar's R&D Survey 2018 defines the scientific research as a creative work conducted on the basis of a systematic approach to increase human, cultural and community knowledge, and uses it for the innovation of new practices. Innovation includes a wide range of activities that lead to the introduction of a new or remarkably improved product.

According to the type of R&D and scientific field, the R&D Survey 2018 indicates that expenditure on research by sector in the field of environment for business sector amounted to 5.0% of total expenditure on R&D compared to 8.4% in 2015 Survey. The percentage of expenditure on research by sector in the field of environment in Business sector was 7.7% in the same survey, compared to 19.6% in 2015 Survey. The percentage of expenditure on research by sector in the field of environment in the Government sector was 6.3% in 2018 Survey, compared to 10.0% in 2015 Survey. Results of 2015 Survey indicate that the percentage of expenditure in the higher education sector was 5.4% of total expenditure on R&D activity, yet it scored 4.3% of total R&D expenditure in 2018.

It is worth noting that R&D spending in the field of energy, which includes renewable energy, is also included in spending on the environment. However, the classification of R&D is based on the binary number of the field of science, which undermines the opportunity to review expenditures on renewable energy and sometimes leads to the integration of some environmental science fields with other science fields, or the integration of other science fields with the environmental science field.

Table 5.5: Expenditure on R&D by sector and classification of social and economic goals (QR), 2018

Item	Business		Government		Higher education		Total	
	QR	%	QR	%	QR	%	QR	%
Land exploration and exploitation	0.0	0.0	14,082,803.3	2.5	0.0	0.0	14,082,803.3	0.4
Culture, entertainment, religion and media	28,719,941.3	6.7	29,221,816.8	5.2	498,896,920.6	19.6	556,838,678.7	15.7
Political and social systems, structures and processes	28,719,941.3	6.7	14,082,803.3	2.5	147,168,691.4	5.8	189,971,436.0	5.4
General progress of knowledge	35,899,926.7	8.3	110,902,075.8	19.7	349,687,098.8	13.7	496,489,101.2	14.0
Defense	14,359,970.7	3.3	0.0	0.0	10,684,042.0	0.4	25,044,012.6	0.7
Environment	33,027,932.5	7.7	35,207,008.2	6.3	109,439,671.6	4.3	177,674,612.3	5.0
Space exploration and exploitation	0.0	0.0	0.0	0.0	10,253,491.0	0.4	10,253,491.0	0.3
Transport, communications and other infrastructure	80,415,835.7	18.7	49,289,811.5	8.8	35,719,782.1	1.4	165,425,429.2	4.7
Energy	50,259,897.3	11.7	0.0	0.0	155,365,105.7	6.1	205,625,003.0	5.8
Industrial production and technology	87,595,821.0	20.3	3,390,434.9	0.6	58,841,962.4	2.3	149,828,218.4	4.2
Health	50,259,897.3	11.7	199,567,405.2	35.4	437,519,491.5	17.1	687,346,794.0	19.4
Agriculture	14,359,970.7	3.3	21,124,204.9	3.8	0.0	0.0	35,484,175.6	1.0
Education	7,179,985.3	1.7	86,443,767.2	15.3	737,836,748.6	28.9	831,460,501.1	23.5

Source: PSA – R&D Survey

2. Employees, Volunteers, Trainers and Participants in Various Environment Programs

2.1 Environment Protection Employees

Environment is often accused of slowing down the economy due to the environment protection requirements and standards that some may see as hindering economy. However, in reality it is the opposite. When we protect environment, this protection requires the presence of several activities and programs that, in turn, attract further investments, which will push the economy forward and create job opportunities that will complete the economic cycle.

The workers in different environment protection activities are not limited to specialists only. Any worker in the environment protection activity is considered an environmental worker, even if his/her specialization/job is not directly related to the environment protection. Being a worker in an environmental field means that he/she is an environmental worker. Tables below show the number of workers in the environment protection activities in different government, semi-government and private sectors targeted in the data collection process in 2019.

Statistics on the number of workers in industries related to environmental protection by nationality, sex, compensation and main economic activity in 2019, show that the largest percentage by economic activity was in waste collection, treatment and disposal, and material recovery activities at 69%. The percentage of workers in waste treatment and other waste management services came in second with 24%, followed by the percentage of workers in sewage, accounting for 7% of total workers in the supply activities and sewage and waste management and treatment activities.

The results also show that the total number of workers in the supply activities and sewage and waste management and treatment activities amounted to 3.2 thousand workers, which constituted 2% of total number of workers in the industrial sector, totaling 162 thousand workers, of whom Qataris constituted 1%. The compensation for total workers in supply activities and sewage and waste management and treatment activities amounted to QR 222 million, representing 1% of total compensation for workers in the industrial sector amounting to QR 22.5 billion.

Table 5.6: Number of workers in environment protection-related industries by nationality, sex, compensation and main economic activity (number, thousand QR), 2019

Code	Economic Activity	No. of Qataris			No. of Non-Qataris			Total			Compensation (Thousand QR)		
		Male	Female	Total	Male	Female	Total	Male	Female	Total	Qataris	Non-Qataris	Total
37	Sewage	0	0	0	744	7	751	744	7	751	0	52,834	52,834
3700	Sewage	0	0	0	744	7	751	744	7	751	0	52,834	52,834
38	Waste collection, treatment and disposal activities, and material recovery	18	0	18	2,087	76	2,163	2,105	76	2,181	4,626	147,172	151,798
3811	Non- hazardous waste collection	2	0	2	1166	32	1198	1168	32	1200	355	49,129	49,484
3821	Non- hazardous waste Treatment and disposal	5	0	5	520	40	560	525	40	565	306	72,627	72,933
3822	Hazardous waste Treatment and disposal	5	0	5	234	4	238	239	4	243	1,486	17,293	18,779
3830	Materials recovery	6	0	6	167	0	167	173	0	173	2,479	8,123	10,602
39	Waste treatment and other waste management service activities	0	0	0	234	1	235	234	1	235	0	17,021	17,021
3900	Waste treatment and other waste management service activities	0	0	0	234	1	235	234	1	235	0	17,021	17,021
E	Total supply activities and sewage and waste management and treatment activities	18	0	18	3,065	84	3,149	3,083	84	3,167	4,626	217,027	221,653

Source: PSA – Annual Bulletin of Economic Statistics/ energy and industry

The results indicate that workers in other environment activities were the highest in terms of annual allocations, as their annual allocations amounted to 55.4 % of total annual allocations for workers in different environmental activities, followed by the allocations for workers in waste management activity, accounting for 9.1% of total annual allocations for workers in various environmental activities.

As for the number of workers, the table below shows that the percentage of workers "other environment" activities was the highest, amounting to 43.0% of total workers in various environmental activities, 49.4% of whom were Qataris, while 50.6 % of them were non-Qataris. The percentage of workers in waste management activities came in second place with a percentage of 26.3%, of whom were Qataris, 3.7% of whom were Qataris, while 96.3 % were non-Qataris. Then the percentage of workers in wastewater management activities came in the third place, as their percentage was 5.6% of the total number of workers in various environmental activities. The percentage of Qataris reached about 13.6% and non-Qataris reached 86.4%. However, the percentage of workers in the activities of managing climate change and air quality and those working in the activities of forecasting, monitoring, analysis, networks and natural disaster programs was the lowest, where the total percentages of workers in these activities was 0.2% of the total number of workers in various environmental activities; 50% were Qataris and 50 % were non-Qataris.

By workers' nationality, the results of 2019 indicate that the number of Qatari male and female workers reached 5,432, making up 31.2% of total workers in the environment protection and management activities, numbering 17,411 workers. Thus, the percentage of non-Qatari males and females reached 68.8%, and their number reached 11.979 workers.

Table 5.7: Number of workers in various environmental activities by activity, nationality, sex and annual salaries (number, QR), 2019

Environment Activities	Number of Environmental Workers									Total Annual Salaries (000 QR)	%	
	Qataris			Non-Qataris			Overall Total					
	M	F	Total	M	F	Total	M	F	Total		For Workers	For Total Salaries
Land, area, property and landscaping management	99	69	168	366	22	388	465	91	556	105,131.15	3.19%	3.43%
Wastewater management	102	30	132	817	24	841	919	54	973	277,857.78	5.59%	9.06%
Waste management	118	50	168	4386	19	4405	4504	69	4573	208,000.17	26.27%	6.79%
Environmental security and safety and environmental health activities	32	51	83	220	24	244	252	75	327	63,653.67	1.88%	2.08%
Environmental studies, research, information, policies and training activities	25	17	42	147	38	185	172	55	227	93,666.46	1.30%	3.06%
Agriculture, livestock and fisheries	234	134	368	522	27	549	756	161	917	200,826.62	5.27%	6.55%
Nature reserves, biodiversity and wildlife	315	31	346	70	8	78	385	39	424	139,272.54	2.44%	4.54%
laboratory, environmental monitoring, water quality control, wastewater, prevention, inspection and so on	102	89	191	42	8	50	144	97	241	84,165.20	1.38%	2.75%
District cooling activities (maintenance and operation)	5	0	5	796	0	796	801	0	801	66,169.08	4.60%	2.16%
Climate change and air quality management activities	8	5	13	14	2	16	22	7	29	9,663.61	0.17%	0.32%
Urban planning and infrastructure activities	46	49	95	54	9	63	100	58	158	54,314.44	0.91%	1.77%
Forecasting, monitoring, analysis and networks activities and natural disaster programs	2	3	5	2	0	2	4	3	7	2,762.71	0.04%	0.09%
other environmental activities	2127	1576	3703	3554	236	3790	5681	1812	7493	1,697,064.33	43.04%	55.36%
Various other public administrations, environmental assessment and processes	79	34	113	531	41	572	610	75	685	63,020.72	3.93%	2.06%
Total	3,294	2138	5,432	11,521	458	11,979	14,815	2,596	17,411	3,065,568.47	100.00%	100.00%

Source: Data collected from the agencies targeted in the data collection process.

It evident that the highest percentage of workers in 2019 was in other environmental activities, reaching 43.0%. The situation was identical in 2008, when the percentage of workers in other environmental activities was the highest, reaching 41.9%. In 2017, the percentage of workers in waste management was the highest, reaching 42.5% of all workers in various environmental activities. In 2016, the highest percentage of was for those working in other environmental activities, with a rate of 43.4%, while the percentage of workers in waste management activities for 2015 was the highest, reaching 66.0% of the total workers in various environmental activities.

Table 5.8: Number of Workers in Various Environmental Activities by Activities, 2015-2019

Activity	2015	2016	2017	2018	2019
Land, area, property and landscaping management	...	575	576	556	556
Design, construction and building standards activities	...	830	830		
Wastewater management	708	708	792	694	973
Waste management	7	4,444	4,379	4,512	4,561
Environmental security and safety and environmental health activities	26	186	355	296	328
Environmental studies, research, information, policies and training activities	5	27	153	148	226
Agriculture, livestock and fisheries	...	970	966	917	917
Nature reserves, biodiversity and wildlife	...	464	539	404	424
laboratory, environmental monitoring, water quality control, wastewater, prevention, inspection and so on	63	267	293	269	241
Climate change and air quality management activities	26	14	49	29	29
Forecasting, monitoring, analysis and networks activities and natural disaster programs	141		189		7
Other environmental activities	72	7728	40	7398	7492
District cooling activities (maintenance and operation)		11	710	720	801
Various other public administrations, environmental assessment and processes	24	1423	267	1554	685
Urban planning and infrastructure activities	...	159	158	158	158
Total	1,072	17,806	10,296	17,655	17,411

Source: Data collected from the agencies targeted in the data collection process.

2.2 Volunteers, Trainers and Participants in Various Environmental Programs

The results for 2019 show that the highest percentage of volunteers by gender was for males, with a rate of 58.3% of the total volunteers, distributed by nationality by 33.3% for non-Qatari males and 25.0% for Qatari males, while the percentage of non-Qatari female volunteers reached 25.0%, compared to 16.6% for Qatari female volunteers.

Table 5.9: Number of volunteers, trainers and participants in various environment programs by education, nationality and sex, 2015-2019

Field and Activity of Environmental Volunteering	Qataris			Non-Qataris			Total			%
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
2015										
Volunteers in the environment protection	395	300	695	315	183	498	710	483	1,193	%95.6
Trainers who provide environmental training courses and workshops	1	0	1	2	0	2	3	0	3	%0.2
Participants in various environmental programs	30	0	30	22	0	22	52	0	52	%4.2
Total	426	300	726	339	183	522	765	483	1,248	%100.0
2016										
Volunteers in the environment protection	2	1	3	6	0	6	8	1	9	2.4%
Trainers who provide environmental training courses and workshops	0	0	0	1	1	2	1	1	2	0.5%
Participants in various environmental programs	42	51	93	251	26	277	293	77	370	97.1%
Total	44	52	96	258	27	285	302	79	381	100.0%
2017										
Volunteers in the environment protection	1		1	32	3	35	33	3	36	100.0%
Total	1		1	32	3	35	33	3	36	100.0%
2018										
Volunteers in the environment protection	23	10	33	52	37	89	75	47	122	100.0%
Total	23	10	33	52	37	89	75	47	122	100.0%
2019										
Volunteers in the environment protection	15	10	25	20	15	35	35	25	60	100.0%
Total	15	10	25	20	15	35	35	25	60	100.0%

Source: data collected from the agencies targeted in the data collection process.

3. Environmental Compliance Activities

3.1 Various Environmental Compliance Activities

The scientific and specialized environment protection and management activities are accompanied by other aspects that are equally important. These aspects are represented by many different activities that mark the environmental achievements through the relevant environmental awards, whether granted to national authorities by international bodies or national institutions, or in the form of environmental gatherings, meetings and conferences on various national, regional or international environmental events. They could also be awareness-raising campaigns that may be the most popular and widespread of these activities. Such campaigns may be separate or may accompany a specific environmental project. There are also the environment advocacy programs that reflect the desire of communities and community organizations to protect the environment. They may come in the form of community development targeting neighboring or surrounding communities in a particular environmental project. A plan is then set to integrate these communities with the environmental project in a way that achieves material and moral benefits for them. However, the plan does not make much change in their current lifestyle.

The following table (5.10) reviews some of these activities, which reflect the environmental commitment at various levels during 2017, 2018 and 2019, with the data received, as the data was not provided by all entities targeted in the study. The results indicate that the expenditure on environmental awareness activities in 2019 was the highest in cost compared to other activities related to environmental commitment, which amounted to 25.5% (QR 1.5 million). The second rank was occupied by expenditure on community environmental development campaigns with 16.7% (QR 1 million).

During the years 2017-2019, expenditures on environmental awareness campaigns, workshops and conferences related to the environment, ranked first, with an average rate of 19.7% during this period. Expenditure on environment-related workshops and conferences, organized by national institutions, ranked second, with an average rate of 18.7% during the same period.

In terms of the number of these environmental activities and events, specialized training workshops by the institution's activity held by the ministry or institution for a specific category for 2019 ranked first, with a rate of 29.5% of the total number of these activities. The percentage of the number of workshops and conferences related to the environment organized by the institution ranked second with a rate of 21.6% for 2019. Similarly, during the period 2017-2019, the percentage of the number of workshops and conferences related to the environment organized by the institution ranked first with an average percentage of 25.3%. The number of specialized training workshops by the institution's activity held by the ministry or institution for a specific category ranked second with an average rate of 20.4% during the same period.

Table 5.10: Environment compliance activities by type of activity and cost (QR), 2017-2019

Event/Program Title	2017			2018			2019		
	No. of Events	No. of Participants or Targeted	Cost (Thousand QR)	No. of Events	No. of Participants or Targeted	Cost (Thousand QR)	No. of Events	No. of Participants or Targeted	Cost (Thousand QR)
Cooperation agreements signed with local and international institutions in the field of environmental protection	4	-		7		-	8		
Specialized researches and studies in environment - district cooling	6	5		-	-	-	38		
Environmental awards granted to other entities	118	423	395	85	129	354.3	40	1,000	147.6
Environmental competitions	33	3,308	572	29	60,870	992.7	11	2,387	400
Participations in environmental events (local and external)	268	16,800	1,831.00	154	56,442	1,114.20	97	2,312,982	713.2
Environment-related workshops and conferences organized by the institution	194	14,911	2,382.90	607	19,729	2,382.90	163	4,219	1,485.80
Specialized training workshops by the activity of the institution, held by the ministry/ institution for a specific category	318	7,619	878.1	238	11,612	1,865.90	223	23,577	717.5
Environment advocacy programs	444	37,706	2,680.00	81	110,145	2,090.30	61	202,372	852
Community environmental development campaigns	111	6,455	290	44	22,865	1,097.80	20	1,001,721	973.4
Environment awareness campaigns	96	173,450	1,372.00	206	1,724,739	4,685.70	94	2,018,642	529.5
Summer, scientific, training camps			-	1	1,200	676			
Other	10	412	1,316.50	7	360	680.6			
Total	1,602	261,089	11,717.50	1,459	2,008,091	15,940.30	755	5,566,900	5,818.90

Source: data collected from the agencies targeted in the data collection process.

4. Sustainability assessment and green building

4.1 GSAS Green Building Standard

2007 marked the start of the development of GSAS Framework. The development process involved in-depth and thorough examination of more than 140 building rating systems, tools, guidelines and standards around the globe. Then, the development process focused on narrowing down the choice to 40 whole building rating systems which were further analyzed based on their scope. This was followed at a later stage by a careful investigation of the best practices used by six (6) of the most prestigious systems at the global level.

The certificate issued according to the "GSAS" system includes:

- GSAS Design & Build (GSAS-D&B) Certificate
- GSAS Construction Management (GSAS-CM) Certificate
- GSAS Operations Certificates

GSAS development process is based on a bottom-up approach, as it was developed from scratch to allow a seamless integration process between local needs and sustainable development goals.

The Global Sustainability Assessment System (GSAS) is the first performance-based system in the Middle East and North Africa (MENA) region, developed for assessing and rating buildings and infrastructure for their sustainability impacts. The primary objective of GSAS is to create a sustainable built environment while addressing the local needs and environmental conditions specific to the region.

The following table (5.11) presents a summary of the total number and areas of projects applying GSAS-D&B, GSAS-CM and GSAS Operations systems. The table shows the total projects registered to obtain all GSAS certificates for green buildings, and the projects that obtained GSAS certificates. The results indicate that an area of 855,250,305 square feet was registered, including 404 projects during the period 2010 - 2020. While the area of projects that received various GSAS certificates amounted to 1,550,047,753 distributed among 1,129 projects.

Table 5.11: Summary of the total projects registered to obtain all GSAS certificates for green buildings, and projects that obtained GSAS certificates 2010 - 2020

Projects registered for GSAS certification

Registration	No.	Area (ft2)
Total No. of registered projects for GSAS-D&B	**366**	**804,359,781**
Total No. of registered projects for GSAS-CM	**14**	**44,592,173**
Total No. of registered projects for GSAS Operation	**24**	**6,298,350**
Total No. of registered projects	**404**	**855,250,305**

GSAS Certified Projects

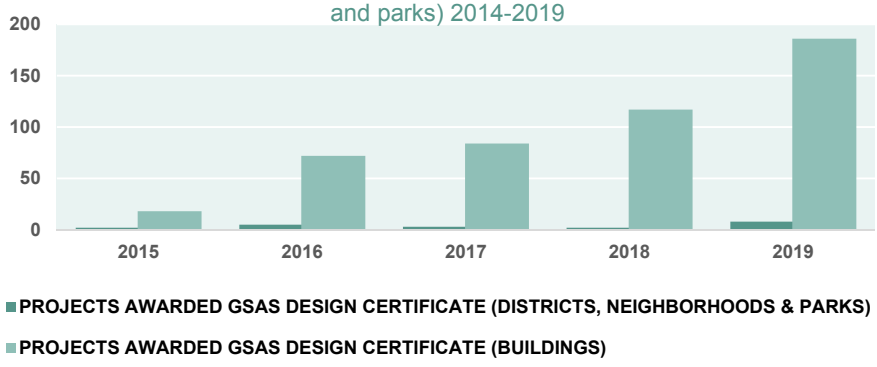
Certificate	No.	Area (ft2)
Total No. of projects obtained GSAS Design Certificate	**585**	**1,040,096,213**
Total No. of projects obtained GSAS Building Certificate	**517**	**459,157,322**
Total No. of projects obtained GSAS-CM	**23**	**48,178,566**
Total No. of projects obtained GSAS Operation	**4**	**2,615,652**
Total projects that received GSAS certificates	**1,129**	**1,550,047,753**

Source: Gulf Organization for Research and Development (GORD)

The following chart also shows the development of the number of projects that obtained GSAS Design Certificate during the period 2014-2019, in the fields of (districts, neighborhoods and parks) and (buildings).

The figure shows that the number of buildings obtaining a GSAS Design Certificate increased at a growth rate of 27% during the period 2014-2019. While, during the same period, the number of areas, neighborhoods and parks that obtained a GSAS Design Certificate increased with a growth rate of 44%.

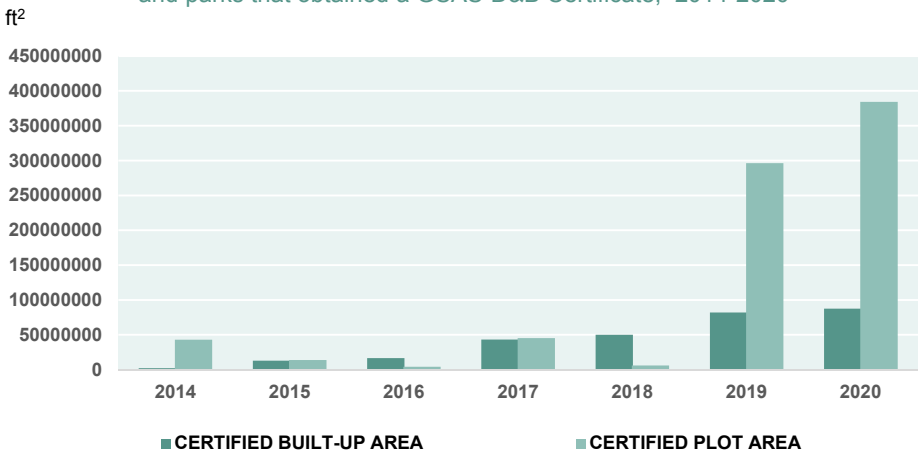
Figure 5.3: No. of projects that have obtained GSAS Design Certificate by project type (Buildings) and (Distrcits, neighborhoods and parks) 2014-2019



Source: Gulf Organization for Research and Development (GORD)

Results also indicate that the area of buildings that obtained a GSAS-D&B certificate increased at a growth rate of 87% during the period 2014-2020. The same applies to the area of districts, neighborhoods and parks, which in turn increased at a growth rate of approximately 44% during the period 2014-2020.

Figure 5.4: Area of buildings and areas of districts , neighborhoods and parks that obtained a GSAS-D&B Certificate; 2014-2020



Source: Gulf Organization for Research and Development (GORD)

Table 5.12: Projects that obtained GSAS certificate by year, type of certificate, number, area, and project type 2012-2020

Year	Projects obtained GSAS Design Certificate				Projects obtained GSAS Construction Certificate				Projects obtained GSAS -CM (Districts, neighborhoods and parks)		Projects obtained GSAS -CM (Buildings)	
	Districts, neighborhoods and parks		Buildings		Districts, neighborhoods and parks		Buildings					
	No.	Site area (ft2)	No.	Area (ft2)	No.	Site area (ft2)	No.	Area (ft2)	No.	Site area (ft2)	No.	Area (ft2)
2012	0	0	4	2,038,562								
2013	1	409,032,000	5	1,112,416								
2014	1	43,056,000	13	2,058,825								
2015	2	13,895,797	18	10,948,819	0	0	2	1,908,457				
2016	5	4,108,813	72	16,564,466								
2017	3	45,191,007	84	32,778,746	0	0	56	10,468,421				
2018	2	3,149,062	117	33,629,879	2	2,787,101	35	16,517,659	8	5,076,238		
2019	8	3,881,800	186	39,064,601	2	292,346,204	88	42,884,325	10	10,706,725	2	1,762,024
2020	9	341,003,348	55	38,582,073	6	43,199,732	326	49,045,423	5	32,395,604	2	853,628
Total	31	863,317,826	554	176,778,387	10	338,333,036	507	120,824,285	23	48,178,566	4	2,615,652

Source: Gulf Organization for Research and Development (GORD)

4.2 LEED Building Standard

The following table shows the area of green buildings that obtained the LEED standard for green buildings in terms of area in cubic meters for the period 2014-2020. It also shows LEED certified buildings by sector. The results indicate that the buildings affiliated with the central government had the largest area in 2020, reaching 72%, and the area of buildings of a major company came in second place with a rate of 13%. The results also indicate that the largest area of green LEED certified buildings was in 2015, where the area amounted to 164.140 m3 and this area was concentrated in the investors sector.

Table 5.13: The area of buildings (m3) that obtained the LEED standard by sector and year; 2014 - 2020

Sector	2014	2015	2016	2017	2018	2019	2020	Undefined	Total
Major company	14,528		2,311	9,636	14,560	15,354	27,244	1,367,706	1,478,112
Central government			27,284	10,635		116,376	147,243	1,331,419	1,485,714
Higher education			33,670					605,636	1,124,339
Investors		164,140			10,105			1,488,763	1,663,009
Primary education								157,424	157,424
Local company			87,987		47,733		9,955	309,893	445,613
Non-profit				9,829		45,808		428,564	591,736
Governmental		6,615						5,967	12,582
Unknown							19,078	375,116	375,116
Total	14,528	170,756	151,252	30,100	72,398	177,537	203,520	6,070,488	7,333,645

Source: Green Business Certification Corporation

5. Environmental Awards

The table below shows the distribution of awards during the period 2014-2019 by the number of awarded national institutions, type of award, and awarding body (international or national) based on available data. The results, overall, show that these awards ranked second in 2019, while they ranked first in 2017. The most of such awards were awarded by national entities, totaling 70% of total awards granted in 2019.

Table 5.14: Number and type of awards granted to national institutions, 2014-2019

Year	No. of Awarded National Institutions	No. of Awards	Type	
			National	International
2014	3	11	3	8
2015	4	18	5	13
2016	5	15	10	5
2017	11	44	27	17
2018	10	19	10	9
2019	13	23	16	7

Source: data collected from the agencies included in the study/questionnaire

- Not all the targeted entities have provided the required data, and some have not provided data in a chronological order, while others have not committed to the required details.

6. National Entities and Institutions that Publish Sustainability Reports

The publication of sustainability reports by Qatar-based companies operating in various fields of economic activities reflects the extent of their environmental and social responsibility and their commitment to the environment protection and sustainability issues. It is clear from the table below that the number of national entities and institutions that publish reports to obtain operation permits, whether large, medium or small industries, are the largest compared to other companies, such as the number of national entities and institutions that publish sustainability reports, and the number of companies listed on Qatar Stock Exchange (QSE).

Table 5.15: Total number of companies that publish sustainability or social responsibility reports and numbers of companies that follow sustainable practices or social responsibility approach 2019

Report Type	Company Type	2019
No. of companies publishing sustainability or social responsibility reports / QSE, and from the official website of the national authorities		
Sustainability or social responsibility reports	Large companies listed on the QSE	5
	Large companies / official website of national authorities	3
	Total	8
No. of companies* that adopt a sustainable practices approach or social responsibility		
Companies that adopt a sustainable practices approach or social responsibility	Large Companies	32
	SMEs	138
	Total	170

*: This includes only companies that submit an operating permit from the Ministry of Municipality and Environment

7. Scientific research, academic projects and program research on various environmental activities

Scientific research, projects and research of academic programs on various fields of environmental activities were monitored by national research authorities and sometimes in cooperation with regional and international research bodies on various fields of environmental activities, such as water, wastewater, waste, biodiversity, climate change and other environmental fields. In terms of the types of scientific research and academic projects and program, different types of research have been

distinguished, such as scientific papers, research projects, and research in various academic fields, as well as papers presented at conferences, capacity building programs, various research articles, and research competitions.

It is evident from the scientific research that was conducted by various research bodies that the predominant research field in 2019 was research in the field of public health and other environmental activities, with 20% of the total research areas of various environmental activities. By type of research in the field of public health and other environmental activities, it is clear from the results that the most common type of research was scientific papers, which accounted for 22% of all research in the field of public health and other environmental activities. Research in the field of energy and environmental sustainability ranked second after research in the field of water, with a rate of 18% of the research field in various environmental activities. Overall, the most common type of research in 2019 was scientific papers in various fields of environmental research, accounting for 83.9% of all types of research in various fields of environmental research.

Moreover, results of 2018 indicated that the predominant field of research was research in the field of biodiversity, which in 2018 accounted for 36% of all research in the fields of various environmental activities. By type of research in the field of biodiversity, it is clear from the results that the most common type of research was scientific papers, which accounted for 49% of all research in the field of biodiversity. Research in the field of energy and environmental sustainability ranked second after research in the field of biodiversity, with a rate of 13%. In general, the type of research with the highest percentage in 2018 was in scientific papers in various fields of environmental research, as it constituted 53.2% of the total types of research in various fields of environmental research.

Table 5.16: Research related to environmental activities by research field and type, 2018-2019

Research Field	Year						
	2018			2019			
	Bachelor, Master and Ph.D.	Research competitions	Research Paper	Conference papers, etc	Other	Bachelor, Master and Ph.D.	Research Paper
Environment Protection, Pollution Control and Environment Technology	7	5	4		3		39
Land Use and Facilities Management		3			5		12
Agriculture, Food Security, Fisheries and Livestock	2	15	1		13		34
Climate Change		1	1		4		17
Energy and Environmental Sustainability	3		20	2	13	3	92
Environmental laws and regulations							2
Conferences							3
Public health and other environmental activities		3		1	11	1	108
Rationalization and awareness		2		4	3		
Response to Natural &Technical Disasters				1			4

Research Field	Year						
	2018			2019			
	Bachelor, Master and Ph.D.	Research competitions	Research Paper	Conference papers, etc	Other	Bachelor, Master and Ph.D.	Research Paper
Biodiversity	10	6	45	1	8		28
Water	6	2	8			1	21
Wastewater	5		11		2	1	27
Air pollution	1	3	1		2	1	4
Energy	1	1			8	1	95
Waste Management		4					13
Green buildings and smart cities					6	1	1
Total	35	45	91	9	78	9	500

Source: Data collected from the target entities in the data collection process

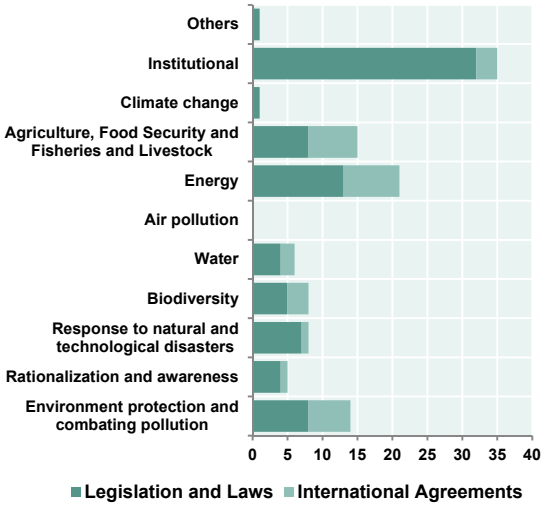
8. Environment-Related Legislation, Laws and International Agreements

The Permanent Constitution of the State of Qatar reviewed many environmental issues and stressed that they should be in accordance with the Islamic standards from which the Constitution is derived, as well as according to international standards. Article 6 of the constitution states that the State shall respect and implement all international charters, treaties and conventions to which it is a party, in addition to articles 23 and 33 on public health, natural resources and the protection of the environment and its natural equilibrium to achieve comprehensive and sustainable development for all generations. Many environmental laws and legislation have been articulated and developed based on these articles.

8.1 Environment-Related Regulations and Legislation

The creation of a legislative and legal environment that regulates, guarantees and enforces the environment protection and management is integrated with other aspects of the State's response to the environment protection and management, such as the financing aspect (expenditure), the provision of human resources and other aspects of the State's readiness to protect the environment. The table shows the number of legislations and laws issued by the State in its various institutions for the environment protection and management, as well as international and regional conventions and treaties during the period 2014-20120.

Figure 5.5: Number of legislations and international agreements on the environment protection by environmental field and type of legislation, 2014-2020



The relative importance of the legislation was as follows: ministerial decrees and laws constitute 45% each, Emiri decisions constitute 60%, and decrees and laws constitute 18% in 2020.

The relative importance of international and regional agreements and treaties in 2020 was also 66.7% of total number of ministerial decrees, decisions and laws related to these agreements.

Table 5.17: Number of legislations issued for the environment protection and management by type of legislation, 2014-2020

Year	Type of Legislation					
	Law and Decree	Emiri Order	Emiri Decision and Decree	Cabinet and Prime Minister Decision	Ministers and Heads of Government Agencies' Decisions	Total
2014	0	0	7	7	0	14
2015	5	0	6	4	8	23
2016	1	0	12	3	9	25
2017	2	0	2	1	0	5
2018	3	0	3	1	1	9
2019	5	0	3	3	1	12
2020	2	0	6	0	3	11

Table 5.18: Number of treaties related to the environment protection and management by type of treaty legislation, 2014-2020

Year	International and Regional Treaties and Conventions					
	Law and Decree	Emiri Order	Emiri Decision and Decree	Cabinet and Prime Minister Decision	Ministers and Heads of Government Agencies' Decisions	Total
2014	1	0	0	0	0	1
2015	2	0	4	0	0	6
2016	1	0	8	0	0	9
2017	0	0	7	0	0	7
2018	0	0	0	0	0	0
2019	0	0	0	0	0	0
2020	0	0	0	0	0	0

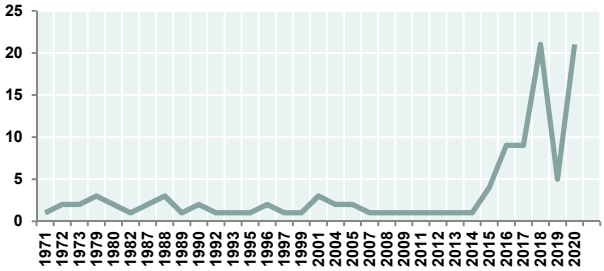
Table 5.19: Number of Legislations Issued to Protect Environmental Management by Environmental Field and Type of Legislation 2013-2020

Type and field of legislation	Law and Decree	Emiri Order	Emiri Decision and Decree	Cabinet and Prime Minister Decision	Ministers and Heads of Government Agencies' Decisions	Total
Period			**2013 - 2016**			
Environment Protection, Pollution Control	**3**	**…**	**4**	**….**	**…**	**7**
Rationalization and awareness	**1**	**…**	**…**	**…**	**2**	**3**
Response to Natural &Technical Disasters	**1**	**…**	**2**	**2**	**1**	**6**
Biodiversity	**…**	**…**	**2**	**1**	**…**	**3**
Water	**…**	**…**	**4**	**…**	**…**	**4**
Agriculture, Food Security, Fisheries and Livestock	**….**	**…**	**4**	**4**	**2**	**10**
Climate Change	**…**	**1**	**…**	**1**	**…**	**2**
Institutional	**1**	**…**	**10**	**14**	**4**	**29**
Energy	**…**	**…**	**4**	**…**	**8**	**12**
Other	**…**	**…**	**…**	**…**	**…**	
Total	**6**	**1**	**30**	**22**	**17**	**76**
Period			**2017 - 2020**			
Response to Natural &Technical Disasters		**…**	**…**	**1**	**…**	**1**
Water		**…**	**2**	**…**	**…**	**2**
Environment Protection, Pollution Control	**4**		**1**	**1**		**6**
Agriculture, Food Security, Fisheries and Livestock	**1**		**3**	**1**	**3**	**8**
Rationalization and awareness				**1**		**1**
Biodiversity	**2**				**1**	**3**
Institutional	**2**		**4**	**1**	**1**	**8**
Water and energy	**1**		**1**			**2**
Energy	**1**		**3**		**1**	**5**
Areas and Maritime Works	**1**					**1**
Total	**12**	**0**	**14**	**5**	**6**	**37**

8.2 International Conventions

The State of Qatar is an active member in many international, Islamic, Arab and Gulf spaces. Qatar has been a member of both the United Nations and the League of Arab States since 1971, a member of the League of the Islamic World since 1972, and a founding member of the Gulf Cooperation Council since 1981.

Figure 5.6: Number of multilateral international environmental agreements ratified by Qatar (1971 - 2020)



The State of Qatar lives within a global system governed by many international and regional frameworks, conventions and laws, from which many conventions of various kinds and different specializations emerge. It is a well-known fact that environmental issues, as a whole, are transboundary, requiring the concerted efforts of all countries to preserve the environment of our planet.

Within the framework of the State's response to the environment protection and management, Qatar has been an active party to several international, bilateral, multilateral, regional and Arab conventions related to the environment protection and management. It is worth mentioning that a number of legislative, institutional, human and financial aspects have emerged from these conventions to meet their requirements. The appendix lists the environmental conventions signed by Qatar.

The number of environmental agreements of various fields ratified by the State of Qatar during the period (1971-2020) is as follows: [1]

(27) International agrement	*(9) Multilateral agreements*	*(1) GCC agreement*
(3) Regional agreements.	*(2) International protocol*	*(68) bilateral agreements.*

9. New Projects Subject to Environmental Impact Assessment (EIA)

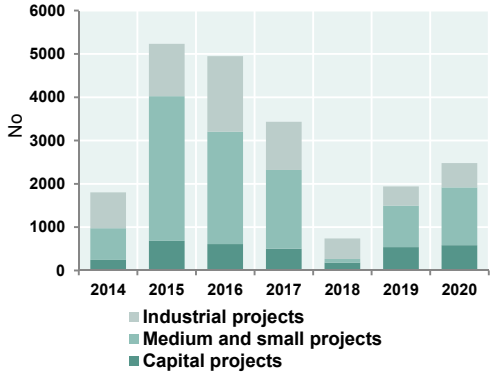
Projects in Qatar are subject to an Environmental Impact Assessment (EIA), a process whose scope and type of analysis depend on the nature and magnitude of the potential environmental impacts of the proposed project. The EIA examines potential environmental risks and impacts on an area, searches for alternatives and identifies ways to improve selection of project impact, location, planning, design and implementation by preventing, minimizing, mitigating or compensating its negative environmental impacts and promoting its positive impacts. The EIA includes the mitigation and management of negative environmental impacts throughout the project implementation period, and takes into account the natural environment (air, water and land), human health and safety and social aspects. The project owner is responsible for conducting the EIA.

[1] For further information, please see the list of international agreements in the annexes.

The results show a rise in the number of projects subject to EIA in response to the environment conditions in 2019 compared to 2014, amounting to 1,939 projects in 2019 compared 442 projects in 2014, an increase of approximately fourfold.

The highest rise ratio was in the major projects, increasing eight times higher in 2017 compared to 2014.

Figure 5.7: Number of new projects subject to EIA by type of project, 2014-2020



10. Environmental Education

The environment protection is not only a process to reduce pollutants and emissions, but it goes beyond that role to be a standard process that accompanies all stages of human life, especially in the educational stage, where one can comprehend the relations between the biotic and abiotic components in which we live. Further, the environment-related education provides specialists capable of managing the change process in human activities to align them with the laws of the universe, and not to ruin, with our own hands, the habitats that we live in. In addition, the environmental education addresses the unabated negative impacts caused by the population and economic growth on the environment resources and ecosystem.

10.1 Environment-specialized students and graduates at different universities and faculties.

Environmental education contributes to raising environmental awareness in the periphery of the recipients of this science and the surrounding circles. Areas of environmental science, which are very diverse, have been distributed to cover almost all of the most well-known life sciences. They have also recently intervened in economic and social aspects to work together within an integrated system to achieve sustainability.

10.1.1 Environment-specialized students

Results show that the number of enrolled students decreased recently compared to previous years during the period 2014-2019, as the number of male enrolled students reached 73 and females 168 in 2019, with an annual growth rate of 6% for males and 1% for females compared to 2014/2015. In terms of the number of students enrolled by university and college, the number of students enrolled at Qatar University for various educational levels was the highest compared to the number of students enrolled in other educational institutions, amounting to 199 male and female students, a percentage of 83% of total number of students enrolled in educational institutions for environmental specialties.

10.1.2 Environment-specialized graduates

It was noted that the number of graduates in environmental disciplines has increased recently than in previous years during the period 2014/2015-2018/2019, as the number of male graduates reached 34 and female graduates reached 55 graduates in the year 2018/2019.

Figure 5.8: Number of graduates in environment-specialized majors from universities and colleges by sex, 2014/15-2018/19

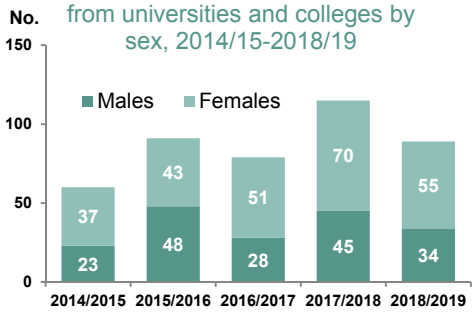


Table 5.20: Number of students enrolled in universities and colleges by sex, university, college and environment specialization during the academic years 2014/15–2018/19

Environment-Related Educational Specialization	2014/2015		2015/2016		2016/2017		2017/2018		2018/2019	
	M	F	M	F	M	F	M	F	M	F
Meteorology	9	3	11	7	2	4	5	2	3	4
HSE	1	0	17	7	0	4	14	16	8	15
Health and Safety – Public Health	0	0	0	0	0	0	0	0	4	8
Health and Safety: Food Security and Inspection	0	0	0	0	0	0	0	0	0	0
Archeology	5	8	8	7	4	2	0	2	0	0
Conservation	3	12	0	0	0	0	0	0	0	0
Environment Sciences	58	105	57	124	42	120	38	112	30	90
Master in Environment Sciences	4	11	7	11	10	17	10	14	10	19
Master's in environmental engineering	14	13	0	0	17	17	10	14	14	15
Master's in urban planning and Design	3	21	0	0	4	26	2	19	3	15
PhD in Urban Planning and Design	1	3	3	28	1	2	1	2	1	2
Total	98	176	103	184	80	192	80	181	73	168

Source: Public and private universities

10.2 The Environment in Educational Curricula

The inclusion of environment topics in the educational curricula at different levels is a quantum leap that reinforces environmental concepts and issues. It is also linked to straightening human behavior towards issues of conservation of the environment and natural resources, such as water; waste minimization, recycling culture, conservation of biodiversity linked to food chains and many other environmental topics addressed in these curricula.

This inclusion also raises awareness among today's children tomorrow's leaders on various environmental issues, as well as arming them with science that enables them to manage future development in a sustainable manner.

10.2.1 Science for the elementary and middle school levels

Table below shows that these environmental lessons and units are included in the initial educational levels, where we note that the proportion of units dealing with environmental topics in the first grades of both semesters, amounted to about 33% of total number of units of science. The table also shows that this interest in environmental topics is evident in Grades 5 and 6, where the proportion of environmental units makes up about 50% compared with the units of science in both semesters. Attention to environmental issues continues up to the advanced grades, such as Grade 9, after which the science subject is divided into several branches, such as chemistry, physics and biology from Grade 10 up to Grade 12.

Table 5.21: The number of environmental units in the primary and preparatory stages in sciences, 2019

Grade	Environmental Units	Overall Units	Percentage of Environmental Units to Total Units	Biotic Components*	Abiotic Components**
First Semester					
Grade 3	1	3	33%	1	0
Grade 4	1	2	50%	1	0
Grade 5	1	2	50%	1	0
Grade 6	1	2	50%	0	1
Grade 7	1	5	20%	1	0
Grade 8	1	5	20%	0	0
Grade 9	0	6	0%	0	0
Second Semester					
Grade 3	1	3	33%	0	1
Grade 4	1	3	33%	0	1
Grade 5	4	4	100%	1	3
Grade 6	3	4	75%	1	3
Grade 7	2	8	25%	1	1
Grade 8	4	8	50%	1	3
Grade 9	4	9	44%	1	3

* Biotic environmental components include all living creatures in the environment: animals, humans, plants, fungi, bacteria and other single-celled creatures.

**: Abiotic environmental components include materials: rocks and lands, water and air, energy: heat and light; powers: wind – air-generated force; sea waves, the flow of water in the valley or on the surface of the earth - the force caused by the movement of water.

Source: Data are compiled from educational curricula for different grades.

10.2.2 Biology, Physics and Chemistry at the secondary level

Table below shows the number of environmental units that were included in biology, physics and chemistry in the secondary school during 2019, where the results indicate that the proportion of environmental units in biology in Grade 12 was the highest during both semesters, amounting to 49% of total biology units.

10.2.2.1 Biology

The environmental units in biology in advanced Grade 11 came in second place, with a percentage of 100% of total biology units in both semesters.

10.2.2.2 Physics

With regard to the percentage of environmental units in physics, the results indicate that Grade 12 foundation and advanced had the highest percentage, during the first semester, reaching 50% for both semesters.

10.2.2.3 Chemistry

With regard to the percentage of environmental units in chemistry, the results indicate that Grade 12 foundation achieved the highest percentage in first and second semesters, reaching 50% of total chemistry units. In second place came Grade 11 both foundation and advanced, reaching 67% of total chemistry units in the first semester, whereas Grade 10 achieved the same percentage, but in the second semester.

Table 5.22: Number of Environmental Units at the Secondary Stage in Biology, Physics and Chemistry 2019

Grade	Environmental Units	Overall Units	Percentage of Environmental Units to Total Units	Biotic Components*	Abiotic Components**
Biology (First Semester)					
Grade 12 (foundation)	2	2	100%	1	1
Grade 11 (advanced)	2	2	100%	1	1
Grade 12 (advanced)	1	3	33%	1	0
Biology (Second Semester)					
Grade 10 (foundation)	2	2	100%	2	0
Grade 11 (foundation)	2	2	100%	2	0
Grade 12 (foundation)	3	4	75%	3	0
Grade 12 (advanced)	4	5	80%	4	0
Physics (First Semester)					
Grade 10	0	3	0%	0	0
Grade 11 (foundation)	0	3	0%	0	0
Grade 12 (foundation)	1	2	50%	0	1
Grade 12 (advanced)	1	2	50%	0	1
Physics (Second Semester)					
Grade 12 (foundation)	0	4	0%	0	3
Grade 11 (advanced)	0	2	0%	0	0
Grade 12 (advanced)	1	3	33%	0	2
Chemistry (First Semester)					
Grade 10	0	1	0%	0	0
Grade 11 (foundation)	0	2	0%	0	0
Grade 11 (advanced)	0	3	0%	0	0
Grade 12 (advanced)	0	2	0%	0	0

Grade	Environmental Units	Overall Units	Percentage of Environmental Units to Total Units	Biotic Components*	Abiotic Components**
Chemistry (Second Semester)					
Grade 10	**1**	**2**	**50%**	**0**	**1**
Grade 11 (advanced)	**1**	**2**	**50%**	**0**	**0**
Grade 12 (advanced)	**2**	**4**	**50%**	**0**	**2**
Grade 11 (foundation)	**1**	**2**	**50%**	**0**	**1**
Grade 12 (foundation)	**3**	**3**	**100%**	**0**	**2**

* Biotic environmental components include all living creatures in the environment: animals, humans, plants, fungi, bacteria and other single-celled creatures.

**: Abiotic environmental components include materials: rocks and lands, water and air, energy: heat and light; powers: wind – air-generated force; sea waves, the flow of water in the valley or on the surface of the earth - the force caused by the movement of water.

Source: Data are compiled from educational curricula for different grades.

10.2.3 Social sciences for the elementary, middle and high school levels

As science and environmental issues are complex and intertwined in many aspects with other sciences, the environment science and related issues have been introduced into culture and social subjects.

10.2.3.1 Social sciences

The results indicate that the percentage of environmental units in social sciences was the highest in the secondary stage (Grades 11 and 12), with an average percentage of all secondary grades (foundation and advanced) that reached 57% of the total units of social sciences during the second semester. This was followed by the average percentages of the environmental units in the preparatory stage of social sciences (Grade 7- 10), where the average percentage reached 50% of the total units of Social Science during the second semester. The percentage of environmental units in the social sciences subject in the primary stage (Grade 3-6) came third, with an average rate of 39% of the total units of social sciences during the second semester.

Table 5.23: Number of Environmental Units in Primary, Preparatory and Secondary Stages in Social Sciences Subjects 2019

Grade	Environmental Units	Overall Units	Percentage of Environmental Units to Total Units	Biotic Components*	Abiotic Components**
Social Sciences (First Semester)					
Grade 3	1	3	33%	0	1
Grade 4	2	6	33%	1	0
Grade 5	2	6	33%	1	1
Grade 6	1	5	20%	1	0
Grade 7	2	6	33%	0	1
Grade 8	1	6	17%	0	1
Grade 9	0	6	0%	0	0
Grade 10	2	5	40%	1	1
Grade 11 (advanced)	0	3	0%	0	0
Grade 12 (advanced)	2	4	50%	0	2
Social Sciences (First Semester)					
Grade 3	1		20%	0	1
Grade 4	2	5	33%	0	2
Grade 5	2	6	33%	1	1
Grade 6	3	6	50%	2	1
Grade 7	1	6	17%	0	1
Grade 8	1	6	17%	0	1
Grade 9	0	6	0%	0	0
Grade 10	2	6	33%	1	1

* Biotic environmental components include all living creatures in the environment: animals, humans, plants, fungi, bacteria and other single-celled creatures.

**: Abiotic environmental components include materials: rocks and lands, water and air, energy: heat and light; powers: wind – air-generated force; sea waves, the flow of water in the valley or on the surface of the earth - the force caused by the movement of water.

Source: Data are compiled from educational curricula for different grades.

11. Environmental Investment – Green Economy

The environmental investment concept refers to the investment that is beneficial to the environment protection and management, leading to the demonstration of one aspect of the State's response to the environment protection and management. The environmental investments in the State of Qatar range between a variety of environmental fields, such as the companies that collect, treat and recycle waste; the companies that provide gardening, public square and landscaping services; the companies that provide district cooling, environmental consulting and wastewater management, and recently renewable energy investments; and many other investments that provide environment protection and management services. However,

no data were available on environmental investments at the time of the preparation of this report.

The environmental investments not only benefit the environment, but the society and economy as well, and therefore they achieve a balance among the three sustainable development pillars. These investments are accompanied by the creation of job opportunities for different positions, such as the ordinary and skilled labour, specialists and experts. Moreover, such investments lead to the creation of diverse economic opportunities, which push forward the economic growth in different sectors.

11.1 Environment Service-Related Industries

The following figure and table delineate the economic activities associated with the environment services which are classified according to ISIC (Rev. 4) on the industry of water supply and activities of sewage and waste management and treatment. Based on the results, a financial deficit is remarked in this activity, as the net value added is negative, which represents the total value added of depreciations. In turn, according to the data in the table below, the total value added is negative representing production value minus goods/services supplies.

Figure 5.9: Activities of environment service-related industries, 2015 – 2019

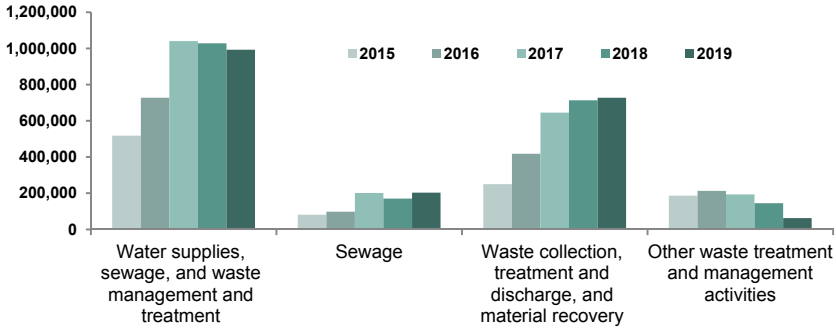


Table 5.24: Environment protection-related industries by economic activity and value added (Thousand QR), 2019

Activity code	Key economic activity	Net value added	Depreciations	Total value added	Goods/services supplies			Production value		
					Total	Services	Goods	Total	Other revenues	Products
E	Water supplies, sewage, and waste management and treatment	552591	47360	599951	392955	220383	172572	992906	2001790	972889
37	Sewage	122434	7897	130331	72950	558682	17270	203281	0	203281
3700	Sewage	122434	7897	130331	72950	558682	17270	203281	0	203281
38	Waste collection, treatment and discharge, and material recovery	392209	32424	424633	302750	157865	144885	727383	18462	708921
3811	Non-hazardous waste collection	121314	13324	134638	49573	27433	22140	184211	7737	176474
3821	Non-hazardous waste treatment and discharge	169778	6024	175820	155665	95963	56702	331485	10064	32142
3822	Hazardous waste treatment and discharge	43266	6733	49999	26031	17845	8186	76030	0	76030
3830	Material recovery	57851	6325	64176	71481	13624	57857	135657	661	134996
39	Other waste treatment and management activities	37948	7039	44987	17255	6838	10417	62242	1555	60687
3900	Other waste treatment and management activities	37948	7039	44987	17255	6838	10417	62242	1555	60687

Source: PSA – Annual Economic Statistics Bulletin/Energy and Industry

11.2 Alternatives that Provide Cooling (District Cooling)

Under the response activities, there are environment-friendly alternatives compared to the conventional methods. These activities are featured in the green economy activities, which aims to reduce the negative impacts of the conventional economy on the environment via the exploitation of non-conventional sources as alternatives in water resource uses, energy consumption reduction, and therefore emission reduction.

For example, multiple enterprises have recently adopted the central district cooling service that cools the air through chilled water units that currently use treated wastewater in the cooling process. According to Kahramaa/District Cooling, the energy used in such type of cooling is less by 40-50% than its counterpart methods of conventional cooling.

This type of cooling in Qatar is produced by specialized enterprises. There are also some establishments that provide such type of cooling for their own facilities. Other establishments treat their own sewage water and then use it in cooling in an integrated process aimed at treating wastewater, conserving fresh water and reducing energy use.

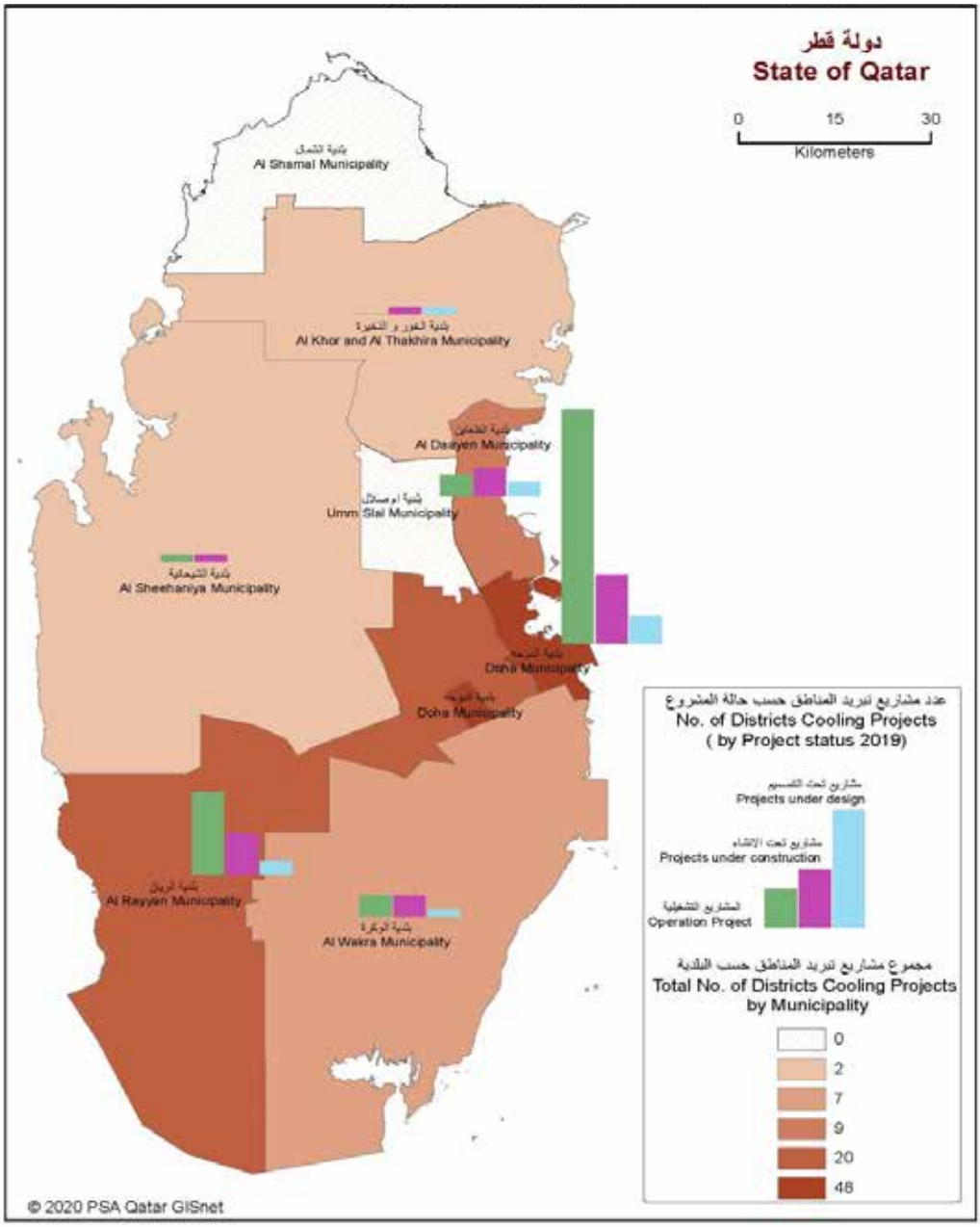
Results show the amount of electrical energy saved in the cooling process, compared to the conventional method, as well as the reduction of CO2 emissions. This has contributed to improving the quality of environment, preserving the natural resources, and creating a large number of job opportunities compared to the conventional cooling methods (nearly staff-free). The cooling plants have offered around 1.696 jobs, including 1.284 technical jobs, and 412 other accompanying jobs, such as the administrators, accountants, sales representatives and service and support staff related to district cooling.

Table 5.25: Indicators of the District Cooling, 2019

Economic Activity	Capacity of basic – combined cooling plants (TR)	Water used(m3)	Quantity of electric power used (MWh)	Quantity of electric power saving compared to conventional cooling (MWh)	Quantity of emission reduction compared to conventional cooling (thousand metric tons of CO2 equivalent)	Quantity of desalinated water saving (thousand m3/ year) using treated water for cooling
Supply of central cooling service	237,000	3,928,190	415,403	166,161	74,772.5	2,085.4
Commercial	56,250	648,833	78,397	31,359	14,111.5	230.4
Hotels	34,650	12,991,326	50,162	20,065	9,029.2	12,649.0
Education	172,300	2,607,775	191,908	76,763	34,543.5	120.5
Transport	69,292	1,159,573	132,882	53,153	23,918.8	124.4
Health	55,153	917,615	121,627	48,651	21,892.9	0.0
Cultural	19,100	625,429	14,112	5,645	2,540.2	0.0
Sports	99,800	921,886	122,727	49,091	22,090.8	782.4
Real estate development	100,236	1,850,271	198,947	79,579	35,810.5	1,129.7
Industrial	27,140	236,296	29,943	11,977	5390	187
Other	45,500	801,617	8,450	3,380	1521	802
Total	916,421	26,688,811	1,364,558	545,824	245,620.9	18,110.4

Source: Planning and Statistics Authority - District Cooling Statistics in Qatar

Map 5.1: Number of District Cooling Projects by Project Status 2019



12. Natural Disaster Preparedness

The State of Qatar has enacted the necessary laws and regulations to mitigate the effects of disasters. Thus, a number of national institutions and entities have been established, such as the Permanent Committee for Emergency (PCE), established by the Council of Ministers' Resolution No. 17 of 1998. The PCE has taken into consideration urban and civil expansion and has adopted all safety and security measures and standards at global levels, and has been enhancing the capabilities of qualified personnel to work in the field of rescue, relief and development to ensure the safety of all people living in Qatar. The State has also established the Standing Committee for Rescue, Relief and Humanitarian Assistance in the affected areas of sisterly and friendly countries, as well as the establishment of government humanitarian associations, non-government organizations and donor institutions that provide support and relief to all countries affected by natural or conflict-related disasters.

It is worth mentioning that the State of Qatar has been participating in all international forums on disaster management based on its strong belief in the importance of concerted international efforts and cooperation at all levels for disaster risk reduction. Qatar also hosted the 3rd Arab Conference on Disaster Risk Reduction at the end of April 2017 entitled "Implementation of the Sendai Framework in the Arab Region" in coordination with the United Nations Office for Disaster Risk Reduction and the League of Arab States. The hosting of the conference came as a fulfillment of Qatar's commitments as an active member of the international community and in implementation of the Sendai Declaration on the need for a regional policy that makes disaster response an effective and influential effort.

Qatar's launch of "HopeFor" initiative in 2011 is one of the outstanding examples of international partnership for disaster risk reduction, which culminated in the 65th session of the United Nations General Assembly Resolution No. 307 entitled: "Improving the effectiveness and coordination of military and civil defense assets for natural disaster response". The State of Qatar supports the Sendai Framework for Disaster Risk Reduction 2015-2030 and its seven objectives. Therefore, the proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies was 100% in Qatar during the period (2018-2022).

Due to Qatar's stable geographic conditions and being located outside the scope of natural disasters; i.e. earthquakes, volcanoes, floods and cyclones, in addition to high environmental and occupational safety indicators, the number of deaths and injured and missing persons as a result of disasters per 100,000 population was zero throughout the period (2014-2019). The direct economic loss resulting from disasters as a percentage of GDP was zero thanks to the absence of natural disasters in Qatar during the period (2014-2019). This is due to the fact that Qatar's geographic location is far from seismic zones, in addition to lack of heavy rainfall and the absence of cyclones. The robust Qatari economy has also contributed to tackling financial crises and reducing their negative impact on the population.

12.1 Covid-19 Pandemic

12.1.1 Most important economic, health, nutritional and voluntary measures taken by the State of Qatar during the Covid-19 crisis

The State of Qatar, like the rest of the world, was exposed to the Covid-19 pandemic crisis at the beginning of the year 2020. Since the beginning of the crisis, the State of Qatar issued many important decisions that reflect the country's readiness to control the outbreak of the Corona virus in the country, as well as mitigate the accompanying economic repercussions. The most important of these measures taken by the State of Qatar at the beginning of the pandemic (see the table). The Emiri directives vary depending on the scope and subject, the most of which take either the form of initiative to reinforce the pillars of the national development or provide dignified standards of living to citizens or as a response to challenges and crisis facing humanity in many parts of the world. HH The Amir directives may take the form of speech to be delivered by him to the Qatari people or through a speech delivered on the opening session of Shura (Advisory) Council or through the councils chaired by him or through statements issued by the Emiri Diwan.

Table No. 5.26: The most important economic, health, nutritional and voluntary measures taken by the State of Qatar during the Covid-19 crisis, 2020

Economic Measures	Food Security and Logistics Measures	Medical Measures	Voluntary Work**
His Highness, the Emir of Qatar, directed, within the Emiri directives* on 15 March 2020, to initiate a package of decisions related to the economic and financial sector, as follows: Providing financial incentives to the private sector in the amount of QAR 75bn to remove all side effects of Covid-19. The expending shares of this amount were identified directly to address all the weaknesses that may accompany the crisis - especially in the areas of the business sector, employment, consumers, investors in the stock exchange and society in general	The Emir of Qatar issued direction to exempt food and medical goods from customs duties for a period of six months	The Emir of Qatar issued direction to exempt food and medical goods from customs duties for a period of six months	Intensification of medical, community, preventive, awareness-raising and voluntary activities at the local level to contain the effects of the economic, social and health crisis on vulnerable groups in Qatar and the world.
QCB put in place the appropriate mechanism to encourage banks to postpone loan installments and private sector obligations with a grace period of six months.	Ministry of Commerce and Industry signed contracts with 14 companies to raise the country's strategic stock of food and consumer goods.	Establishment of temporary medical facilities by the Ministry of Public Health, in cooperation with the Qatari Armed Forces, to provide healthcare for mild cases of Covid-19 cases, with a capacity of 4645 beds.	Distribution of medical staff affiliated with voluntary bodies such as doctors, nurses and paramedics in health centers, quarantine and isolation sites, and external service centers to conduct swaps and treat patients and contacts.
Directing Qatar Development Bank (QDB) to postpone outstanding loan installments of all borrowers for a period of six months			Providing health care in quarantine places
Qatar Central Bank issued a circular to banks and money exchanges operating in the country regarding		At the beginning of the crisis, work was done to prepare other medical field facilities in different	The health educators presented many educational lectures and

Economic Measures	Food Security and Logistics Measures	Medical Measures	Voluntary Work**
the facilitation of electronic money transfers abroad and the provision of electronic services to the workers category.		regions of Qatar, with the aim of providing medical services for light to medium cases, with a capacity of 18,000 beds during the coming weeks - during the period (15 March 2020-15 April 2020).	live and recorded training courses, while applying all the precautionary measures in place.
Directing government funds to increase their investments in the stock market by QR 10 billion.			Transferring COVID-19 patients to and from quarantine and isolation centers. In this regard, the number of emergency medical services received 14,805 patients, at a cost of 20,815,319 Qatari riyals.
QCB provided additional liquidity to banks operating in Qatar			Providing meals for vulnerable groups affected by the pandemic
Exemption of food and medical goods from customs duties for a period of 6 months, provided that the saving is reflected in a lower selling price to the consumer.			Providing personal protective clothing for workers fighting the pandemic, and providing preventive health supplies to prevent transmission of infection
Exempting the following sectors from electricity and water fees for a period of 6 months: hospitality and tourism, retail sector, small and medium industries, commercial complexes in exchange for providing services and exemptions to tenants and logistic areas.			Providing psychological support to quarantined persons
Rent exemption for the logistics areas and small and medium industries for a period of six months.			Initiatives to limit the spread of the epidemic, support quarantine centers and educate workers

*: Amiri Directives

**: Qatar Red Crescent-Covid-19 Control Project

12.1.2 People infected, recovered, and died from the Coronavirus

From results, it is clear that the largest percentage of infections was during the month of May, where the percentage in this month was 30.2% of the total infections that occurred during the year 2020. While the percentage of infections during the beginning of the pandemic was at the end of February, while it was the lowest during March, as it did not exceed 0.5% of the total infections that occurred during the year 2020. As for the largest percentage of deaths, it was during the month of June, with a rate of 30.6% of the total deaths that occurred during the year 2020, which amounted to 245 deaths. The death rate was the lowest during the months of February and March, reaching 0.8%. During the year 2020, the number of people recovered reached approximately 141.5 thousand recoveries out of the total number of infections, which amounted to 143.8 thousand infections, with a recovery rate of more than 98%. The largest percentage was during the month of June, with a percentage of 36.6% of the total number of recoveries.

Table 5.27: Number of people infected, recovered, and died due to Covid-19, 2020

Month	Deaths	Recoveries	Infections
29 February– 31 March 2020	2	62	781
1-30 April 2020	8	1310	12628
1-31 May 2020	28	28918	43501
1-30 June 2020	75	51274	39178
1-31 July 2020	61	25813	14607
1-31 August 2020	23	8290	8083
1-30 September 2020	17	7032	6982
1-31 October 2020	18	6884	6796
1-30 November 2020	5	6507	6277
1-31 December 2020	8	5332	5001
Total	245	141422	143834

Ministry of Public Health

References and Data Sources

1. Qatar Civil Aviation Authority – Meteorology Department
2. Ministry of Municipality and Environment
3. Ministry of Public Health
4. Ministry of Finance
5. Ministry of Interior
6. Public Works Authority (Ashghal)
7. Qatar General Electricity and Water Corporation (Kahramaa) – Annual Report
8. The Ministry of Education and Higher Education.
9. CGIS – Qatar
10. Ministry of Municipality and Environment – Annual Agricultural Consumption Bulletin
11. Ministry of Municipality and Environment – Annual Bulletin of Crop Production Tracts
12. Ministry of Municipality and Environment – Annual Bulletin of Fish Statistics
13. PSA – Environment Statistics Report
14. PSA – Water Statistics Report
15. PSA – Annual Statistical Abstract – Environment Statistics Chapter
16. PSA - Annual Statistical Abstract – Agriculture Statistics Chapter
17. PSA - Annual Statistical Abstract – Population Statistics Chapter
18. PSA - Annual Statistical Abstract – Foreign Trade Statistics Chapter
19. PSA – Annual Statistical Abstract – Transport Statistics Chapter
20. PSA - Annual Statistical Abstract – National Accounts Statistics Chapter
21. PSA - Population, Housing and Establishments Census Bulletin
22. PSA – Environment Statistics Bulletin
23. PSA – Bulletin of District Colling in Qatar
24. PSA – Annual Economic Statistics Bulletin
25. PSA – Labour Force Sample Survey
26. PSA – R&D Survey

Appendices

Environment- Related International Conventions 1971-2019

Year	Type of Convention
International Convention	
1972	Convention for the Protection of the World Cultural and Natural Heritage (International)
1972	Convention on the International Regulations for Preventing Collisions at Sea 1972 (COLREGs) (International)
1973	International Convention for the Prevention of Pollution from Ships, 1973 (International)
1979	SAR Convention - 1979 International Convention on Maritime Search and Rescue as amended by Resolutions MSC.70 (69) and MSC.155 (78) 2006 Edition
1980	Annex I Convention on the Physical Protection of Nuclear Material (International)
1980	Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the Purposes of Patent Procedure, held in Budapest on April 28, 1977, and amended on September 26, 1980 (International)
1987	Vienna Convention (1985) for the Protection of the Ozone Layer, and the Montreal Protocol of 1987 on ODS and its amendments of 1990 and 1992.
1987	Arab Cooperation Agreement Organizing and Facilitating Relief Operations
Decree No. 51 of 1988	International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (Brussels, 1971)
Decree No. 52 of 1988	International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (Brussels, 1969) and its Annexes
Decree No. 53 of 1988	International Convention on Civil Liability for Oil Pollution Damage (Brussels, 1969), as amended by the 1976 Protocol
1990	International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC), 1990 (International)
1992	United Nations Convention on Climate Change
1993	Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction (International)
1995	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989
1996	Comprehensive Nuclear-Test-Ban Treaty (CTBT) (International)
1997	Convention on the Law of Non-Navigational Uses of International Watercourses (International)
Decree 29 of 1999	UN Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD)
2001	Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction
2001	Stockholm Convention on Persistent Organic Pollutants
2004	International Treaty on Plant Genetic Resources for Food and Agriculture
2004	Rotterdam Convention on Prior Informed Consent (PIC) Procedure of Certain Pesticides and Chemicals in International Trade
2005	Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation, 2005 (Complete Text of Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation, 2005) (International)
2005	Protocol for the Suppression of Unlawful Acts against the Safety of Fixed Platforms Located on the

Year	Type of Convention
	Continental Shelf, 2005 (International)
2009	Qatar's Agreement with the International Atomic Energy Agency to apply guarantees within the framework of Nuclear Weapons Non-Proliferation Convention (International)
2017	Global Dryland Alliance (GDA)
2018	International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) 2004
Multilateral Agreements	
1971	Ramsar Convention on Wetlands
1973	Convention on International Trade in Endangered Species of Wild Fauna and Flora (International)
1979	Convention on the Conservation of Migratory Species of Wild Animals
1982	United Nations Convention on the Law of the Sea (UNCLOS), Third Conference of the Law of the Sea (UNCLOS III) (International)
Decree 36 of 1989	Protocol concerning Marine Pollution Resulting from Exploration and Exploitation of the Continental Shelf 1988
Decree-law 90 of 1996	Biodiversity Convention, 1992
2016	Paris Agreement on Climate Change 2016
2017	The Islamic Organization for Food Security (IOFS)
2018	MoU for the Support of Environment and Education Research - Signed by the Center for Humanities and Social Sciences at the Faculty of Arts and Sciences at Qatar University, the Qur'an Botanical Garden at Qatar Foundation for Education, Science and Community Service and the Royal Botanic Garden of Edinburgh, UK
Regional Conventions	
1979	Convention on the Establishment of Arab Fisheries Company (Regional)
1990	Protocol of Protection of the Marine Environment against Pollution from Land-based Sources on February 21, 1990 - Regional Marine Environment Protection Organization in Kuwait (Regional)
2001	Convention on Conservation of Wildlife and its Natural Habitats in GCC Countries (Regional)
2011	Statute of the GCC Emergency Management Center (Regional)
2018	Convention on the Establishment of Arab Fisheries Company (Regional)
International Protocol	
2007	Cartagena Protocol on Biosafety
2017	Nagoya Protocol on Fair Sharing of Benefits Arising from the Utilization of Genetic Resources
Bilateral Agreements	
2008	MoU on bilateral recognition of precious metals stamping, and cooperation in the measurement and monitoring of precious metals and valuable stones between the Government of Qatar and the Government of the Sultanate of Oman
2012	MoU on agriculture, livestock, and fisheries between the Government of Qatar and the Government of Bulgaria (Bilateral)
Decree No. 5 of 2013 • No. 9	Draft MoU for cooperation in the field of environment between the Government of the State of Qatar and the Government of the Republic of Singapore
2014	MoU for Cooperation in the Environmental Field between the Government of the State of Qatar and the Government of the Kingdom of Saudi Arabia
2015	MoU between Qatar General Organization for Standardization and the American Society for Testing and Materials
2015	MoU for Cooperation in the Field of Agriculture between the Government of the State of Qatar and the Government of the Republic of Tunisia
2015	MoU for Cooperation in the Field of Agriculture between the Government of the State of Qatar and the Government of the Republic of Turkey
2015	Twinning Agreement between Doha Municipality and the Libertador Bolivarian Municipality in Venezuela
2016	MoU for Cooperation in the Field of Agriculture between the State of Qatar and Government of Turkish Republic
2016	MoU for Cooperation in the Field of Evaluation between Qatar General Organization for Standardization and Turkish Standards Institution

Year	Type of Convention
2016	MoU in the Field of Environment and Conservation between the Government of the State of Qatar and the Government of the Sultanate of Oman
2016	Twinning Agreement between Doha Municipality in the State of Qatar and Ankara Municipality in the Republic of Turkey
2016	MoU for Economic, Scientific and Technical Cooperation in the Field of Agriculture between the Government of the State of Qatar and the Government of Georgia
2016	MoU for Cooperation in the Field of Veterinary Health and Livestock Production between the Ministry of Municipality and Environment of the State of Qatar and the Ministry of Agriculture of the Republic of Georgia
2016	MoU for Cooperation in the Field of Agriculture between the Government of the State of Qatar and the Government of the Republic of Azerbaijan
2016	MoU for Cooperation in the Field of Climate Change, Risk Assessment, Adaptation and Mitigation between the Ministry of Municipality and Environment of the State of Qatar and the Italian Ministry for the Environment Land and Sea
2016	MoU for Cooperation in the Field of Agriculture between the Ministry of Municipality and Environment of the State of Qatar and the Ministry of Agriculture and Environment Protection of the Republic of Serbia
2017	MoU in the Field of Biodiversity and Wildlife Conservation between the Ministry of Municipality and Environment of the State of Qatar and the State Committee for Environment Protection and Land Resources of Turkmenistan
2017	Agreement on Cooperation in the Fields of Standardization, Metrology, Certification and Accreditation between the Government of the State of Qatar and the Government of Turkmenistan
2017	MoU for the Protection of Endangered Fungal Species and the Preservation of Their Natural Environment between the Government of the State of Qatar and the Government of the Republic of Azerbaijan
2017	MoU for Cooperation in the Field of Agriculture between the Government of the State of Qatar and the Government of the Republic of Uganda
2017	Agreement for Cooperation in the Field of Environment and Nature Protection between the Government of the State of Qatar and the Government of the Republic of Croatia
2018	MoU for cooperation in the agricultural field between the Government of the State of Qatar and the Government of the Kingdom of Morocco
2018	Agreement for cooperation in the field of agriculture, livestock and fisheries between the Ministry of Municipality and Environment in the State of Qatar and the Ministry of Agriculture in the State of Palestine
2018	MoU on Food Security and Cooperation in the Field of Agriculture, Agro-food industry between the Ministry of Municipality and Environment in the State of Qatar and the Ministry of Agricultural Food, Forest Policies and Tourism in the Republic of Italy
2018	MoU for cooperation in the field of agriculture between the Ministry of Municipality and Environment in the State of Qatar and the Ministry of Agriculture and Rural Development in Romania
2018	MoU for cooperation in the field of agriculture and food security between the Government of the State of Qatar and the Government of Nepal
2018	MoU / Ecuador
2018	MoU / Mali
2018	MoU for cooperation between the Ministry of Municipality and Environment in the State of Qatar and the Ministry of Production and Labor in the Republic of Argentina, represented by the State Secretariat for Agricultural Industries
2018	A joint declaration of intent for cooperation in the agricultural field between the Ministry of Municipality and Environment in the State of Qatar and the Ministry of Agriculture and Livestock Resources of the Republic of Ecuado
2018	Agreement for cooperation in the field of agriculture between the Ministry of Municipality and Environment and Vito Middle East WLL Qatar
2018	MoU between the Government of the State of Qatar represented by the Ministry of Municipality and Environment and the Government of the Sultanate of Oman represented by the Ministry of Agriculture, Fisheries and Livestock Resources
2018	A joint letter of intent for cooperation in the agricultural field between the Ministry of Municipality and Environment in the State of Qatar and the Ministry of Agriculture and Food in the French Republic

Year	Type of Convention
2018	Twinning Agreement between the Municipality of Doha in the State of Qatar and the Municipality of Sarajevo in the Republic of Bosnia and Herzegovina
2018	Twinning Agreement between the Municipality of Doha in the State of Qatar and the Municipality of Quito in the Republic of Ecuador
2018	Twinning Agreement between the Municipality of Doha in the State of Qatar and the Municipality of San Salvador in the Republic of El Salvador
2018	MoU between the Government of the State of Qatar and the Government of the Federal Republic of Somalia
2018	MOU for cooperation in the field of energy between the Ministry of Energy and Industry of the State of Qatar and the Ministry of Energy of the Republic of Bulgaria
2018	MoU for cooperation in the energy fields between the Ministry of Energy and Industry in the State of Qatar and the Department of Energy of the United States of America
2019	Decree No. (6) of 2019 ratifying MoU for cooperation in the agricultural field between the government of the State of Qatar and the government of the Kingdom of Morocco
2019	Decree No. (22) of 2019 ratifying MoU for cooperation in the field of energy between the Ministry of Energy and Industry in the State of Qatar and the Ministry of Energy in the Republic of Bulgaria
2019	MoU for Cooperation in the field of agriculture and food security with United Kingdom of Great Britain
2019	MoU for Cooperation in the field of agriculture and food security with Ireland
2019	MoU for Cooperation in the field of agriculture and food security with Oman

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