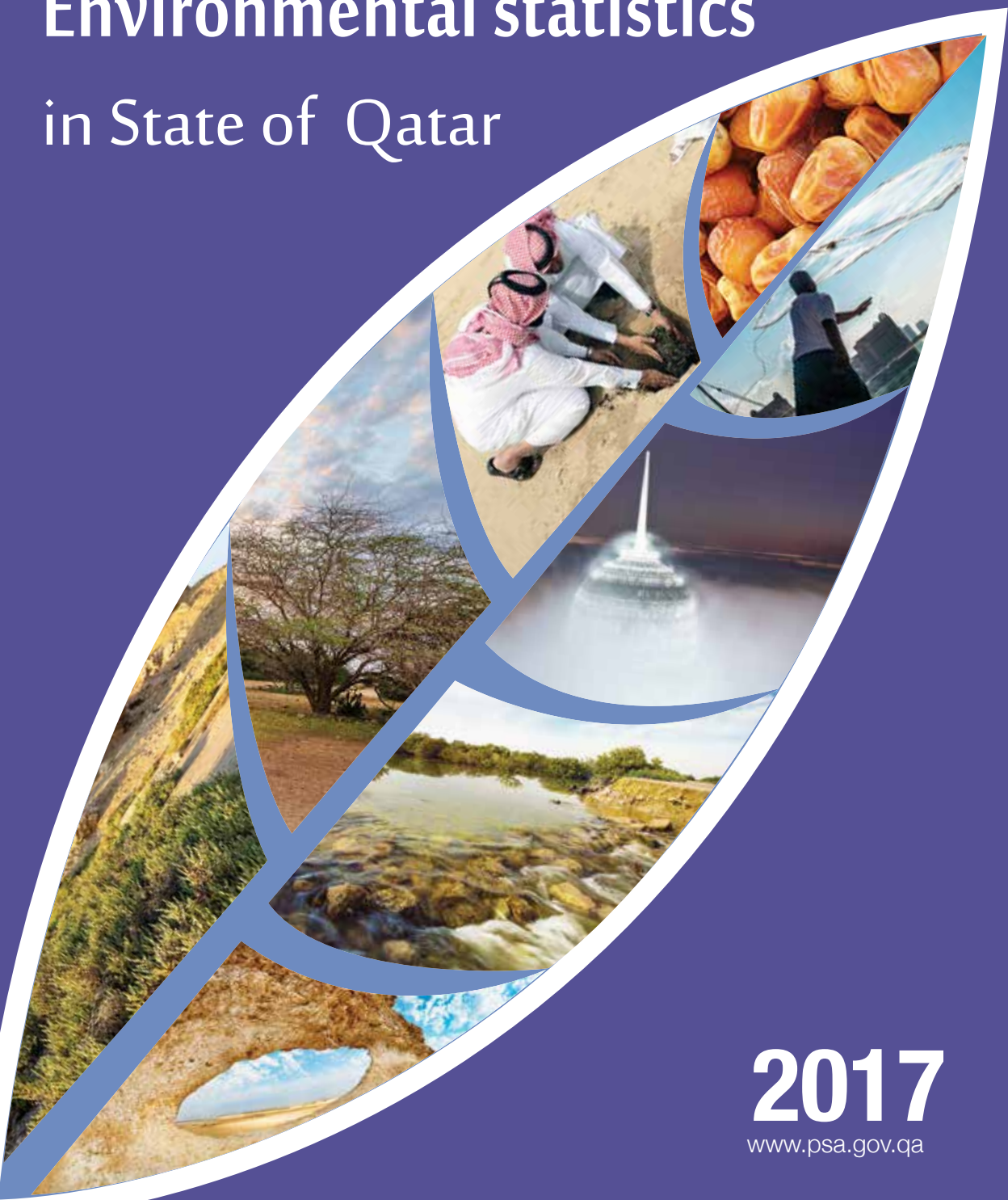
جهاز التخطيط والإحصاء
Planning and Statistics Authority

# Environmental statistics

## in State of Qatar



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# Environment Statistics

## In the State of Qatar 2017

August, 2019

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# Preface

The Planning and Statistics Authority (PSA) is pleased to present its Fourth Environment Statistics Report 2017. 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 and contribute to more than 60% of the SDGs 2030, as well as competitiveness indicators and other regional and international requirements. Environment Statistics are the core of environment accounts, which measure the impact of economy on the environment and measure as well 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 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.

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 acoordination.

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 labour 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 statistics information in this report. 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 Planning and Statistics Authority

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# Introduction

Qatar National Vision QNV 2030 pays special attention to the environment theme, which is unparalleled in many Middle Eastern countries, and deals with the environment development pillar on an equal footing with the rest of QNV 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 .

This 4th issue of Environment Statistics Report 2017 is produced in a way similar to the 3rd report 2015, where environment statistics tables are compiled by environment field to fall under the sector they represent in terms of a framework based on causal analysis which describes interactions between the community (the three pillars of QNV) and the environment through the production of information and indicators that are related to Environment Policy. This interaction describes the pressures of human activities on the environment, the state of the environment as a result of these pressures, the impacts of the changing state of the environment on the ecosystem itself and on human health, and finally the societal response to the change in the state of the environment.

# Objectives of the Environment Statistics Report:

1. Provide statistical data on various environment elements and their distribution in Qatar, in terms of the state of the environment and impact on the environment ...etc.
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 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 extent of 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 objectives, especially in the second and third levels, which still in need for effort and work at the level of methodologies and availability of data sources.

## Environment Data Sources

The environment statistics data is based on several sources: the administrative registrations of data producing entities, the General Census and the specialized environmental surveys.

### 1. Administrative Registrations Data from Authorities Concerned with the Environment Protection

The environment statistics are collected from various ministries and government and public institutions and administrations based on their envoironment competence and from private organisations and associations working in the field of environment. Statistics are also collected from various statistical departments within PSA, such as the Economic Statistics and National Accounts Dept. and Information Systems Dept. are established with these public and private institutions followed by visits in order to provide updates on environmental data and information and to clarify emerging new requirements by these institutions.

### 2. General Census

The environment data on completed buildings and residential units connected to public utilities (water, electricity and sewerage network) are collected through the general census questionnaire, 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. During 2017, the District Cooling Survey was implemented, targeting national and private public entities in various economic sectors that implement for self-use or those that apply district cooling system to provide refrigeration service to their customers.

This report is targeting decision-makers and planners working in environment-related government agencies and institutions, universities and scientific research centers, various media, activists for environment protection and conservation, and regional and international environment-related organizations.

# UN Framework for the Development of Environment Statistics (FDES) [1]

The Environment Statistics Report in Qatar 2016 is based on the UN Framework for the Development of Environment Statistics (FDES)[2] which aimed at organizing environment statistics at the national and international levels.

The Framework for the Development of Environment Statistics (FDES) 2013 ،including the Core Set of Environment Statistics, as well as an Action Plan for putting the FDES to work, were endorsed by the 44th session of the UN Statistical Commission[3] (New York, 26 February–1 March 2013)

### FDES History

FDES is used to link the components of the environment to the collected statistical data sets. In which the components of the environment are the scope of environment statistics, the FDES sets are catogarized based on the recognition that environmental problems are the result of human activities and natural events, as a reflecting to these activities a sequence of action, impact, and reaction. Due to relevant information of social, economic activities, and natural events, therefore, refers to their impacts on the environment, the responses to these impacts by the society, individuals and organizations in order to bring about an environmental balance.

### FDES Structure

The contents of FDES are statistical topics, through which the components of the environment can be converted to describable and analytical statistical topics. The components of the environment in the FDES are natural resources, such as soil, climate, human settlements, flora and fauna.

### What is the FDES?

The FDES is a multi-purpose conceptual and statistical framework that is comprehensive and integrative in nature, and marks out the scope of environment statistics. It provides an organizing structure to guide the collection and compilation of environment statistics at the national level. It brings together data from various relevant subject areas and sources. It is broad and holistic in nature ،covering the issues and aspects of the environment that are relevant to policy analysis and decision making by applying it to cross-cutting issues, such as climate change.

(1) A Framework for the Development of Environment Statistics

(2) Corresponding International Standard Classification link: http://unstats.un.org/unsd/environment/fdes.htm

(3) The United Nations Statistical Commission is the apex entity of the global statistical system bringing together Chief Statisticians from member states from around the world. It is the highest decision making body for international statistical activities, especially the setting of statistical standards, the development of concepts and methods and their implementation at the national and international level.

### The FDES consists of six components as follows (see Figure 1):

Environment conditions and quality - environment resources and their uses – residuals - extreme events and disasters - human settlements and environmental health - environment protection, management and engagement.

**Figure 1: FDES Components**


### Uses of FDES

There is a need to develop a framework that can help in the development, coordination and organization of environment statistics, and there is a perception of the use of this framework for the following specific purposes:

- Reviewing environmental problems and concerns and identifying their measurable aspects.
- Identifying the variables of the statistical aspects of measurable environmental concerns.
- Assessing the needs for data and its sources and availability.
- Structuring databases, information systems and statistical publications.

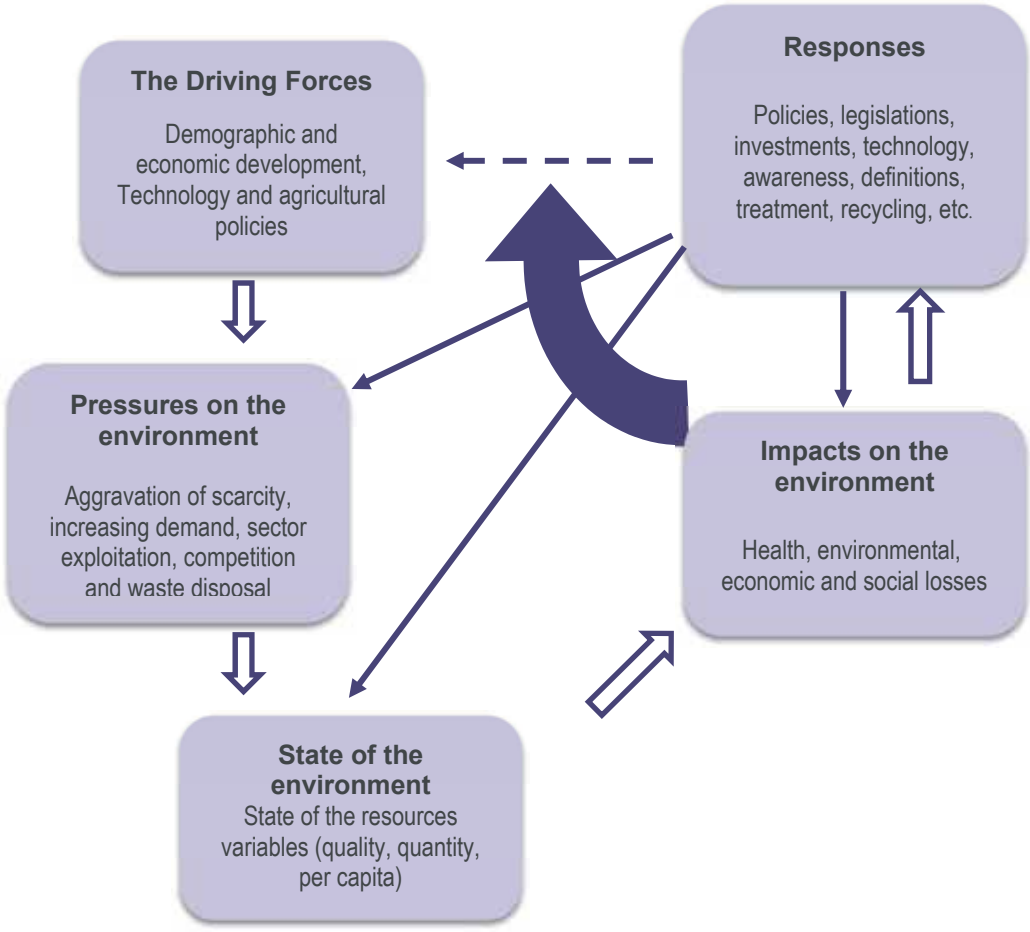
### Importance of Environment Statistics for Policy-making

The environment statistics create key information about the state of the environment and its most relevant changes through space and time. It's strengthen assessments through quantitative techniques, making analyses more robust, timely and progressively harmonized at the international level. The environment statistics is necessary for producing environmental assessments, state of the environment reports, environmental compendia, environmental indicators, sustainable development indicators ،as well as facilitating the integrated environmental-economic accounting.

### Relation to Other Existing Frameworks

The FDES is structured in a way that allows links to economic and social domains. It is compatible with and supports other state of the art frameworks and systems ‹both statistical and analytical, such as the System of Environmental-Economic Accounting (SEEA), the Driving forces—Pressure—State—Impact—Response (DPSIR) framework, as shown in Figure 2 below:

**Figure 2: Environmental framework in relation to economic and social domains**



**The driving forces:** are the forces associated with the economic, demographic and social developments, which affect various aspects of environmental resources as a result of the requirements of these developments.

**Pressures on the environment:** are those emerging pressures on the environment as a result of the requirements and needs of the driving forces. Those pressures are represented in the increase of demand for environmental goods, services and resources required to provide the needs of the driving forces.

**State of the environment:** is the current state of the environment after being exposed to pressures, the vulnerability and the magnitude and direction of change in the state of environmental services, goods and resources.

**Impacts on the environment:** are the consequences linked to the magnitude of change in environmental conditions, services, goods and resources. These consequences are often associated with the diseases afflicting human beings, as well as the loss of environmental resources and/or the extent of change in the effectiveness of environmental goods and services.

**Responses to the environment:** are the actions and measures taken to protect and manage the environment in ways that address the impact on the environment and ensure the sustainability of environmental assets and the flow of environmental goods and services for both current and future generations.

### Uses of FDES:

- Is a flexible multi-purpose tool that adapts to the needs and priorities of the countries and different users.
- Helps to identify a set of statistics related to decision-making.
- Facilitates presentation of data synthesis.
- Simplifies the complex environmental issues adequately.
- Consistent with other statiscal frameworks and classifications.
- Enhances sound concepts.

### Challenge Facing the Production of the Environment Statistics

The environment statistics include a wide range of information, which is multidisciplinary by nature. The resources of the environment statistics are distributed across a variety of data producers, and are compiled in many ways. In order to effectively produce environment statistics, it is necessary to have a specific statistical and environmental expertise, scientific knowledge, institutional development capabilities and sufficient resources. Many countries still receive substantial technical assistance and capacity building in this regard. Consequently, environment statistics requires an appropriate framework to guide its development, coordination and organization at all levels, in addition to the lack of database from institutional sources.

## Summary of Environmental Indicators and the Aspects Affecting Them

**Table 1: Summary of environmental indicators and the aspects affecting them**

| Indicator | Value | Unit |
|---|---|---|
| **Chapter 1: Indicators of the Driving Forces** | | |
| The rate of population growth 2012-2017 | 4 | % |
| The highest distribution of population in the state by municipalities was in Doha Municipality, Census 2015 | 39.8 | % |
| Population density of Doha, Census 2015 | 4,353 | Person/$km^2$ |
| GDP 2017 | 607,620 | Million QR |
| The average growth rate of the construction sector 2013-2017 | 22 | % |
| **Chapter 2: Indicators of the pressures on the environment** | | |
| Road lengths 2017 | 7,039 | Km |
| Annual growth rate of the main road lengths 2012 and 2016 | -6 | % |
| Total area of arable land 2017 | 65,000 | Hectare |
| Actual cultivated land area 2017 | 11,340 | Hectare |
| Uncultivated arable land area 2017 | 53,410 | Hectare |
| Number of registered farms 2017 | 1,310 | Number |
| Self-sufficiency percentage 2017 | 11.5 | Percentage |
| Amount of fertilizers used 2017 | 22 | Ton |
| Amount of chemical pesticide imports 2017 | 112,543 | Kg |
| Value-added in agriculture, forestry and fishing sector 2017 | 1.129 | Million Qatari Riyals |
| Percentage of workers in agriculture, forestry and fishing to total labor force 2017 | 1.24 | % |
| Green space area (excluding public parks) 2017 | 1.386 | Thousand $m^2$ |
| Number of public parks 2017 | 83 | Number |
| Public parks area 2017 | 1,125 | Thousand $m^2$ |
| Amount of demand for water 2017 | 498.8 | Million $m^3$ per year |
| Amount of electricity consumption 2017 | 45,555 | Giga watt/hour |
| Total cars and motorcycles 2017 | 1,522,733 | Number |
| Total new registered cars and motorcycles 2017 | 71,497 | Number |
| Percentage of population connected to sewage services 2017 | 100 | % |
| Percentage of completed buildings connected to sewage network, Census 2015 | 87.7 | % |
| Percentage of housing units connected to sewage network, Census 2015 | 91.4 | % |
| Percentage of completed buildings connected to electricity grid, Census 2015 | 99.7 | % |
| Percentage of completed buildings connected to water network, Census 2015 | 99.7 | % |

| Indicator | Value | Unit |
|---|---|---|
| Chapter 3: Indicators of State of the Environmental and Impact | | |
| Number of air monitoring stations 2017 | 44 | Number |
| Number of marine buoys 2017 | 2 | Number |
| Number of earthquake monitoring stations 2017 | 9 | Number |
| Annual rainfall rates, Doha International Airport Station 2017 | 78.4 | Mm |
| Average maximum relative humidity, Doha International Airport station 2017 | 66 | % |
| Average minimum relative humidity, Doha International Airport station 2017 | 24 | % |
| Average maximum atmospheric pressure, Doha International Airport station 2017 | 1016.2 | HB |
| Average minimum atmospheric pressure, Doha International Airport station 2017 | 894.8 | HB |
| Average wind speed, Doha International Airport station 2017 | 6.6 | Knot |
| Number of terrestrial and marine reserves 2017 | 14 | Number |
| Terrestrial and marine reserves area 2017 | 3,464.92 | $km^2$ |
| Percentage of terrestrial reserves area to total area of Qatar and its islands 2015 | 23.6 | % |
| Number of Arabian Oryx in nature reserves 2017 | 1,626 | Number |
| Number of registered terrestrial flora and fauna 2010-2013 | 965 | Number |
| Number of registered marine flora and fauna 2010-2013 | 853 | Number |
| Number of extinct terrestrial flora and fauna 2010-2013 | 2 | Number |
| Number of endangered terrestrial flora and fauna 2010-2013 | 14 | Number |
| Number of endangered marine flora and fauna 2010-2013 | 7 | Number |
| Average amount of fish catch per fishing vessel 2017 | 32 | Metric ton per vessel |
| Average amount of fish catch per fisherman 2017 | 4 | Metric ton/fisherman |
| Average number of fishermen per fishing vessel 2017 | 8 | Metric ton per vessel |
| Percentage of fish stocks within safe biological limits 2017 | 59 | % |
| Rate of over-exploitation of fishing 2017 | 8,720 | Ton |
| Rate of sustainable exploitation of fishing 2017 | 3,356 | Ton |
| Amount of fish farming 2017 | 10 | Ton |
| Annual average water balance 1998-2017 | 55.8 | Million $m^3$ per year |
| Desalinated water production (not including loss) 2017 | 578.54 | Million $m^3$ per year |
| Amount of abstracted groundwater 2017 | 250 | Million $m^3$ per year |
| Amount of reused wastewater 2017 | 960 | Million $m^3$ per year |
| Amount of actual water losses 2017 | 23.46 | Million $m^3$ per year |
| Rate of actual water losses 2017 | 4.01 | % |
| Percentage of Non-Conforming Samples of Microbial Analysis of Drinking Water from Public sources 2017 | 2 | % |
| Percentage of Non-Conforming Samples of Microbial Analysis of | 3 | % |

| Indicator | Value | Unit |
|---|---|---|
| Drinking Water from Private sources 2017 | | |
| Percentage of Non-Conforming Samples of Microbial Analysis of Drinking Water from Other sources 2017 | 0 | % |
| Percentage of Non-Conforming samples of Chemical Analysis of Desalinated and bottled Water 2017 | 1.3 | % |
| Percentage of Non-Conforming samples of Pseudomonas Analysis of Desalinated and bottled Water 2017 | 0 | % |
| Percentage of Non-Conforming samples of Regular Analysis of Desalinated and bottled Water, 2017 | 1.7 | % |
| Percentage of Non-Conforming samples of Other Analysis of Desalinated and bottled Water, 2017 | 0 | % |
| Percentage of Non-Conforming Samples of Analysis of Desalinated Water 2017 | 2.5 | % |
| Percentage of Non-Conforming Samples of Analysis of bottled Water 2017 | 3.1 | % |
| Number of sewage plants 2017 | 24 | Number |
| Design capacity of sewage plants 2017 | 827.9 | 1,000 $m^3$ per day |
| Percentage of treated wastewater to total wastewater 2017 | 99 | % |
| Amount of treated wastewater used for agriculture irrigation 2017 | 69,508 | 1,000 $m^3$ per year |
| Amount of treated wastewater used for green space irrigation 2017 | 61,029 | 1,000 $m^3$ per year |
| Amount of treated wastewater used to inject groundwater 2017 | 63,859 | 1,000 $m^3$ per year |
| Treated water discharged in lakes 2017 | 33,817 | 1,000 $m^3$ per year |
| Treated water discharged in the sea 2017 | 455 | 1,000 $m^3$ per year |
| Total discharge of surface groundwater to the sea 2017 | 95,398,680 | $m^3$ per year |
| Rate of BOD removal 2017 | 98.7 | % |
| Rate of COD removal 2017 | 95.9 | % |
| Number of solid waste deportation stations 2017 | 4 | Number |
| Number of solid waste landfills 2017 | 2 | Number |
| Number of solid waste dumps 2017 | 2 | Number |
| Number of solid waste treatment plants 2017 | 1 | Number |
| Total amount of treated waste 2017 | 8,156,591 | Ton |
| Per capita household waste production 2017 | 1.19 | Kg per day |
| Number of tons of recycled materials 2017 | 42,116 | Ton |
| Compost waste production (including pre-screening compost) 2017 | 38,441 | Ton |
| Waste to energy 2017 | 245,552 | Megawatts/hour |
| Biological gases 2017 | 28,566 | 1,000 $m^3$ |
| Generation of hazardous waste in tons per million US dollars of GDP at fixed price (100 = 2013) 2017 | 0.29 | Ton/US $ 1,000,000 |
| Per capita of total generated hazardous waste 2017 | 22.6 | Metric ton per capita |
| Mass consumption of substances that deplete the ozone layer 2017 | 1180.11 | Metric ton |

| Indicator | Value | Unit |
|---|---|---|
| Amount of substances that deplete the ozone layer, according to Montreal Protocol 2017 | 68.53 | Metric ton |
| Number of cases of infectious and communicable diseases reported to the Department of Preventive Health 2017 | 24,745 | Number |
| Number of recorded cases of tuberculosis 2017 | 635 | Number |
| **Chapter 4: Indicators of responses for the protection and management of the environment** | | |
| Public expenditures on the protection and management of the environment sector 2017 | 5,703 | Million QR |
| Capital expenditures on the protection and management of the environment sector 2017 | 2989.7 | Million QR |
| Current expenditures on the protection and management of the environment sector 2017 | 513.0 | Million QR |
| Expenditures on environment-related scientific research 2015 | 257.2 | Million QR |
| Expenditures on environmental activities 2017 | 1,650 | 1,000 QR |
| Number of legislations for the protection and management of the environment 2017 | 5 | Number |
| Number of international conventions and treaties for the protection and management of the environment 2017 | 1 | Number |
| Number of projects that are subject to environmental impact assessment in response to environmental requirements 2017 | 3432 | Number |
| Number of students enrolled in universities and colleges in environmental disciplines 2016/2017 | 272 | Number |
| Number of students graduated from universities and colleges in environmental disciplines 2016/2017 | 79 | Number |

## Summary of Environmental Indicators in SDGs

### Table 2: Summary of Environmental Indicators in SDGs

| SDG | Target | Indicator | Indicator Title | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | End poverty in all its forms everywhere | | | | | | | | | |
| 1 | 4 | 1 | Proportion of population living in households with access to basic services | *Safe Water* | 100% | 100% | 100% | 100% | 100% | 100% |
| | | | | *Electricity* | 100% | 100% | 100% | 100% | 100% | 100% |
| | | | | *Education* | 100% | 100% | 100% | 100% | 100% | 100% |
| | | | | *Health* | 100% | 100% | 100% | 100% | 100% | 100% |
| | | | | *Communications* | 100% | 100% | 100% | 100% | 100% | 100% |
| | | | | *Transport Roads* | 100% | 100% | 100% | 100% | 100% | 100% |
| | | | | *Transport* | 100% | 100% | 100% | 100% | 100% | 100% |
| | | | | *Bank Services* | 100% | 100% | 100% | 100% | 100% | 100% |
| 1 | 4 | 2 | Proportion of total adult population with secure tenure rights to land, with legally recognized documentation and who perceive their rights to land as secure, by sex and by type of tenure | *Individual ownership (Qatari Males)* | 9.0% | 10.5% | 9.7% | 9.1% | 7.8% | 6.4% |
| | | | | *Individual ownership (Qatari Females)* | 5.1% | 4.7% | 4.5% | 4.9% | 3.9% | 3.7% |
| | | | | *Total Individual ownership Qataris* | 7.0% | 7.5% | 7.0% | 7.0% | 5.7% | 5.0% |
| | | | | *Qatari joint ownership* | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| 1 | 5 | 1 | Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population | | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 5 | 2 | Direct economic loss attributed to disasters in relation to global gross domestic product (GDP) | | 0 | 0 | 0 | 0 | 0 | 0 |

| SDG | Target | Indicator | Indicator Title | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| 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 (Yes/No) | | Yes | Yes | Yes | Yes | Yes | Yes |
| 1 | 5 | 4 | 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% |
| 3 | Ensure healthy lives and promote well-being for all at all ages | | | | | | | | | |
| 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) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | Achieve gender equality and empower all women and girls | | | | | | | | | |
| 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 | Males | 100% | 100% | 100% | 100% | 100% | 100% |
| | | | | Females | 100% | 100% | 100% | 100% | 100% | 100% |
| | | | | Total | 100% | 100% | 100% | 100% | 100% | 100% |
| | | | and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure | | | | | | | |
| | | | Percentage of female owners of farms of total owners of individual and collective farms | Agricultural land (farms) Individual and collective ownership | ... | ... | 8.8 | 8.9 | 9.1 | ... |
| | | | Percentage of female owners of farms of total owners of individual farms only | Agricultural land (farms) Individual ownership | ... | ... | 9.6 | 10 | 10.3 | ... |

| SDG | Target | Indicator | Indicator Title | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Percentage of female owners of farms of total owners of individual and collective farms | Ezbaa land for livestock<br>Individual and collective ownership | 16.1 | 20.5 | 17.4 | 17.7 | 18.1 | ... |
| 5 | a | 2 | Countries where the legal framework (including customary law) guarantees women's equal rights to land ownership and/or control (Yes/No) | | Yes | Yes | Yes | Yes | Yes | Yes |
| **6** | **Ensure availability and sustainable management of water and sanitation for all** | | | | | | | | | |
| 6 | 1 | 1 | Proportion of population using safely managed drinking water services | | 100% | 100% | 100% | 100% | 100% | 100% |
| 6 | 2 | 1 | Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water | | 100% | 100% | 100% | 100% | 100% | 100% |
| 6 | 3 | 1 | Proportion of wastewater safely treated | | 100% | 100% | 100% | 100% | 100% | 100% |
| 6 | 6.4 | 6.4.1 | Change in water-use efficiency over time | | Water Efficiency in the Agricultural, Industrial and Commercial Sector (QR / L) | | | | | |
| | | | GDP in commercial activities (constant prices 2004 & 2013) (QR) / Quantity of water used in agriculture sector (liters) | | 0.002 | 0.002 | 0.003 | 0.003 | 0.003 | |
| | | | GDP in commercial activities (constant prices 2004 &2013) (QR) / Quantity of water used in industrial sector (liters) | | 49.8 | 50.3 | 50.5 | 46.5 | 51.5 | |
| | | | GDP in commercial activities (constant prices 2004 &2013) (QR) / Quantity of water used in commercial sector (liters) | | 1.34 | 1.94 | 2.10 | 2.09 | 1.29 | |
| 6 | 4 | 2 | Level of water stress: freshwater withdrawal as a proportion of available freshwater resources | | 100% | 91.40 % | ... | 230% | 320% | 229% |

| SDG | Target | Indicator | Indicator Title | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 5 | 1 | Degree of integrated water resources management implementation (0-100) | | ... | ... | ... | ... | 82.00 | 82.00 |
| | | | | Enabling environment | ... | ... | ... | ... | 55.00 | 55.00 |
| | | | | Establishments and companies | ... | ... | ... | ... | 100.00 | 100.00 |
| | | | | Management tools | ... | ... | ... | ... | 79.00 | 87.50 |
| | | | | Financing | ... | ... | ... | ... | 85.00 | 85.00 |
| 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 | | 100% | 100% | 100% | 100% | 100% | 100% |
| **7** | **Ensure access to affordable, reliable, sustainable and modern energy for all** | | | | | | | | | |
| 7 | 1 | 1 | Proportion of population with access to electricity | | 100% | 100% | 100% | 100% | 100% | 100% |
| 7 | 1 | 2 | Proportion of population with primary reliance on clean fuels and technology | | 100% | 100% | 100% | 100% | 100% | 100% |
| 7 | 2 | 1 | Renewable energy share in the total final energy consumption | | ... | ... | ... | 0.0001 % | 0.0001 % | 0.0001 % |
| **9** | **Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation** | | | | | | | | | |
| 9 | 1 | 1 | Proportion of the rural population who live within 2 km of an all-season road | | 100% | 100% | 100% | 100% | 100% | 100% |
| **11** | **Make cities and human settlements inclusive, safe, resilient and sustainable** | | | | | | | | | |
| 11 | 1 | 1 | Proportion of urban population living in slums, informal settlements or inadequate housing | | 0% | 0% | 0% | 0% | 0% | 0% |

| SDG | Target | Indicator | Indicator Title | | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 3 | 1 | Ratio of land consumption rate to population growth rate | Population (Thousand) | | … | … | … | 2.405 | … | … |
| | | | | Area ($km^2$) | | … | … | … | 11,627 | … | … |
| | | | | Population density per $km^2$ | | … | … | … | 207 | … | … |
| 11 | 5 | 1 | Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population | | | 0% | 0% | 0% | 0% | 0% | 0% |
| 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 | | | 0% | 0% | 0% | 0% | 0% | 0% |
| 11 | 6 | 1 | Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities | | | 100% | 100% | 100% | 100% | 100% | 100% |
| 11 | 6 | 2 | Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (normal, abnormal, less than normal) | Aspire Zone PM10 | | ... | ... | Normal | Normal | Normal | Normal |
| | | | | Qatar University PM10 | | ... | ... | Normal | Abnormal | Normal | Normal |
| | | | | Corniche PM10 | | ... | ... | Normal | Normal | Normal | Normal |
| 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 (General Census 2015) | Sex | Males | … | … | … | 20.0% | … | … |
| | | | | | Females | … | … | …. | 7.1% | … | …. |
| | | | | | Total | … | … | … | 27.1% | … | … |
| | | | | Age Groups | Less than 15 years | … | … | | 4.0% | … | … |
| | | | | | 15-24 years | … | … | | 3.8% | … | … |
| | | | | | 25 years and above | … | … | | 19.3% | … | … |

| SDG | Target | Indicator | Indicator Title | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| 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 (Yes/No) | | Yes | Yes | Yes | Yes | Yes | Yes |
| 11 | b | 2 | 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% |
| **12** | **Ensure sustainable consumption and production patterns** | | | | | | | | | |
| 12 | 3 | 1 | Global food loss index (in million Qatari Riyals) | Tomato | ... | ... | ... | 6.00 | ... | ... |
| | | | | Cucumber | ... | ... | ... | 6.10 | ... | ... |
| | | | | Zucchini | ... | ... | ... | 3.90 | ... | ... |
| | | | | Melon | ... | ... | ... | 0.70 | ... | ... |
| 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 | International agreement | ... | ... | ... | ... | ... | 1 |
| | | | | Multilateral agreement | ... | ... | ... | ... | 1 | 1 |
| | | | | Bilateral agreement | 1 | 1 | 1 | 4 | 9 | 5 |
| | | | | International protocol | ... | ... | ... | ... | ... | 1 |
| 12 | 4 | 2 | Hazardous waste generated per capita and proportion of hazardous waste treated, by type of treatment | | 13.1 | 19.4 | 35.2 | 32.5 | 15.4 | 22.6 |
| 12 | 5 | 1 | National recycling rate, tons of material recycled | | 6,632 | 16,450 | 17,514 | 69,748 | 53,384 | 42,116 |

| SDG | Target | Indicator | Indicator Title | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|
| 12 | 8 | 1 | Extent to which (i) global citizenship education and (ii) education for sustainable development (including climate change education) are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment (Yes/No) | Yes | Yes | Yes | Yes | Yes | Yes |
| **13** | **Take urgent action to combat climate change and its impacts** | | | | | | | | |
| 13 | 1 | 1 | Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population | 0 | 0 | 0 | 0 | 0 | 0 |
| 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 | 100% | 100% | 100% | 100% | 100% | 100% |
| 13 | 1 | 3 | Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies (Yes/No) | Yes | Yes | Yes | Yes | Yes | Yes |
| 13 | 2 | 1 | Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other) (Yes/No) | Yes | Yes | Yes | Yes | Yes | Yes |

| SDG | Target | Indicator | Indicator Title | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 3 | 1 | Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula (Yes/No) | | Yes | Yes | Yes | Yes | Yes | Yes |
| 13 | 3 | 2 | Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions | | Yes | Yes | Yes | Yes | Yes | Yes |
| **14** | **Conserve and sustainably use the oceans, seas and marine resources for sustainable development** | | | | | | | | | |
| 14 | 1 | 1 | Index of coastal eutrophication and floating plastic debris density (Doha) | Salinity (practical salinity units) | … | … | 35.3 | … | 42.8 | 47.4 |
| | | | | Lead (mcg/L) | … | … | … | … | … | … |
| | | | | Dissolved oxygen (mg/L) | ND | … | 6.8 | … | … | … |
| | | | | Nitrite (mg/L) | 5.1 | … | 2.2 | 3.3 | 1.4 | 0.0 |
| | | | | Nitrate (mg/L) | ND | … | 28.9 | ND | 35.6 | 0.1 |
| | | | | Silicate (mg/L) | ND | … | 26.9 | ND | 136.0 | 0.5 |
| | | | | Phosphate (mg/L) | 18 | … | 2.6 | ND | … | ND |
| | | | | Total suspended solids (mg/L) | 14.3 | … | 22.2 | 11.1 | 11.1 | 20.5 |
| | | | | Mercury (mcg/L) | … | … | … | … | … | … |
| | | | | Chlorophyll (mcg/L) | 0 | … | 0.9 | … | … | … |
| 14 | 2 | 1 | Proportion of national exclusive economic zones managed using ecosystem-based approaches | | 100% | 100% | 100% | 100% | 100% | 100% |

| SDG | Target | Indicator | Indicator Title | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 3 | 1 | Average marine acidity (pH) measured at agreed suite of representative sampling stations | Khor Al Adaid | … | … | ND | … | 7.9 | 7.7 |
| | | | | Mesaieed | … | … | 6.5 | … | 8.1 | 8.1 |
| | | | | Al Wakra | … | … | 7.2 | … | ... | 8.1 |
| | | | | Ras Bufintas | … | … | 6.8 | … | 8.0 | NM |
| | | | | Doha | … | … | ND | … | 8.0 | 8.0 |
| | | | | Al Khor | … | … | ND | … | 8.1 | 7.8 |
| | | | | Al Thakhira | … | … | ND | … | 8.2 | 7.8 |
| | | | | Ras Laffan | … | … | ND | … | 8.0 | 7.9 |
| | | | | Ras Rukn | … | … | ND | … | 8.1 | 7.8 |
| | | | | Dukhan | … | … | … | … | 8.1 | 7.9 |
| | | | | Salwa | … | … | … | … | 8.0 | 7.8 |
| 14 | 4 | 1 | Proportion of fish stocks within biologically sustainable levels | | 72% | 75% | 76% | 68% | 80% | 59% |
| 14 | 5 | 1 | Coverage of protected areas in relation to marine areas | | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 |
| 14 | 6 | 1 | Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing | | The fishing fleet in the State of Qatar is traditional and operates only in Qatari territorial waters. Qatar has no vessels operating outside the territorial or international waters. In addition, the fishing ports in Qatar do not receive any fishing vessels operating outside the territorial waters of Qatar. | | | | | |
| 14 | 7 | 1 | Sustainable fisheries as a proportion of GDP in small island developing States, least developed countries and all countries | | 0.09 | 0.10 | 0.12 | 0.16 | 0.19 | ... |

| SDG | Target | Indicator | Indicator Title | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | b | 1 | Progress by countries in the degree of application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fisheries (Yes/No) | | Yes | Yes | Yes | Yes | Yes | Yes |
| **15** | **Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss** | | | | | | | | | |
| 15 | 1 | 1 | Forest area as a proportion of total land area | | Mangrove area in 2015 = 9 $km^2$ | | | | | |
| 15 | 2 | 1 | Progress towards sustainable forest management | | ... | ... | ... | ... | ... | ... |
| 15 | 3 | 1 | Proportion of land that is degraded over total land area (2015) | Total area of degraded land | 10619 | | | | | |
| | | | | Land degradation affects a moderate above average level | 275 | | | | | |
| | | | | Land degradation affects below average level | 2797 | | | | | |
| | | | | Land degradation affects slightly above average | 5696 | | | | | |
| | | | | Land degradation affects slightly below average | 802 | | | | | |
| 15 | 4 | 1 | Coverage by protected areas of important sites for mountain biodiversity | | NA | NA | NA | NA | NA | NA |
| 15 | 4 | 2 | Mountain Green Cover Index | | NA | NA | NA | NA | NA | NA |
| 15 | 5 | 1 | Red List Index | Red List Index | ... | ... | ... | 0.84 | 0.84 | 0.83 |
| | | | | Red List Index (maximum limit) | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | Red List Index (minimum limit) | 0 | 0 | 0 | 0 | 0 | 0 |

| SDG | Target | Indicator | Indicator Title | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 6 | 1 | Countries that have adopted legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits (Yes/No) | Yes | Yes | Yes | Yes | Yes | Yes |
| 15 | 7 | 1 | Proportion of traded wildlife that was poached or illicitly trafficked | ... | ... | ... | 0.30% | 0.20% | 0.10% |
| 15 | 8 | 1 | Countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species (Yes/No) | Yes | Yes | Yes | Yes | Yes | Yes |
| 15 | c | 1 | Proportion of traded wildlife that was poached or illicitly trafficked | ... | ... | ... | 0.003 | 0.002 | 0.001 |

... Unavailable
NM Not Measured
ND Not Disclosed
NA Not Applicable

Data Sources:
Ministry of Municipality and Environment
Ministry of Interior
Ministry of Justice
Ministry of Public Health
Qatar General Electricity & Water Corporation
Public Works Authority
Planning and Statistics Authority - General Census
Planning and Statistics Authority - Land Use Survey

Chapter One

# 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 24° 27 `and 26° 10`north of the equator and longitudes 50° 45`and 51° 40`east 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.

### *1.2. Area*

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

**Table 1.1: Area of the State of Qatar ($km^2$) by General Census Years 1986-2015**

| Year | Area ($km^2$) |
|---|---|
| 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 1.2: Qatari islands by area and distance from coast line (km)**

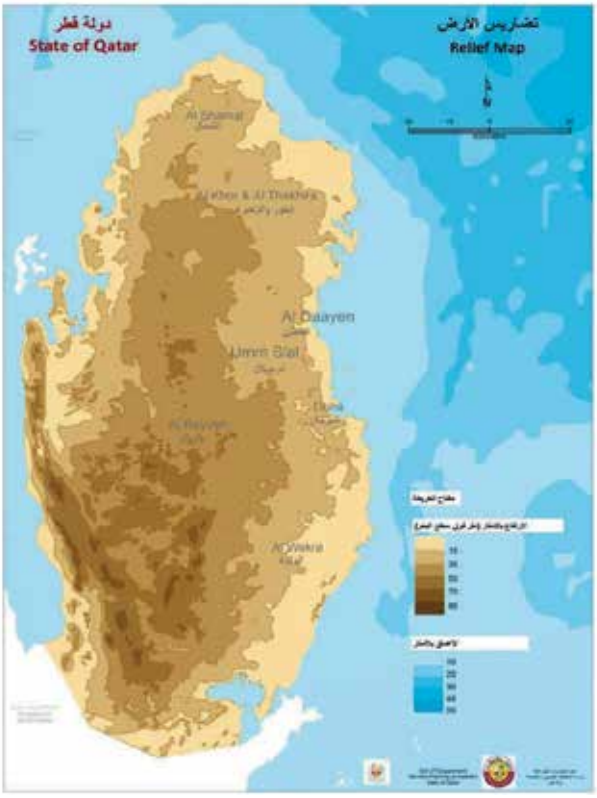
| Island | Area (km) | Distance from Coast Line (km) |
|---|---|---|
| Halul | 1.5 | 90.0 |
| Al Aalyah | 1.8 | 7.0 |
| Al Safliyah | 1.0 | 5.0 |
| Shraouh | 1.0 | 63.0 |
| Ashat | 6.0 | 10.0 |
| Al Bashiryah | 5.0 | 1.5 |
| Rukn | 1.4 | 2.0 |
| Total | 17.68 | 178.5 |

Source: Ministry of Interior, Directorate of Coasts Security

## *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.

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




Source: GIS Network – Qatar

## *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*

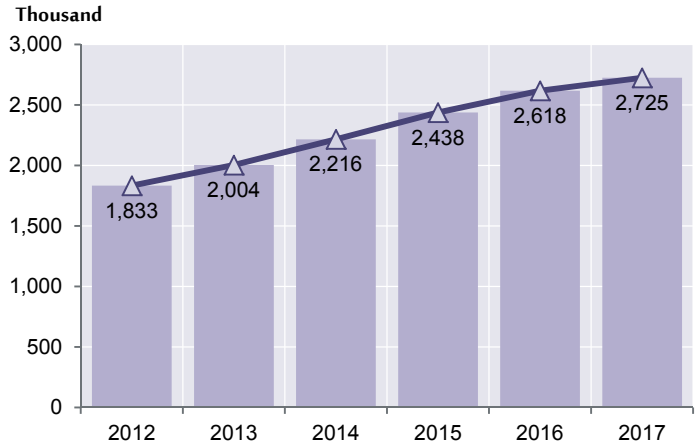
The administrative boundaries of municipalities are divided into eight municipalities, namely; Doha, Al Rayyan, Al Wakra, Umm Salal, Al Khor, Al Shamal, Al Thaayin and Al Shihaniyah. Al Wakra Municipality is the largest municipality area wise (22.2% of total area), whereas Doha Municipality is the smallest (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 seven hundred and twenty five thousand people in 2017. The figure below shows an increase in population during previous years, with an annual growth rate of 8.3% between 2012 and 2017.

**Figure 1.1: Mid-Year Population Estimates in Thousands (2012-2017)**




## 2.2. Annual Population Growth Rate

The annual population growth rate in Qatar reached its highest peak in 2014, amounting to 10%. Then the rate slightly retreated to 9.3% during the years 2016 and 2017. 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 1.3: Population and Annual Population Growth Rate 2012-2017**

| Description | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| Mid-year population | 1,832,903 | 2,003,700 | 2,216,180 | 2,437,790 | 2,617,634 | 2,724,606 |
| Annual Population Growth Rate | 6% | 9% | 11% | 10% | 7% | 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 Wakra Municipality comes first in terms of area by 22.2% 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 $km^2$). 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 $km^2$.

**Table 1.4: Population by Municipality and Density (person/$km^2$), Census 2015**

| Municipality | Area ($km^2$) | Population | Population Density (person/$km^2$) |
|---|---|---|---|
| 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

The statistics in Table (1.5) indicate a six-fold increase in population density rate between the censuses in 1986 and 2015, from 32 persons per $km^2$ in Census 1986 up to 207 persons per $km^2$ in Census 2015. We also find that population density rate doubled during the last two censuses in 2010 and 2015, from 146 to 207 persons per $km^2$.

**Table 1.5: Population and Population Density (person/km2) by Census Years 1986-2015**

| Year | Population | Area of Qatar ($km^2$) | 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 2017, however, the annual growth rate of demand for these goods and services declined by 4.3% over the period 2013-2017. Nevertheless, compared to 2016, the annual growth rate of demand for goods and services improved by 100% in 2017.

**Table 1.6: 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), 2013-2017***

| Indicator | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| GDP at current prices (million QR) | 723,369 | 750,658 | 588,733 | 552,305 | 607,620 |
| Average annual per capita GDP growth rate (%) | -2.9 | -6.2 | -28.7 | -12.6 | 5.7 |
| Consumer Price Index (2013=100) | 100 | 103 | 105 | 108 | 108 |
| Per capita GDP rate (QR) | 361,016 | 388,717 | 241,503 | 210,994 | 223,012 |
| Inflation rate in Qatar 2012-2017 at current prices (%) | 3.2 | 3.4 | 1.9 | 2.6 | 0.5 |
| GDP growth by economic activity (%) | 4.4 | 4.0 | 3.7 | 2.1 | 1.6 |

*Data from previous years have been updated from the source
Source: PSA, Economic Statistics Bulletin

The statistics in Table (1.7) show a huge growth in the construction sector in 2017 compared to 2013 by 123%, whereas the average growth rate of this sector reached 22.2% over the period 2013-2017.

The second highest change was in agriculture, forestry and fishery activities, reaching 59% in 2017 compared to 2013. The annual growth rate in this activity during the period 2013-2017 was 12%. In the same context, the growth rate in activities in the field of health and social work increased by 51% in 2017 compared to 2013 with an annual growth rate of 11% during the period 2013-2017.

**Table 1.7: Percentage distribution of GDP growth by economic activity at constant prices (2013=100), 2013-2017**

| Economic Activity | | 2013 | 2014 | 2015 | 2016 | 2017 | Annual Growth 2013- Rate 2017 |
|---|---|---|---|---|---|---|---|
| 1 | Agriculture, Forestry and Fishery | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 12.3 |
| 2 | Mining and quarrying | 55.7 | 53.2 | 51.1 | 49.5 | 84.4 | -0.7 |
| 3 | Manufacturing | 10.2 | 10.2 | 10.3 | 10.1 | 10.1 | 2.5 |
| 4 | Electricity, gas, steam, HVAC, water supply, drainage, waste management and treatment activities | 0.4 | 0.4 | 0.5 | 0.5 | 0.5 | 5.8 |
| 5 | Construction | 5.4 | 6.4 | 7.5 | 9.4 | 10.8 | 22.2 |
| 6 | Wholesale and retail trade and repair of motor vehicles and motorcycles | 5.9 | 6.3 | 6.5 | 5.7 | 5.5 | 1.1 |
| 7 | Transport and storage | 2.0 | 2.1 | 2.1 | 2.3 | 2.3 | 5.3 |
| 8 | Accommodation and food service activities | 0.7 | 0.8 | 0.8 | 0.8 | 0.8 | 4.0 |
| 9 | Information and Communications | 1.1 | 1.2 | 1.3 | 1.2 | 1.2 | 4.3 |
| 10 | Finance and insurance activities | 5.4 | 5.8 | 6.1 | 6.5 | 6.9 | 9.6 |
| 11 | Real estate activities | 4.0 | 4.2 | 4.4 | 4.6 | 4.7 | 7.6 |
| 12 | Professional, scientific and technical activities, and administrative and support service activities | 2.2 | 2.3 | 2.4 | 2.5 | 2.5 | 5.9 |
| 13 | Public administration and compulsory social security | 5.1 | 5.4 | 5.6 | 5.3 | 5.2 | 2.9 |
| 14 | Education | 1.3 | 1.4 | 1.4 | 1.4 | 1.5 | 6.6 |
| 15 | Health and social work activities | 1.2 | 1.3 | 1.4 | 1.7 | 1.6 | 10.8 |
| 16 | Arts, entertainment, leisure and other service activities | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 4.1 |
| 17 | Activities of households hiring individuals, and activities of households producing non-distinctive goods and services for their own use | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 7.4 |
| 18 | Indirectly measured financial services | -2.6 | -2.6 | -3.1 | -3.3 | -3.6 | 11.5 |
| 19 | Import duties | 0.4 | 0.3 | 0.2 | 0.1 | 0.1 | -32.0 |
| **Total** | | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | - |

Source: PSA, Economic Statistics Bulletin

Chapter Two

# 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 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

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.

### Box 2.1: Land Use in Relation to National Policies

The following programs/projects have emanated from the national strategy to enhance economic and technical efficiency.

**Program/Project:**
1. Land use efficiency.
**Objectives:**
- Endorse and implement the comprehensive national plan for urban development and integrated transport.
- Establish economic zones dedicated for industrial lands, along with good services and competent management and organization.
- Achieve sustainable improvements in agricultural productivity.

**Output:**
- Improve land use efficiency.

**Program/Project:**
2. Database on environmental information/land use.
**Objective:**
- Establish an electronic database that offers the possibility to search.

**Output:**
- Improve environment management and cooperation at regional and international levels.

**Land use in relation to international frameworks, such as the SDGs**

- Goal 2, Indicator 2.4.1: Proportion of agricultural area under productive and sustainable agriculture.
- Goal 15, Indicator 15.1.1: Forest area as a proportion of total land area.
- Goal 11, Indicator 11.3.1: Ratio of land consumption rate to population growth rate.

**Land use in relation to international frameworks, such as the international competitiveness indicators**

- Road network density per $km^2$.

**Table 2.1: Land use area according to UN classification ($km^2$), 2012-2017**

| No. | Classification | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| 1 | Agricultural land area = (2)+(3)+(4)+(5) | 650 | 650 | 650 | 650 | 650 | 650 |
| 2 | Agricultural land area (arable land) | 23.0 | 23.7 | 30.6 | 24.1 | 24.1 | 24.1 |
| 3 | Permanent cropland area | 30.5 | 31.5 | 25.0 | 25.0 | 26.5 | 25.7 |
| 4 | Permanent meadow and pasture land area | 51.8 | 70.9 | 61.2 | 66.7 | 59.4 | 65.8 |
| 5 | Fallow and other agricultural land area | 544.7 | 523.9 | 533.4 | 534.3 | 539.8 | 534.1 |
| 6 | Forest and other wooded land = (7)+(8) | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | Forest land area | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | Other wooded land area | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | Built-up and related land area | … | … | … | … | … | … |
| 10 | Wet open land area (including mangrove area) | ... | ... | ... | 9.1 | 9.1 | 9.1 |
| 11 | Area of dry open land with special vegetation cover | … | … | … | … | … | … |
| 12 | Area of open land without, or with insignificant vegetation cover | … | … | … | … | … | … |
| 13 | Total land area = (1)+(6)+(9)+(10)+(11)+(12) | … | … | … | … | … | … |
| 14 | Water area (inland water bodies area) | … | … | … | … | … | … |
| 15 | Total area of Qatar = (13)+(14) | … | … | … | 11627.0 | 11627.1 | 11627.1 |

… NA

(2) Including area cultivated with grains and vegetables.

(3) Including area cultivated with fruits and palms.

(4) Including area cultivated with green fodder .

(5) Including uncultivated arable land.

Source: PSA, General Census of Population, Housing and Establishments.

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

## 1.1 *Land Used for Roads*

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.

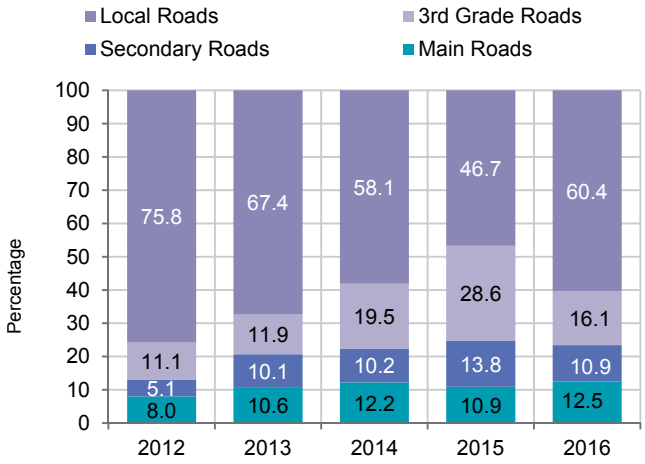
The statistics in Table (2.2) for the length of roads in Qatar during the period 2012-2016, show that in 2016 the total length of roads reached 7,039 km, and the annual growth rate of road lengths during this period was -6%. In terms of road lengths by type of road, the length of the main roads reached 881 km, with an annual growth rate of 5% during the period 2012-2016, and 3rd grade road lengths reached 1,136 km, with an annual growth rate of 3% for the same period. Secondary road lengths also increased to 769 km with an annual growth rate of 14% during the same period. Local road lengths of 4,253 km declined at an annual growth rate of -11% over the same period.

**Table 2.2: Road lengths by road type (km) 2012-2016**

| Road Type | 2012 | 2013 | 2014 | 2015 | 2016 | Annual Growth Rate 2016 and 2012 |
|---|---|---|---|---|---|---|
| Main Roads | 715 | 1,018 | 905 | 1,060 | 881 | 5% |
| Secondary Roads | 456 | 967 | 759 | 1,337 | 769 | 14% |
| 3rd Grade Roads | 1,000 | 1,138 | 1,441 | 2,783 | 1,136 | 3% |
| Local Roads | 6,809 | 6,469 | 4,302 | 4,546 | 4,253 | -11% |
| Total | 8,980 | 9,592 | 7,407 | 9,726 | 7,039 | -6% |

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

**Figure 2.1: Percentage Distribution of Road Lengths by Road Type 2012-2016**




In terms of the relative importance of road lengths in Qatar, Figure (2.1) illustrates that local roads had the lion's share of road lengths in 2012, amounting to 75.8% of total road lengths of all types, compared to 60.4% in 2016. Also in 2016, 3rd grade roads ranked in second place of relative importance with 16.1%, followed by main roads with 12.5%, and then secondary roads with 10.9%.

## *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. The next Box shows the agricultural use in relation to national policies and various international frameworks.

### Box 2.2: Agricultural Use in Relation to National Policies

The following programs/projects have emanated from the national strategy to enhance economic and technical efficiency.

**Program/Project:**
1. Water use efficiency.

**Objectives:**
- Develop a program for water conservation measures within the agricultural development plans.

- Expand the sewage treatment networks to increase recycled water use.
- Achieve sustainable improvements in agricultural productivity.

**Output:**

- Improve water use efficiency.

**Program/Project:**

2. Database on environmental information/agricultural use.

**Objective:**

- Create an electronic database that offers the possibility to search.

**Output:**

- Improve environment management and cooperation at regional and international levels.

**Agricultural use in relation to international frameworks, such as the SDGs 2030**

- Goal 2, Indicator 9: Proportion of change in tariff on imports and exports of agricultural products.

**Agricultural use in relation to international frameworks, such as the international competitiveness indicators.**

- Agricultural land area (thousand hectares)

**Map 2.1: Farms (including Ezbaas), 2010 and 2015**

Figure (2.2) below indicates that the total arable land area in Qatar amounted to 65,000 hectares in 2017. This figure has been constant over the past few years, of which 11,590 hectares were actual cultivated land and 53,410 hectares were arable land in 2017.

**Figure 2.2: Total arable land area (2012-2017)**

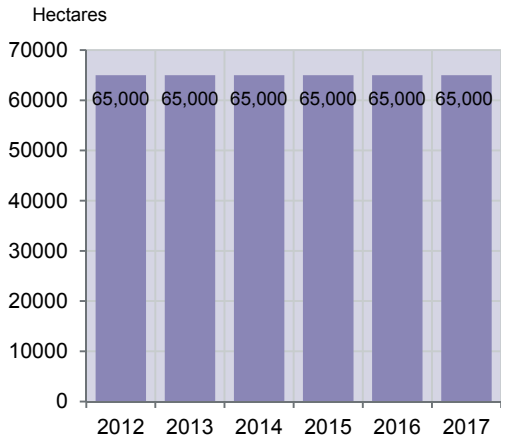
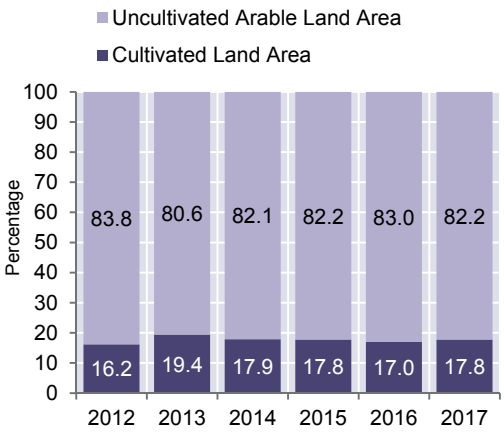



**Figure 2.3: Percentage Distribution of Agricultural Use Area 2012-2017**




In 2017, the percentage of uncultivated arable land area was 82.2% of total arable land, while the percentage of cultivated land area was 17.8% of total arable land. It is noted that the percentages are almost constant over the past few years.

In terms of crop area in agricultural land, Table (2.3) below shows that the green fodder cultivated land area was the largest of total cultivated land in 2017, with an area of 6,583 hectares at a relative importance of 56.8% of total cultivated area, followed by palm tree area by 2,341 hectares at a relative importance of 20.2%, followed by vegetable area by 2,159 hectares at a relative importance of 18.6%, followed by grain area by 277 hectares at a relative importance of 2.4%, and finally the fruit tree area by 230 hectares at a relative importance of 2.0%.

**Table 2.3: Arable land area by type (hectare) 2012-2017**

| Year | Cultivated Land Area | | | | | | Un-Cultivated Land Area | Total Arable Land |
|---|---|---|---|---|---|---|---|---|
| | Grain | Vegetables | Fruits | Palm | Green Fodder | Total | | |
| 2012 | 314 | 1,988 | 570 | 2,477 | 5,183 | 10,532 | 54,468 | 65,000 |
| 2013 | 395 | 1,973 | 550 | 2,599 | 7,093 | 12,610 | 52,390 | 65,000 |
| 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 |
| Annual Growth Rate 2012 and 2017 | **-2%** | **2%** | **-17%** | **-1%** | **5%** | **2%** | **0%** | **0%** |

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

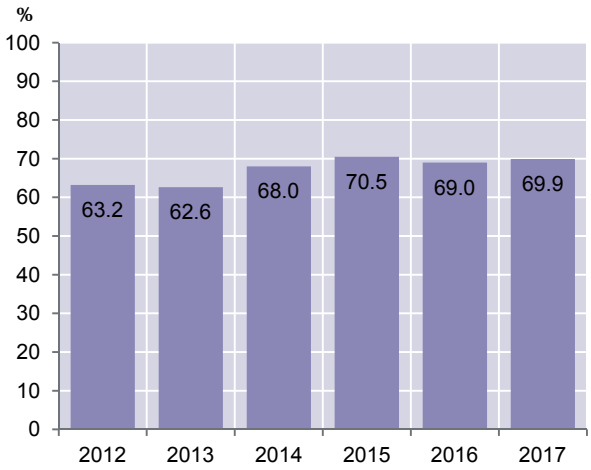
Table (2.4) below indicates that registered farms in Qatar amounted to 1,310 farms in 2017, with an area of 49,988 hectares. As for active farms, they reached 916 farms, with an area of 36,750 hectares.

**Table 2.4: Agricultural Land Uses (Hectare, Number, Percentage) 2012-2017**

| Statement | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual Growth Rate 2012-2017 |
|---|---|---|---|---|---|---|---|
| Total arable area (hectare) | 65,000 | 65,000 | 65,000 | 65,000 | 65,000 | 65,000 | 0% |
| Number of registered farms | 1,318 | 1,340 | 1,282 | 1,290 | 1,307 | 1,310 | 0% |
| Total registered farms area | 44,591 | 47,478 | 47,116 | 47,470 | 49,878 | 49,988 | 2% |
| Total arable area of registered farms | 26,755 | 28,487 | 28,270 | 28,482 | 29,927 | 29,992 | 2% |
| Number of active farms | 833 | 839 | 872 | 910 | 902 | 916 | 2% |
| Total active farms area | 33,168 | 36,123 | 35,862 | 36,631 | 36,426 | 36,750 | 2% |
| Total arable area of active farms | 19,901 | 21,674 | 21,517 | 21,979 | 21,856 | 22,050 | 2% |
| Crop area of exposed crops in active farms | 10,259 | 12,473 | 11,030 | 11,571 | 10,777 | 11,340 | 2% |
| Total crop area of active farms | 10,388 | 12,609 | 11,217 | 11,805 | 11,021 | 11,589 | 2% |
| Farm condensation degree% | 52.2 | 58.2 | 52.1 | 53.7 | 50.4 | 52.6 | 0% |

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

**Figure 2.4: Percentage of active farms of total registered farms 2012-2017**




In terms of distribution of farms by municipality and farm type, Table (2.5) below shows that Al Khor Municipality took the lead in farm area, occupying 35.9% of total farm area in Qatar in 2017, followed by Al Rayyan Municipality by 33.7%. The least farm area was in Doha Municipality with 0.7% 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. Statistics indicate that in 2017 there were 593 crop farms, 25 livestock farms, 675 mixed crop-livestock farms and 17 other farms.

**Table 2.5: Number and area of farms (Hectare) by type and municipality 2017**

| Municipality | Crops | | Livestock | | Mixed | | Others* | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number of Farms | Area (Hectare) | Number of Farms | Area (Hectare) | Number of Farms | Number of Farms | Area (Hectare) | Number of Farms | Area (Hectare) | Number of Farms |
| Doha | 22 | 348.4 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 22 | 348.4 |
| Al-Rayan | 248 | 10067.9 | 11 | 630.5 | 232 | 5966.2 | 9 | 174.2 | 500 | 16838.8 |
| Al Wakra | 41 | 2120.3 | 3 | 892.7 | 27 | 825.3 | 1 | 13.7 | 72 | 3852.0 |
| Umm Salal | 73 | 1700.5 | 2 | 85.8 | 85 | 3193.5 | 1 | 205.4 | 161 | 5185.2 |
| Al Khor | 135 | 6550.2 | 6 | 136.5 | 214 | 11235.0 | 3 | 24.2 | 358 | 17945.9 |
| Al Shamal | 47 | 874.2 | 2 | 8.2 | 89 | 3168.7 | 3 | 14.9 | 141 | 4065.9 |
| Al Dhaayin | 27 | 412.0 | 1 | 14.7 | 28 | 1324.7 | 0 | 0.0 | 56 | 1751.4 |
| Total | 593 | 22073.4 | 25 | 1768.3 | 675 | 25713.4 | 17 | 432.5 | 1310 | 49987.6 |

* 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 534,515 tons, the green fodder production dominated the agricultural production in 2017 by 74.0%, followed by milk and dairy products with 56,146 tons at a relative importance of 7.8%, followed by vegetables with 55,579 tons at a relative importance of 7.7%, followed by fruits and dates with 28,975 tons at a relative importance of 4.0%, followed by meat production with 24,805 tons at a relative importance of 3.4%, followed by fish with 15,358 tons at a relative importance of 2.1%, followed by egg production with 5,753 tons at a relative importance of 0.8%, and finally comes grain production with 1,377 tons at a relative importance of 0.2% (see Table 2.6 below).

**Table 2.6: Agricultural production by food groups (tons) 2012-2017**

| Food Group | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual Growth Rate 2012&2017 |
|---|---|---|---|---|---|---|---|
| Grain | 1,904 | 2,260 | 2,455 | 1,613 | 1377 | 1377 | -6% |
| Green Fodder | 421,256 | 574,207 | 496,136 | 541,957 | 483,210 | 534,515 | 5% |
| Fruits and Dates | 22,546 | 32,989 | 28,244 | 28,339 | 29,794 | 28,975 | 5% |
| Vegetables | 43,565 | 43,446 | 50,648 | 58,077 | 53,596 | 55,579 | 5% |
| Meat | 10,792 | 13,550 | 15,401 | 16,541 | 25,988 | 24,805 | 18% |
| Milk and Dairy Products | 39,551 | 58,743 | 90,803 | 79,804 | 62,061 | 56,146 | 7% |
| Eggs | 4,309 | 4,365 | 4,338 | 4,522 | 4,962 | 5,753 | 6% |
| Fish | 11,273 | 12,005 | 16,213 | 15,202 | 14,513 | 15,358 | 6% |
| Total | 555,196 | 741,565 | 704,238 | 746,055 | 675,501 | 722,508 | 5% |

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 11.5% in 2017, at an annual growth rate of 1% from 2012. A fluctuation in the index of food self-sufficiency ratios in Qatar was observed over the period (2012-2017).

With regard to self-sufficiency by food groups, the percentage of self-sufficiency in fruits and dates group stood at 31.7% in 2017, which is higher than the rest of food groups, followed by self-sufficiency in grain group at 26.8%, egg group at 16.4%, fish group at 13.1%, meat group at 11.9%, and finally came milk and dairy products group at 7.0%. 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.

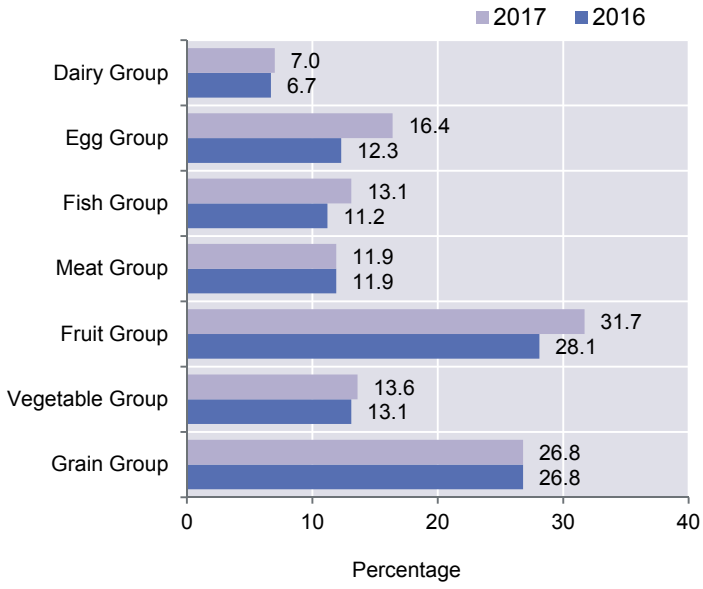
**Table 2.7: Total food commodities available for consumption and percentage of self-sufficiency (ton, %) 2012-2017***

| Year | Local Production (Ton) | Available for Consumption (Ton) | Percentage of Food Self-Sufficiency |
|---|---|---|---|
| 2012 | 176,256 | 1,606,810 | 11.0 |
| 2013 | 212,495 | 1,569,335 | 15.3 |
| 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 |
| Annual Growth Rate 2012&2017 | 7% | 6% | 1% |

*Data from previous years have been updated from the source

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

**Figure 2.5: Percentage of self-sufficiency by food groups 2016&2017**




Note: For the rest of food groups, the percentage of self-sufficiency equals 0%.

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

## 1.5 *Amounts of Fertilizers and Pesticides Used*

### *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 2.8: Amount of fertilizers used by type of fertilizer (ton) 2012-2015***

| | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|
| Soft Compost | 9,012 | 1,743 | 0 | 0 |
| Rough Compost | 0 | 0 | 0 | 0 |
| Poultry Manure | 0 | 0 | 0 | 0 |
| Heat-Treated Compost | 0 | 0 | 0 | 22 |
| Total | 9,012 | 1,743 | 0 | 22 |

*No updated data from source

Source: Ministry of Municipality and Environment

### *1.5.2 Amount of Imported Pesticides by Type*

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 (2.9) below shows that the amount of chemical pesticide imports decreased from 174,463 kg to 112,543 kg (an annual growth rate of -8%) during the period 2012-2017.

**Table 2.9: Qatar imports of chemical pesticides by type (kg) 2012-2017**

| Type of Imported Pesticide | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual Growth Rate 2012-2017 |
|---|---|---|---|---|---|---|---|
| Pesticides used for public health purposes | 141,889 | 33,120 | 9,435 | 0 | 0 | 0 | -100% |
| Insecticides | 25,424 | 12788 | 30,055 | 15,477 | 0 | 0 | -100% |
| Fungicides | 3,150 | 4,920 | 11,680 | 85,141 | 0 | 0 | -100% |
| Herbicides | 4,000 | 0 | 500 | 4,682 | 0 | 0 | -100% |
| Unspecified pesticides | 0 | 34,173 | 500 | 24,700 | 88,861 | 112,543 | - |
| Growth regulators | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Total | 174,463 | 85,001 | 52,170 | 130,000 | 88,861 | 112,543 | -8% |

Source: Ministry of Municipality and Environment

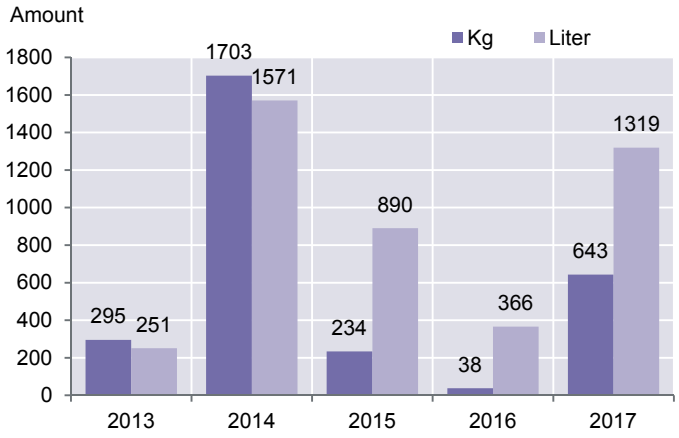
### *1.5.3 Amount of pesticides used to control pests at homes and government facilities*

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.
- 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 (2.6) below shows that the pesticides used to control pests at homes and government facilities amounted to 643 kg and 1,319 liters in 2017.

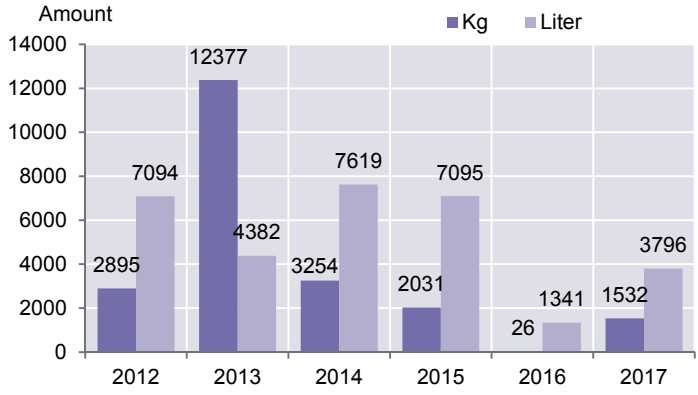
**Figure 2.6: Amount of pesticides used to control pests at homes and government facilities 2013-2017**




### *1.5.4 Amount of 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 (2.7) below show that the pesticides used to control palm pests amounted to 1,532 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 2013.

**Figure 2.7: Amount of pesticides used to control palm tree pests 2012-2017**



## 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 1,129 million in 2017 compared to QR 641 million in 2012, at an annual growth rate of 12%.

As for employment in the agriculture and fishery sector, the sector contributes to the creation of job opportunities through agricultural labour, where the proportion of employment in agriculture activity reached 1.2% of total labour force in 2017. We note that the number of manpower in this sector increased from 18,162 workers in 2012 to 25,544 workers in 2017, the majority of whom were expatriates, with an annual growth rate of 7% during this period.

**Table 2.10: Importance of agriculture, forestry and fishery sector for Qatari economy 2012-2017***

| Year | Economic Agricultural Sector | | | 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 agriculture, forestry and fishery sector | Total number of labour force | Percentage of workers in agriculture, forestry and fishery sector of total labour force% |
| 2012 | 641 | 692,655 | 0.09 | 18,162 | 1,341,193 | 1.35 |
| 2013 | 695 | 734,863 | 0.09 | 21,207 | 1,543,265 | 1.37 |
| 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 | 1,129 | 607,620 | 0.19 | 25,544 | 2,054,502 | 1.24 |
| Annual Growth Rate 2012&2017 | 12% | -3% | 16% | 7% | 9% | -2% |

*Data from previous years have been updated from the source

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

## 1.7 *Amount and value of exports and imports of agricultural products*

The value of exports of Qatari agricultural products amounted to QR 35,316,000 in 2017, decreasing from the exports of 2012 by an annual growth rate of -9%. As for imports of agricultural products, their value increased steadily at an annual growth rate of 9% from QR 2.4 million in 2012 to QR 3.7 million in 2017.

**Table 2.11: Amount and value of agricultural product exports and imports in Qatar (tons, thousand QR) 2012-2017***

| Year | Agricultural Product Exports | | Agricultural Product Imports | |
|---|---|---|---|---|
| | Amount (ton) | Value (thousand QR) | Amount (ton) | Value (thousand QR) |
| 2012 | 15,333 | 55,113 | 917,938 | 2,443,983 |
| 2013 | 20,392 | 87,101 | 875,592 | 2,502,923 |
| 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 |
| Annual Growth Rate 2012&2017 | -2% | -9% | 8% | 9% |

*Data from previous years have been updated from the source

Source: PSA, Foreign Trade Statistics

## 1.8 *Livestock breeding on farms by type and municipality*

The total number of livestock on farms amounted to 379 thousand in 2017, at an annual growth rate of 10% from 2016. Table (2.12) below shows that the annual growth rates of sheep breeding on farms was high, amounting to 16% compared to the rest of the annual growth rates of livestock breeding on farms, followed by other livestock breeding at 12%, and then horse breeding at 7% from year 2016.

**Table 2.12: Number of livestock on farms by type and municipality, 2016 & 2017**

| Type | Total Livestock in 2016 | Total Livestock in 2017 | Annual Growth Rate 2016 & 2017 | Number of Livestock by Municipality 2017 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Doha | Al Rayyan | Al Wakra | Umm Salal | Al Khor | Al Shamal | Al Dhaayin |
| Cow | 21,619 | 19,040 | -12% | 0 | 8,800 | 272 | 2,503 | 5,782 | 1,284 | 399 |
| Sheep (Lamb) | 239,497 | 278,653 | 16% | 0 | 52,370 | 5,947 | 27,343 | 148,158 | 37,054 | 7,781 |
| Goat | 74,210 | 73,629 | -1% | 0 | 24,823 | 4,917 | 8,910 | 28,116 | ,3681 | 3,182 |
| Camel | 12,606 | 12,335 | -2% | 0 | 7,456 | 242 | 1,059 | 2,018 | 1,334 | 226 |
| Horse | 6,110 | 6,531 | 7% | 0 | 772 | 28 | 1,124 | 954 | 3,214 | 439 |
| Other | 24,767 | 27,826 | 12% | 0 | 8,360 | 145 | 2,138 | 12,563 | 3,992 | 628 |
| Total | 378,809 | 418,014 | 10% | 0 | 102,581 | 11,551 | 43,077 | 197,591 | 50,559 | 12,655 |

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

As for the number of livestock on farms by municipality, the above table shows that the number of livestock in Al Khor Municipality had the biggest share in terms of livestock breeding on farms, amounting to 197 thousand, followed by Al Rayyan Municipality with 102 thousand, followed by Al Shamal Municipality with around 51 thousand, followed by Umm Salal Municipality with nearly 43 thousand, and finally Al Wakra Municipality with about 12 thousand. It is worth mentioning that in Doha Municipality there is no livestock breeding, as farms there are allocated for permanent crop cultivation.

## *1.9 Green Space Area by Municipality*

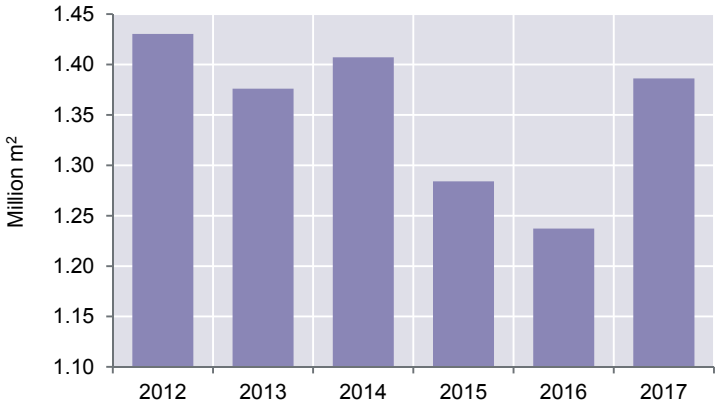
The total green space area in Qatar amounted to 1.4 million square meters in 2017, at an annual growth rate of -1% from 2012. In terms of relative importance of green space area by municipality in 2017, we find that the vast share of green space area was in Doha Municipality with 44.2% of total green space area by municipality. As for annual growth rates in 2012 and 2017, the highest rate of green space area by municipality was in Al Shamal Municipality at 37%, followed by Al Dhaayin Municipality at 35%, and finally came Umm Salal at 28%.

**Table 2.13: Green space area ($m^2$) in Qatar, excluding public parks 2012-2017**

| Municipality | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual Growth Rate 2012 & 2017 |
|---|---|---|---|---|---|---|---|
| Doha | 959,229 | 894,229 | 742,229 | 592,229 | 503,543 | 613,241 | -9% |
| Al Rayyan | 344,269 | 344,269 | 484,873 | 502,206 | 527,206 | 552,206 | 10% |
| Al Shamal | 8,523 | 8,523 | 8,523 | 14,241 | 34,452 | 41,206 | 37% |
| Al Wakra | 52,858 | 52,858 | 47,000 | 47,000 | 47,000 | | -100% |
| Umm Salal | 14,600 | 15,200 | 16,700 | 19,000 | 17,250 | 50,000 | 28% |
| Al Khor | 25,920 | 25,920 | 72,876 | 72,876 | 84,483 | 17,250 | -8% |
| Al Dhaayin | 25,000 | 35,000 | 35,000 | 36,550 | 23,250 | 112,233 | 35% |
| Total | **1,430,399** | **1,375,999** | **1,407,201** | **1,284,102** | **1,237,184** | **1,386,136** | **-1%** |

Source: Ministry of Municipality and Environment

**Figure 2.8: Green space area (million $m^2$) in Qatar, excluding public parks 2012-2017**




The number of planted trees, shrubs and palm trees amounted to 103,527 in 2017, of which 8,251 were palm trees, 33,384 were assorted trees, 35,550 were shrubs and 26,342 were other types. It is noted that there was a decrease in the annual growth rates of the number and area of trees, shrubs and palms from 2012.

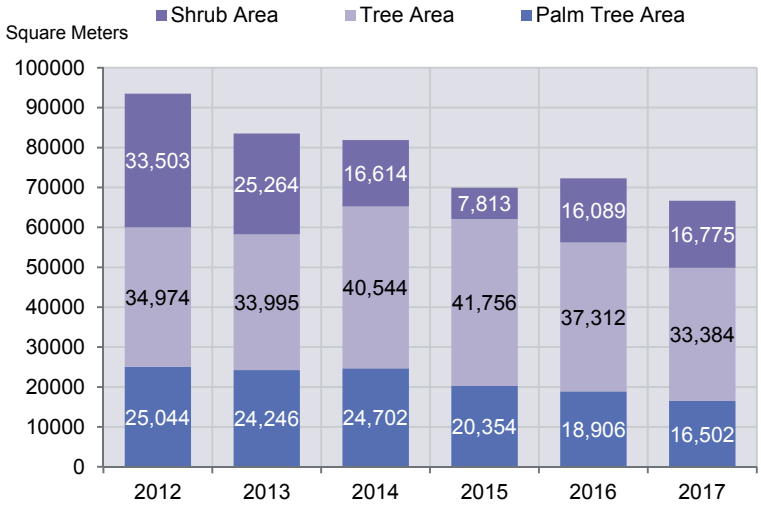
**Table 2.14: Green space area in Qatar, excluding public parks (Number, thousand square meters, km) 2012-2017***

| Statement | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual Growth Rate 2012 & 2017 |
|---|---|---|---|---|---|---|---|---|
| Green space area ($m^2$) | | 1,430,399 | 1,375,999 | 1,407,201 | 1,284,102 | 1,237,184 | 1,416,386 | 0% |
| Re-cultivated area (maintenance) $m^2$ | | 0 | 0 | 0 | 0 | 31,000 | 0 | - |
| Median and roadside planting (km) | | 72,700 | 85,200 | 82,400 | 118,939 | 86,300 | 96,230 | 6% |
| Number | Palm trees | 11,922 | 11,223 | 11,151 | 10,177 | 9,453 | 8,251 | -7% |
| | Trees | 34,974 | 33,995 | 40,504 | 41,756 | 37,312 | 33,384 | -1% |
| | Bushes | 69,006 | 52,528 | 35,227 | 17,626 | 34,177 | 35,550 | -12% |
| | Others | 44,900 | 61,661 | 86,016 | 101,051 | 22,542 | 26,342 | -10% |
| | Total | 160,802 | 159,407 | 172,898 | 170,610 | 103,484 | 103,527 | -8% |
| Area $m^2$ | Palm trees | 25,044 | 24,246 | 24,702 | 20,354 | 18,906 | 16,502 | -8% |
| | Trees | 34,974 | 33,995 | 40,544 | 41,756 | 37,312 | 33,384 | -1% |
| | Bushes | 33,503 | 25,264 | 16,614 | 7,813 | 16,089 | 16,775 | -13% |
| | Others | 93,521 | 83,505 | 81,860 | 69,923 | 72,307 | 66,661 | -7% |

*Data from previous years have been updated from the source

Source: Ministry of Municipality and Environment

**Figure 2.9: Green space area ($m^2$), excluding public parks by planted trees 2012-2017**



## *1.10 Public Park Area by Municipality*

The number of public parks in the State of Qatar was 83 parks in 2017, at an annual growth rate of 7% from the year 2012, with a total area of 1,125,273 square meters. In 2017, the number of trees planted in public parks amounted to 115 palm trees, 212 assorted trees, 2,484 shrubs and 5,003 other types.

In terms of annual growth rates of trees planted in public parks, there was an increase in the annual growth rate of bushes by 18% from 2012, and so was the case for the number of other trees, where the annual growth rates increased by 42%, whereas the annual growth rate of green space area in public parks amounted to 5% from 2012.

## Table 2.15: Public parks by number and area 2012-2017*

| Year | Number of Public Parks | Public Park Area $m^2$ | Cultivated Area (Green Spaces) $m^2$ | Re-cultivated Area (Maintenance) $m^2$ | Number | | | | | Area $m^2$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Palm Trees | Trees | Bushes | Others | Total | Palm Trees | Trees | Bushes | Total |
| 2012 | 58 | 1,093,474 | 576,405 | 147,089 | 747 | 4,234 | 1,082 | 853 | 6916 | 1,494 | 4,234 | 541 | 6,269 |
| 2013 | 67 | 1,138,466 | 597,725 | 147,089 | 795 | 4,429 | 1,134 | 853 | 7211 | 1,590 | 4,429 | 567 | 6,586 |
| 2014 | 81 | 1,244,713 | 623,742 | 147,089 | 812 | 5,992 | 2,654 | 4,649 | 14107 | 1,624 | 5,992 | 1,327 | 8,943 |
| 2015 | 85 | 1,286,145 | 660,542 | 7,750 | 812 | 6,007 | 2,665 | 4,649 | 14133 | 1,624 | 6,007 | 1,333 | 8,964 |
| 2016 | 82 | 1,128,473 | 656,401 | ... | 115 | 212 | 2,484 | 5,003 | 7814 | 230 | 344 | 1,242 | 1,816 |
| 2017 | 83 | 1,125,273 | 721,176 | ... | 115 | 212 | 2,484 | 5,003 | 7814 | 230 | 344 | 1,242 | 1,816 |
| Annual Growth Rate 2012 & 2017 | **7%** | **1%** | **5%** | **-100%** | **-31%** | **-45%** | **18%** | **42%** | | **-31%** | **-39%** | **18%** | |

*Data from previous years have been updated from the source

Source: Ministry of Municipality and Environment

# 2. Water Demand for Total Sectors

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 the pressures resulting from the growing need for energy, as the relation between water and energy is interdependent.

Water demand in the State of Qatar reached 499 million cubic meters in 2015. 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 seeks to enact a law for water to reduce water consumption and sustain water resources for the coming generations.

**Table 2.16: Water demand (million cubic meters per year) 2012-2015**

| Year | Water Demand |
|---|---|
| 2012 | 408.3 |
| 2013 | 436.8 |
| 2014 | 463.4 |
| 2015 | 498.8 |
| Annual Growth Rate 2012 & 2015 | %7 |

Source: Qatar Electricity and Water Co.

# 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.

## Box 3: Power Generation in Relation to National Policies

The following programs/projects have emanated from the national strategy to enhance economic and technical efficiency.

**Program/Project:**
1. Power and gas sector efficiency.

**Objectives:**

- Study options to reduce gas consumption per power and water cogeneration unit through the modernization of the delivery system.
- Improve thermal efficiency in power generation.
- Accelerate the adoption of power-saving technologies.
- Ensure the follow-up of the implementation of green building code in Qatar.
- Establish a national committee for renewable energy.

**Output:**

- Promote power and gas use efficiency and improve air quality

**Program/Project:**

2. Reduction of natural gas combustion and emissions.

**Objective:**

- Reduce gas combustion rate in half to 0.0115 billion cubic meters per million tons of generated power, compared to 0.0230 billion cubic meters per million tons of produced power in 2008.

**Output:**

- Clean air and effective responses to climate change.

**Program/Project:**

3. Database on environmental information/power generation.

**Objective**:

- Create an electronic database that offers the possibility to search.

**Output**:

- Improved environment management and cooperation at regional and international levels.

**Power generation in relation to international frameworks, such as the Sustainable Development Goals 2030 (SDGs)**

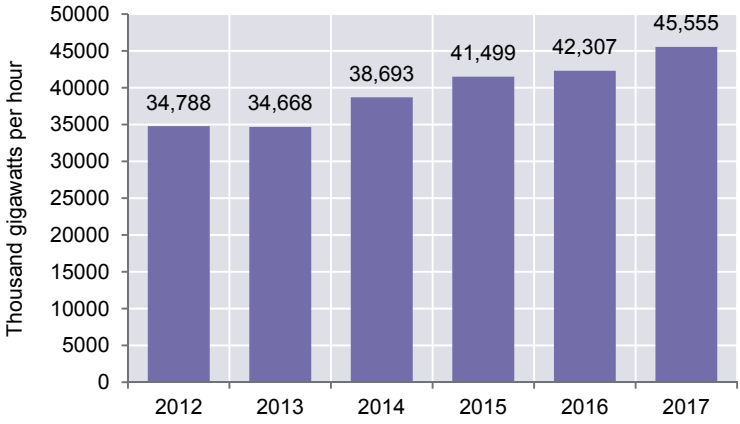
- Goal (7), Indicator (1.3): Power density measured by the primary power and GDP.

**Power generation in relation to international frameworks, such as the international competitiveness indicators**

- Power use intensity.

The total amount of electricity generated reached 45,555 gigawatts per hour in 2017, an annual growth rate of 6% compared to year 2012. The following figure shows a rise in the curve of the amount of electricity generated.

**Figure 2.10: Power generation per year (thousand gigawatts per hour) 2012-2017**




# 4. Modes of Transport by Type of Licence

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. Box (4) below shows the transport use in relation to national policies and international frameworks.

## Box 4: Modes of Transport Use in Relation to National Policies

The following programs/projects have emanated from the national strategy to enhance economic and technical efficiency.

**Program/Project:**
1- Improve air quality management and reduce emissions.
**Objective:**

- Eliminate increased ozone levels in Qatar through the improvement of air quality management.

**Output**:

- Clean air and effective responses to climate change.

**Program/Project:**
2- Prevent communicable diseases.

**Objectives**:

- Reduce the rate of pulmonary tuberculosis incidence from 6.1 cases to 1.1 cases per 10,000 people.
- Implement early warning system to monitor and track cases.

**Output:**

- Reduce the threat of communicable diseases.

**Program/Project:**
3- Land use efficiency.
**Objective**:

- Adopt and implement a comprehensive national plan for urban development and integrated transport.

**Output**:

- Improve land use efficiency.

**Program/Project:**
4. Database on environmental information/modes of transport.

**Objective**:

- Create an online database that offers search possibility.

**Output**:

- Improve environment management and cooperation at regional and international levels.

**Modes of transport use in relation to international frameworks, such as the Sustainable Development Goals 2030 (SDGs)**

- Goal 3, Indicator 6: Tuberculosis incidence per 1,000 people per year.

**Modes of transport use in relation to international frameworks, such as the international competitiveness indicators**

- Density of road network per $km^2$.

The statistics in Table (2.17) below show that the total number of cars and motorcycles by type of licence was more than one million in 2017, of which 1.4 million were government-licence cars, private cars, private transport cars and taxis.

The table also shows the cumulative numbers of various modes of transport during the period 2012-2017, where other types of licences topped the list with an annual growth rate of 94% from the year 2012, followed by government vehicle licences with 39%, and then private transport licences at an annual growth rate of 14%.

**Table 2.17: Total cars and motorcycles by type of licence 2012-2017***

| Type of Licence | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual Growth Rate 2012 & 2017 |
|---|---|---|---|---|---|---|---|
| Government | 684 | 11,863 | 12,902 | 14,128 | 14,895 | 3,531 | 39% |
| Private | 562,266 | 708,439 | 780,621 | 850,882 | 908,995 | 955,328 | 11% |
| Private Transport | 211,443 | 293,866 | 324,250 | 356,664 | 381,439 | 401,028 | 14% |
| Heavy Equipment | 25,024 | 45,098 | 50,090 | 56,991 | 61,582 | 26,699 | 1% |
| Taxi | 27,320 | 9,117 | 10,448 | 11,473 | 12,243 | 13,143 | -14% |
| Motorcycle | 12,542 | 10,952 | 13,169 | 15,438 | 17,261 | 19,742 | 9% |
| Trailer | 33,055 | 31,107 | 34,273 | 39,221 | 42,855 | 44,737 | 6% |
| Public Transport | 2,773 | 2,238 | 2,345 | 2,787 | 2,813 | 2,821 | 0% |
| Other | 2,020 | 5,395 | 5,396 | 5,396 | 5,396 | 55,704 | 94% |
| Total | **877,127** | **1,118,075** | **1,233,494** | **1,352,980** | **1,447,479** | **1,522,733** | **12%** |

*Data from previous years have been updated from the source

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

The statistics in Table (2.18) below indicate that the total number of registered new cars and motorcycles stood at 71,497 in 2017, with an annual growth rate of -3% from year 2012. All types of licences showed low growth rates except for heavy equipment, with a growth rate of 148%, motorcycles 13% and trailers 8% from year 2012.

**Table 2.18: Registered new cars and motorcycles by type of licence 2012-2017**

| Type of Licence | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual Growth Rate 2012 & 2017 |
|---|---|---|---|---|---|---|---|
| Government | 168 | 100 | 520 | 448 | 224 | 46 | -23% |
| Private | 58,923 | 65,025 | 69,479 | 67,447 | 55964 | 43868 | -6% |
| Private Transport | 21,712 | 24,311 | 29,129 | 31,274 | 23801 | 18713 | -3% |
| Heavy Equipment | 37 | 3,242 | 4,899 | 6,767 | 4494 | 3469 | 148% |
| Taxi | 1,164 | 881 | 1,328 | 1,024 | 727 | 876 | -6% |
| Motorcycle | 1,328 | 1,477 | 1,903 | 2,006 | 1654 | 2404 | 13% |
| Trailer | 1,146 | 1,358 | 2,910 | 4,725 | 3406 | 1679 | 8% |
| Public Transport | 7 | 13 | 31 | 379 | 19 | 7 | 0% |
| Other | 534 | 674 | 122 | 581 | 405 | 435 | -4% |
| Total | 85,019 | 97,081 | 110,321 | 114,651 | 114651 | 71497 | -3% |

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

# 5. Completed Buildings Connected to Public Utilities

## Box 5: Urban Wastewater in Relation to National Policies

The following programs/projects have emanated from the national strategy to enhance economic and technical efficiency.

**Program/Project:**

1- Water efficiency use projects.

**Objectives:**

- Expand the sewage treatment networks to increase recycled wastewater use.
- Study the feasibility of establishing systems for the collection and treatment of industrial wastewater.

**Output**:

- Improve water use efficiency.

**Program/Project:**

2. Database on environmental Information/wastewater.

**Objective**:

- Create an online database that offers search possibility.

**Output**:

- Improve environment management and cooperation at regional and international levels.

**Wastewater use in relation to international frameworks, such as the Sustainable Development Goals 2030 (SDGs)**

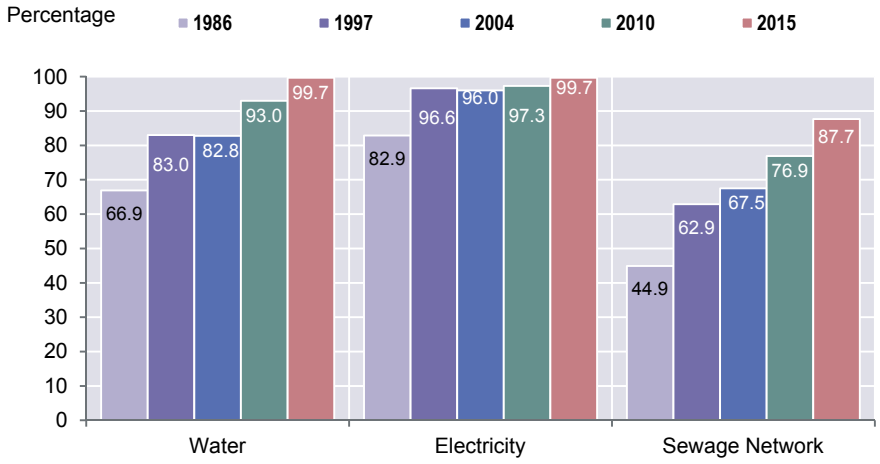
- Goal 6, Indicator 1: Proportion of population using safely managed drinking water services.
- Goal 6, Indicator 2: Proportion of population using safely managed wastewater services.
- Goal 6, Indicator 3: Proportion of safely treated wastewater by economic activity.
- Goal 7, Indicator 1: Proportion of population with access to electricity.

**Wastewater use in relation to international frameworks, such as the international competitiveness indicators**

- Proportion of population whose domestic wastewater is treated at wastewater treatment plants.
- Intensity of consumption/abstracted amount in million cubic meters.

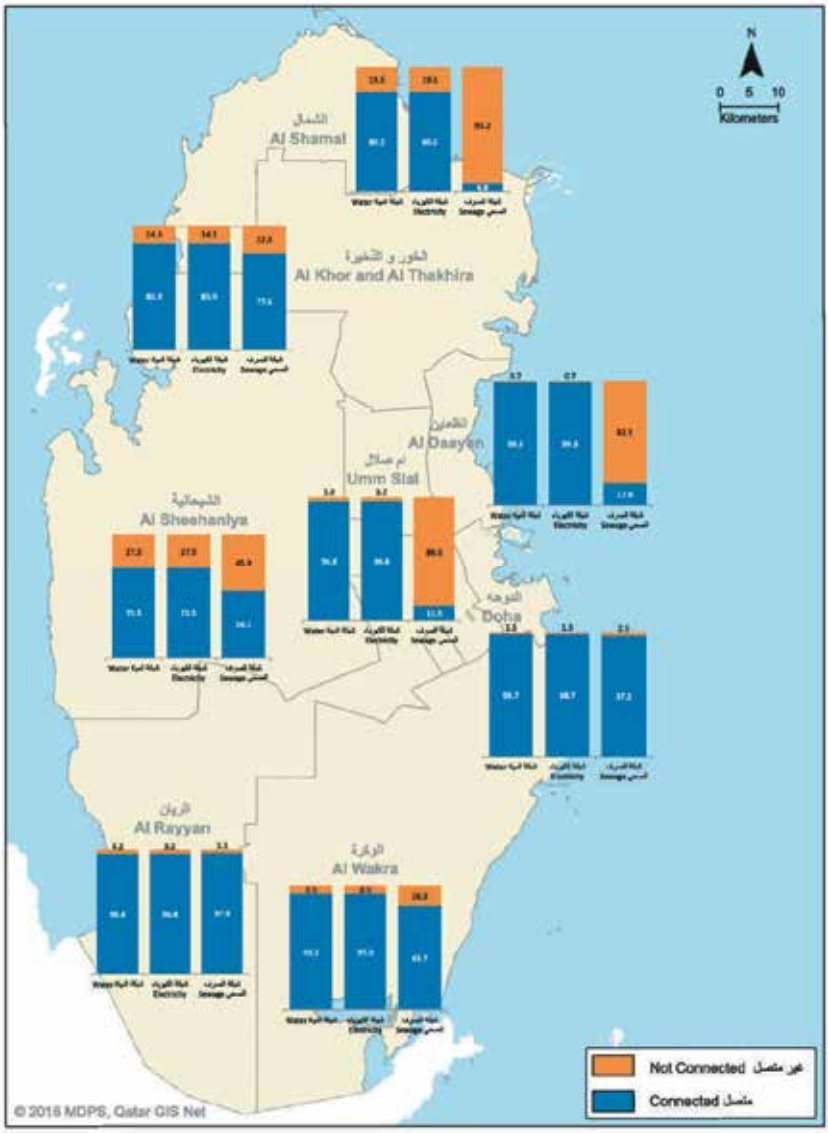
The statistics in Figure (2.11) below indicate a general rise in completed buildings connected to public utility networks during the years of Census 1986-2015. The index of completed buildings connected to electricity grid increased from 82.9% in 1986 to 99.7% in 2015. So is the case with the index of 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.

**Figure 2.11: Percentage of completed buildings connected to public utility network by type of utility and general census years 1986-2015**




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.

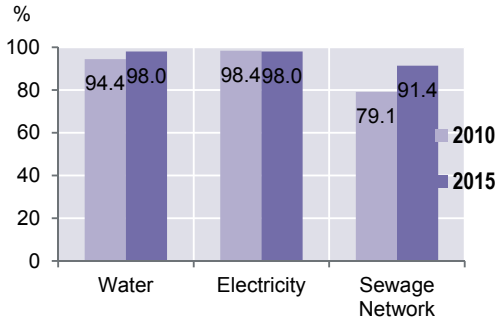
**Map 2.2: Completed buildings by connection to public utilities, Census 2015**



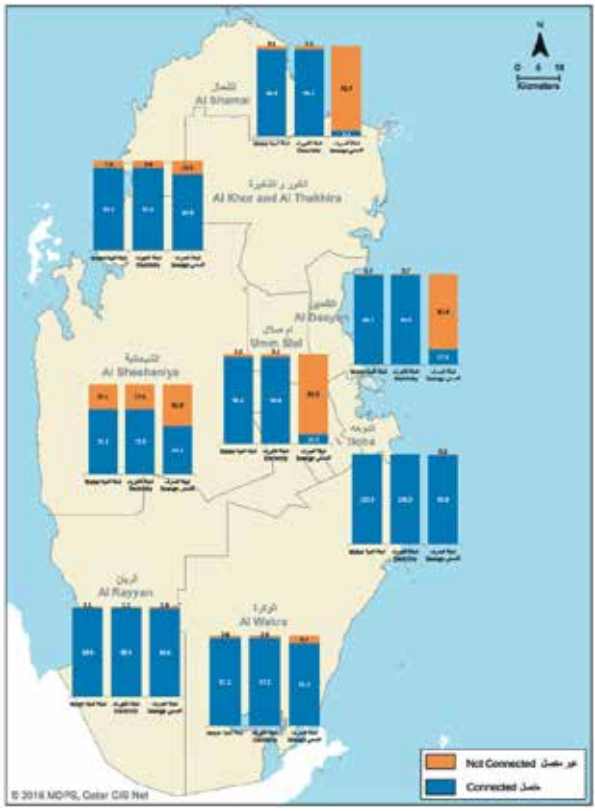
# 6. Housing Units Connected to Public Utilities

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 2.12: Percentage of Housing Units Connected to Public Utility Network by Type of Utility, General Censuses 2010 and 2015**



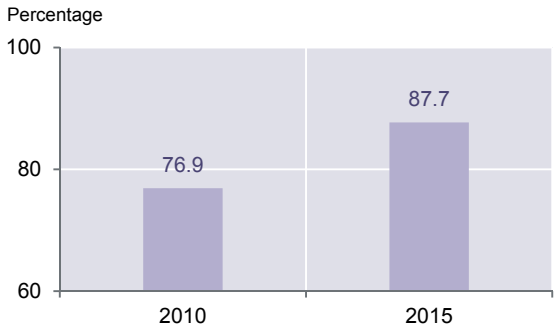

**Map 2.3: Housing Units by Connection to Public Utilities, Census 2015**



# 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.

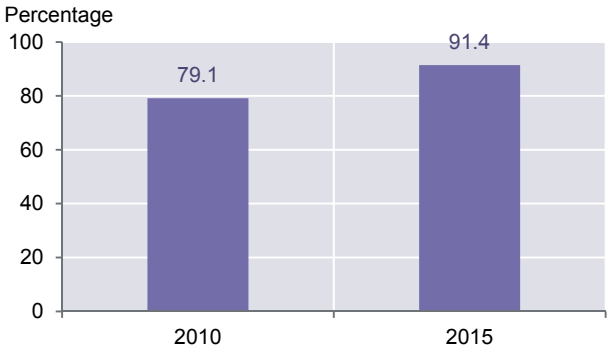
**Figure 2.13: Percentage of completed buildings connected to public sewage network by General Census years 2010-2015**




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%.

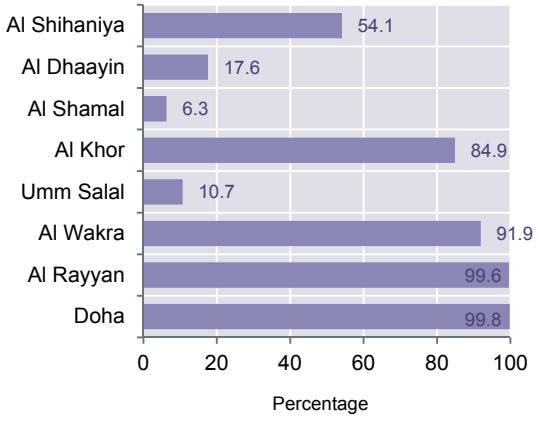
With regards to housing units connected to sewage network, the results of Censuses (2010-2015) indicate that the number of these housing units increased from 204,831 (accounting for 79.1% of total housing units) in 2010 to 286,903 (accounting for 91.4 % of total housing units) in 2015.

**Figure 2.14: Percentage of housing units connected to public sewage network, Census 2010 & Simplified Census 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 Salal and Al Dhaayin Municipalities by 6.3% 10.7% and 17.6% respectively.

**Figure 2.15: Percentage of housing units connected to public sewage network by municipality, Simplified Census 2015**




Source: PSA, General Census

Chapter Three

# The State of the Environmental and the Impacts

# 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 44 stations, 2 monitoring buoys and 9 seismic stations. Table (3.1) 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 3.1: Number of weather monitoring stations (onshore and offshore) during the period 2012-2017**

| Statement | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| No. of air monitoring stations | 20 | 20 | 30 | 30 | 44 | 44 |
| No. of buoys | ... | ... | 2 | 2 | 2 | 2 |
| No. of seismic stations | ... | ... | 6 | 6 | 9 | 9 |

...: Unavailable
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 Average Annual Temperature

During the period 2015-2017, the average annual temperatures recorded at selected monitoring stations alternated between 26.9◦ C and 30◦ C. The annual temperature at Al Karaana station reached 29.9◦ C in 2015, which was the highest temperature among the five stations, followed by Doha International Airport reaching 29.2◦ C in 2016 and 29.5◦ C in 2017. The lowest annual temperature was recorded at Ruwais station reaching 26.9◦ C in 2015. When comparing annual temperatures in 2012 to 2015 by stations, we find that the average temperature at Al Karaana station increased from 27.6◦ C to 29.9◦ C.

**Table 3.2: Average annual temperatures (Celsius) by selected monitoring stations, 2012-2017**

| Station | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| Ruwais | 26.8 | 26.8 | 27.3 | 27.4 | 26.9 | 27.2 |
| Dukhan | 26.8 | 26.6 | 27.1 | 27.5 | 26.8 | 27.1 |
| Mesaieed | 27.8 | 27.5 | 27.9 | 28.4 | 27.3 | 28.0 |
| Al Karaana | 27.6 | 27.1 | 27.5 | 29.9 | 27.6 | 28.1 |
| Doha Intl. Airport | 28.7 | 28.4 | 28.8 | 29.0 | 29.2 | 29.5 |

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

### 1.1.2 Average maximum and minimum monthly temperatures

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

**Table 3.3: Average maximum and minmum temperatures at selected monitoring stations in Qatar in 2017**

| Station Selected | | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Doha Intl. Airport (average 1962-1992)** | Min | 12.8 | 13.7 | 16.7 | 20.6 | 25.0 | 27.7 | 29.1 | 28.9 | 26.5 | 23.4 | 19.5 | 15.0 |
| | Max | 21.7 | 23 | 26.8 | 31.9 | 38.2 | 41.2 | 41.5 | 40.7 | 38.6 | 35.2 | 29.5 | 24.1 |
| **Doha Intl. Airport** | 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 |
| **Al Karaana** | Min | 12.0 | 11.8 | 17.2 | 21.7 | 26.0 | 27.8 | 30.0 | 30.4 | 27.1 | 23.4 | 18.6 | 12.6 |
| | Max | 23.2 | 20.9 | 28.1 | 36.5 | 41.2 | 43.5 | 46.2 | 44.8 | 42.3 | 37.3 | 29.8 | 24.0 |
| **Dukhan** | Min | 14.5 | 13.5 | 18.2 | 22.9 | 27.1 | 28.6 | 30.1 | 30.3 | 27.7 | 25.0 | 20.4 | 15.0 |
| | Max | 20.6 | 19.4 | 25 | 32.1 | 36.5 | 37.2 | 42.2 | 40.2 | 37.6 | 33.3 | 27.8 | 21.4 |
| **Ruwais** | Min | 16.7 | 15.2 | 19.3 | 24.0 | 28.2 | 29.8 | 31.6 | 32.2 | 29.6 | 28.3 | 23.4 | 17.9 |
| | Max | 21.1 | 18.9 | 22.9 | 28.5 | 33.8 | 34.4 | 38.1 | 38.0 | 36.1 | 32.8 | 27.7 | 22.3 |
| **Mesaieed** | Min | 23.2 | 20.9 | 26.4 | 34.5 | 39.5 | 42.9 | 41.6 | 40.3 | 38.5 | 36.6 | 29.8 | 24.9 |
| | Max | 12.9 | 12.9 | 18.2 | 22.5 | 25.9 | 27.0 | 30.2 | 32.2 | 28.6 | 23.4 | 19.9 | 12.8 |

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

The average maximum temperature statistics in five selected monitoring stations show that the highest maximum temperature was recorded at Al Karanah station as of May until August, where the temperature was too high compared to other stations during 2015-2017.

Comparing the average temperatures recorded at Doha International Airport at a long-term rate (1962-2017), we note that the average minimum temperature during 2016-2017 was high, as was the average monthly maximum temperature recorded in 2016.

**Figure 3.1: Monthly average maximum temperatures by month and selected monitoring stations, 2017**

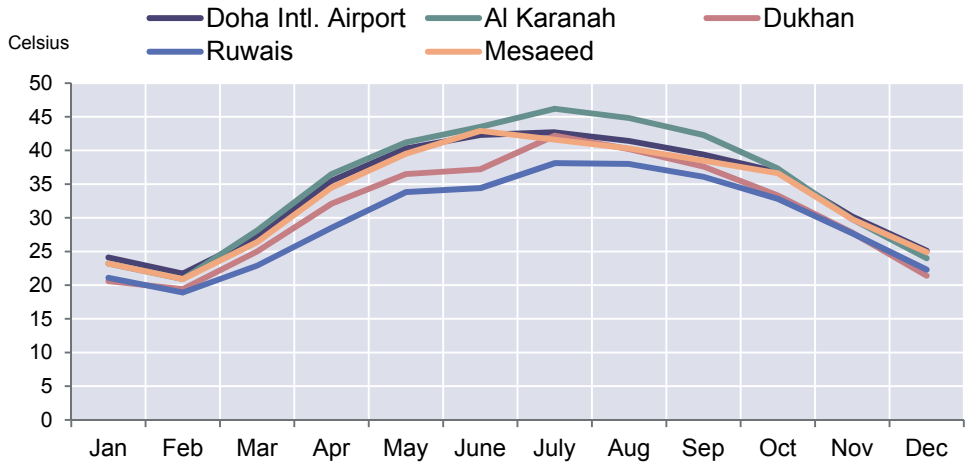
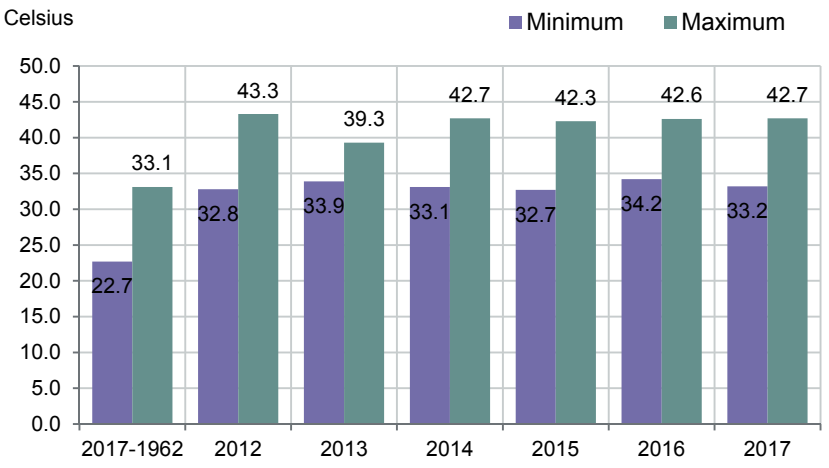



Figure 3.2 below indicates the average minimum and maximum temperatures in July at Doha International Airport during the period 2016-2017 and the average long-term temperatures during the period (1962-2017). The data indicates that the highest average maximum temperature was in 2012, reaching 43.3˚ C, 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 2012-2017 were above the average long-term temperatures (1962-2017).

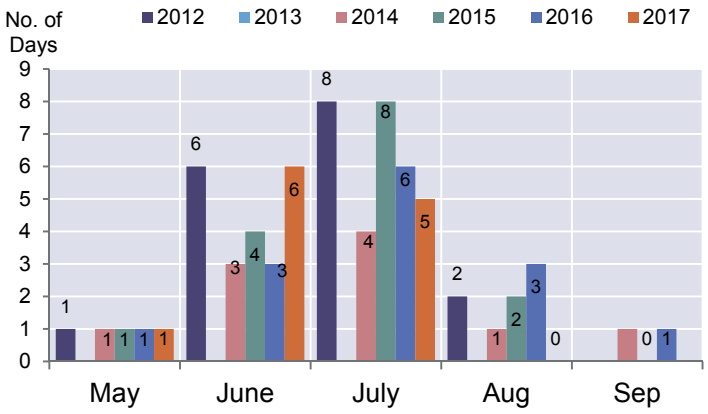
**Figure 3.2: Average minimum and maximum temperatures in July at Doha Intl. Airport (2012-2017) and average long-term temperatures (1962-2017)**



Through maximum and minimum temperature measured at Doha International Airport in 2016-2017, statistics show that July 1 and 9 were the hottest days in 2016, with a high temperature of 48.1˚ C and 47.3˚ C. Alternatively, January 30 was the coldest day in 2016 (10.7° C). In June, 2017, the maximum temperature was between 46.3° C and 47.5° C, while the lowest temperature was 10.2° C on 3 February 2017.

Comparing the temperatures at Doha International Airport during the period (2012-2017), the recorded maximum temperatures that were equal or above 45˚ C were distributed between the months of May and August. However, the month of July in 2012 and 2015 was the hottest in both years, with the temperature soaring above 45˚ C over eight days in July of both years (see Figure 3.3 below).

**Figure 3.3: Number of days in which temperatures were equal or above 45˚ C by month and year at Doha Intl. Airport 2012-2017**




Note: During the remaining months of the year, the temperature did not exceed 45˚ C.

## *1.2 Rainfall*

Rainfall includes all types of rain, such as drizzle (where the rainfall accumulating during 24 hours is less than 1 mm) light, medium and heavy rain that may lead to floods and flash 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 is the case in all the desert areas. The annual average total rainfall at Doha International Airport station rose from 33.1 mm in 2010 to 115.4 mm in 2015. The annual rainfall level dropped to 78.4 mm in 2017. Compared to the selected monitoring stations, the highest annual rainfall averaged 129.7 mm in Ruwais in 2017.

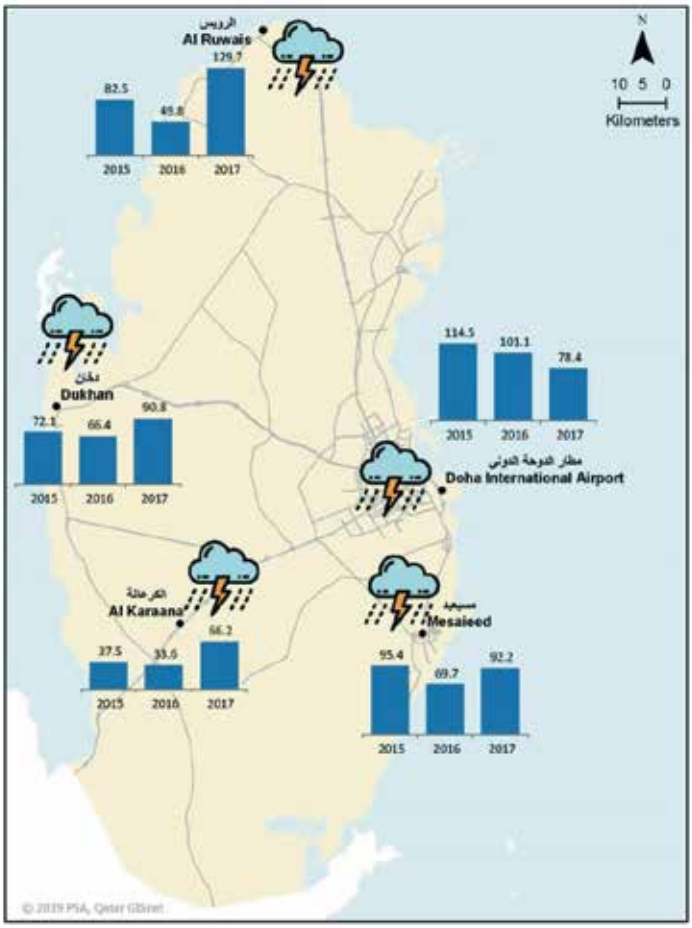
**Table 3.4: Annual rainfall rates by selected monitoring stations (mm) 2012-2017**

| Station | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| Mesaieed | 17.6 | 36.6 | 73.0 | 95.4 | 69.7 | 92.2 |
| Ruwais | 40.0 | 98.3 | 56.5 | 82.5 | 49.8 | 129.7 |
| Dukhan | 35.8 | 54.7 | 44.6 | 72.1 | 66.4 | 90.8 |
| Doha Intl. Airport | 23.9 | 41.6 | 52.4 | 115.4 | 101.1 | 78.4 |
| Al Karaana | 32.9 | 56.3 | 53.4 | 37.5 | 33.6 | 66.2 |

*Data from previous years have been updated from the source

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

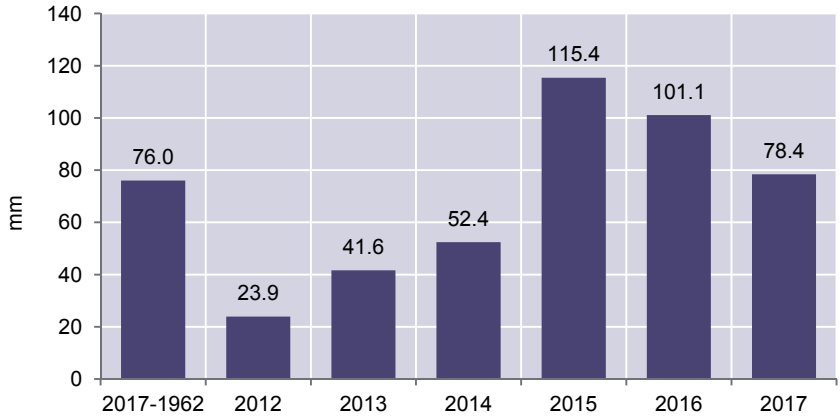
**Map 3.1: Rainfall rate by years and selected monitoring stations (mm) 2015-2017**



### 1.2.2 Annual Long-Term Rainfall Rates

Figure (3.4) below shows the total amount of annual rainfall recorded at Doha International Airport during the period 2012-2017 compared to the average rainfall over the past 55 years and the average long-term rainfall (1962-2017). One can notice that the amount of rainfall rose dramatically in 2015 and 2016, reaching 115.4 mm and 101.1 mm respectively.

**Figure 3.4: Annual rainfall recorded at Doha Intl. Airport (2012-2017), and average long-term rainfall (1962-2017)**




### 1.2.3 Monthly Rainfall Rates

The year 2015 was characterized by spring rainfall in March and April at all selected stations (see Table 3.6). The statistics indicate that the highest amounts of rainfall by months was at Ruwais station in December 2015, at a rate of 58.3 mm, followed by Doha International Airport station in December also at a rate of 51.3 mm.

## *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 Annual Average Relative Humidity

The relative humidity increases in coastal areas than in internal and desert areas. In 2016, the annual average minimum relative humidity amounted to 25%, and the annual average maximum relative humidity amounted to 66%, while in 2017 the average minimum relative humidity amounted to 24%, and the annual average maximum relative humidity amounted to 66%, all of which were measured at Doha International Airport station. The average minimum relative humidity ranged between 18% and 53% and the averages maximum relative humidity ranged between 66% and 83% at the five selected monitoring stations during the period 2015-2017.

During 2016-2017, the average maximum relative humidity recorded at weather monitoring stations, ranged between 66% and 82%, while the average minimum relative humidity ranged between 21% and 51%.

**Table 3.5: Annual average minimum and maximum relative humidity by selected monitoring stations 2012-2017**

| Station | RH | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| Mesaieed | Min | 30 | 32 | 31 | 32 | 28 | 25 |
| | Max | 77 | 76 | 77 | 76 | 74 | 69 |
| Ruwais | Min | 53 | 53 | 49 | 53 | 51 | 50 |
| | Max | 83 | 84 | 82 | 83 | 78 | 78 |
| Dukhan | Min | 35 | 43 | 39 | 38 | 40 | 38 |
| | Max | 81 | 79 | 80 | 80 | 82 | 81 |
| Doha Intl. Airport | Min | 46 | 31 | 31 | 32 | 25 | 24 |
| | Max | 79 | 74 | 71 | 72 | 66 | 66 |
| Al Karaana | Min | 18 | 31 | 22 | 18 | 21 | 21 |
| | Max | 76 | 70 | 81 | 75 | 76 | 77 |

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

## 1.4 *Atmospheric Pressure*

### 1.4.1 Monthly Maximum and Minimum Atmospheric Pressure Values (Highest and Lowest)

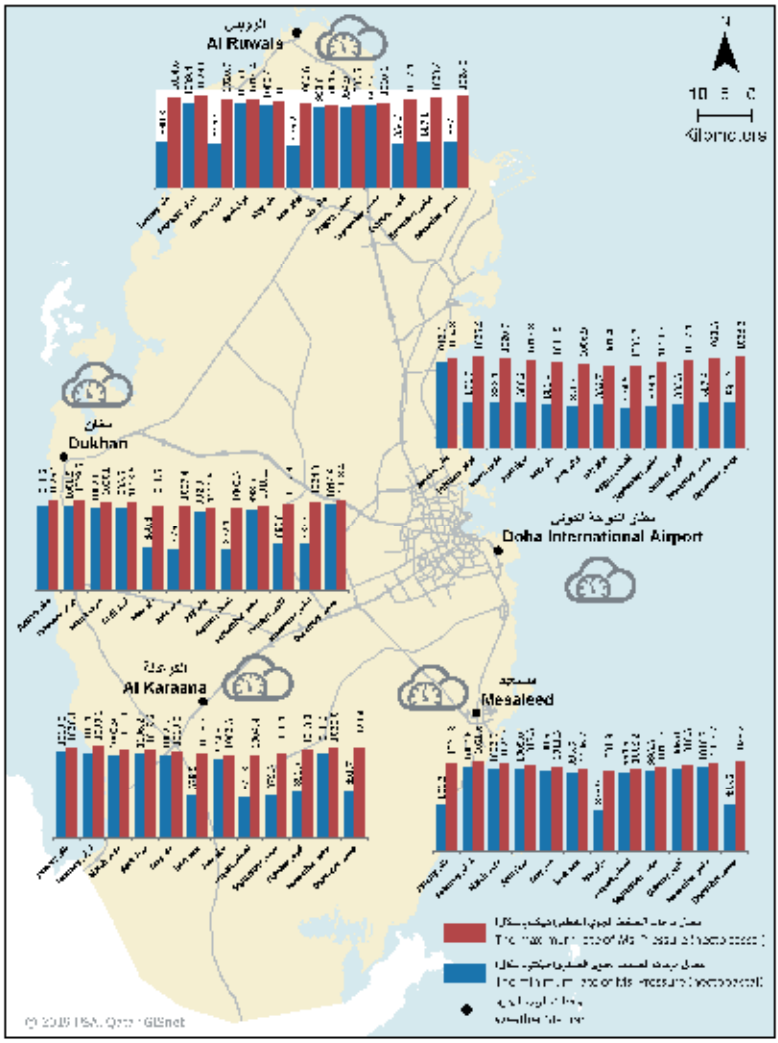
Winter in Qatar witnesses averages of high atmospheric pressure unlike its high temperature summer. According to the statistics of Doha International Airport station, the maximum atmospheric pressure value was 1,028.9 HB in February 2017, while the minimum atmospheric pressure value was 874.6 HB in August 2017.

**Table 3.6: Highest and lowest values of maximum and minimum atmospheric pressure (HB) by months and selected monitoring stations in 2017**

| Month | Doha Intl. Airport | | Al Karaana | | Dukhan | | Ruwais | | Mesaieed | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| Jan. | 1012.3 | 1024.8 | 1013 | 1026.1 | 1011.6 | 1025 | 890.8 | 1024.6 | 891.3 | 1024.8 |
| Feb. | 891.9 | 1028.9 | 1010.4 | 1030.1 | 1008.9 | 1029.5 | 1009.4 | 1029 | 1009.6 | 1028.6 |
| Mar. | 888.1 | 1020.9 | 1003.9 | 1022 | 1002 | 1020.8 | 886.8 | 1020.7 | 1002.9 | 1020.8 |
| Apr. | 888.2 | 1017.8 | 1006.2 | 1019.2 | 1005.5 | 1018.6 | 1005.6 | 1018.4 | 1005 | 1017.8 |
| May | 881.4 | 1011.5 | 1002.7 | 1013 | 880.8 | 1011.5 | 1000.4 | 1011.5 | 1000.6 | 1011.5 |
| Jun. | 876.4 | 1006.9 | 878.5 | 1008.3 | 875.9 | 1007.4 | 875.2 | 1006.8 | 993.5 | 1006.7 |
| Jul. | 882.7 | 1001.4 | 994.5 | 1002.8 | 992.9 | 1001.6 | 993.8 | 1001.4 | 873.9 | 1001.3 |
| Aug. | 874.6 | 1003.2 | 875.8 | 1004.4 | 872.1 | 1003.5 | 994.9 | 1003.5 | 994.9 | 1003.2 |
| Sep. | 879.4 | 1010.3 | 879.5 | 1011.4 | 998.6 | 1010.2 | 999.2 | 1010.1 | 998.8 | 1010.3 |
| Oct. | 883.8 | 1017.1 | 890.7 | 1018.3 | 889.6 | 1017.3 | 884.3 | 1017.1 | 1006 | 1016.8 |
| Nov. | 887.4 | 1023.8 | 1011.6 | 1025 | 888.8 | 1024 | 887.8 | 1023.4 | 1010.7 | 1023.7 |
| Dec. | 891.2 | 1028.3 | 891.7 | 1029.4 | 1014.9 | 1028.4 | 892.1 | 1028 | 893.6 | 1028.2 |
| Total | 894.8 | 1016.2 | 954.9 | 1017.5 | 953.5 | 1016.5 | 943.4 | 1016.2 | 973.4 | 1016.1 |

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

**Map 3.2: Atmospheric Pressure by months and selected monitoring stations (HB) 2017**



## *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 Annual Average Wind Speed

The statistics in Table (3.7) indicate that the annual average wind speed recorded at weather monitoring stations were not much different from each other.

**Table 3.7: Annual average wind speed by selected weather monitoring stations 2012-2017**

| Station | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| Mesaieed | 7.8 | 7.9 | 7.3 | 7.5 | 7.0 | 7.2 |
| Ruwais | 8.2 | 6.9 | 6.2 | 6.8 | 8.1 | 8.5 |
| Dukhan | 8.5 | 8.6 | 8.1 | 8.4 | 8.3 | 8.3 |
| Doha Intl. Airport | 7.3 | 7.5 | 7.2 | 7.1 | 6.6 | 6.6 |
| Al Karaana | 7.2 | 6.9 | 6.4 | 6.8 | 6.6 | 6.4 |

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

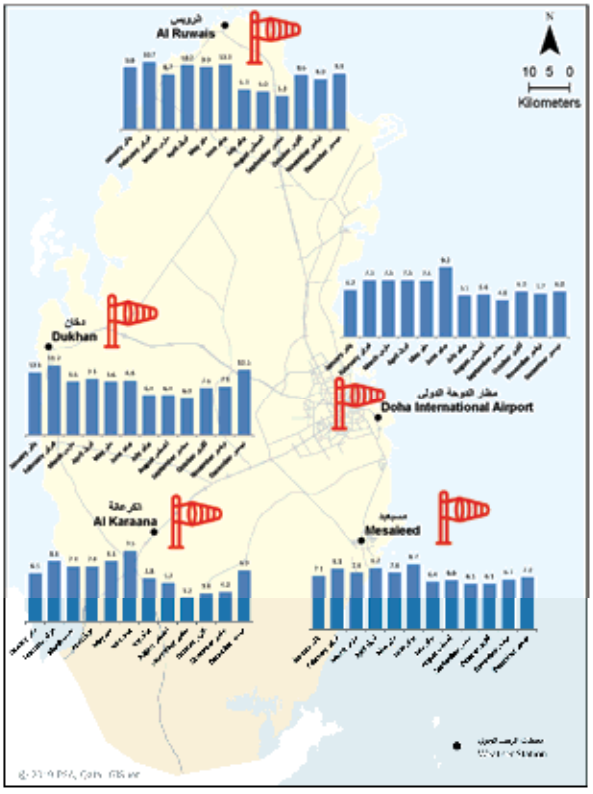
### 1.5.2 Monthly Average Wind Speed

Table (3.8) below shows that the highest value of monthly average wind speed was recorded at Dukhan station in January 2016, reaching 11.3 knots, while the lowest value was at Doha Intl. Airport station in October 2016, reaching 5.0 knots. On the other hand, the highest value of average wind speed was also 11.3 knots in February 2017 at Dukhan station and the lowest was 4.7 knots in September 2017 at Doha Intl. Airport station.

**Table 3.8: Average Wind speed (knots) by months and selected weather monitoring stations, 2017**

| | Mesaieed | Ruwais | Dukhan | Doha Intl. Airport | Al Karaana |
|---|---|---|---|---|---|
| Jan. | 7.1 | 9.8 | 10.1 | 6.2 | 6.5 |
| Feb. | 8.1 | 10.7 | 11.2 | 7.5 | 8.1 |
| Mar. | 7.6 | 8.7 | 8.6 | 7.5 | 7.4 |
| Apr. | 8.2 | 10.2 | 9.1 | 7.5 | 7.4 |
| May | 7.6 | 9.9 | 8.6 | 7.4 | 8.1 |
| Jun. | 8.7 | 10.3 | 8.8 | 9.2 | 9.5 |
| Jul. | 6.4 | 6.3 | 6.4 | 5.5 | 5.8 |
| Aug. | 6.6 | 6.0 | 6.4 | 5.6 | 5.2 |
| Sep. | 6.1 | 5.3 | 6 | 4.8 | 3.2 |
| Oct. | 6.1 | 8.6 | 7.6 | 6.0 | 3.8 |
| Nov. | 6.7 | 8.0 | 7.8 | 5.7 | 4.0 |
| Dec. | 7.0 | 8.8 | 10.5 | 6.0 | 6.9 |
| Total | 7.2 | 8.5 | 8.3 | 6.6 | 6.4 |

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




**Map 3.3: Average wind speed by months and selected weather monitoring stations (knot), 2017**

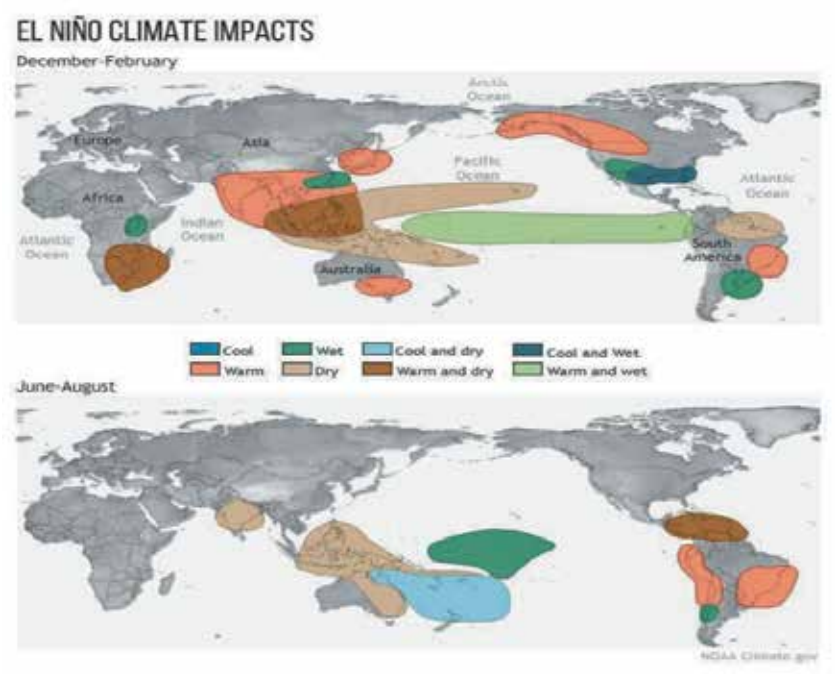
## *1.6 El Niño*

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 .

### 1.6.1 El Niño Impact on Qatar and GCC Countries

El Niño is one of the key environmental indicators of climate sector. Map (3.4) "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 3.4: El Niño climate impacts worldwide**



## *1.7 Weather Phenomena*

There is a close link between human health and the weather phenomena, such as the temperature increase or decrease, dust, sand storm, haze, etc. These weather phenomena cause diseases of the respiratory tract, inflammation of the eyes, conjunctivitis, fever, cold ... etc.

- Haze: the phenomenon of low horizontal visibility caused by fine suspended particles in the air surface layer so that the horizontal visibility is 5 km or less.
- Sand and dust storms: the phenomenon of low visibility when active and strong winds blow sand and dust, leading to low horizontal visibility of 1 km or less.
- Fog: the phenomenon of water vapor condensation in the air layer in contact with the surface of the Earth, leading to low horizontal visibility of less than 1 km.

According to meteorological statistics, there is a wobbling rise in the phenomenon of haze loaded with raised dust and sand, leading to low horizontal visibility of 5 km or less. The maximum number of haze days in 2015 was in July, reaching 18 days, and gradually decreased to 4 haze days in November, and then rose again.

# 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. The box below shows the relationship between this indicator, the national policies and other regional and international commitments.

## Box 6: Biodiversity in Relation to National Policies

The following programs/projects have emanated from the national strategy to enhance economic and technical efficiency.

**Program/Project:**
1. Create a national database on biodiversity.
**Objectives:**
- Create a comprehensive electronic database on biodiversity.
- Expand protected areas that are actively managed.

**Output:**
- Conserve, protect and manage nature and natural heritage in a sustainable manner.

**Program/Project:**
2. Sustainable fish resources.
**Objective:**
- Increase fish stock levels, enforce effective laws and provide possibilities for local aquaculture breeding farms.

**Output:**
- Conserve fish stock.

**Program/Project:**
3. Land use efficiency.
**Objective:**
- Achieve sustainable improvements in agricultural productivity.

**Output:**
- Improve land use efficiency.

**Biodiversity in relation to international frameworks, such as the SDGs2030**
- Goal 14, Indicator 2: Proportion of fish stocks within biologically sustainable levels.
- Goal 14, Indicator 7.1: Sustainable fisheries as a percentage of GDP in small island developing States, least developed countries and all countries
- Goal 14, Indicator 5.1: Coverage of protected areas in relation to marine areas
- Goal 15, Indicator 5.1: Red List Index.
- Goal 15, Indicator 7.1: Proportion of traded wildlife that was poached or illicitly trafficked.

## 2.1 *Nature Reserves*

The number of terrestrial and marine nature reserves stood at 14 in 2017, covering an area of 3,464.74 km$^2$. In 2015, the largest area of nature reserves was in Khor Al Adaid, where the terrestrial area of this reserve reached 1,293.16 km$^2$, accounting for 11.1% of total area of Qatar, while the marine area of this reserve reached 542.04 km$^2$.

**Table 3.9: Area of nature reserves in Qatar (terrestrial and marine) (km$^2$), 2017**

| Nature Reserve | Terrestrial | | Marine | Total |
|---|---|---|---|---|
| | Km$^2$ | % | Km$^2$ | % |
| Total area of Qatar with islands | 11,627.04 | ... | ... | ... |
| Al Eraiq | 54.76 | 0.5% | 0.00 | 54.76 |
| Al Thakhira | 114.46 | 1.0% | 179.14 | 293.60 |
| Khor Al Adaid | 1,291.13 | 11.1% | 542.04 | 1,833.17 |
| Al rafaa | 53.33 | 0.5% | 0.00 | 53.33 |
| Um Al Amad | 5.72 | 0.0% | 0.00 | 5.72 |
| Um Qarn | 24.71 | 0.2% | 0.00 | 24.71 |
| Al Sunai | 3.92 | 0.0% | 0.00 | 3.92 |
| Al Reem | 1,154.10 | 9.9% | 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 | 0.3% | 0.00 | 34.73 |
| Wadi Sultana | 1.33 | 0.0% | 0.00 | 1.33 |
| **Total Reserves** | **2744.41** | **0.24** | **720.33** | **3464.74** |

Source: Ministry of Municipality and Environment

The statistics in the table below indicate stability in the proportion of terrestrial reserves during the period (2012-2017) at 23.60% of total area of Qatar with islands, which is an achievement in itself, despite rapid population growth and urbanization experienced by the State recently.

**Table 3.10: Number and area of nature reserves (terrestrial and marine) in Qatar ($km^2$) 2012-2017**

| Year | Number of Terrestrial Nature Reserves | Number of Marine Nature Reserves | Total Number of Terrestrial and Marine Nature Reserves | Area of Terrestrial Nature Reserves ($km^2$) | Area of Marine Nature Reserves ($km^2$) | Area of Terrestrial and Marine Nature Reserves ($km^2$) | Percentage of Terrestrial Nature Reserves to Total Area |
|---|---|---|---|---|---|---|---|
| 2012 | 11 | 2 | 13 | 2,743.19 | 720.51 | 3,463.70 | 23.54% |
| 2013 | 11 | 2 | 13 | 2,742.97 | 720.51 | 3,463.48 | 23.54% |
| 2014 | 12 | 2 | 14 | 2,744.41 | 720.33 | 3,464.74 | 23.60% |
| 2015 | 12 | 2 | 14 | 2,744.41 | 720.33 | 3,464.74 | 23.60% |
| 2016 | 12 | 2 | 14 | 2743.74 | 721.18 | 3,464.92 | 23.60% |
| 2017 | 12 | 2 | 14 | 2743.74 | 721.18 | 3,464.92 | 23.60% |
| Annual Growth Rate 2012 & 2017 | 2% | 0% | 1% | 0% | 0% | 0% | 0% |

Source: Ministry of Municipality and Environment

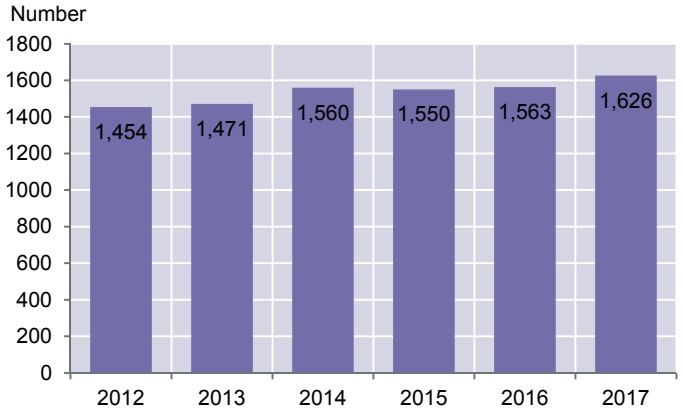
**Map 3.5: Distribution of Nature Reserves in Qatar, 2017**

## 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(4).

Qatar has been giving 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 from 1,454 in 2012 to 1,626 in 2017, at an annual growth rate of 2%.

**Figure 3.5: Number of Arabian Oryx in Nature Reserves 2012-2017**




The Arabian Oryx is distributed in 11 terrestrial nature reserves, and the maximum number is in Al Mashabiya reserve, which, in 2017, accommodated more than half the number of Arabian Oryx in Qatar (i.e. 44.0% of total Arabian Oryx in nature reserves).

(4) Wikipedia the Free Encyclopedia: https://en.wikipedia.org/wiki/Arabian_oryx

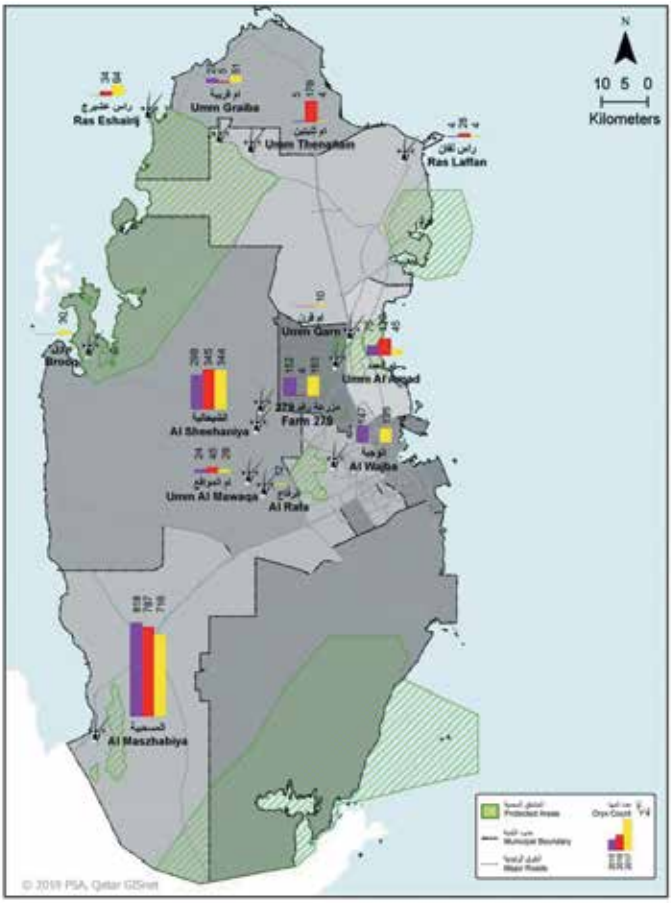
**Table 3.11: Total number of Arabian Oryx by terrestrial nature reserves (2012-2017)**

| Location | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual Growth Rate 2012 & 2017 |
|---|---|---|---|---|---|---|---|
| Al Shihaniya | 343 | 361 | 357 | 298 | 345 | 344 | 0% |
| Al Mashabiya | 752 | 786 | 763 | 818 | 787 | 716 | -1% |
| Doha Zoo(1) | 35 | 0 | 0 | 0 | 0 | 0 | -100% |
| Al Wajba | 122 | 138 | 161 | 147 | 0 | 125 | 0% |
| Umm Thanyatain | 4 | 4 | 4 | 5 | 176 | 4 | 0% |
| Umm Qariba | 27 | 27 | 27 | 27 | 5 | 51 | 14% |
| Umm Al Mawaqi | 21 | 19 | 21 | 24 | 45 | 28 | 6% |
| Ras Laffan | 4 | 4 | 4 | 4 | 28 | 4 | 0% |
| Al Sinai (2) | 0 | 0 | 29 | 0 | 4 | 163 | - |
| Farm No. (279) (3) | 146 | 132 | 171 | 152 | 139 | 45 | -21% |
| Umm Al Amad | … | … | 23 | 75 | 34 | 94 | - |
| Ushairij | … | … | … | … | .. | 12 | - |
| Al Rifaa | … | … | … | … | .. | 10 | - |
| Umm Qarn | … | … | … | … | .. | 30 | - |
| Burouq | … | … | … | … | 345 | 344 | - |
| Total | 1,454 | 1,471 | 1,560 | 1,550 | 1,563 | 1,626 | 2% |

(1) Closed for maintenance since 2012.
(2) Added on 2014
(3) Added on 2011
…: Unavailable
Source: Ministry of Municipality and Environment

In terms of the distribution of the Arabian Oryx by nature reserves, despite the small area of Al Mashabyiah reserve, it accommodates more than half the number of Arabian Oryx. However, the number of Arabian Oryx is less in Umm Qariba, Umm Thanyatain and Ras Laffan reserves, despite their vast area, while, there is no Arabian Oryx in Khor Al Adaid or Al Thakhira reserves.

**Map 3.6: Number of Arabian Oryx in different nature reserves 2015-2017**




## 2.3 *Number of Endangered Species by Type*

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, 6 endangered species have been, 22 rare and threatened species and 7 near-threatened species.

**Table 3.12: 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 (3.13) 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/rare species out of 8 species of terrestrial mammals.

**Table 3.13: Number of terrestrial flora by species and risk of extinction, 2017**

| Terrestrial Species | T. Flora | Fungus | T. Mammals | Amphibians | T. Reptiles | T. Birds | T. 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 T. species | **422** | **142** | **6** | **1** | **29** | **322** | **228** |

Source: Ministry of Municipality and Environment

The statistics in Table (3.14) 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 3.14: Number of marine flora and fauna by species and threat of extinction, 2017**

| Marine Species | Marine Flora | Fish | Marine Mammals | Marine Amphibians | Marine Birds | Marine 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/ Section 4 (14.4.1) of SDGs 2030 on the protection and exploitation of marine resources in a sustainable way 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.

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 2002(5). 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.

The statistics indicate that the total amount of fish catch increased from 11,274 metric tons in 2012 to 15,358 metric tons in 2017 and fishing reached its peak rate in 2014 with an amount of 16,213 metric tons.

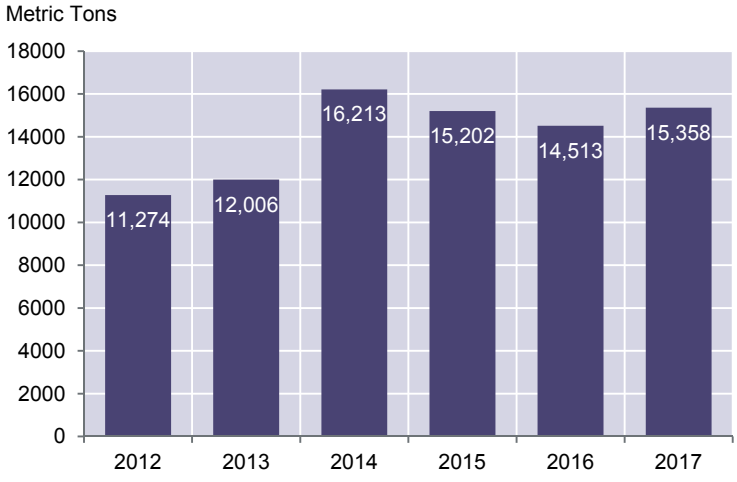
(5) UNCLOS
http://treaties.un.org/pages/ViewDetailsIII.aspx?&src=TREATY&mtdsg_no=XXI~6&chapter=21&Temp=mtdsg3&lang=en

**Table 3.15: Amount of fish catch and number of fishing vessels and fishermen 2012-2017**

| Year | Fish Catch (metric tons) | No. of Fishing Vessels | No. of Fishermen | Average amount of fish catch per fishing vessels (metric tons per vessel) | Average amount of fish catch per fisherman (metric tons per vessel) | Average number of fishermen per fishing vessels (fisherman per fishing vessel) |
|---|---|---|---|---|---|---|
| 2012 | 11,274 | 499 | 3,573 | 23 | 3 | 7 |
| 2013 | 12,006 | 499 | 2,264 | 24 | 5 | 5 |
| 2014 | 16,213 | 464 | 2,900 | 35 | 6 | 6 |
| 2015 | 15,202 | 475 | 3,011 | 32 | 5 | 6 |
| 2016 | 14,513 | 480 | 3,193 | 35 | 6 | 7 |
| 2017 | 15,358 | 478 | 3,664 | 32 | 4 | 8 |
| Annual Growth Rate 2012 & 2017 | **6%** | **-1%** | **1%** | **7%** | **6%** | **3%** |

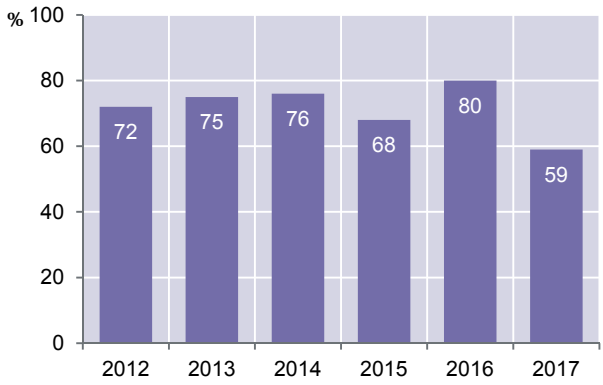
Source Ministry of Municipality and Environment, and PSA calculations

**Figure 3.6: Amount of fish catch in Qatar (metric tons) 2012-2017**




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 below indicates that the percentage of fish stocks within safe biological limits dropped from 72% in 2012 to 59% in 2017.

**Figure 3.7: Percentage of fish stocks within safe biological limits 2012-2017**




The results in Table (3.16) “fishing by exploitation rate” indicate that the current rate of over-exploitation of stocks of marine fauna "talang queenfish, cobia, toothless trevally, whitefin trevally, greater amberjack, grouper, emperor fish, greyish grunt, painted sweet-lip fish, humped fish, gold-lined seabream, rabbit fish and threadfin bream" exceeded the maximum exploitation rate, indicating that their stocks were exposed to overfishing pressure, reaching 8,720 tons of fish. On the other hand, the rate of fish catch in maximum fishing exploitation category increased to 171 tons, including “notched threadfin bream and cuttlefish”. As for the fishing for each of the marine fauna ‘kingfish, mackerel tuna, goldsilk seabream, twobar seabream and crab”, it was within sustainable exploitation rate, amounting to 3,356 metric tons in 2017.

**Table 3.16: Fishing by exploitation rate (tons) 2012-2017**

| Year | Over-Exploitation | Maximum Exploitation | Sustainable Exploitation | Improper Exploitation | Unclassified | Total |
|---|---|---|---|---|---|---|
| 2012 | 2,299 | 4,370 | 1,395 | 685 | 2,526 | 11,274 |
| 2013 | 2,235 | 5,270 | 1,513 | 721 | 2,267 | 12,006 |
| 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 |
| Annual Growth Rate 2012 & 2017 | 31% | -48% | 19% | 9% | -4% | 6% |

Overexploitation: It includes talang queenfish, cobia, toothless trevally, whitefin trevally, greater amberjack, grouper, emperor fish, greyish grunt, painted sweet-lip fish, humped fish, gold-lined seabream, rabbit fish and threadfin bream.

Maximum exploitation: It includes notched threadfin bream and cuttlefish.

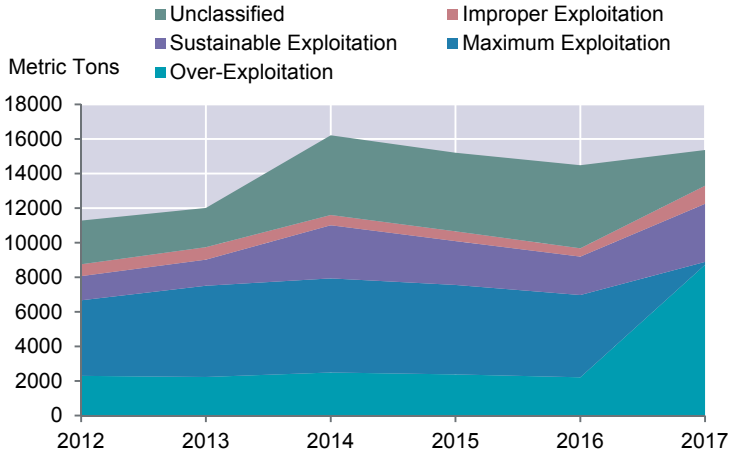
Sustainable exploitation: It includes kingfish, mackerel tuna, goldsilk seabream, twobar seabream and crab.

Improper exploitation: It includes flat needlefish, crevalla, malabar cavalla, red snapper, blackspot snapper and parrotfish.

Unclassified: It includes fish and crustaceans such as barracuda, long finned mullet, flattened crab, and assorted fish

Source: Ministry of Municipality and Environment

**Figure 3.8: Fish catch by exploitation rate (metric tons), 2012-2017**




The results of Figure (3.9) "Percentage distribution of fish catch by exploitation rate 2012-2017" show that the highest percentage of over-exploitation during the period (2012-2017) was in 2013, reaching 43.9%. Logically, these years had the highest rate of sustainable exploitation, reaching 18.9% and 16.7% respectively, while the lowest rate of sustainable exploitation was in 2010, scoring 11.7% of fish catch with maximum exploitation.

**Figure 3.9: Percentage distribution of fishing by exploitation rate, 2012-2017**

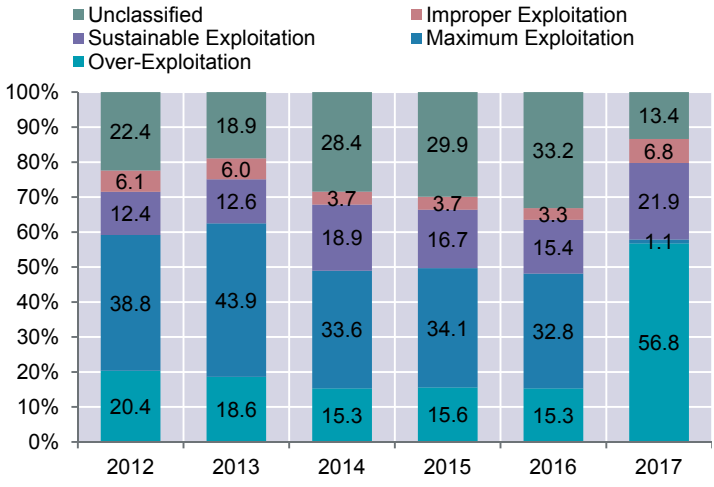


Table (3.15) "Amount of fish catch and number of fishing vessels and fishermen 2012-2017" above shows an increase in fishing quota per vessel during the period 2012-2017 from 23 tons per vessel in 2012 to 32 tons per vessel in 2017. This increase reflects the evolution of fishing equipment and methods. The statistics indicate a decline in the number of fishing vessels during the same period from 499 in 2012 to 478 in 2017.

Following the same pattern, the statistics in Figure (3.10) below indicate a slight increase in the number of fishermen from 3,573 to 3,664 fishermen during the period 2012-2017, while fish catch increased from 3 tons per fisherman in 2012 to 4 tons per fisherman in 2017.

**Figure 3.10: Fishing Effort, 2012-2017**

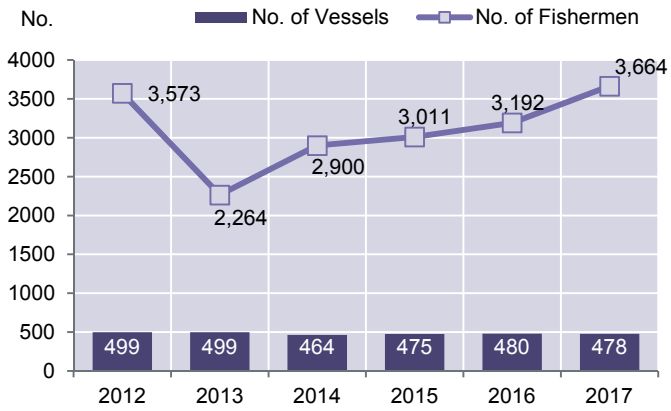
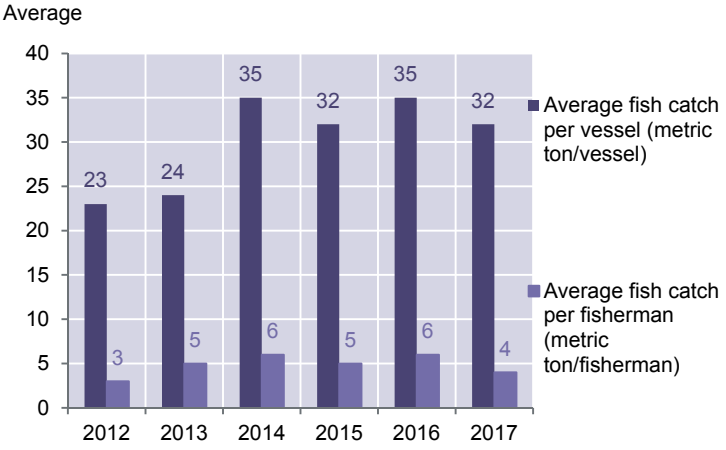



Figure No. (3.11) below clearly shows that fishing rate reached its peak in in 2014 and 2016 at an average of 35 metric tons per vessel and 6 metric tons per fisherman.

**Figure 3.11: Average fish catch per vessel and fisherman, 2012-2017**



The statistics on artisanal fishing vessels in Qatar indicate that they reached 478 vessels in 2017, at an annual growth rate of -1% from 2012. It should be noted that Al Khor City scored the highest share of the number of artisanal fishing vessels, amounting to 236 vessels (i.e. 49.3% of total artisanal fishing vessels) at an annual growth rate of 4% from 2012, while the annual growth rate of the number of artisanal fishing vessels declined in Doha, Al Wakra and Al Shamal to -26% , -4% and -2% respectively.

**Table 3.17: Number of artisanal fishing vessels by coastal areas 2012-2017**

| Year | Doha | Al Khor | Al Wakra | Al Shamal | Total |
|---|---|---|---|---|---|
| 2012 | 22 | 196 | 227 | 54 | 499 |
| 2013 | 22 | 196 | 226 | 55 | 499 |
| 2014 | 19 | 214 | 191 | 40 | 464 |
| 2015 | 17 | 234 | 179 | 45 | 475 |
| 2016 | 17 | 236 | 182 | 45 | 480 |
| 2017 | 5 | 236 | 187 | 50 | 478 |
| Annual Growth Rate 2012 & 2017 | -26% | 4% | -4% | -2% | -1% |

Ministry of Municipality and Environment

According to statistics in Table (3.18) below, the number of sailors in artisanal fishing amounted to 3,664 sailors in 2017, at an annual growth rate of 1% from 2012. The statistics indicate an increase in the number of sailors in Al Khor City, amounting to 1,786 sailors, at an annual growth rate of 5% from 2012, while the number of sailors dropped in both Doha, Al Wakra and Al Shamal at a rate of -22%, -1% and -6% respectively from 2012.

**Table 3.18: Number of sailors in artisanal fishing by coastal areas, 2012-2017**

| Year | Doha | Al Khor | Al Wakra | Al Shamal | Total |
|---|---|---|---|---|---|
| 2012 | 137 | 1,390 | 1,628 | 418 | 3,573 |
| 2013 | 81 | 868 | 1,022 | 293 | 2,264 |
| 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 |
| Annual Growth Rate 2012 & 2017 | -22% | 5% | -1% | -6% | 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 Table (3.19) below, the amount of the Nile tilapia fish farming reached 10 metric tons in 2017, at an annual growth rate of -29% from 2012. 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 3.19: Fish farming (tons) 2012-2017**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual Growth Rate 2012 & 2017 |
|---|---|---|---|---|---|---|---|
| Fish Farming* | 56 | 56 | 56 | 10 | 10 | 10 | -29% |

* Nile tilapia fish

Source: Ministry of Municipality and Environment

## 2.6 *Volume and Value of Exports and Imports of Fish, Crustaceans, Molluscs and Others*

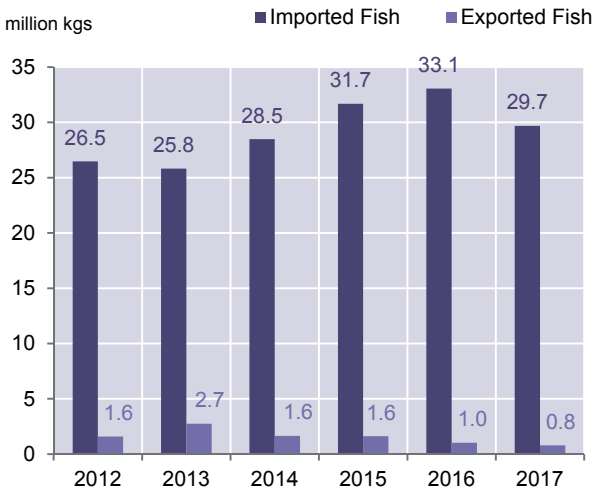
The statistics in Table (3.20) below and Figure (3.12) indicate an increase in the amount of fish and crustaceans imported to Qatar, reaching nearly 30 million kg worth of QR 296 million, while the amount of exported fish reached approximately 796,000 kg worth of QR 3 million. The annual growth rate of exported fish decreased by -13% from 2012.

**Table 3.20: Volume and value of Qatar exports and imports of fish, crustaceans, molluscs and other aquatic invertebrates (kg, QR) 2012-2017**

| Year | Imports | | Exports | |
|---|---|---|---|---|
| | Volume of Imported Fish (kg) | Value of Imported Fish (QR) | Volume of Imported Fish (kg) | Value of Imported Fish (QR) |
| 2012 | 26,476,624 | 209,423,493 | 1,596,238 | 4,708,762 |
| 2013 | 25,819,252 | 197,168,366 | 2,742,425 | 9,177,574 |
| 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 |
| Annual Growth Rate 2012 & 2017 | 2% | 7% | -13% | -7% |

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

**Figure 3.12: Volume of exports and imports of fish, crustaceans, molluscs and other aquatic invertebrates (million kgs), 2012-2017**



## 2.7 *Sea Turtle Nest Habitat*

Statistics indicate that the total number of sea turtles nests amounted to 208 nests in 2017, the majority of which are concentrated in Fuwairit, Ras Laffan and the two islands of Ras Rukn and Halul.

**Table 3.21: Total number of registered sea turtle nests by location, 2012-2017**

| Location | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual Growth Rate 2012 & 2017 |
|---|---|---|---|---|---|---|---|
| Ras Laffan | 109 | 54 | 147 | 68 | 42 | 42 | -17% |
| Fuwairit | 19 | 15 | 25 | 31 | 32 | 52 | 22% |
| Al Maroona | 0 | 0 | 0 | 0 | 0 | 4 | - |
| Ras Rukn Island | 22 | 13 | 27 | 10 | 7 | 43 | 14% |
| Umm Tais Island | 21 | 16 | 29 | 6 | 10 | 24 | 3% |
| Shraouh Island | 10 | 8 | 6 | 6 | 8 | 3 | -21% |
| Halul Island | 73 | 54 | 92 | 97 | 61 | 40 | -11% |
| Al Ghariya | 10 | 7 | 19 | 3 | 4 | 0 | -100% |
| Total | 264 | 167 | 345 | 221 | 164 | 208 | -5% |

Source: PSA, Environment Statistics Bulletin

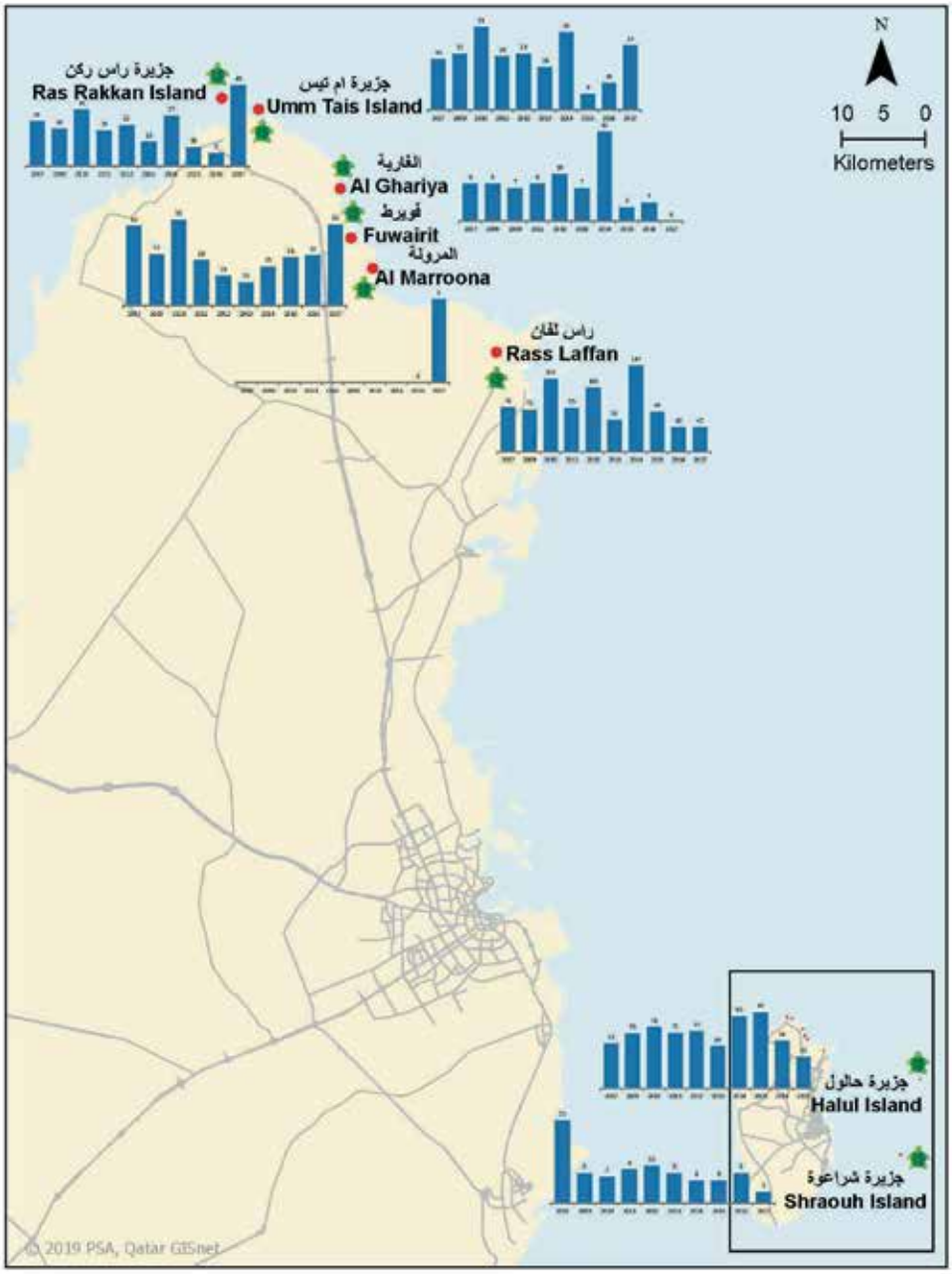
The number of live hatching turtles reached 2,814 turtles, with a success rate of hatching turtle eggs that reached 73.5% in 2017.

**Table 3.22: Number of live hatching turtles and hatching success rate, 2012-2017**

| Location | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual Growth Rate 2012 & 2017 |
|---|---|---|---|---|---|---|---|
| Number of live hatching turtles | 16,885 | 10,681 | 22,066 | 14,135 | 10,489 | 2,814 | -30% |
| Hatching success rate | 76.8 | 82.3 | 83.1 | 38.8 | 84.4 | 73.5 | -1% |

Source: PSA, Environment Statistics Bulletin

**Map 3.7: Number of sea turtle nests, 2012-2017**



# 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 as shown in the box below. Since the issue of water is crucial, it is not limited to the programs and goals stated below, but it intersects with so many other projects, goals and outputs in this strategy.

## Box 7: Water in Relation to National Policies

The following programs/projects have emanated from Qatar's NDS within the promotion plans of economic and technical efficiency, and environment protection for the coming generations:

**Program/Project:**

1- Water use efficiency

**Goals:**

- Reduce desalinated water leakage from distribution networks to 10% in proportion to the current ratio estimated at (30%-35%).

- Make sure that water meters gauge the entire consumed water.

- Support installation of modern devices used at homes, and other techniques to conserve water.

- Develop a procedures plan to conserve water within the agricultural development plans.

- Expand wastewater treatment networks to increase recycled water use.

- Prepare a feasibility study to establish systems to collect and treat industrial wastewater.

**Output:**

Promote water use efficiency and conservation.

**Program/Project:**

2- National Law of Water

**Goal:**

- Enact a holistic national law of water to establish an integrated system of quality requirements, discharge regulations, conservation incentives of water, to replace the current fragmented regulation and provision system.

**Output:**

- Clean water and sustainable use.

**Program/Project:**

3- Groundwater table management plan in urban areas.

**Goal:**

- Monitor groundwater, preserve aquifers, and remove excess water at the groundwater table in Doha.

**Program/Project:**

4- Environment/water database.

**Goal:**

- Create an online database that offers search possibility.

**Output:**

- Improve environmental management and cooperation at regional and international level.

**Water in relation to international frameworks, e.g. SDGs 2030.**

- Goal 6, Indicator 3.1: Proportion of safely treated wastewater
- Goal 6, Indicator 4.1: Change in water use efficiency over a period of time
- Goal 6, Indicator 4.2: Pressure ratio over water consumption: pure water abstraction vis-à-vis the available pure water sources.
- Goal 6, Indicator 5.1: degree of implementation of water resource integrated management.

**Water in relation to international frameworks, e.g. the international competitiveness indicators**

-Water resources- Total per capita internal renewable water in cubic meters

- Proportion of population connected to sewerage network

-Water consumption intensity - Water withdrawal in million cubic meters

Qatar is among the world's least countries with natural fresh water resources, i.e. annual production rate. The groundwater resources did not exceed 73.8 million $m^3$, rainfall (long-term annual average 1998-2017) amounted to 71.6 million $m^3$, and annual inflows of groundwater from Saudi Arabia reached 2.2 million $m^3$. From Table (3.23) below, it is clear that the annual safe water abstraction level should not surpass 55.8 million $m^3$, after calculation of the outflow of water from aquifers into the sea, and deep saline reservoirs, which amount to 18 million $m^3$ annually. Therefore, the annual renewable safe water abstraction (water balance) represents 47.5 million $m^3$.

**Table 3.23: Natural Water Balance of Aquifers in Qatar (Average Annual Values During (1998-2017)**

| Balance item | Million $m^3$/year | Source |
|---|---|---|
| Recharge of aquifers from rainfall | 71.6 | Ministry of Environment (long-term annual average 1998-2017) |
| Inflows from Saudi Arabia | 2.2 | Agriculture and Water Research Management (2006) (long-term annual average) |
| Total water renewable resources (safe groundwater abstraction level) = (1) + (2) | 73.8 | |
| Flowing out groundwater reservoirs into the sea and deep saline reservoirs | 18.0 | Ministry of Environment (long-term annual average 1998-2017) |
| Annual average of water balance (net and safe renewed yield on an annual basis)1 = (3) – (4) | 55.8 | |

(1) Does not include return flow from irrigation.

Source: Ministry of Municipality and Environment

In reality, however, groundwater abstraction ratio is five times higher than the safe yield (250 million $m^3$/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.

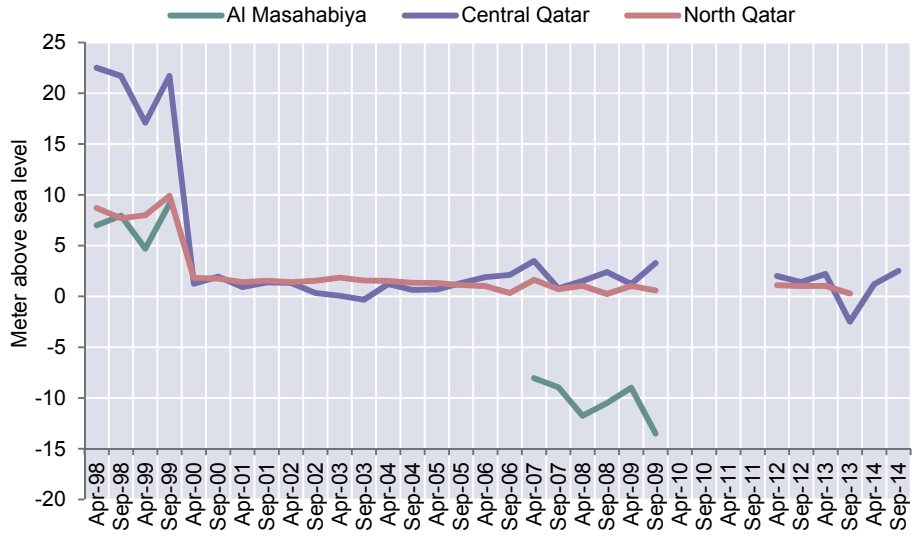
## *3.1 Groundwater Quality and Quantity*

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.

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 3.13 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.

**Figure 3.13: 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.

It is worth mentioning that most groundwater abstractions (230 million $m^3$ 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 $m^3$.

**Table 3.24: Quantity of Abstracted Groundwater by Sector of Use (million $m^3$/year) 2012-2017**

| Year | Total abstracted groundwater | Uses of groundwater | | | |
|---|---|---|---|---|---|
| | | farms | municipal | domestic | industrial |
| 2012 | 250.3 | 230.1 | 10.4 | 9.6 | 0.2 |
| 2013 | 250.1 | 230 | 10.2 | 9.7 | 0.2 |
| 2014 | 250.3 | 230 | 10.4 | 9.7 | 0.2 |
| 2015 | 250 | | 230 | | 20 |
| 2016 | 250 | | 230 | | 20 |
| 2017 | 250 | | 230 | | 20 |

Source: Ministry of Municipality and Environment

Table (3.25) and Figures (3.14), and (3.15) below 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.

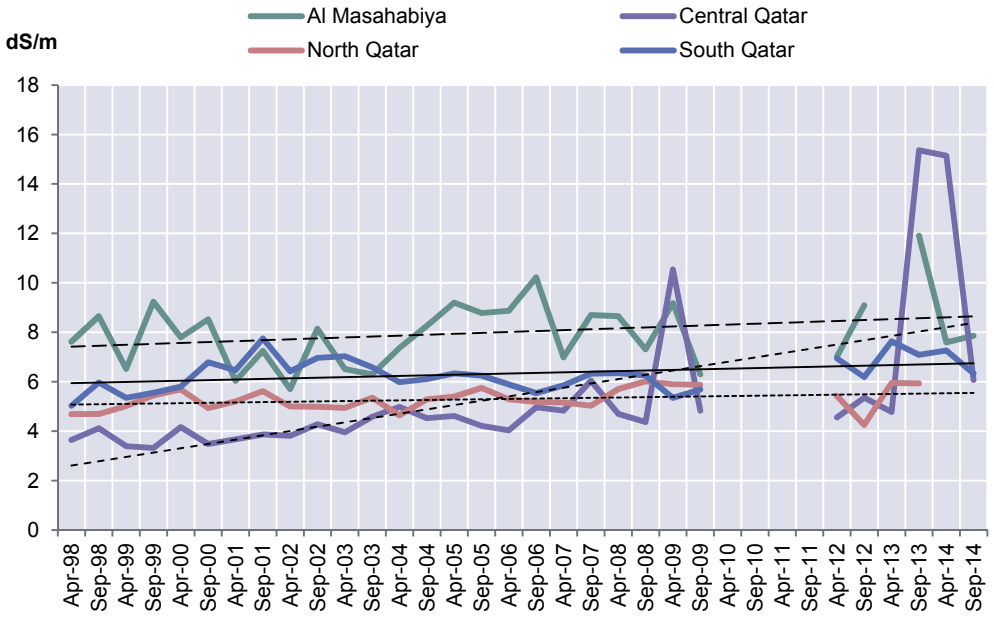
It is clear that during the period 1998-2014, the four aquifers were categorized as being of medium salinity with increasing salinity level. According to the available data, the dissolved solids were slightly decreasing in Al-Mashabiya, North Qatar, and South Qatar.

**Table 3.25: 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 |

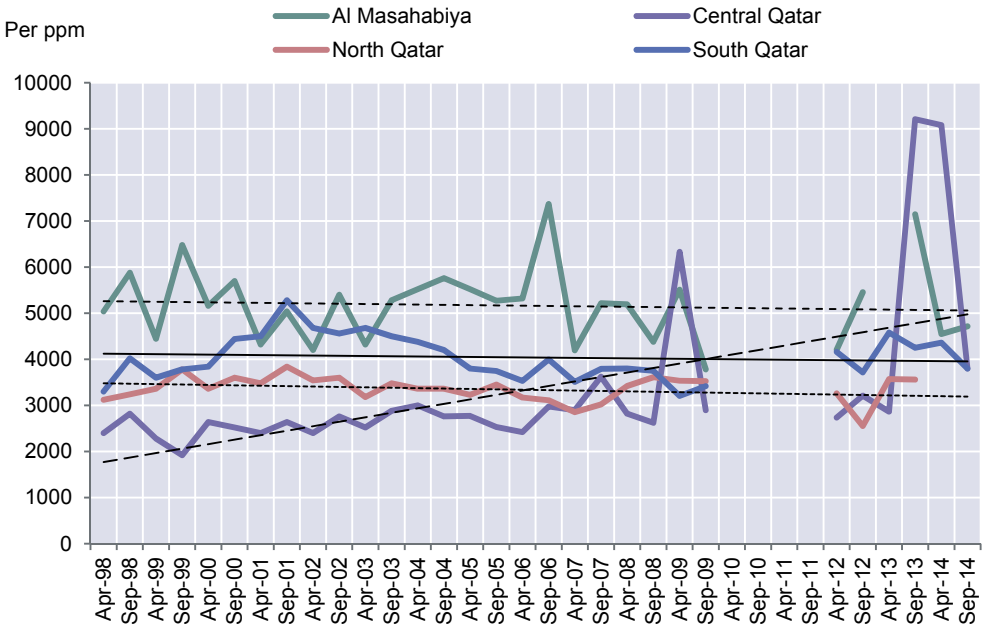
Source: Kahramaa, and PSA calculations

**Figure 3.14: Trend of Electrical Conductivity in Selected Aquifers (Mean) 1998-2014**




Source: Kahramaa, and PSA calculations

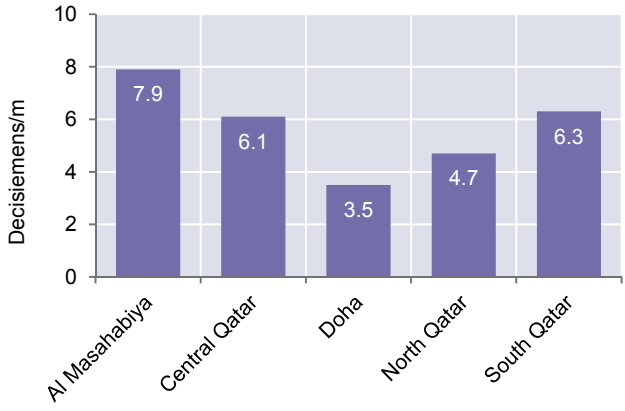
**Figure 3.15: TDS Trend in Selected Aquifers (Mean) 1998-2014**




Source: Kahramaa, and PSA calculations

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.

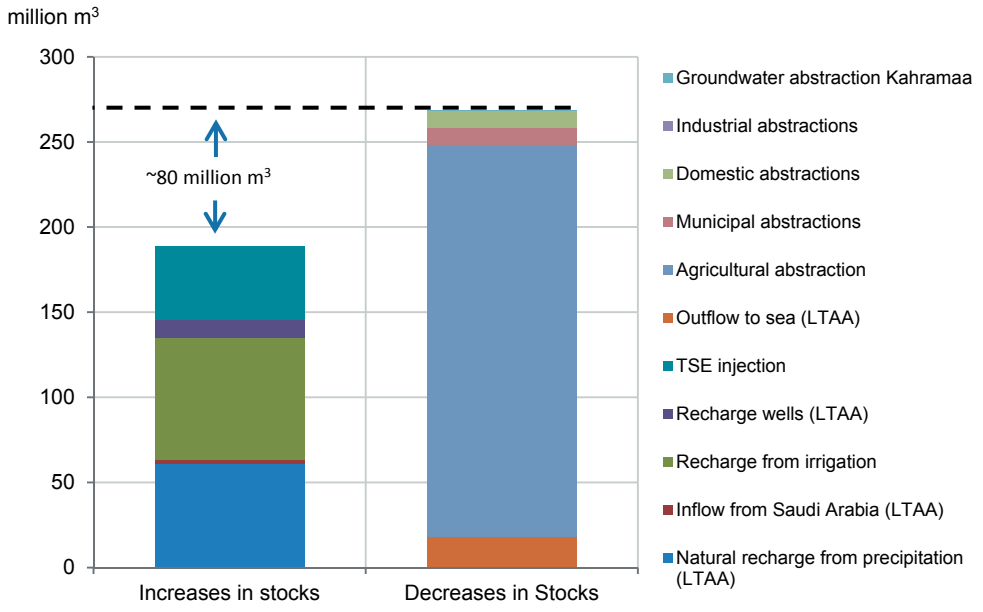
**Figure 3.16: Electrical Conductivity in September 2014 (Average of Entire Wells per Aquifer)**




Source: Kahramaa and PSA calculations

Figure (3.17) 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 2016). The long-term renewable natural water resources are estimated at around 60.6 million $m^3$ per year (58.4 million $m^3$ of recharge due to rainfall and 2.2 million $m^3$ flow into Qatar from Saudi Arabia on an annual basis). The mentioned natural recharge sources account for 37% of annual additions to aquifers. As for the remaining proportion of annual additions to aquifers, it accounts for 63% due to artificial recharge processes (recharge of wells), and injection of treated wastewater and irrigation return flow.

**Figure 3.17: Water Balance (Long-term Annual Average) 2016**



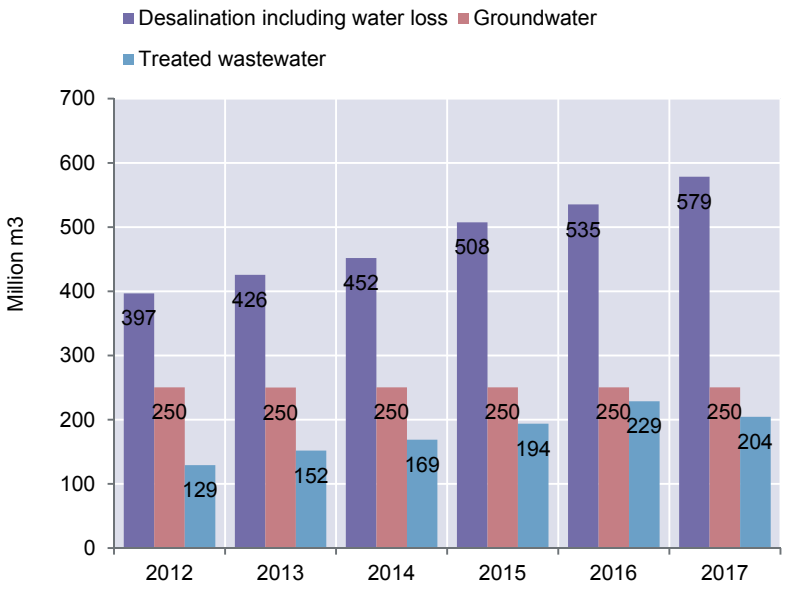

Source: Ministry of Environment, Kahramaa, and Ashghal – Data compiled by PSA

## 3.2 *Water Abstraction and Uses*

Figure (3.18) below shows the water available for use, and 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 960 million $m^3$. Desalinated water production (after loss) constituted 60.3% (578.54 million $m^3$), groundwater 26.04% (250 million $m^3$), and treated wastewater 13.6% of total water available for use.

The current groundwater abstraction ratios are five times higher than renewable natural water, and over 90% of this water is used in agriculture.

**Figure 3.18: Water available for use (after loss) by type of water (million $m^3$) 2012-2017**




Comparing the production of desalinated water after loss during the period (2012-2017), the findings showed 8% rise in the annual growth rate of desalinated water production in 2017 from 2012. Water service subscribers increased by 29% during the same period, while real water loss slumped from 6.8% in 2012 to 4% in 2017, in line with Qatar's NDS goals aiming to reduce water loss by a growth rate of -19% from 2012.

**Table 3.26: Water production and real loss (million $m^3$, %) 2012-2017**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Growth Rate 2012-2017 | Annual Growth Rate 2012 & 2017 |
|---|---|---|---|---|---|---|---|---|
| Desalinated water ($Mm^3$) including loss | 426.1 | 453.2 | 482.2 | 533 | 557 | 602 | 41% | 7% |
| Desalinated water ($Mm^3$) excluding loss | 397.0 | 425.6 | 451.8 | 507.5 | 535.22 | 578.54 | 46% | 8% |
| Real loss (Mm3) | 29.1 | 27.6 | 30.4 | 25.5 | 21.78 | 23.46 | -19% | -4% |
| Real loss (%) | 6.80% | 6.10% | 6.30% | 4.27% | 4.04 | 4.01 | -41% | -10% |
| Number of desalinated water consumers (water service subscribers) | 241,204 | 242,552 | 262,018 | 277,433 | 296846 | 310034 | 29% | 5% |

Source: Kahramaa

The water available for use is composed of desalinated seawater, treated wastewater, and abstracted groundwater. In 2016, the total water available for use amounted to 1,014.71 million $m^3$, of which 55% was desalinated seawater, 25% was abstracted groundwater, and 20% was treated wastewater.

In 2016, over 11% of available water for use was not used because it was lost during transport (2.1%), discharged into wastewater lagoons (3.9%), discharged into the sea (0.01%) or injected into deep aquifers (6%).

Since 2008, total water withdrawn from aquifers remained unchanged at 250 million $m^3$ annually, i.e. over five 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 2016, around 51% of treated wastewater was directly reused for agriculture and green space irrigation, while about 19.5% was discharged into wastewater lagoons and the sea and was no longer available for further use. In addition, 29.53% of treated wastewater was injected into deep aquifers.

### Assumptions and Clarifications on Statistics:

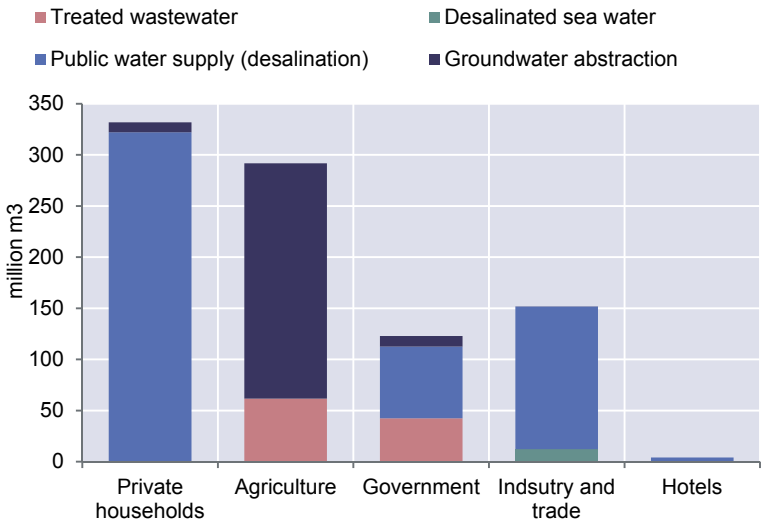
1. Industrial uses of water: data are provided by QP HSE Sustainable Development Industry Reporting initiative (published by the Ministry of Energy and Industry in 2013), in which 30 companies were listed (91% of invited companies). The report is assumed to include the water uses mentioned by Kahramaa, 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 2012-2016.

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 2016, total water used in Qatar (after deducting water loss quantities from the public network estimated at 21.78 million $m^3$) amounted to 950.61 million $m^3$. The largest share is directed for private domestic uses at 342.31 million $m^3$, followed by government uses at 112.55 million $m^3$, and commercial activities at 132.25 million $m^3$, and finally industries at 10.3 million $m^3$. As for the key sources of water used in agriculture, they are as follows: 230 million $m^3$ of groundwater (79%) and 61.7 million $m^3$ of treated wastewater (21%). Refer to Figure (3.19) below.

**Figure 3.19: Water use by sector and water source excluding water loss during transport (million $m^3$) 2016**




Source: Ministry of Municipality and Environment, and compilation was conducted by PSA

Table (3.27) below presents the full balance of water uses in Qatar in 2016. 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 (9.88%), or amounts of drinking water lost during transport (2.15%).

**Table 3.27: Water Use Balance 2016**

| Statement | Amount of water likely to be available for use | Amount of used water and losses | Remarks |
|---|---|---|---|
| Amount of distilled water | 557.7 | | Volume of water received from Kahramaa |
| Amount of extracted fresh groundwater | 250.80 | | It includes data on agricultural, municipal, domestic and industrial wells for 2014. |
| Amount of treated wastewater | 204.40 | | Amount of wastewater discharged from urban wastewater treatment plants. |
| Amount of untreated wastewater | 1.94 | | Untreated wastewater discharged into industrial basins. |
| Total amount of water available for use | 1014.71 | | Amount of water available before water loss. |
| Amount of untreated wastewater | | 1.94 | |
| Total distilled water losses | | 21.78 | Total water losses. |
| Amount of treated wastewater discharged into industrial basins | | 39.17 | |
| Amount of treated wastewater discharged into the sea | | .68 | |
| Amount of treated wastewater injected into deep aquifers | | 60.36 | |
| Amount of water used in the agricultural sector | | 291.70 | Groundwater and treated wastewater. |
| Amount of water used in the industrial sector and commercial activities | | 143.69 | 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 | | 342.31 | Amount of water provided by KAHRAMAA and from domestic and municipal wells. |
| Amount of water used in the government sector | | 112.55 | Amount of water provided by KAHRAMAA and amount of treated wastewater for irrigation of green spaces. |
| Total amount of water used and losses | | 1,014.18 | |

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

**Figure 3.20: Percentage distribution of water available for use, 2016**

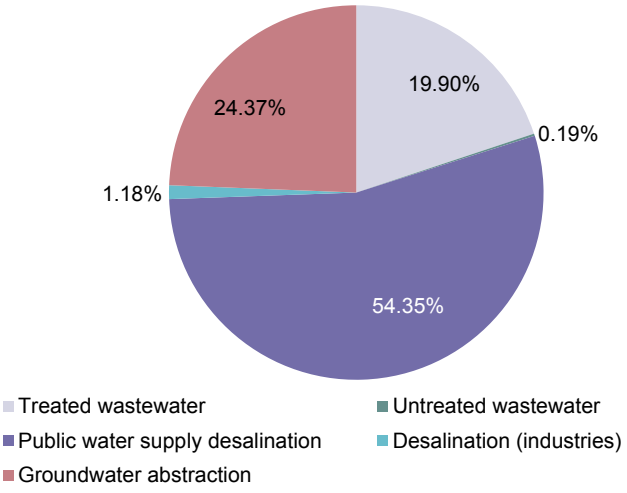



**Figure 3.21: Water Uses and Lost Quantities (%), 2016**

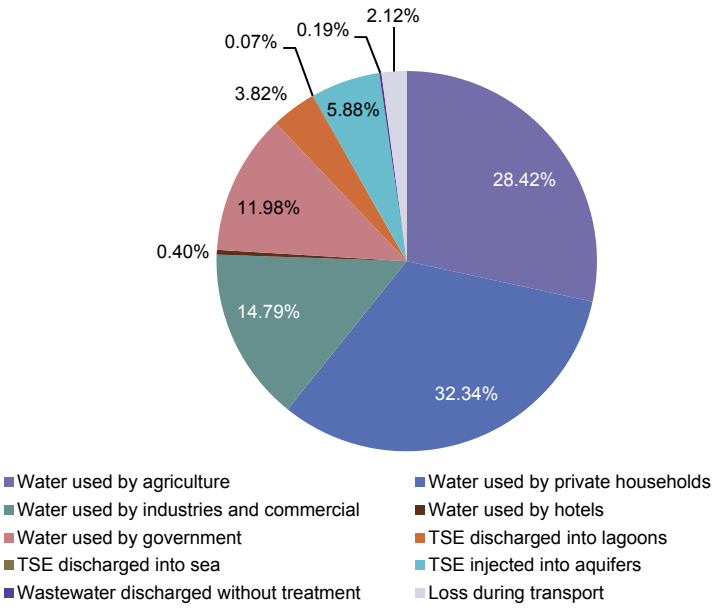
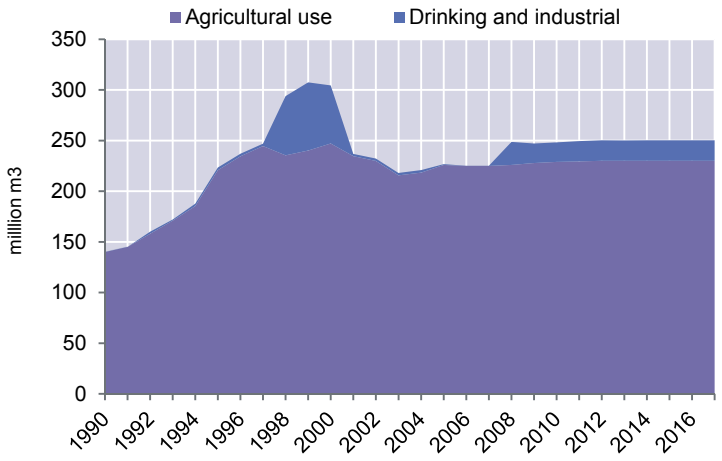


Figure (3.22) below shows the abstracted groundwater from 1990 to 2017. Abstraction reached its peak in 1999 when 307 million $m^3$ were abstracted, which is six times the water balance (long-term annual average)6. Since 2008, groundwater abstraction ratio recorded 250 million $m^3$, which is five times higher than the water balance (long-term annual average). Along those years, agriculture had the largest share of abstracted water (92% in 2017).

**Figure 3.22: Groundwater abstraction, 1990-2016**

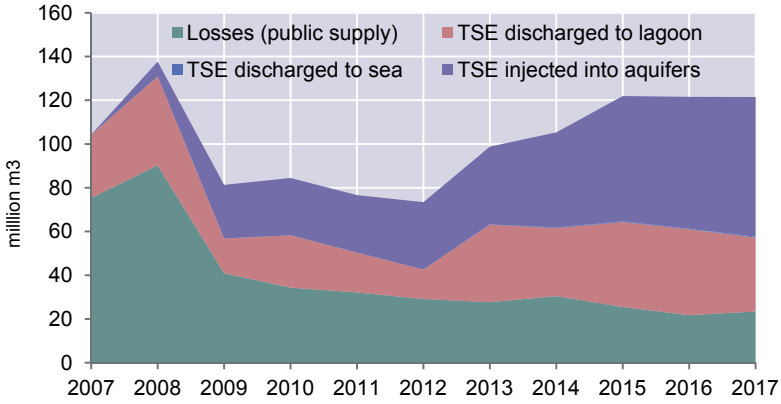



Source: Ministry of Municipality and Environment and Kahramaa

Figure (3.23) below indicates the amounts of water loss and unused treated wastewater during the period (2007-2017). The figure shows that water loss caused by public water supplies network, and treated wastewater discharged into lagoons, reached their peak in 2008, and decreased remarkably again since 2009. Treated wastewater, which is discharged into the sea, is considered as insignificant.

[6] Natural recharge of aquifers, inflows from Saudi Arabia minus water flowing out into the sea and deep aquifers (47.5 million $m^3$ per year) (long-term annual average).

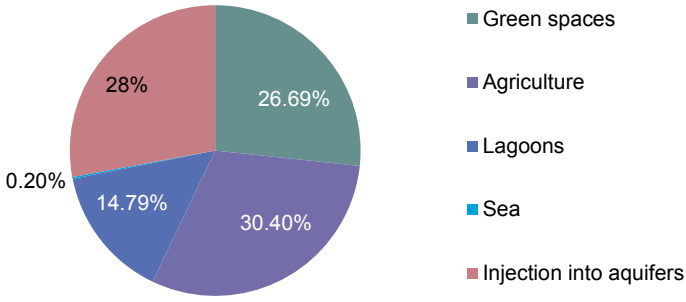
**Figure 3.23: Unused water and injection of treated wastewater, 2007-2017**




Source: Kahramaa and Ashghal. Compilation conducted by PSA

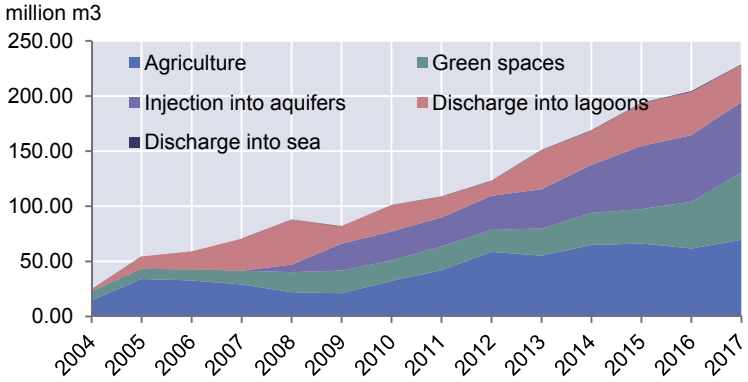
Given the increasing design capacity of wastewater treatment since 2004, treated wastewater production quadrupled from 54 million $m^3$/day in 2004 to 828 million $m^3$/day in 2017, the treated wastewater production increased 9-fold from 24.54 million $m^3$ in 2004 to 228.67 million $m^3$ in 2017. Agriculture had the largest share of treated wastewater use (30.4% in 2014), followed by government use for green space irrigation (26.7%). In 2017, around 14.8% of treated wastewater was discharged into wastewater lagoons, and therefore became unavailable for reuse. In addition, 28% of treated wastewater was injected into deep aquifers, and less than 1% was discharged into the sea. Refer to Figures (3.24) and (3.25).

**Figure 3.24: Use and discharge of treated wastewater, 2017**




Source: Ashghal

**Figure 3.25: Use and discharge of treated wastewater 2004-2017**




Source: Ashghal

## 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 (3.28) below shows drinking water quality according to bacteriological tests of drinking water samples by municipality and source in 2017.

**Table 3.28: Results of bacteriological tests of drinking water samples by municipality and source 2017**

| Municipality | Drinking Water Source | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Public Sources | | | Private Sources | | | Other Sources* (farms) | | |
| | Total number of samples | Number of incompatible samples | Percentage of incompatible samples | 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 | 1949 | 61 | 3.0 | ... | ... | ... | ... | ... | ... |
| Al-Wakra | 152 | 1 | 0.7 | ... | ... | ... | ... | ... | ... |
| Umm Salal | 76 | 0 | 0.0 | ... | ... | ... | ... | ... | ... |
| Al-Khor / Al Thakhira | 90 | 2 | 2.0 | ... | ... | ... | ... | ... | ... |
| Al-Shamal / Al-Shihaniya | 133 | 0 | 0.0 | ... | ... | ... | ... | ... | ... |
| Al-Dhaayin | 7 | 0 | 0.0 | ... | ... | ... | ... | ... | ... |
| Mesaieed | 3 | 0 | 0.0 | ... | ... | ... | ... | ... | ... |
| Total | 2410 | 64 | 2.7 | ... | ... | ... | ... | ... | ... |

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 3.29: Results of bacteriological tests of drinking water samples by month and source, 2017**

| Month | Drinking Water Source | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Public Sources | | | Private Sources | | | Other Sources* (farms) | | |
| | Total number of samples | Number of incompatible samples | Percentage of incompatible samples | 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 | 60 | 2 | 3% | 84 | 7 | 8% | ... | ... | ... |
| February | 213 | 5 | 2% | 85 | 4 | 5% | ... | ... | ... |
| March | 116 | 2 | 2% | 159 | 4 | 3% | ... | ... | ... |
| April | 91 | 0 | 0% | 102 | 2 | 2% | ... | ... | ... |
| May | 98 | 1 | 1% | 133 | 2 | 2% | ... | ... | ... |
| June | 69 | 0 | 0% | 45 | 0 | 0% | ... | ... | ... |
| July | 68 | 0 | 0% | 106 | 5 | 5% | ... | ... | ... |
| August | 50 | 0 | 0% | 54 | 3 | 6% | ... | ... | ... |
| September | 245 | 4 | 2% | 67 | 2 | 3% | ... | ... | ... |
| October | 159 | 10 | 6% | 151 | 3 | 2% | ... | ... | ... |
| November | 99 | 2 | 2% | 85 | 5 | 6% | ... | ... | ... |
| December | 30 | 2 | 7% | 27 | 0 | 0% | ... | ... | ... |
| Total | 1298 | 28 | 2% | 1,098 | 37 | 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.

Figure (3.26) below on the results of bacteriological tests of drinking water samples by source during the period (2012-2017) 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%. 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 amounted to 3% in 2017, while the average rate during the years 2012-2017 was 1.2%. In addition, the results of drinking water tests during the same period 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 decreased from 2.7% in 2012 to 1.7% in 2017.

**Figure 3.26: Percentage of incompatible samples in the bacteriological tests of drinking water samples by source, 2012-2017**

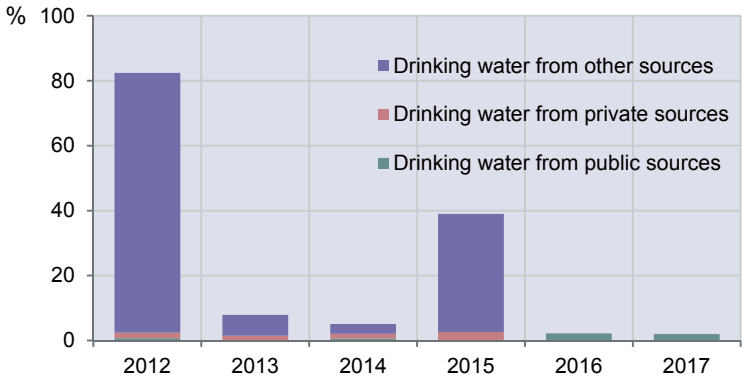



Figure (3.27) below indicates that the percentage of incompatible samples, taken from desalination water plants, mineral water and bottled water in 2015, were distributed over four tests during the period (2012-2017). In the remaining years, incompatible samples were confined to “other tests” and “chemical tests”. The incompatible samples were nearly constant in “other tests” during the period 2012-2015 at a rate of about 1.75%, while the incompatible samples in “chemical tests” increased from 1% in 2012 to 1.3% in 2017, a difference of less than 0.3 point.

**Figure 3.27: Percentage of incompatible samples of tests of desalination water plants and bottled water by type of test 2012-2017**

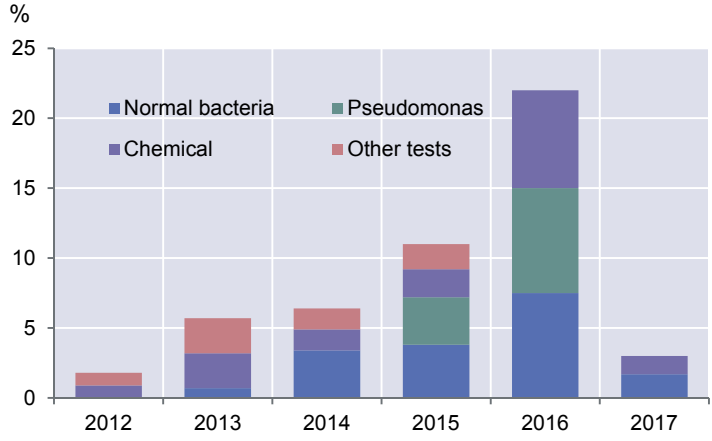
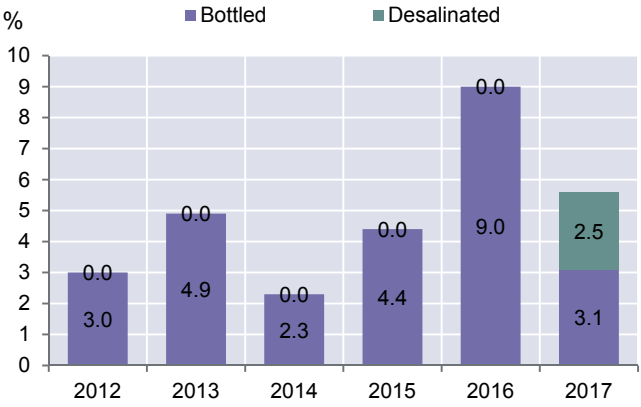


Figure (3.28) below shows that no desalinated drinking water samples were found incompatible in "chemical and bacteriological tests" during the period 2012-2016. In 2017, however, the percentage of desalinated drinking water samples that were incompatible with standards of "chemical and bacteriological tests" was 2.5%. The percentage of drinking bottled water, which was incompatible with bottled water standards, reached 3.1% in 2017.

**Figure 3.28: Percentage of incompatible samples of tests of desalination water plants and bottled water by source, 2012-2017**




## 3.4 *Quality of Wastewater Generated from Urban Areas*

### 3.4.1 *Collection of wastewater from urban areas and treatment infrastructure*

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.

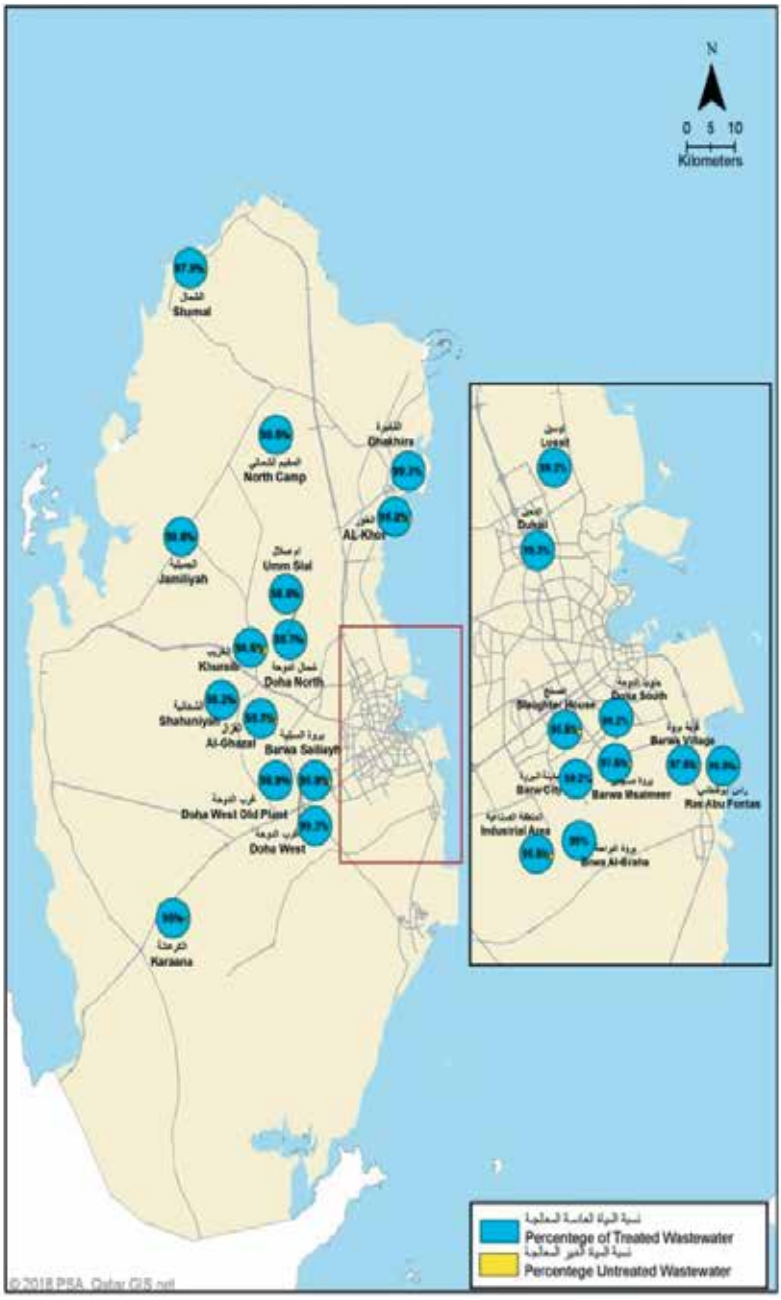
Number of wastewater treatment plants reached 24; at an annual growth rate of 4% from 2017, with a design capacity of 827.9 thousand $m^3$/day in 2017. Compared to previous years, wastewater treatment plants design capacity rose by 17% during the period 2012-2017. The plants received 231 million $m^3$ of wastewater per year, of which 229 million $m^3$ were treated, i.e. 99% of total wastewater in 2017.

### Table 3.30: Wastewater in Sewage Treatment Plants 2012-2017

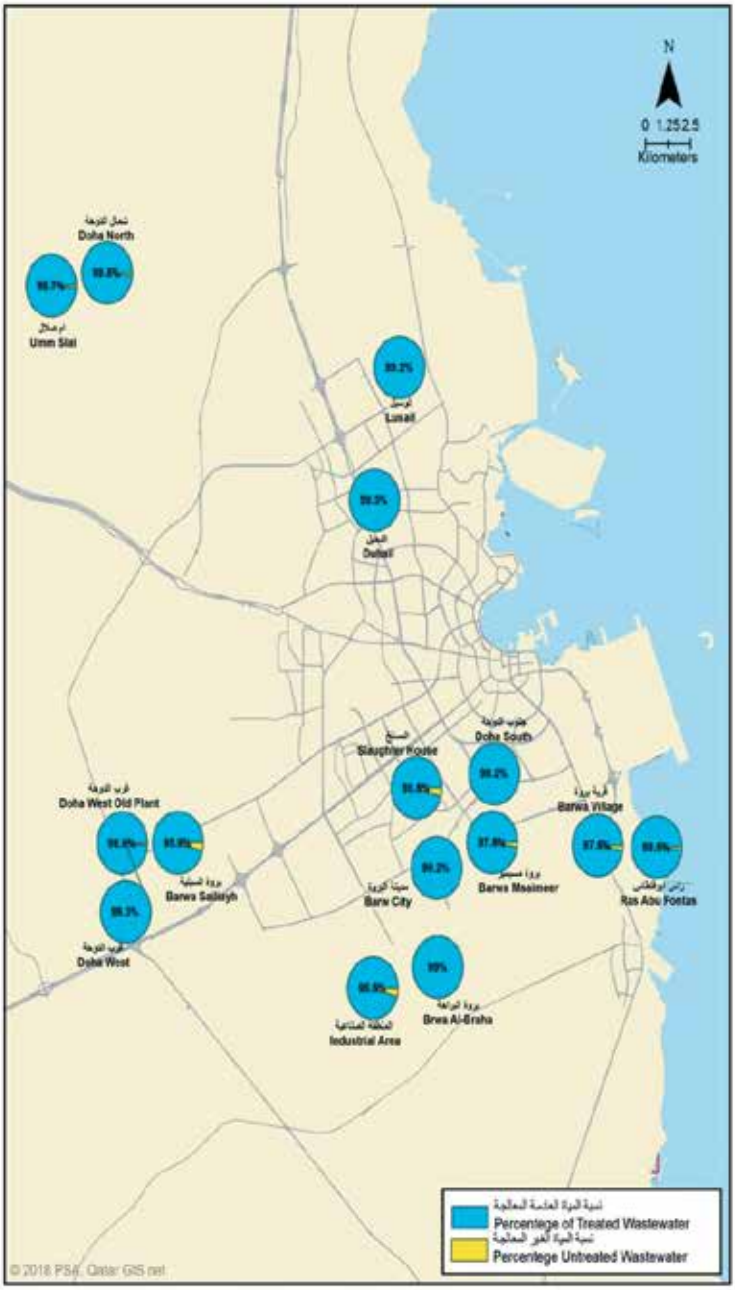
| Year | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual growth rate 2012-2017 |
|---|---|---|---|---|---|---|---|
| Number of Sewage Plants | 20 | 22 | 23 | 23 | 24 | 24 | **4%** |
| Total design capacity of sewage plants (1000 $m^3$/day) | 379 | 695 | 705 | 809 | 827.4 | 827.9 | **17%** |
| Amount of collected wastewater (1000 $m^3$/year) | 142,339 | 158,792 | 173,933 | 197,492 | 209,518 | 231,473 | **10%** |
| Amount of treated wastewater (1000 $m^3$/year) | 129,212 | 151,883 | 168,949 | 193,854 | 204,392 | 228,668 | **12%** |
| Percentage of treated wastewater of total wastewater | 90.8% | 95.6% | 97.1% | 98.2% | 98% | 99% | **2%** |
| Treated wastewater used for agriculture irrigation (1000 $m^3$/year ) | 58,707 | 55,233 | 64,920 | 66,289 | 61,699 | 69,508 | **3%** |
| Amount of treated wastewater used for green space irrigation (1000 $m^3$/year) | 19,915 | 24,670 | 29,096 | 31,088 | 42,480 | 61,029 | **25%** |
| Amount of treated wastewater used for injection into aquifers (1000 $m^3$/year) | 30,854 | 35,599 | 43,465 | 57,291 | 60,364 | 63,859 | **16%** |
| Amount of treated wastewater discharged into lagoons (1000 $m^3$/year) | 13,474 | 35,391 | 31,109 | 38,845 | 39,168 | 33,817 | **20%** |
| Amount of treated wastewater discharged into the sea (1000 $m^3$/year) | 293 | 234 | 358 | 350 | 681 | 455 | **9%** |
| Dry sludge from wastewater (ton per year) | 21,573 | 27,170 | 32,066 | 39,717 | 40,857 | 40,805 | **14%** |
| Sludge from wastewater (1000 $m^3$ per year) | 372 | 289 | 543 | 218 | 196 | 222 | **-10%** |
| Amount of wastewater not collected in wastewater treatment plants, and discharged untreated into lagoons (million $m^3$) | 21,900,000 | 18,037,935 | 11,303,180 | 1,699,666 | 1941389 | 2441946 | **-36%** |
| Total discharge of surface groundwater into the sea (million $m^3$ per year) | 68,685,456 | 64,367,443 | 63,016,341 | 75,686,500 | 89689055 | 95,398,680 | **7%** |

Source: Public Works Authority (Ashghal)

**Map 3.8: Treated wastewater ratio of total wastewater by plants, 2017**



**Map 3.9: Treated wastewater ratio of total wastewater by plants in Doha Municipality, 2017**



### 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.

According to the type of wastewater treatment in plants, 5 plants use secondary treatment: Al-Jamiliyah, Al-Kharib, AL-Shamal, Slaughter House and Ras Abu Fontas. 15 plants use tertiary treatment (disinfection): Al-Thakhira, Al-Khor, Barwa Al-Baraha, Barwa City, Barwa Village, Barwa Musaimeer, Doha West, Duhail, Industrial Area, Doha South, Al-Shihaniya, Al-Ghazal, Al-Karaana, Umm Salal and Al-Shamal Camp. Finally, 3 plants use tertiary treatment by nitrogen and phosphorus removal: Doha North, Doha West and Lusail in 2017.

**Table 3.31: Wastewater treatment plants from urban areas, hydraulic design capacity and amount of wastewater pumped into each plant, 2017**

| Wastewater Treatment Plant | Type of Treatment | Hydraulic Design Capacity | | Amount of Wastewater Pumped into Each Plant (1000 $m^3$/year) |
|---|---|---|---|---|
| | | 1000 $m^3$/day | 1000 $m^3$/year | |
| Al-Jamiliyah PTP | Type of Treatment Secondary (sterilization) | 0.54 | 197.10 | 116.5 |
| AL-Kharib PTP | | 0.06 | 21.90 | 16 |
| Al-Shamal PTP | | 0.15 | 54.75 | 118 |
| Slaughter House PTP | | 0.81 | 296.00 | 84 |
| Ras Abu Fontas PTP | | 0.54 | 197.10 | 102 |
| Al Thakhira PTP | Tertiary (disinfection) | 3.2 | 1168 | 1426 |
| Al Khor PTP | | 9.72 | 3547.80 | 4430 |
| Barwa Al Baraha PTP | | 12.00 | 4380.00 | 4702 |
| Barwa City STP | | 15.00 | 5475.00 | 1289 |
| Barwa Musaimeer PTP | | 1.5 | 547.50 | 323 |
| Barwa Al Siliayah PTP | | 1.50 | 547.50 | 306 |
| Barwa Village PTP | | 1.00 | 365.00 | 197 |
| Doha West Old STP | | 54.00 | 19710.00 | 21362 |
| Duhail PTP | | 0.81 | 295.65 | 68 |
| Industrial Area STP | | 30 | 10950 | 12508 |
| Al Ghazal (3) PTP | | .44 | 160.6 | 146 |
| Al Shihaniyah | | 1.35 | 490.93 | 604 |
| Umm Salal | | 1.50 | 547.50 | 57 |
| Al Karaana(1) | | 10.00 | 3650.00 | 3823 |
| Al Shamal Camp | | 0.25 | 89.43 | 140 |
| Doha North STP | Tertiary (N & P removal) | 244.00 | 89060.00 | 33526 |
| Doha West STP | | 175.50 | 64057.50 | 66488 |
| Doha South STP(4) | | 204 | 74460 | 69228 |
| Lusail(2) | | 60.00 | 21900.00 | 10497 |
| (Total)(5) | | 827.05 | 301872.9 | 231388.5 |

(1) Al-Karaana: under test and operates on tanks.

(2) Lusail Plant: tanker based.

(3) Al Ghazal PTP was operated in 2017.

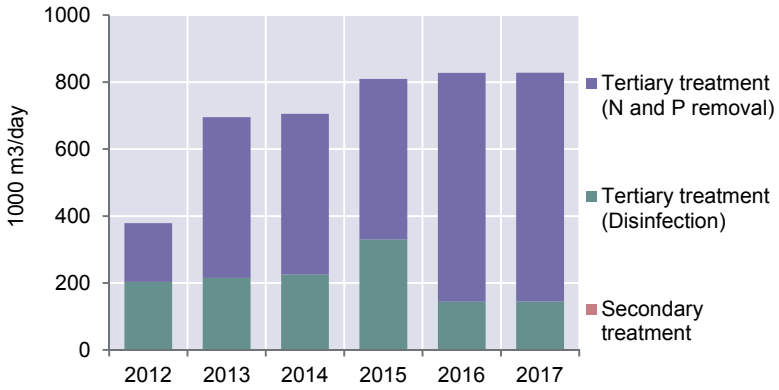
(4) The plant was upgraded with tertiary treatment (nitrogen and phosphorus removal) in 2016

(5) Total does not include the Slaughter House Plant

Source: Public Works Authority (Ashghal)

The design capacity of wastewater treatment plants which implement secondary treatment amounted to 2.1 thousand $m^3$/day, tertiary treatment (disinfection) to 142.3 thousand $m^3$/day and tertiary treatment (nitrogen and phosphorous removal) to 683.5 thousand $m^3$/day in 2017.

**Figure 3.29: Hydraulic design capacity by type of treatment at wastewater treatment plants 2012-2017**




Statistics indicate that Doha West Wastewater Treatment Plant started implementing advanced tertiary treatment (N and P removal) in 2009. Doha South Plant began to implement advanced tertiary treatment nitrogen and phosphorus removal) since 2016, and in 2017 it accommodated more than 30% of the treatment capacity of wastewater generated from urban areas in Qatar. In 2013, Lusail Plant (which is tanker based) began to implement nitrogen and phosphorus removal treatment. A new wastewater treatment plant was added in 2017, called Al Ghazal Plant, which offers advanced tertiary treatment applying nitrogen and phosphorus removal with a design capacity of 44 thousand meter3/day. It is noteworthy that since 2004, all urban wastewater treatment plants have been equipped with, at least, secondary treatment methods, ensuring that organic pollution is largely eliminated.

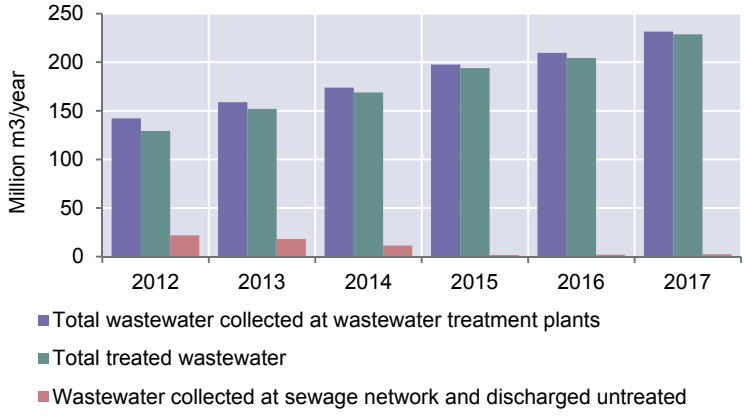
### 3.4.3 *Urban Wastewater Treatment, Discharge and Quality*

In 2017, total urban wastewater (excluding Industrial Area) attained 231.5 million $m^3$, of which 99.1% was treated in wastewater treatment plants. Since 2004, organic pollution (BOD and COD) has been removed by over 95% most of the time. In 2017, 98.7% of BOD and 95.9% of COD were removed in urban wastewater treatment plants (24 plants).

Doha West Plant is Qatar's largest urban wastewater treatment plant. It achieves high removal ratios of BOD, COD, nitrogen and phosphorous. In 2017, over 65 million $m^3$ of wastewater were treated (29% of total urban wastewater in Qatar). In Doha West Plant, 99% of BOD, 96% of COD, 83% of overall nitrogen and 86% of overall phosphorous were removed.

Since 2012, over 91% of urban wastewater has been treated in treatment plants. In 2017, treatment increased to 99% of total wastewater, and around 2.4 million $m^3$, collected via tankers, were discharged in Al-Karaana wastewater lagoon (this water is not often produced by residential units). See Figure (3.30).

**Figure 3.30: Collected wastewater, treated wastewater and discharged untreated wastewater (million $m^3$/year) 2012-2017**




Source: Public Works Authority (Ashghal)

Statistics of Figure (3.32) show that organic pollution in terms of COD was removed at over 95% until 2017. During the period 2012-2017, COD collected amount increased from 54,154 metric tons in 2012 to 103,636 metric tons in 2017 (a 14% annual growth). In addition, the removal ratio slightly decreased in the same period 96.1% in 2012 to 95.9% in 2017.

**Figure 3.31: Treatment efficiency at urban wastewater treatment plants by BOD (ton, %) 2012-2017**

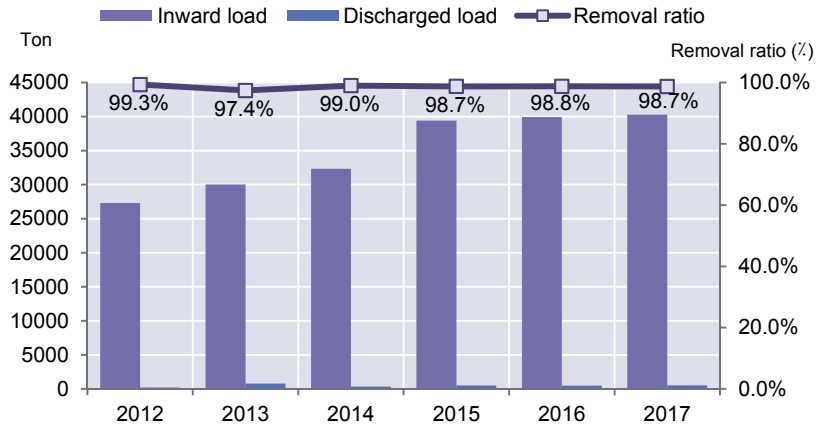
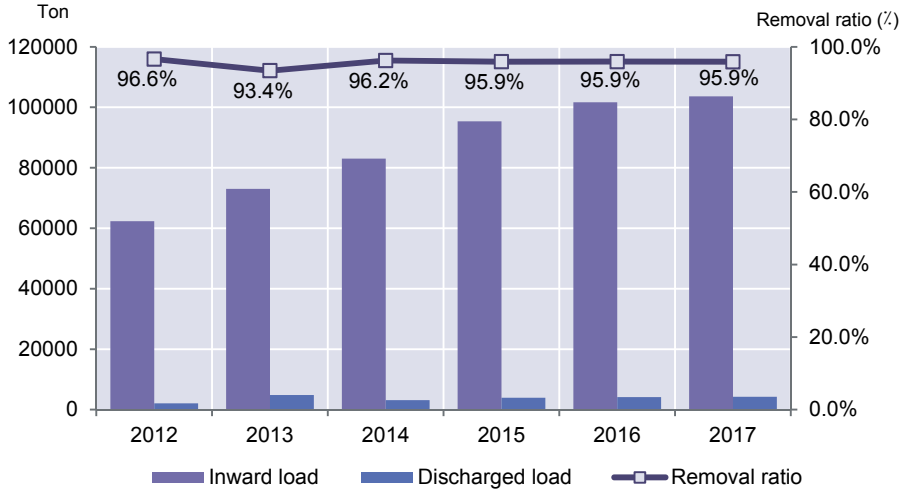



**Figure 3.32: Treatment efficiency at urban wastewater treatment plants by COD (ton, %) 2012-2017**



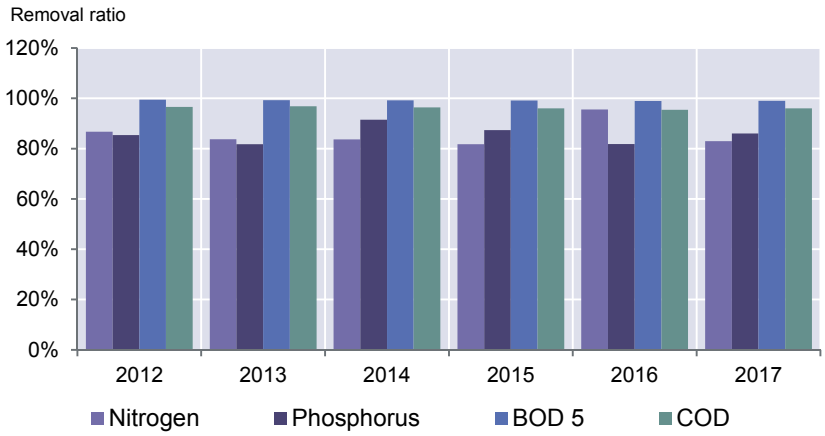

Source: Public Works Authority (Ashghal)

Source: PSA calculations

During the period 2012-2017, BOD was highly removed and it exceeded 97%. BOD quantities, collected in 2012, increased from 23,411 metric tons to 40,288 metric tons in 2017 (an annual growth of 11%). The removal ratio also nearly maintained its level during this period between 99.2% in 2012 and 98.7% in 2017.

Figure (3.33) below on removal of BOD5, COD, and overall nitrogen and phosphorous in Doha West Plant during the period 2012-2017, indicates that this plant is Qatar's largest treatment plant of urban wastewater at a design capacity of 175.5 thousand $m^3$/day. Doha West Plant is equipped with the ability to remove nitrogen and phosphorous since 2009. Phosphorous removal rose from 85.4% in 2012 to 86% in 2017, while nitrogen removal decreased from 86.7% to 83% for the same period.

**Figure 3.33: Removal ratios of BOD5, COD, total N and P at Doha West Wastewater treatment Plant 2012-2017**




Source: Public Works Authority (Ashghal)

Source: PSA calculations

### 3.4.4 *Quality of wastewater*

In 2017, the Public Works Authority took samples of treated wastewater in sewage treatment plants to conduct detailed tests on fecal coliform bacilli. Table (3.32) indicates that there were incompatible samples in all plants in 2017. Also, the results of samples for parasitic tests (protozoa) indicated that there were no samples incompatible to the specifications approved by the plants.

**Table 3.32: Detailed and specialized results of bacteriological and parasitic tests for treated wastewater by treatment plant, 2017**

| Station | 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 | 365 | 365 | 100% | 0 | 0% | 6 | 0 | 0% |
| Doha West | 56 | 56 | 100% | 0 | 0% | 61 | 0 | 0% |
| Doha West (Old) | 52 | 52 | 100% | 0 | 0% | | | |
| Industrial Area | 365 | 365 | 100% | 0 | 0% | 6 | 0 | 0% |
| Doha North | 366 | 366 | 100% | 0 | 0% | 365 | 0 | 0% |
| Lusail | 40 | 40 | 100% | 0 | 0% | 33 | 0 | 0% |
| Barwa City | 48 | 48 | 100% | 0 | 0% | | | |
| Barwa Musaimeer | 48 | 48 | 100% | 0 | 0% | | | |
| Barwa Al-Siliyyah | 48 | 48 | 100% | 0 | 0% | | | |
| Barwa Village | 48 | 48 | 100% | 0 | 0% | | | |
| Barwa Al-Baraha | 48 | 48 | 100% | 0 | 0% | | | |
| Al-Khor | 365 | 365 | 100% | 0 | 0% | 48 | 0 | 0% |
| Ras Abu Fontas | 48 | 48 | 100% | 0 | 0% | | | |
| Al-Shihaniyah | 48 | 48 | 100% | 0 | 0% | | | |
| Al-Thakhira | 48 | 48 | 100% | 0 | 0% | | | |
| Jamiliyah | 48 | 48 | 100% | 0 | 0% | | | |
| Al Shamal Camp | 48 | 48 | 100% | 0 | 0% | | | |
| Al-Shamal | 48 | 48 | 100% | 0 | 0% | | | |
| Duhail | 48 | 48 | 100% | 0 | 0% | | | |
| Umm Salal | 10 | 10 | 100% | 0 | 0% | | | |
| Al-Kharib | 48 | 48 | 100% | 0 | 0% | | | |
| Al-Karaana | 340 | 340 | 100% | 0 | 0% | | | |
| Al-Ghazal | 48 | 48 | 100% | 0 | 0% | | | |
| Total | 2,631 | 2,631 | 100% | 0 | 0% | 519 | 0 | 0% |

Source: Public Works Authority (Ashghal)

Referring to the tests conducted by Ashghal on the concentration of inward and outward pollutants from wastewater treatment plants, there were no violations of the specifications of the samples taken from the plants in 2017 by plant and non-conformity to specifications.

The Ministry of Public Health, in controlling the quality of treated wastewater according to the source used for irrigation at Corniche area during the period 2012-2017, adopted WHO's standards related to microorganisms, and FOA's standards related to heavy metals.

The statistics in Table (3.33) below on the results of detailed and specialized bacteriological and parasitic tests of treated wastewater by treatment plant during the period 2010-2013, indicate that all samples taken from the monitored plants were compatible. The Ministry of Public Health, as a regulatory body, conducts these tests to monitor the quality of treated wastewater.

**Table 3.33: Results of detailed and specialized bacteriological and parasitic tests of treated wastewater by treatment plant 2010-2013***

| Year | Wastewater Treatment Plant | Detailed Tests by Fecal Coliform Bacilli/ 100 Ml of Sample | | | Parasites tests (Protozoa) | | |
|---|---|---|---|---|---|---|---|
| | | No. of Samples | Incompatible Samples | | No. of Samples | Incompatible Samples | |
| | | | No. | % | | No. | % |
| 2010 | Doha South | 12 | 0 | 0.0 | 12 | 0 | 0.0 |
| | Doha West | 12 | 0 | 0.0 | 12 | 0 | 0.0 |
| | Doha North | 12 | 0 | 0.0 | 12 | 0 | 0.0 |
| | **Total** | **36** | **0** | **0.0** | **36** | **0** | **0.0** |
| 2011 | Doha South | 12 | 0 | 0.0 | 12 | 0 | 0.0 |
| | Doha West | 12 | 0 | 0.0 | 12 | 0 | 0.0 |
| | Doha North | 12 | 0 | 0.0 | 12 | 0 | 0.0 |
| | **Total** | **36** | **0** | **0.0** | **36** | **0** | **0.0** |
| 2012 | Doha South | 12 | 0 | 0.0 | 12 | 0 | 0.0 |
| | Doha West | 12 | 0 | 0.0 | 12 | 0 | 0.0 |
| | Doha North | 12 | 0 | 0.0 | 12 | 0 | 0.0 |
| | **Total** | **36** | **0** | **0.0** | **36** | **0** | **0.0** |
| 2013 | Doha South | 12 | 0 | 0.0 | 12 | 0 | 0.0 |
| | Doha West | 12 | 0 | 0.0 | 12 | 0 | 0.0 |
| | Doha North | 12 | 0 | 0.0 | 12 | 0 | 0.0 |
| | **Total** | **36** | **0** | **0.0** | **36** | **0** | **0.0** |

*: The data is for the last available updated year

Source: Ministry of Public Health

Table (3.34) below shows 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, no irregularities were recorded, thus the quality of treated wastewater used for irrigation conforms to the highest international standards. The incidence of non-conforming samples in parasitic tests (protozoa) also decreased significantly from a rate exceeding 4.0% in 2010 to reach zero in recent years 2012, 2013, 2016 and 2017. However, the monitoring program temporarily paused in 2014 and 2015 and resumed in 2016.

**Table 3.34: Quality of treated wastewater by test source, use, and type of tests (Corniche) 2010-2017**

| 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 |
| 2010 | 104 | 0 | 0.0% | 100 | 4 | 4.0% | 36 | 0 | 0.0% |
| 2011 | 147 | 0 | 0.0% | 143 | 4 | 2.8% | 36 | 0 | 0.0% |
| 2012 | 154 | 0 | 0.0% | 154 | 0 | 0.0% | 36 | 0 | 0.0% |
| 2013 | 97 | 0 | 0.0% | 97 | 0 | 0.0% | 36 | 0 | 0.0% |
| 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% |

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.

## Box 8: National Policy in Relation to Waste Management

The following programs/projects result from the National Development Strategy within its environment protection plan for the coming generations:

**Program/project:**

1- Establish a solid waste management plan including the contribution of the then Ministry of Municipality and Urban Planning (currently Ministry of Municipality and Environment).

**Goals:**

- Establish a solid waste management plan that emphasizes recycling.
- Attain 38% of recycling of solid waste, (currently it is 8%).
- Fix domestic waste generation at 1.6 Kg daily per capita.

**Output:**

Reduce waste and increase recycling and use efficiency

**Program/project:**

2- Database of environment information/waste management

**Goal:**

- Create an online database that offers search possibility

**Output:**

- Improve environment management and cooperation at regional and international level

**Waste management in relation to international frameworks such as SDGs 2030**

- Goal (11), indicator (4): percentage of solid urban waste regularly collected and appropriately discharged vis-à-vis the entire waste generated in cities.
- Goal (12), indicator (4): national recycling ratio, and tons of recycled materials.

- Goal (12), indicator (4.2): Total hazardous waste generated per capita, and ratio of treated hazardous waste by type of treatment.
- Goal (11), indicator (6.1): percentage of solid urban waste regularly collected and appropriatly discharged of total waste generated in the city.

**Waste management in relation to international frameworks such as the indicators of international competitiveness.**

- Paper/cardboard recycling ratio

The 2017 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.

**Table 3.35: Number of Waste Management Facilities 2012-2017**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual growth rate 2012-2017 |
|---|---|---|---|---|---|---|---|
| No. of transfer stations | 4 | 4 | 4 | 4 | 4 | 4 | 0% |
| No. of landfills | 2 | 2 | 2 | 2 | 2 | 2 | 0% |
| No. of dumps | 1 | 1 | 1 | 1 | 2 | 2 | 15% |
| No. of waste treatment plant (1) | 1 | 1 | 1 | 1 | 1 | 1 | 0% |

(1) Domestic Solid Waste Management Center in Mesaieed
Source: Ministry of Municipality and Environment

Total solid waste in Qatar amounted to 8.2 million tons in 2017. According to the results in Table (3.36), treated solid waste decreased after reaching 12.3 million tons per year in 2012. In 2017, around 55% of domestic waste was discharged into DSWMC in Mesaieed.

**Table 3.36: Managed Waste by Type and Waste Management Facility (ton) 2012-2017**

| Waste by Type | Waste Management Facility | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| Domestic | Umm Al-Afai Landfill (1) | 44,151 | 0 | 0 | 0 | 0 | 0 |
| | Mesaieed Landfill | 258,991 | 326,960 | 408,526 | 482,640 | 537,313 | 536,050 |
| | DSWMC | 568,466 | 603,703 | 639,522 | 613,226 | 618,156 | 648,337 |
| | Total Domestic Waste | **871,608** | **930,663** | **1,048,048** | **1,095,866** | **1,155,469** | **1,184,387** |

| Waste by Type | Waste Management Facility | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| Construction | Rawdat Rashid Dump/inward | 9,228,296 | 8,893,750 | 6,433,372 | 3,806,745 | 1,998,853 | 140,402 |
| | Rawdat Rashid Dump/treated | 0 | 0 | 0 | 459,857 | 485,657 | 177,969 |
| | Umm Al Afai Landfill | 59,086 | 0 | 0 | 0 | 0 | 0 |
| | Mesaieed Landfill/inward | 419,503 | 460,737 | 622,978 | 469,669 | 548,527 | 533,036 |
| | Umm Thanyatain Dump(3) | 0 | 0 | 0 | 0 | 2069906 | 3418673 |
| | Total Inward Construction Waste | **9,706,885** | **9,354,487** | **7,056,350** | **4,276,414** | **4,644,286** | **4,092,111** |
| | Total Treated Construction Waste | **0** | **0** | **0** | **459,857** | **485,657** | **177,969** |
| Bulky (2) | Umm Al-Afai Landfill | 304,259 | 0 | 0 | 0 | 0 | 0 |
| | Mesaieed Landfill | 1,340,776 | 1,796,396 | 1,747,678 | 2,048,954 | 2,333,567 | 2,661,504 |
| | Total Bulky Waste | **1,645,035** | **1,796,396** | **1,747,678** | **2,048,954** | **2,333,567** | **2,661,504** |
| Tires | Rawdat Rashid Dump / inward (3) | 2,726 | 16,448 | 31,605 | 36,297 | 37,824 | 37,186 |
| | Rawdat Rashid Dump (3)/treated | 0 | 0 | 18,172 | 12,933 | 17,739 | 15,062 |
| | Umm Al-Afai Landfill/ treated | 0 | 0 | 19,351 | 9,269 | 5,621 | 13 |
| | Total Inward Tires | **2,726** | **16,448** | **31,605** | **36,297** | **37,824** | **37,186** |
| | Total Treated Tires | **0** | **0** | **37,523** | **22,202** | **23,360** | **15,075** |
| Other | Umm Al-Afai Landfill | 558 | 0 | 0 | 0 | 0 | 0 |
| | Mesaieed Landfill | 4,797 | 10,064 | 12,540 | 207,367 | 213,022 | 171,912 |
| | DSWMC | 0 | 0 | 0 | 9,468 | 10,625 | 9,491 |
| | Total Other Types | 5,355 | 10,064 | 12,540 | 216,835 | 223,647 | 181,403 |
| Total Inward | | **12,231,609** | **12,108,058** | **9,896,221** | **7,674,366** | **8,394,793** | **8,156,591** |
| Total Treated | | **0** | **0** | **37,523** | **482,059** | **509,017** | **193,044** |

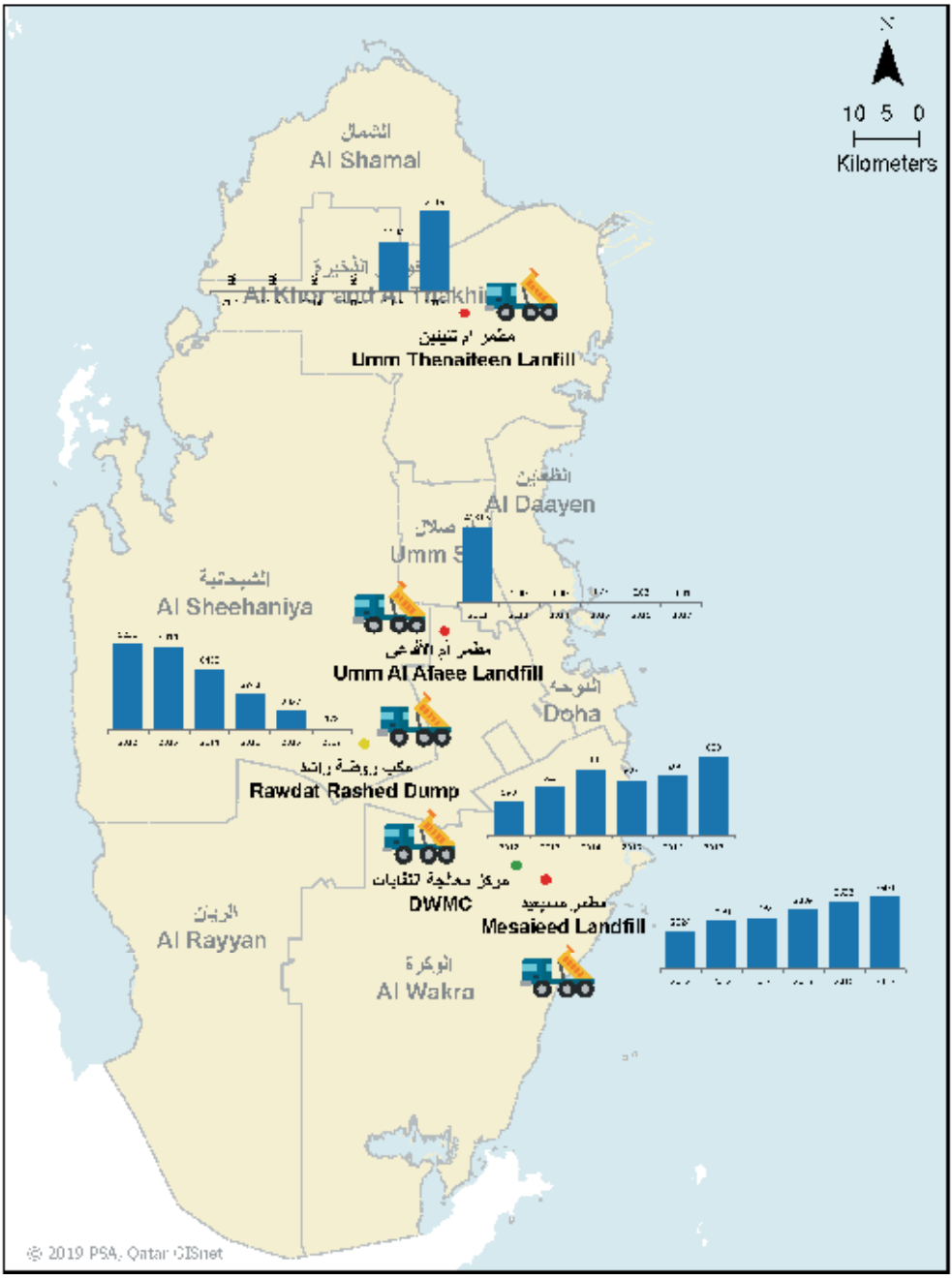
(1) Since 2013 Umm Al-Afai Dump has been Closed.

(2) Bulky waste disposed of only in Umm Al-Afai and Mesaieed.

(3) Umm Thanyatain Dump was added in 2016.

Source: Ministry of Municipality and Environment

**Map 3.10: Waste Generated by Waste Management Facilities (1,000 metric tons), 2012-2017**



According to relative importance, Qatar's construction sector comes first in terms of the amount of treated waste, with 50.2% of total waste in 2017.

Around 3,245 tons of domestic waste were generated per day in 2017. This means that the average is 1.19 kg per capita per day.

**Table: 3.37: Daily generated solid waste by type (metric ton/day), 2012-2017***

| Year | Domestic waste | Construction waste | Bulky waste | Tires | Others | Total |
|---|---|---|---|---|---|---|
| 2012 | 2,388 | 26,594 | 4,507 | 7 | 15 | **3,3511** |
| 2013 | 2,550 | 25,629 | 4,922 | 45 | 28 | **33,173** |
| 2014 | 2,871 | 19,332 | 4,788 | 87 | 34 | **27,113** |
| 2015 | 3,002 | 11,716 | 5,614 | 61 | 594 | **20,987** |
| 2016 | 3166 | 12724 | 6393 | 104 | 613 | **22,999** |
| 2017 | 3245 | 11211 | 7292 | 102 | 497 | **22,347** |
| Annual Growth Rate 2012 & 207 | 6% | -16% | 10% | 71% | 101% | -8% |

*Data from previous years have been updated from the source

Source: Ministry of Municipality and Environment and PSA calculations

**Table 3.38: Daily treated waste by type (kg/day), 2012-2017***

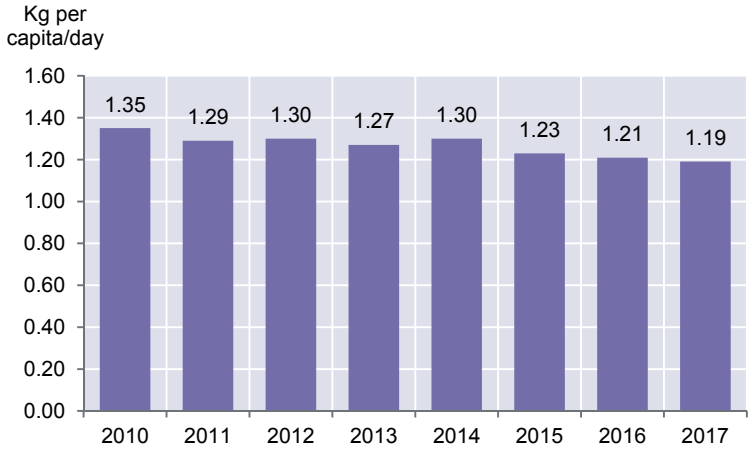
| Year | Domestic waste | Construction waste | Bulky waste | Tires | Others | Total |
|---|---|---|---|---|---|---|
| 2012 | 2,387,967 | 26,594,205 | 4,506,945 | 7,468 | 14,671 | **33,511,258** |
| 2013 | 2,549,761 | 25,628,732 | 4,921,633 | 45,063 | 27,573 | **33,172,762** |
| 2014 | 2,871,364 | 19,332,466 | 4,788,159 | 86,589 | 34,356 | **27,112,934** |
| 2015 | 3,002,373 | 11,716,203 | 5,613,573 | 60,827 | 594,068 | **20,987,044** |
| 2016 | 3,165,668 | 12,724,071 | 6,393,334 | 103,627 | 612,732 | **22,999,433** |
| 2017 | 3,244,896 | 11,211,263 | 7,291,792 | 101,879 | 496,995 | **22,346,825** |
| Annual Growth Rate 2012 & 207 | 6% | -16% | 10% | 69% | 102% | -8% |

*Data from previous years have been updated from the source

Source: Ministry of Municipality and Environment and PSA calculations

Figure (3.34) below indicates that the daily per capita generated domestic waste decreased from 1.35 kg to 1.19 kg, which is less than the target set in the National Development Strategy (1.6 kg per capita/day).

**Figure 3.34: Per capita generated domestic waste (kg/day) 2010-2017**




# 5. 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 8.2 million tons in 2017. DSWMC received 648.34 thousand tons, and 42 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 3.39: Recycled domestic waste (ton) 2012-2017***

| Item | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual growth rate 2012&2017 |
|---|---|---|---|---|---|---|---|
| Total inward waste | 12,231,609 | 12,108,058 | 9,896,221 | 7,683,635 | 8,400,414 | 8,156,604 | -8% |
| Domestic waste treated at DSWMC, Mesaieed | 568,466 | 603,703 | 639,522 | 613,226 | 618,156 | 648,337 | 3% |
| Amount of recycled materials | 6,632 | 16,450 | 17,514 | 69,748 | 53,384 | 42,116 | 45% |

*Data from previous years have been updated from the source

Source: Ministry of Municipality and Environment

## 5.1 *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 $km^2$ 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.

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

**Table 3.40: DSWMC's productive capacity by type 2012-2016***

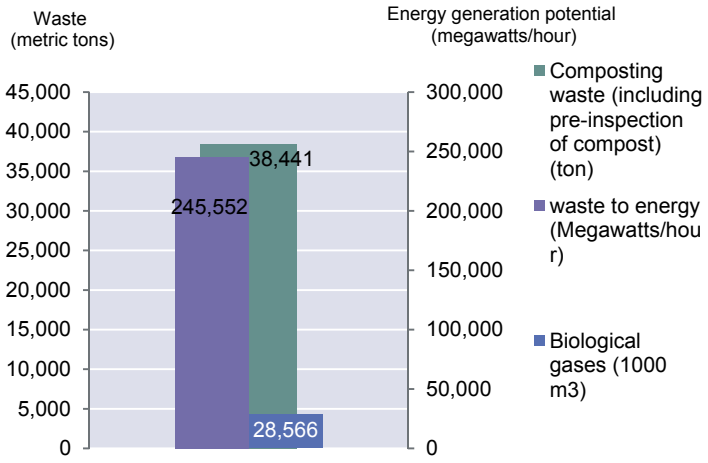
| Item | 2012 | 2013 | 2014 | 2015 | 2016 | Annual growth rate 2012&2016 |
|---|---|---|---|---|---|---|
| Quantity of waste treated at DSWMC (ton) | 590,351 | 612,646 | 639,522 | 622,695 | 628,781 | 2% |
| Composting waste produced (including compost pre-inspection) ton | 8,250 | 38,861 | 63,880 | 35,135 | 38,441 | 47% |
| Waste to energy (megawatts/hour) | 19,082 | 152,961 | 203,628 | 238,670 | 245,552 | 89% |
| Biological gases (1000 $m^3$) | 4,428 | 14,045 | 14,038 | 20,920 | 28,566 | 59% |

* Data from previous years have been updated from the source

Source: Ministry of Municipality and Environment

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 246 thousand megawatts of electricity, used to operate the center itself, while part of this energy goes to government sector.

**Figure 3.35: DSWMC's productive capacity by type, 2016**




# 6. 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.

Hazardous waste generation index during (2012-2017) decreased from 0.74 metric ton per unit of GDP in 2014 to 0.37 metric ton per unit of GPD in 2015. Afterwards, it decreased to 0.18 metric ton per unit of GDP in 2016.

**Figure 3.36: Hazardous generated waste in tons per million US dollars of GDP (constant prices 2013=100) for the years 2012-2017**

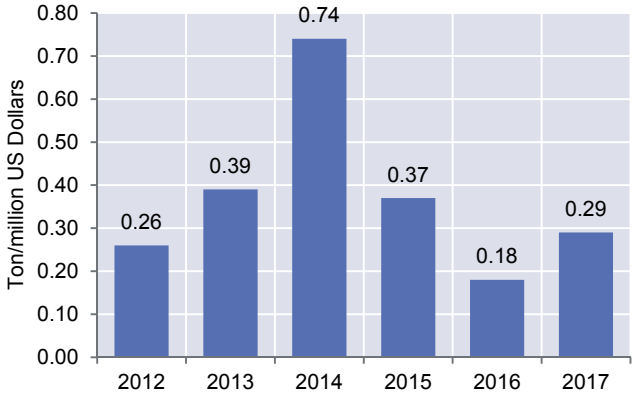



**Figure 3.37: Per capita of total hazardous generated waste (kg per capita), 2012-2017**

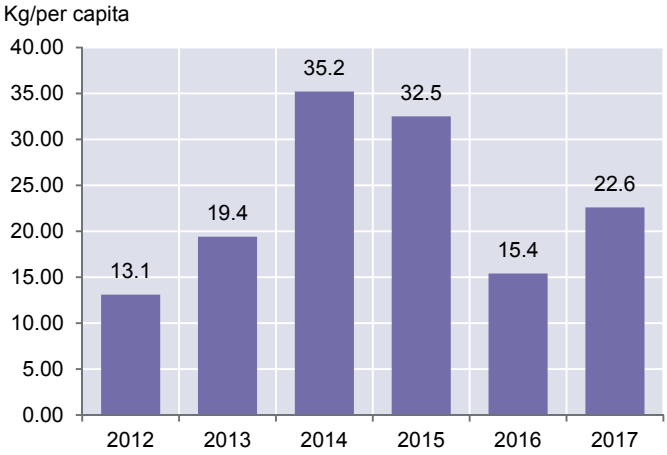
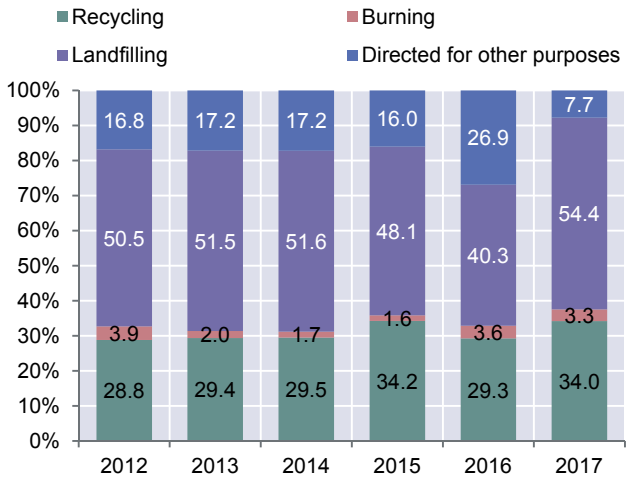



Figure 3.38 below indicates that the total per capita generated hazardous waste amounted to 22.6 kg in 2017, while it reached its peak in 2014, and decreased again in 2016.

**Figure 3.38: Percentage distribution of hazardous waste by disposal methods, 2012-2017**




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. According to Figure (3.38), it was noted that in 2017, 54.4% of hazardous waste was disposed of in landfills, followed by 34.0% by recycling, 7.7% was used for other purposes and 3.3% was disposed of by incineration.

# 7. Energy Consumption

## *7.1 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 2017, the highest share was registered for the sector of construction (52.4%), while the lowest was for insurance accounting for less than 1% of total expenditure on intermediate consumption of both electricity and water.

## Table 3.41: Value of expenditure on electricity, fuel and oils by economic activity (thousand QR) 2012-2017

| Economic Sector | Item | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual growth rate 2012-2017 |
|---|---|---|---|---|---|---|---|---|
| Banks | Electricity & water | 22,490 | 23,307 | 26,992 | 26,818 | 29,483 | 26,119 | 3 |
| | oil & Fuel | 12,285 | 1,246 | 1,405 | 1,442 | 1,171 | 1,486 | -34 |
| Insurance | Electricity & water | 5,587 | 2,010 | 2,404 | 3,256 | 3,746 | 1,920 | -19 |
| | Fuel & oil | 1,075 | 395 | 376 | 465 | 499 | 312 | -22 |
| Energy and manufacturing | Electricity | 5,778,810 | 6,466,466 | 6,233,543 | 6,108,948 | 6,514,278 | 9,394,628 | 10 |
| | Water | 2,659,274 | 2,945,915 | 3,047,582 | 3,161,390 | 3,466,842 | 3,694,005 | 7 |
| Wholesale and retail | Electricity | 205,404 | 235,466 | 241,670 | 221,168 | 228,445 | 309,001 | 9 |
| | Water | 53,897 | 54,498 | 63,389 | 59,955 | 74,727 | 94,071 | 12 |
| | Fuel & oil | 153,572 | 189,936 | 258,063 | 202,336 | 214,907 | 259,968 | 11 |
| Transport and communications | Electricity & water | 72,660 | 77,832 | 80,438 | 114,488 | 119,139 | 161,524 | 17 |
| | Fuel & oil | 11,580,239 | 12,058,708 | 13,124,577 | 9,693,410 | 11,089,519 | 14,020,584 | 4 |
| Construction | Electricity & water | 310,304 | 324,307 | 344,776 | 466,682 | 607,371 | 650,114 | 16 |
| | Fuel & oil | 1,012,269 | 1,300,043 | 1,718,582 | 1,937,433 | 2,410,912 | 2,611,768 | 21 |
| Business services | Electricity & water | 108,409 | 179,791 | 158,737 | 204,605 | 251,517 | 276,436 | 21 |
| | Fuel & oil | 162,583 | 100,684 | 123,374 | 244,206 | 243,893 | 258,991 | 10 |
| Personal social services | Electricity & water | 63,386 | 70,528 | 71,655 | 195,803 | 120,018 | 123,431 | 14 |
| | Fuel & oil | 45,074 | 84,958 | 71,739 | 123,279 | 99,883 | 87,514 | 14 |
| &Hotels restaurants | Electricity | 99,850 | 108,650 | 168,586 | 125,708 | 194,158 | 226,776 | 18 |
| | Water | 29,697 | 33,357 | 35,844 | 83,080 | 70,880 | 89,718 | 25 |
| | Fuel & oil | 40,587 | 46,902 | 62,696 | 90,577 | 98,510 | 103,182 | 21 |

Source: PSA, Economic Statistics Bulletin

## 7.2 *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.

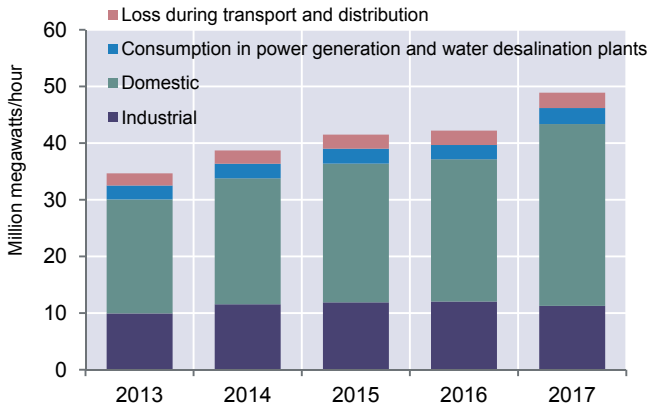
Total electricity consumption amounted to 49 million megawatts/hour in 2017, a growth rate of 7% during the period 2012-2017. Electricity consumption in the domestic sector had the highest share of total consumed electricity in 2017. It amounted to 32 million megawatts/hour, with a relative importance of 66%, followed by the industrial sector, which consumed 11 million megawatts/hour, with a relative importance of 23%, followed by power generation and water desalination plants at around 3 million megawatts/hour, with a relative importance of 5.8%. The loss during transport and distribution of electricity reached about 3 million megawatts/hour, with a relative importance of 5.5% in 2017.

**Table 3.42: Electricity consumption by sector (megawatts/hour) 2012-2017**

| Sector | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual growth rate 2012-2017 |
|---|---|---|---|---|---|---|---|
| Industrial | 9,798,062 | 9,944,423 | 11,568,215 | 11,886,696 | 12,026,249 | 11,261,941 | 3% |
| Domestic | 20,386,671 | 20,121,050 | 22,215,842 | 24,490,670 | 25,107,915 | 32,095,345 | 10% |
| Consumption in power generation and water desalination plants | 2,435,593 | 2,443,814 | 2,567,926 | 2,647,006 | 2,532,392 | 2,831,204 | 3% |
| Loss during transport and distribution | 2,167,607 | 2,159,043 | 2,340,897 | 2,474,889 | 2,532,392 | 2,694,696 | 4% |
| Total | **34,787,933** | **34,668,330** | **38,692,880** | **41,499,261** | **42,198,948** | **48,883,186** | **7%** |

Source: Kahramaa – Annual Statistical Report

**Figure 3.39: Electricity consumption by sector (million megawatts/hour) 2013-2017**




# 8. 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.

## Box 10: Air Quality in Relation to National Policies

The following programs/projects result from the National Development Strategy within its environment protection plan for the coming generations

**Program/Project**

1- Energy and gas efficiency

**Goals:**

- Study choices to reduce gas consumption per joint electricity and water production unit by updating the connection systems.
- Improve thermal efficiency in the production of energy.
- Expedite the adoption of energy conservation techniques.
- Ensure follow up of green spaces system implementation in Qatar.
- Establish a national committee for renewable energy.

**Output:**

- Enhance use efficiency of energy and gas, and improve air quality.

**Program/Project:**

2- Improve air quality management.

**Goal:**

- Eradicate cases of increasing ozone levels in Qatar by improving air quality management.

**Outputs:**

- Improve environment management and cooperation at regional and international level.
- Pure air and effective responses to climate change.

**Program/Project:**

3- Prevent communicable diseases

**Goals:**

- Reduce TB widespread from 6.1 to 1.1 cases per 10,000 people.
- Apply early warning system for monitoring and tracking cases.

**Output:**

- Reduce threat of communicable diseases

**Program/Project:**

4- Database of environment/air quality

**Goal:**

- Create an online database that offers search possibility

**Output:**

- Improve environment management and cooperation at regional and international level

**Air quality in relation to international frameworks, such as the SDGs 2030**

- Goal 11: indicator 5: Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)

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 (3.44) shows that during the years 2016 and 2017, 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), where it was recorded as normal in 2017 in all monitoring stations It exceeded the national standard at Aspire Zone Station, Qatar University and the Corniche in 2016, where it was recorded as normal.

The "natural" criterion was adopted as a national boundary reflecting the extent that pollution should not exceed. The following table (3.44) shows that during the years 2016 and 2017, the values of the index did not exceed the "normal" limit for all the pollutants observed, and were all within the "clean" criterion except for nitrogen dioxide (NO2) which was recorded under the "normal" criterion in 2016 at all monitoring stations, while it was within the "clean" criterion in 2017 at all monitoring stations. Likewise, fine particulate matter 10 micrometers or less in diameter (PM10) was recorded as "normal" in 2016 and 2017 at all monitoring stations.

**Table 3.43: Annual average of air quality in Doha by station 2016 & 2017**

| Description | 2016 | | | 2017 | | | Annual Limit * |
|---|---|---|---|---|---|---|---|
| | Aspire Zone | Qatar University | Corniche | Aspire Zone | Qatar University | Corniche | |
| **(SO2)** | Clean | Clean | Clean | Clean | Clean | Clean | Normal |
| **(NO2)** | Clean | Clean | Clean | Clean | Clean | Clean | Normal |
| **(O3)** | Clean | Clean | Clean | Clean | Clean | Clean | Normal |
| **(CO)** | Clean | Clean | Clean | Clean | Clean | Clean | Normal |
| **(PM10)** | Normal | Normal | Normal | Normal | 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 3.40: Air Quality Index for all elements at Corniche Station 2017**

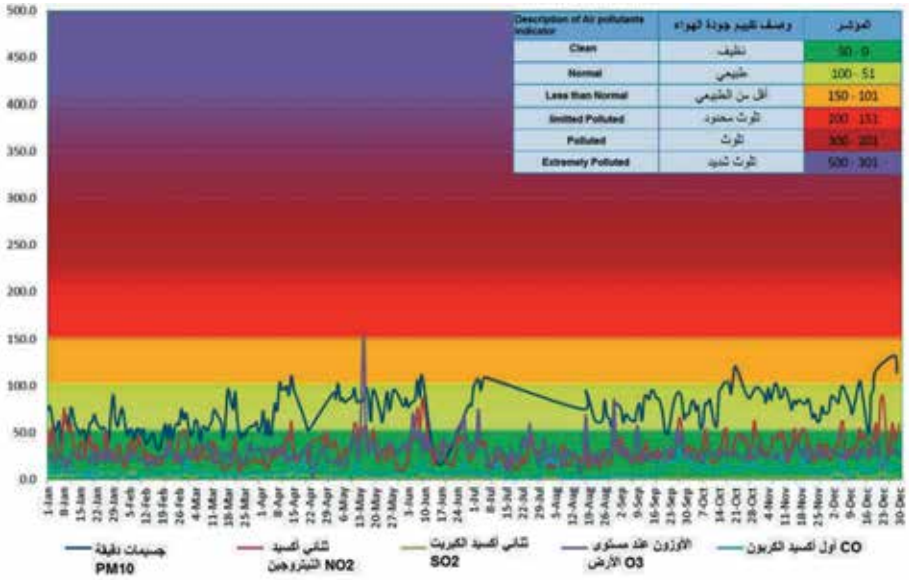



**Figure 3.41: Air Quality Index for all elements at Qatar University Station 2017**

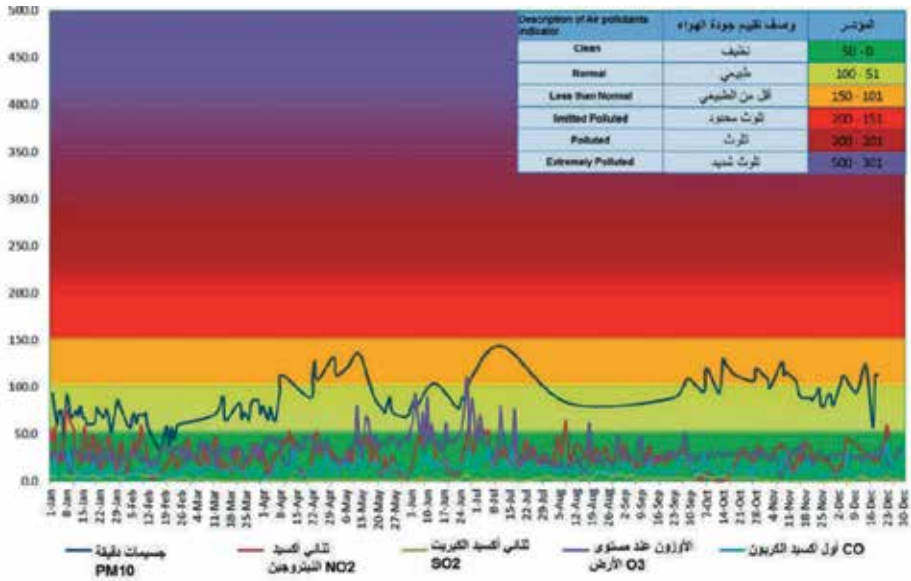
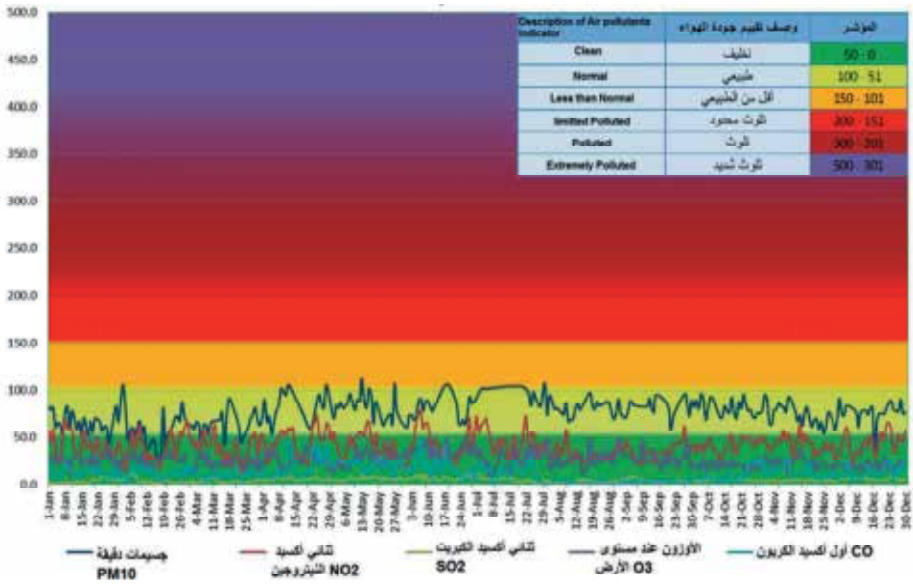


**Figure 3.42: Air Quality Index for all elements at Aspire Zone Station 2017**



# 9. Greenhouse Gases

## Box (11): Air Emissions in Relation to National Policies

The following programs/projects have emanated from the National Development Strategy to promote economic and technical efficiency.

**Program/Project**

1- Energy and gas sector efficiency

**Goals:**

- Study choices to reduce gas consumption per joint electricity and water production unit by updating the connection systems.
- Improve thermal efficiency in the production of energy.
- Expedite the adoption of energy conservation techniques.
- Ensure follow up of green space system implementation in Qatar.
- Establish a national committee for renewable energy.

**Output:**

Enhance energy and gas use efficiency, and improve air quality.

**Program/Project:**

2- Reduce natural gas flaring and emissions

**Goal**:

- Halve gas flaring to 0.0115 billion $m^3$ per million tons of generated energy compared to 0.0230 billion $m^3$ in 2008.

**Output:**

- Clean air and effective responses to climate change.

**Program/Project:**

3- Database on environment information/ air emissions

**Goal:**

- Create an online database that offers search possibility

**Output:**

- Improve environment management and cooperation at regional and international level

**Air quality in relation to international frameworks, such as the SDGs 2030.**

- Goal 9 – Indicator 4.1: CO2 emission per unit of value added.

**Air quality in relation to international frameworks such as the international competitiveness indicators.**

- Energy use intensity.

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:

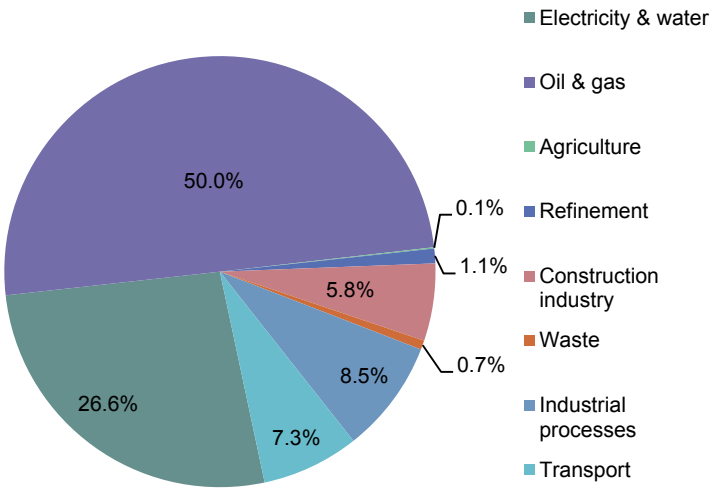
1. $CO_2$.
2. $CH_4$.
3. $N_2O$.
4. PFCs.
5. HFCs.
6. SF6.

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.

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.

The Ministry of Municipality and Environment is currently working on releasing the Second National Communications Report, which it started preparing in 2015. The following Figure shows the largest contributions to greenhouse gases emissions in Qatar as mentioned in the First National Communications Report in 2007. This relative distribution shows the state of the environment due to the emissions caused by the different human activities, and energy consumption either to respond to the population needs or to the economic growth.

**Figure 3.43: Largest contributions of greenhouse emissions in Qatar according to First National Communication Report, 2007**




Source: Ministry of Municipality and Environment – First National Communications Report 2007

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.

# 10. 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.

Figure 3.44 below shows that the mass of ODS consumption decreased at an annual rate of 7% during the period 2012-2017. The results of Table 3.44 below also indicate that after 2008 only HCFCs-22 and HCFCs (123, 141b, 142b) were consumed.

**Table 3.44: Mass of ODS consumption (metric ton), 2012-2017**

| Year | CFCs 11 | CFCs 12 | HCFCs 22 | HCFCs 123 | HCFCs 141b | HCFCs 142b | Total |
|---|---|---|---|---|---|---|---|
| 2012 | 0.0 | 0.0 | 1,497.4 | 35.7 | 17.41 | 132 | 1682.51 |
| 2013 | 0.0 | 0.0 | 1368 | 30.5 | 15.71 | 47.63 | 1461.84 |
| 2014 | 0.0 | 0.0 | 1495 | 40.98 | 10.05 | 11.98 | 1558.01 |
| 2015 | 0.00 | 0.00 | 1096.01 | 1.36 | 21.97 | 48.77 | 1168.11 |
| 2016 | 0.00 | 0.00 | 1066.10 | 36.00 | 15.52 | 37.37 | 1145.99 |
| 2017 | 0.00 | 0.00 | 1084.66 | 6.00 | 59.45 | 36.00 | 1180.11 |
| Annual Growth Rate 2012-2017 | - | - | -6% | -30% | 28% | -23% | -7% |

Source: Ministry of Municipality and Environment

**Table 3.45: ODS (by Ozone Depleting Potential ODP) according to Montreal Protocol (metric ton), 2012-2017**

| Year | CFCs 11 | CFCs 12 | HCFCs 22 | HCFCs 123 | HCFCs 141b | HCFCs 142b | Total |
|---|---|---|---|---|---|---|---|
| 2012 | 0.0 | 0.0 | 82.4 | 0.71 | 1.92 | 8.58 | 93.61 |
| 2013 | 0.0 | 0.0 | 75.2 | 0.61 | 1.73 | 3.10 | 80.64 |
| 2014 | 0.0 | 0.0 | 82.2 | 0.82 | 1.11 | 0.78 | 84.91 |
| 2015 | 0.00 | 0.00 | 60.28 | … | 2.42 | 3.17 | 65.90 |
| 2016 | 0.00 | 0.00 | 58.64 | … | 0.72 | 1.72 | 6.53 |
| 2017 | 0.00 | 0.00 | 59.66 | … | 6.53 | 2.34 | 68.53 |
| Annual Growth Rate 2012-2017 | ... | ... | -6% | ... | 28% | -23% | -6% |

Source: Ministry of Municipality and Environment

Data indicate that the annual per capita ODS consumption decreased during the years 2015 and 2017 to 0.10 kg per capita reaching 0.07 kg per capita/year. This decrease was due to the ban of import of CFC-11 and CFC-12 as of 2010 according to Montreal Protocol.

**Figure 3.44: ODS consumption (kg/per capita), 2012-2017**

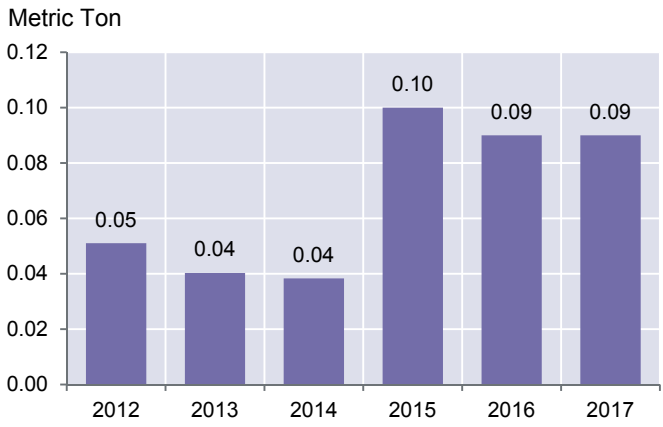
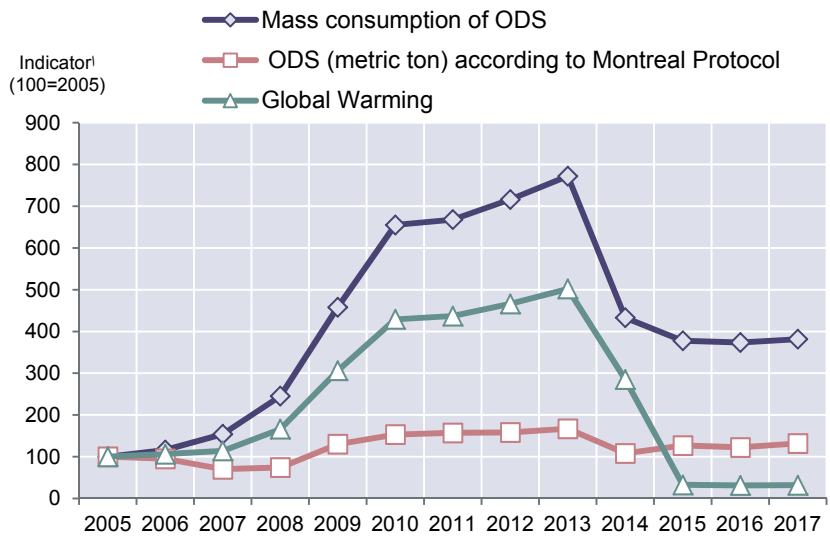



Figure 3.45 below indicates a comparison of ODS consumption in Qatar between the years 2005 and 2017 calculated based on the mass, global warming potential and ODP. The figure shows a general slump in the mass consumption of ODS at 433% and ODP at 108%, as well as the global worming potential at 285%.

**Figure 3.45: Comparing ODS Mass Consumption, Global Warming Potential and ODP, 2005-2017**




Source: Ministry of Municipality and Environment
Source: PSA calculations.

# 11. Environment Pollution-Related Diseases

Not only does environment pollution affect the health of biological systems and ecosystem in general, but it also affects the human health, which depends and interacts with the biological systems related to the population, food and water environment. The national environment strategy has been aware of this interdependence, which is reflected in the following Box.

## Box 12: Environment Pollution-Related Diseases in Relation to National Policies

The following programs/projects have emanated from the national strategy to promote economic and technical efficiency:

**Program/Project:**

1- Prevent communicable diseases.

**Goal:**

- Cut the percentage of TB from 6.1 cases to 1.1 per each 10,000 people.
- Apply early warning system for monitoring and tracking cases.

**Output**:

- Cut the percentage of communicable disease threat.

**Program/Project:**

2-Reduce natural gas flaring and emissions

**Goal:**

- Halve gas flaring to reach 0.0115 billion $m^3$ per million tons of generated energy compared to 0.0230 billion $m^3$ per million tons of generated energy.

**Output:**

- clean air and effective responses to clime change.

**Program/Project:**

3- Environment database/relation of diseases to environment pollution.

**Goal:**

- Create an online database that offers search possibility.

**Output:**

- Improve environment management and cooperation at regional and international level.

**Energy uses in relation to international framework such as the SDGs 2030**

Goal 3, Indicator 9.1: Mortality rate attributed to household and ambient air pollution.

From the table below indicates the infectious and communicable diseases reported to the Preventive Health Department at the Ministry of Public Health during the period (2012-2017). It is clear that the highest annual growth rates of diseases were infectious diarrhea, with an annual growth rate of 30% in 2012-2017. The annual growth rate of cases of parasitic scabies was about 22%, 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 2012-2017 increased by 33%. The total reported cases increased from 8,830 cases in 2012 to 24,745 cases in 2017. The cases of mumps/parotitis and measles decreased by 44%, while the rate of growth of the incidence of rubella cases fell by 37% during the same period.

**Table 3.46: Number of Infectious and Communicable Disease Cases Reported to the Preventive Health Department, 2012-2017**

| Diseases | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual growth rate 2012 & 2017 |
|---|---|---|---|---|---|---|---|
| Typhoid/ paratyphoid | 468 | 67 | 411 | 383 | 567 | 725 | 9 |
| bacterial food poisoning | 528 | 795 | 402 | 353 | 459 | 385 | -6 |
| TB | 252 | 256 | 143 | 305 | 262 | 295 | 3 |
| Non-pulmonary TB | 259 | 215 | 322 | 224 | 244 | 340 | 6 |
| Leprosy | 44 | 39 | 44 | 30 | 25 | 38 | -3 |
| Measles | 160 | 73 | 46 | 18 | 30 | 9 | -44 |
| Rubella | 20 | 58 | 20 | 7 | 20 | 2 | -37 |
| Hepatitis | 1,769 | 2,027 | 1,317 | 619 | 508 | 1,150 | -8 |
| Mumps/parotitis | 382 | 289 | 13 | 21 | 20 | 21 | -44 |
| Infectious diarrhea | 235 | 810 | 400 | 0 | 0 | 887 | 30 |
| Scabies | 328 | 380 | 538 | 688 | 793 | 894 | 22 |
| Meningitis and types | 191 | 271 | 215 | 263 | 257 | 329 | 11 |
| Other | 4,194 | 5,546 | 5,546 | 6272 | 6,666 | 5,090 | 4 |
| Total | 8,830 | 10,826 | 9,417 | 9183 | 22,313 | 24,745 | 33 |

Source: Ministry of Public Health

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

**Table 3.47: Number of reported TB cases by Country of Nationality, 2012-2017**

| Country | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual growth rate 2012 & 2017 |
|---|---|---|---|---|---|---|---|
| Qatar | 14 | 10 | 16 | 18 | 7 | 21 | 8% |
| KSA | 0 | 2 | 0 | 0 | 1 | 1 | -100% |
| Somalia | 1 | 2 | 3 | 0 | 1 | 4 | 32% |
| Egypt | 4 | 5 | 4 | 2 | 2 | 5 | 5% |
| India | 108 | 99 | 100 | 120 | 98 | 133 | 4% |
| Pakistan | 21 | 18 | 22 | 17 | 12 | 13 | -9% |
| Iran | 1 | 0 | 1 | 0 | 0 | 0 | -100% |
| Bangladesh | 29 | 20 | 34 | 53 | 57 | 81 | 23% |
| Nepal | 177 | 157 | 127 | 143 | 123 | 162 | -2% |
| Other countries | 156 | 158 | 158 | 176 | 122 | 119 | -5% |
| Total | 511 | 471 | 465 | 529 | 506 | 635 | 4% |

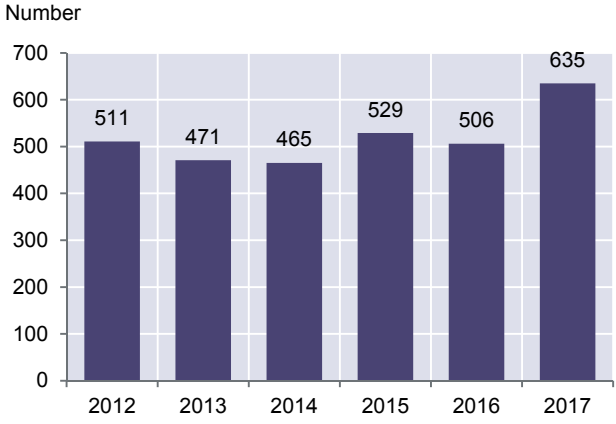
Source: Ministry of Public Health

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

The following Table shows reported TB cases by patients' country of origin during 2012-2017. TB cases amounted to 635 cases, most of whom are of Asian origin, including 133 from Nepal, 133 from India, 81 from Bangladesh, 21 from Qatar, and 119 from other countries. The Table also shows a 4% increase in total cases of TB during the same period.

From the Figure below, we notice that the highest increase was in 2017 compared to 2016, with a total of 506 reported cases from various nationalities. However, in 2017, the total cases increased to reach 635 cases.

**Figure 3.46: Number of TB Cases, 2012-2017**



The Table below shows the number of deaths by selected causes of death during the period 2012-2017. According to statistics, the annual growth rates of death increased by 12% compared to 2012. 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 36% of total causes of death during the period 2012-2017. They are distributed as follows: Pneumonia-related death (46%), the rest of the respiratory system disease-related deaths (-26%), chronic lower respiratory diseases (-8%) and causes of death related to the malignant tumors in the bronchus and lung (2%).

**Table 3.48: Number of reported deaths by cause of death, 2012-2017**

| Cause of Death | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual Growth Rate 2012 & 2017 |
|---|---|---|---|---|---|---|---|
| Infectious diarrhea and gastroenteritis | 0 | 0 | 1 | 0 | 0 | 0 | … |
| Other gastroenteritis | 0 | 0 | 1 | 0 | 4 | 1 | … |
| Other TB diseases | 0 | 0 | 0 | 4 | 0 | 3 | … |
| Blood poisoning | 6 | 13 | 17 | 24 | 6 | 11 | 13% |
| Hepatitis | 6 | 9 | 12 | 10 | 7 | 4 | -8% |
| Malaria | 1 | 0 | 1 | 0 | 2 | 0 | -100% |
| Rest of infectious and parasitic diseases | 6 | 7 | 5 | 6 | 8 | 8 | 6% |
| Malignant tumor in the bronchus and lung | 23 | 30 | 31 | 35 | 14 | 26 | 2% |
| Leukemia | 15 | 14 | 13 | 13 | 18 | 14 | -1% |
| Rest of blood diseases, blood-forming organ diseases and other particular perturbations including immune mechanism | 9 | 12 | 12 | 3 | 6 | 17 | 14 |
| Rest of endocrine, nutritional, and metabolic diseases | 22 | 11 | 19 | 17 | 115 | 156 | 48% |
| Arteriosclerosis | 0 | 1 | 3 | 0 | 2 | 3 | … |
| Rest of circulatory system diseases | 10 | 7 | 9 | 6 | 10 | 8 | -4% |
| Influenza | 0 | 3 | 4 | 4 | 2 | 0 | … |
| Pneumonia | 16 | 41 | 70 | 50 | 38 | 45 | 23% |
| Other acute LRTI | 1 | 2 | 2 | 4 | 4 | 2 | 15% |
| chronic lower respiratory diseases | 9 | 7 | 5 | 7 | 14 | 9 | 0% |
| Rest of respiratory system diseases | 48 | 40 | 34 | 97 | 100 | 32 | -8% |
| Liver diseases | 31 | 25 | 35 | 27 | 17 | 16 | -12% |
| Poisoning incidence and exposure to poisonous substances | 4 | 9 | 53 | 11 | 2 | 2 | -13% |
| Total | 207 | 231 | 327 | 318 | 369 | 357 | 12% |

Source: PSA – Births and Deaths Statistics Bulletin

Chapter Four

# 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 comes 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 the international community. The following Box shows the interrelationship between response activities and the SDGs 2030.

## Box 13: Response Indicators in Relation to SDGs 2030

- Goal 3, Indicator 3.b.2: Total net official development assistance to medical research and basic health sectors.
- Goal 6, Indicator 6.a.1: Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan
- Goal 6, Indicator 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.
- Goal 7, Indicator 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
- Goal 11, Indicator 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.
- Goal 12, Indicator 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.
- Goal 12, Indicator 12.6.1: Number of companies publishing sustainability reports
- Goal 13, Indicator 13.a.1: Mobilized amount of United States dollars per year between 2020 and 2025 accountable towards the $100 billion commitment.
- Goal 13 Indicator 13.3.1: Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula.
- Goal 14, Indicator 14.b.1: Progress by countries in the degree of application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fisheries.
- Goal 14, Indicator 14.c.1: Number of countries making progress in ratifying, accepting and implementing through legal, policy and institutional frameworks, ocean-related instruments that implement international law, as reflected in the United Nation Convention on the Law of the Sea, for the conservation and sustainable use of the oceans and their resources
- Goal 15, Indicator 15.b.1: Official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems.
- Goal 15, Indicator 15.6.1: Number of countries that have adopted legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits.
- Goal 15, Indicator 15.8.1: Proportion of countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species.

# 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 as shown in the Box below:

## Box No 14: Expenditure on the Environment Protection in Relation to National Policies

The following programs/projects have emanated from the NDS within the economic stability promotion and environment protection for the coming generations:

**Program/Project:**

1-Link public finance to the National Development Strategy/ re-budgeting.

**Goal:**

- Establish a forward coordinated budget, linked to the NDS 2011-2016, NDS 2017-2022, and the operational plans of the spending authorities.

**Output:**

- Review of public finance framework.

**Program/Project:**

2- Public Investment Management.

**Goals:**

- Establish programs of public investment in which the entire big decisions related to public investment are taken, based on a systematic assessment of their benefits and costs in proportion to the national development priorities in general.
- Enable the private sector to engage in public investment projects within a coherent framework that provides development benefits for the State, including knowledge and skill transfer.

**Outputs:**

- Public Investment Management Framework.
- Close links between the expenditure on the environment protection and many other environment strategy programs.

**Expenditure on the environment protection in relation to international frameworks such as the SDGs.**

- A variety of SDGs. See Box 13 above.

**Expenditure on the environment protection in relation to international frameworks such as the international competitiveness indicators.**

- Spending on health/reducing pollutants in the air, soil and marine environment, and improving environment conditions for the population.

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 2012/2013-2017. 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 4.1 shows the value of public expenditure on the environmental protection and management sector during the fiscal years 2012/2013-2017 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, and that 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 7% during the period 2012/2013-2017. In terms of detailing the type of expenditure, the results show that expenditure on total major projects (capital expenditure) increased at an annual rate of 8% during the same period, while current expenditures as an annual growth rate declined by 18% for the same period.

The current expenditure on landscape and park protection activities achieved the highest annual growth rate in total current expenditures, reaching an annual rate of 26% during 2012/2013-2017.

**Figure 4.1: Public expenditure on the environment protection and management (million QR), 2012/2013–2017**

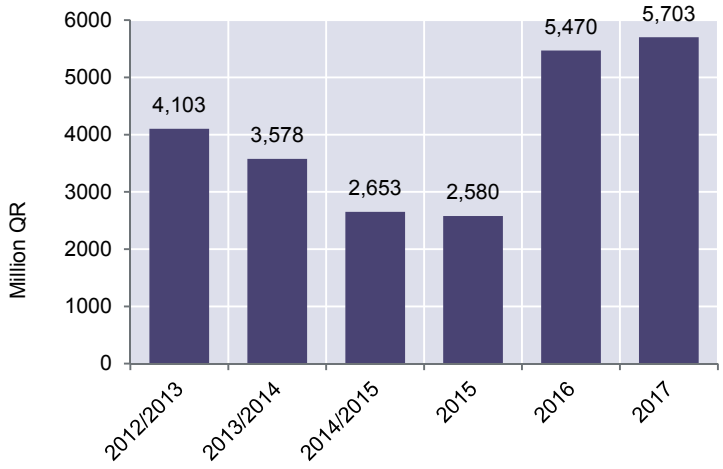



Table 4.1 and Figure 4.2 show the value of public expenditures on the environment protection and management sector by type of expenditure and the environmental field in million QR for the fiscal years 2012/2013-2017. The results indicate that the expenditure on the environment during this period amounted to about QR 24.1 billion, of which QR 13.1 billion focused on capital expenditure and major projects in the areas of sewage and waste, and on gardens and parks, an average of 54.4% of total expenditure on this sector. During the same period, approximately QR 10.9 billion was spent on current expenses, salaries and wages at an average rate of 45.6% of total expenditure on the environment sector during this period.

**Table 4.1: Public expenditure on the environment protection and management by type of expenditure and environmental field (million QR), 2012/2013-2017**

| Type of expenditure | 2012/13 | 2013/14 | 2014/15 | 2015 | 2016 | 2017 | Annual growth rate 2012/2013-2017 |
|---|---|---|---|---|---|---|---|
| **Capital Expenditure** | | | | | | | |
| Waste management | 11.8 | 24.1 | 76.5 | 63.8 | 26.0 | 64.9 | 41 |
| Labs, etc. | 6.4 | 13.8 | 2.9 | 1.1 | 0.0 | 0.1 | -56 |
| Landscape and park protection | 165.1 | 89.5 | 110.0 | 18.4 | 76.0 | 49.6 | -21 |
| Wastewater management | 1885.1 | 1562.1 | 1504.8 | 1786.1 | 2682.0 | 2677.5 | 7 |
| Other capital expenditure | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 197.7 | 0 |
| Total major projects | 2068.4 | 1689.5 | 1694.2 | 1869.4 | 2784.0 | 2989.7 | 8 |

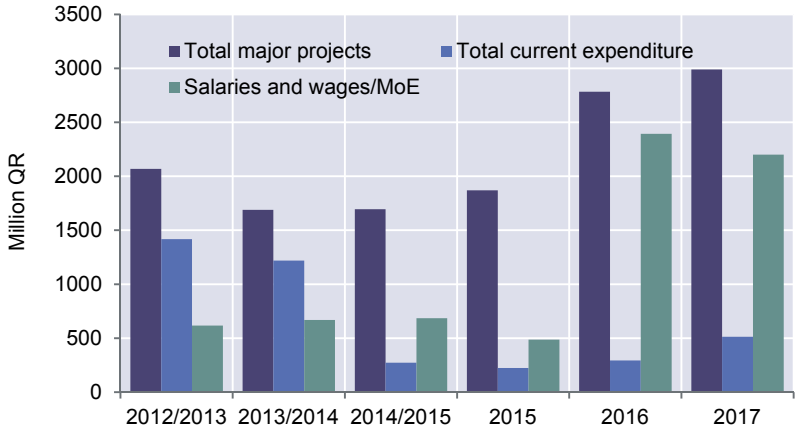
| Type of expenditure | 2012/13 | 2013/14 | 2014/15 | 2015 | 2016 | 2017 | Annual growth rate 2012/2013-2017 |
|---|---|---|---|---|---|---|---|
| **Current Expenditure** | | | | | | | |
| Current expenses / Ministry of Municipality and Environment | 785.8 | 684.8 | 124.2 | 87.2 | 201.0 | 193.1 | -24 |
| Waste management | 119.8 | 151.7 | 93.6 | 65.6 | | 120.2 | 0 |
| Landscape and public park protection | 37.9 | 38.4 | 55.1 | 71.6 | 40.0 | 118.4 | 26 |
| Operating expenses/ sewage | 0.0 | 0.0 | 0.0 | 0.0 | 52.0 | 69.0 | 0 |
| Environmental activities not elsewhere classified | 474.5 | 344.1 | 0.0 | 0.0 | 0.0 | 12.3 | -52 |
| Total current expenditure | 1418.0 | 1219.0 | 272.9 | 224.3 | 293.0 | 513.0 | -18 |
| Salaries and wages / Ministry of Municipality and Environment | 616.8 | 669.5 | 685.8 | 486.6 | 2393.0 | 2200.8 | 29 |
| Total expenditure on the environment protection | 4103.2 | 3577.9 | 2652.9 | 2580.3 | 5470.0 | 5703.4 | 7 |

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

The Table below shows that the share of salaries and wages at the Ministry of Municipality and Environment made up an average of about 29% during the period 22012/2013-2017, whereas the current expenditure of the same ministry constituted 9% 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 3.9 billion, which constituted an average of about 16.4% of total expenditure on the environment protection (capital expenditure, current expenditure, salaries and wages).

It is clear from the results that the most capital expenditure was on sewage projects during the fiscal years 2012/2013-2017. The average capital expenditure on sewage projects constituted 50% of the total expenditure on environmental protection (capital and current expenditure, salaries and wages) during this period. Capital expenditure on sanitation projects in 2017 accounted for 47% of the total expenditure on environmental protection (capital and current expenditure, salaries and wages).

**Figure 4.2: Public expenditure on the environment protection and management by type of expenditure and environmental field (million QR), 2012/2013–2017**




## *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 2017, based on the available data, as not all the target entities in this study provided the required data, while others provided data without details by type of expenditure or by specific environmental field.

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 only 10%. With regard to the largest capital expenditure, it was on the protection of natural and desalinated water resources by 58.5% of total capital expenditure, followed by capital expenditure on waste management by 19.0% of total capital expenditure. The results also indicated that the percentage of current expenditure of total expenditure (current and capital) for various environmental fields, in which capital and current expenditure was found, was 90%. As for the largest current expenditure, it was on the wastewater management by 32.0% of total current expenditure, followed by current expenditure on R&D activities by 19.9% of total current expenditure.

**Table 4.2: Value of Expenditure on the environment by type of expenditure and main environmental field (thousand QR), 2017**

| | Environmental Activities | Expenditure on the Environment (Thousand QR) | | | | | Relative Distribution |
|---|---|---|---|---|---|---|---|
| | | Current Expenditure | Relative Distribution | Capital Expenditure | Relative Distribution | Overall Total Expenditure | |
| 1 | Waste management | 102,108.4 | 6.9% | 31,549.3 | 19.0% | 133,657.7 | 8.1% |
| 2 | Wastewater management | 475,039.7 | 32.0% | 1,571.9 | 0.9% | 476,611.6 | 28.9% |
| 3 | Pollution reduction | 14,109.8 | 1.0% | 10,266.1 | 6.2% | 24,375.8 | 1.5% |
| 4 | Ventilation and treatment of waste gases | 15,348.1 | 1.0% | - | 0.0% | 15,348.1 | 0.9% |
| 5 | Protection and treatment of soil and groundwater | 248,891.4 | 16.8% | 6,316.6 | 3.8% | 255,208.0 | 15.5% |
| 6 | Noise and vibration reduction | 13,560.6 | 0.9% | 1,209.9 | 0.7% | 14,770.6 | 0.9% |
| 7 | Radiation protection | 19.2 | 0.0% | - | 0.0% | 19.2 | 0.0% |
| 8 | Biodiversity and landscape protection | 138,198.7 | 9.3% | - | 0.0% | 138,198.7 | 8.4% |
| 9 | R&D activities | 295,982.7 | 19.9% | 918.6 | 0.6% | 296,901.3 | 18.0% |
| 10 | Environmental protection activities nec | 68,183.6 | 4.6% | 3,401.5 | 2.0% | 71,585.1 | 4.3% |
| 11 | Natural and desalinated water sources protection | 106,894.3 | 7.2% | 97,137.7 | 58.5% | 204,032.0 | 12.4% |
| 12 | District cooling activities | 6,151.4 | 0.4% | 13,740.0 | 8.3% | 19,891.4 | 1.2% |
| **Total** | | **1,484,487.9** | **100.0%** | **166,111.6** | **100.0%** | **1,650,599.6** | **100.0%** |

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

The results from table (4.3) 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 29% 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 sewage networks was the highest by 64% of total expenditure on wastewater management activity, amounting to QR 476.6 million. In second place came the expenditure on R&D activities in environmental field by 18%. The share of the sub-activity “studies for the protection of soil and groundwater” was the largest by 27.4% of total expenditure on R&D activity. While expenditure on "protection and treatment of soil and groundwater" activities came third by 9% of total expenditure on various environmental fields. The share of expenditure on the sub-activity of "soil and water bodies (beaches) cleaning" was the largest by 48.3% of total expenditure on the protection and treatment of soil and groundwater.

**Table 4.3: Value of expenditure on the environmental by type of expenditure and environmental sub-field (thousand QR), 2017**

| Code | Environmental Activities | Current Expenditure | Capital Expenditure | Total Expenditure |
|---|---|---|---|---|
| | Wastewater Management | | | |
| 2.1 | Pollution prevention by adjusting the production process | 269.2 | 0.0 | 269.2 |
| 2.2 | Sewage networks | 305966.1 | 170.0 | 306136.1 |
| 2.3 | Wastewater treatment units | 160237.8 | 1101.9 | 161339.7 |
| 2.4 | Cooling water treatment | 15.0 | 20.0 | 35.0 |
| 2.5 | Procedures, control, laboratories and the like | 7496.5 | 280.0 | 7776.5 |
| 2.7 | Other activities | 1055.1 | 0.0 | 1055.1 |
| 2 | Total wastewater management expenditure | **475039.7** | **1571.9** | **476611.6** |
| | Protection and Treatment of Soil and Groundwater | | | |
| 5.111 | Comprehensive protection and treatment of soil and groundwater | 6316.6 | 6316.6 | 12633.2 |
| 5.1 | Reducing the deposition of pollutants | 41148.7 | 0.0 | 41148.7 |
| 5.2 | Soil and water bodies (beaches) cleaning activities | 123345.1 | 0.0 | 123345.1 |
| 5.3 | Protection of soil from erosion and other physical degradation | 77223.5 | 0.0 | 77223.5 |
| 5.5 | Procedures, control, laboratories and the like | 847.5 | 0.0 | 847.5 |
| 5.7 | Other activities | 10.0 | 0.0 | 10.0 |
| 5 | Total expenditure on the protection and treatment of soil and groundwater | **248891.4** | **6316.6** | **255208.0** |
| | R&D Activities | | | |
| 9.1 | Ambient air and climate protection studies | 28473.3 | 0.0 | 28473.3 |
| 9.2 | Water protection studies | 1990.5 | 56.9 | 2047.4 |
| 9.3 | Waste studies | 21844.3 | 0.0 | 21844.3 |
| 9.4 | Soil and groundwater protection studies | 81242.8 | 0.0 | 81242.8 |
| 9.5 | Maritime Studies | 429.6 | 48.8 | 478.4 |
| 9.6 | Noise and vibration reduction studies | 13095.4 | 0.0 | 13095.4 |
| 9.7 | Radiation protection studies | 41131.4 | 0.0 | 41131.4 |
| 9.8 | Species and habitat protection studies | 62801.5 | 454.5 | 63256.0 |
| 9.9 | Environmental impact assessment studies | 26191.9 | 0.0 | 26191.9 |
| 9.10 | Other environmental studies and research | 18781.9 | 358.4 | 19140.3 |
| 9 | Total Expenditure on R&D Activities | **295982.7** | **918.6** | **296901.3** |

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

**Table 4.4: Total expenditure on the environment by environmental activity field, 2015-2017 (thousand QR)**

| Code | Environmental Activities | Total Expenditure | | |
|---|---|---|---|---|
| | | 2015 | 2016 | 2017 |
| 1 | Waste management | 20.0 | 22,045.9 | 133,657.7 |
| 2 | Wastewater management | 156,280.7 | 1,425,312.5 | 476,611.6 |
| 3 | Pollution reduction | 794.3 | 2,285.3 | 24,375.8 |
| 4 | Ventilation and treatment of waste gases | - | 3,013.6 | 15,348.1 |
| 5 | Protection and treatment of soil and groundwater | ... | ... | 255,208.0 |
| 6 | Noise and vibration reduction | ... | ... | 14,770.6 |
| 7 | Radiation protection | 280.1 | - | 19.2 |
| 8 | Biodiversity and landscape protection | - | 1,589.0 | 138,198.7 |
| 9 | Research and development activities | 2,539.4 | 370,326.8 | 296,901.3 |
| 10 | Environmental protection activities nec | 21,273.3 | 3,565.9 | 71,585.1 |
| 11 | Natural and desalinated water source protection | - | 403,695.8 | 204,032.0 |
| 12 | District cooling activities | 3,000.0 | 6,000.0 | 19,891.4 |
| 13 | Monitoring and disaster reduction systems | 50,192.3 | - | - |
| Total | | 234,380.1 | 2,237,834.8 | 1,650,599.6 |

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

Table 4.4 above shows that environmental expenditure in 2017 was more distributed among environmental activities, although expenditure in 2017 was 26.4%, which is lower than in 2016. Expenditure on wastewater management was prevalent during the period 2015-2017. The largest proportion was on average about 60% of total expenditure on all environmental activities during these three years. This was followed by expenditure on R&D activity, which was prevalent in 2016-2017, with an average of 17.5% of total environmental expenditure on various activities during these two years.

## *1.3 Environmental Expenditure on Scientific Research*

Qatar's R&D Survey 2015 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 2015 indicates that expenditure on research by sector in the field of environment for business sector amounted to 19.6 of total expenditure on R&D compared to 30.0% in 2012. The percentage of expenditure on research by sector in the field of environment in the government sector was 10.0% in the same survey, compared to 5.1% in 2012. The percentage in the higher education sector increased from 0.0% in 2012 to 5.4% of total expenditure on R&D activity in 2015. It is noteworthy that the classification of R&D is based on the binary number of the field of science, which 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 4.5: Expenditure on R&D by sector and classification of social and economic goals (QR), 2015

| Item | Business sector | | Government sector | | Higher education sector | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Value QR | % | Value QR | % | Value QR | % | Value QR | % |
| Land exploration and exploitation | 6,315,576.67 | 1.2 | 10,581,883.05 | 2.7 | 0.00 | 0.0 | 16,897,459.72 | 0.6 |
| Culture, entertainment, religion and media | 0.00 | 0.0 | 13,227,353.81 | 3.3 | 515,415,665.35 | 24.2 | 528,643,019.16 | 17.3 |
| Political and social systems, structures and processes | 54,377,115.15 | 10.3 | 43,914,814.65 | 11.1 | 257,707,832.68 | 12.1 | 355,999,762.48 | 11.7 |
| General progress of knowledge | 4,210,384.45 | 0.8 | 8,994,600.59 | 2.3 | 369,122,873.12 | 17.3 | 382,327,858.16 | 12.5 |
| The environment | 103,154,418.99 | 19.6 | 39,682,061.43 | 10.0 | 114,321,519.76 | 5.4 | 257,158,000.18 | 8.4 |
| Space exploration and exploitation | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| Transport, communications and other infrastructure | 84,207,688.97 | 16.0 | 10,581,883.05 | 2.7 | 152,105,750.87 | 7.1 | 246,895,322.88 | 8.1 |
| Energy | 119,574,918.34 | 22.7 | 26,454,707.62 | 6.7 | 123,040,957.71 | 5.8 | 269,070,583.67 | 8.8 |
| Industrial production and technology | 31,577,883.36 | 6.0 | 26,454,707.62 | 6.7 | 39,721,883.98 | 1.9 | 97,754,474.97 | 3.2 |
| Health | 89,470,669.53 | 17.0 | 181,214,747.19 | 45.7 | 359,434,608.73 | 16.9 | 630,120,025.46 | 20.6 |
| Agriculture | 0.00 | 0.0 | 26,454,707.62 | 6.7 | 7,750,611.51 | 0.4 | 34,205,319.13 | 1.1 |
| Education | 33,409,400.60 | 6.3 | 9,259,147.67 | 2.3 | 192,796,461.29 | 9.0 | 235,465,009.55 | 7.7 |
| Total | 526,298,056.07 | 100.0 | 396,820,614.29 | 100.0 | 2,131,418,165.00 | 100.0 | 3,054,536,835.36 | 100.0 |

Source: PSA – R&D Survey 2015

# 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 (4.6) and (4.7) 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 2017.

The results in Table (4.6) below, on the number of workers in industries related to environmental protection by nationality, sex, compensation and main economic activity in 2017, show that the largest percentage by economic activity was in waste collection, treatment and disposal, and material recovery activities at 58%. The percentage of workers in in sewage came in second with 27%, followed by the percentage of workers in waste treatment and other waste management services, accounting for 15% 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 2.5 thousand workers, which constituted 1.5% of total number of workers in the industrial sector, totaling 167 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 186.3 million, representing 0.9% of total compensation for workers in the industrial sector amounting to QR 21.5 billion.

**Table 4.6: Number of workers in environment protection-related industries by nationality, sex, compensation and main economic activity (number, thousand QR), 2017**

| Activity Code | Main 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** | Sewerage | 0 | 0 | 0 | 685 | 6 | 691 | 685 | 6 | 691 | 0 | 38,243 | 38,243 |
| **3700** | Sewerage | 0 | 0 | 0 | 685 | 6 | 691 | 685 | 6 | 691 | 0 | 38,243 | 38,243 |
| **38** | Waste collection, treatment and disposal activities; materials recovery | 23 | 0 | 23 | 1,390 | 44 | 1,434 | 1,413 | 44 | 1,457 | 8,291 | 112,611 | 120,902 |
| **3811** | Collection of non-hazardous waste | 2 | 0 | 2 | 529 | 2 | 531 | 531 | 2 | 533 | 748 | 21,209 | 21,957 |
| **3821** | Treatment and disposal of non-hazardous waste | 4 | 0 | 4 | 523 | 37 | 560 | 527 | 37 | 564 | 261 | 64,109 | 64,370 |
| **3822** | Treatment and disposal of hazardous waste | 8 | 0 | 8 | 136 | 5 | 141 | 144 | 5 | 149 | 2,455 | 17,227 | 19,682 |
| **3830** | Materials recovery | 9 | 0 | 9 | 202 | 0 | 202 | 211 | 0 | 211 | 4,827 | 10,066 | 14,893 |
| **39** | Remediation activities and other waste management services | 2 | 0 | 2 | 363 | 13 | 376 | 365 | 13 | 378 | 0 | 27,247 | 27,247 |
| **3900** | Remediation activities and other waste management services | 2 | 0 | 2 | 363 | 13 | 376 | 365 | 13 | 378 | 0 | 27,247 | 27,247 |
| **E** | Total supply activities and sewage and waste management and treatment activities | 25 | 0 | 25 | 2,438 | 63 | 2,501 | 2,463 | 63 | 2,526 | 8,291 | 178,101 | 186,392 |

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

One can notice from Table (4.7) below that it is difficult to calculate the average of wages the environmental workers receives, as there are some observations on the data, such as the lack of commitment of some data providers to provide data consistently, e.g. the number of workers in a designated environmental protection activity with annual allocations (total annual salaries of those workers). At times, we find that data on the number of workers and annual allocations are provided consistently by environmental protection activities, and sometimes we find that only the data on the numbers of workers by environmental protection activities are provided without stating the annual allocations for those workers, while sometimes it is the opposite, i.e. data on annual allocations are provided, without stating the numbers of workers by specific environmental protection activities.

According to available data, the results in the table indicate that workers in wastewater management activities were the highest in terms of annual allocations, as their annual allocations amounted to 23% of total annual allocations for workers in different environmental activities, followed by the allocations for workers in waste management activity, accounting for 16% of total annual allocations for workers in various environmental activities.

As for the number of workers, the above table shows that the percentage of workers in waste management activities was the highest, amounting to 42.5% of total workers in various environmental activities, followed by the percentage of workers in the activities of agriculture, livestock and fisheries, amounting to 9.1% of total workers in various environmental activities. While the percentage of workers in climate change and air quality management and workers in other environmental activities was the lowest, reaching 0.9% of total workers in various environmental activities.

By workers' nationality, the results in Table (4.7) of 2017 indicate that the number of Qatari male and female workers reached 1,700, making up 16.1% of total workers in the environment protection and management activities, numbering 10,296 workers.

**Table 4.7: Number of workers in various environmental activities by activity, nationality, sex and annual salaries (number, QR), 2017**

| Environment Activities | Number of Environmental Workers | | | | | | | | | Total Annual Salaries (QR) | Percentage Distribution | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Qataris | | | Non-Qataris | | | Overall Total | | | | | |
| | M | F | Total | M | F | Total | M | F | Total | | For Workers | For Total Salaries |
| Workers in land, area, property and landscaping management | 100 | 70 | 170 | 383 | 23 | 406 | 483 | 93 | 576 | 108,303.7 | 5.6% | 8.4% |
| Workers in design, construction and building standards activities | 3 | | 3 | 496 | 331 | 827 | 499 | 331 | 830 | 19,682.0 | 8.1% | 1.5% |
| Workers in wastewater management | 4 | 0 | 4 | 787 | 1 | 788 | 791 | 1 | 792 | 296,735.6 | 7.7% | 22.9% |
| Workers in waste management | 131 | 48 | 179 | 4190 | 10 | 4200 | 4321 | 58 | 4379 | 210,390.1 | 42.5% | 16.2% |
| Workers in environmental security and safety and environmental health activities | 47 | 25 | 72 | 255 | 28 | 283 | 302 | 53 | 355 | 40,932.2 | 3.4% | 3.2% |
| Workers in environmental studies, research, information, policies and training activities | 13 | 29 | 42 | 90 | 21 | 111 | 103 | 50 | 153 | 35,299.1 | 1.5% | 2.7% |
| Workers in agriculture, livestock and fisheries | 235 | 137 | 372 | 565 | 29 | 594 | 800 | 166 | 966 | 205,155.1 | 9.4% | 15.8% |
| Workers in nature reserves, biodiversity and wildlife | 300 | 26 | 326 | 207 | 6 | 213 | 507 | 32 | 539 | 140,238.7 | 5.2% | 10.8% |
| Workers in laboratory, environmental monitoring, water quality control, wastewater, prevention, inspection and the like | 100 | 93 | 193 | 86 | 14 | 100 | 186 | 107 | 293 | 88,422.7 | 2.8% | 6.8% |
| Workers in climate change and air quality management activities | 14 | 8 | 22 | 25 | 2 | 27 | 39 | 10 | 49 | 11,418.4 | 0.5% | 0.9% |
| Workers in forecasting, monitoring, analysis and networks activities and natural disaster programs | 82 | 37 | 119 | 62 | 8 | 70 | 144 | 45 | 189 | 3,131.1 | 1.8% | 0.2% |
| Workers in other environmental activities | 1 | 0 | 1 | 35 | 4 | 39 | 36 | 4 | 40 | 3,517.4 | 0.4% | 0.3% |
| Workers in district cooling activities (maintenance and operation) | 8 | 1 | 9 | 699 | 2 | 701 | 707 | 3 | 710 | 39,254.1 | 6.9% | 3.0% |
| Workers in various other public administrations, environmental assessment and processes | 62 | 32 | 94 | 136 | 37 | 173 | 198 | 69 | 267 | 38,070.2 | 2.6% | 2.9% |
| Workers in urban planning and infrastructure activities | 47 | 47 | 94 | 55 | 9 | 64 | 102 | 56 | 158 | 55,181.4 | 1.5% | 4.3% |
| Total | **1,147** | **553** | **1,700** | **8,071** | **525** | **8,596** | **9,218** | **1,078** | **10,296** | **1,295,731.9** | **100.0%** | **100.0%** |

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

Table (4.8) for the period of 2015-2017 shows the number of workers in various environmental protection activities by total number of workers and year based on available data. The results show that the highest percentage of workers in 2017 was that of workers in waste management, amounting to 42.5% of total workers in various environmental activities, while in 2016 the highest percentage was that of workers in other environmental activities at 43.4%. Nevertheless, the percentage of workers in waste management activities in 2015 was the highest at 66.0% of total workers in various environmental activities.

**Table 4.8: Number of workers in various environmental activities by activity, 2015- 2017**

| Environment Activities | 2015 | 2016 | 2017 |
|---|---|---|---|
| Workers in land, area, property and landscaping management | ... | 575 | 576 |
| Workers in design, construction and building standards activities | ... | 830 | 830 |
| Workers in wastewater management | 708 | 708 | 792 |
| Workers in waste management | 7 | 4,444 | 4,379 |
| Workers in environmental security and safety and environmental health activities | 26 | 186 | 355 |
| Workers in environmental studies, research, information, policies and training activities | 5 | 27 | 153 |
| Workers in agriculture, livestock and fisheries | ... | 970 | 966 |
| Workers in nature reserves, biodiversity and wildlife | ... | 464 | 539 |
| Workers in laboratory, environmental monitoring, water quality control, wastewater, prevention, inspection and the like | 63 | 267 | 293 |
| Workers in climate change and air quality management activities | 26 | 14 | 49 |
| Workers in forecasting, monitoring, analysis and networks activities and natural disaster programs | ... | 159 | 158 |
| Workers in other environmental activities | 141 | | 189 |
| Workers in district cooling activities (maintenance and operation) | 72 | 7,728 | 40 |
| Workers in various other public administrations, environmental assessment and processes | ... | 11 | 710 |
| Workers in urban planning and infrastructure activities | 24 | 1,423 | 267 |
| Total | 1,072 | 17,806 | 10,296 |

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

## 2.2 *Volunteers, Trainers and Participants in Various Environmental Programs*

Table (4.9) shows the number of volunteers, trainers, and participants in various environmental programs by education, nationality and sex in 2017, based on available data. The results indicate that the percentage of Qataris accounted for 58.2%, which was the highest in terms of volunteers, trainers and participants in environmental programs, whereas non-Qataris stood at 41.8%. By sex, male Qatari volunteers accounted for 34.1% compared to 27.2% for non-Qatari male volunteers. The percentage of female Qatari volunteers was 24.0% compared to 14.7% for female

non-Qatari volunteers, while in 2016 it was 13.6% for female Qatari volunteers compared with 7.1 for female non-Qatari volunteers.

**Table 4.9: Number of volunteers, trainers and participants in various environment programs by education, nationality and sex, 2015-2017**

| Field and Activity of Environmental Volunteering | Qataris | | | Non-Qataris | | | Total | | | Percentage Distribution of Total Volunteers |
|---|---|---|---|---|---|---|---|---|---|---|
| | 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 | 44 | 52 | 96 | 258 | 27 | 285 | 302 | 79 | 381 | 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.

Table (4.10) reviews some of these activities, which reflect the environmental commitment at various levels during 2015, 2016 and 2017, 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 2015 was the highest in cost compared to other activities related to environmental commitment, which amounted to 47.2% (QR 6.1 million). 31.9% (QR 4.1 million), amounting to 47.2% (QR 6.1 million), followed by expenditure on participations in the environmental events (local and external), amounting to 31.9% (QR 4.1 million). During 2016-2017, the expenditure on environmental workshops and conferences organized by national institutions came first with 37.1% and 27.7%, respectively. Expenditure on awareness campaigns ranked second with 29.3% in 2016, while expenditure on environment advocacy programs ranked third with 20.8% in 2017.

In terms of the number of these environmental activities and events, the number of participations in local and external environmental events in 2015 ranked first with 26.4% of total activities. The highest number of events in 2016 was the number of environmental awards granted to other entities, amounting to 37.7%, with a total of 231 awards. In 2017, the number of environment advocacy programs ranked first with 27.7% with 444 environment advocacy events and programs.

## Table 4.10: Environment compliance activities by type of activity and cost (QR), 2015-2017

| Event/Program Title | 2015 | | | 2016 | | | 2017 | | |
|---|---|---|---|---|---|---|---|---|---|
| | 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) |
| Number of cooperation agreements signed with local and international institutions in the field of environmental protection | … | … | … | … | … | … | 4 | … | … |
| Number of specialized researches and studies in environment - district cooling | … | … | … | … | … | … | 6 | 5 | … |
| Number of environmental and astronomical camps | … | … | … | 1 | 250 | 250.0 | 0 | 0 | … |
| Number of environmental competitions | 6 | … | … | 7 | 2523 | 272.5 | 33 | 3308 | 572.0 |
| Number of participations in environmental events (local and external) | 23 | … | 4,125.0 | 14 | 18116 | 112.7 | 256 | 16792 | 1785.0 |
| Number of participations in local and international conferences specialized in district cooling | 0 | 0 | 0.0 | 0 | 0 | … | 12 | 8 | 46.0 |
| Number of environment-related workshops and conferences organized by the institution | 16 | … | 2250.0 | 71 | 29126 | 2778.0 | 194 | 14911 | 3573.8 |
| Number of specialized training workshops by the activity of the institution, held by the ministry/ institution for a specific category | … | … | … | 63 | 1300 | 210.0 | 318 | 7619 | 878.1 |
| Number of environment advocacy programs | 4 | … | 450.0 | 31 | 59000 | 1509.0 | 444 | 37706 | 2680.0 |
| Number of community environmental development campaigns | | | | 102 | 9544 | 122.0 | 111 | 6455 | 290.0 |
| Number of environment awareness campaigns | 13 | … | 6,098.0 | 93 | 2091 | 2191.5 | 96 | 173450 | 1372.0 |
| Number of environmental awards granted to other entities | 11 | … | … | 231 | 206 | 45.6 | 118 | 423 | 395.0 |
| Others | … | … | … | … | … | … | 10 | 412 | 1316.5 |
| Total | 87 | … | 12923.0 | 613 | 122156 | 7491.3 | 1602 | 261089 | 12908.4 |

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

# 4. Environmental Awards

Table (4.11) below shows the distribution of awards during the period 2010-2017 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 most of these awards were granted in 2017, and were awarded by national entities, totaling 60% of total awards granted in 2017.

**Table 4.11: Number and type of awards granted to national institutions, 2010-2017**

| Year | No. of Awarded National Institutions | No. of Awards | Type of Award | |
|---|---|---|---|---|
| | | | National | International |
| 2010 | 1 | 2 | 0 | 2 |
| 2011 | 1 | 2 | 0 | 2 |
| 2012 | 2 | 4 | 1 | 3 |
| 2013 | 2 | 4 | 1 | 3 |
| 2014 | 2 | 8 | 2 | 6 |
| 2015 | 4 | 18 | 5 | 13 |
| 2016 | 5 | 16 | 9 | 7 |
| 2017 | 11 | 43 | 26 | 17 |

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.

## *4.1 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, and the number of major industries nominated for the e-permit system are the largest compared to other companies, such as the number of national entities and institutions that publish sustainability reports, although the latter are mostly large companies that influence Qatari economy.

**Table 4.12: Number of national entities and institutions that publish sustainability reports, 2016&2017**

| Year | National entities and institutions that publish sustainability reports | National entities and institutions that publish reports to obtain operation permits | Major industries nominated for e-permit system | Authorized entities to dispose of waste | Total |
|---|---|---|---|---|---|
| **2016** | ... | 235 | 34 | 9 | 278 |
| **2017** | 20 | ... | ... | ... | 20 |

**Table 4.13: Number of projects, researches and academic program researches related to environmental activities, which include different annual periods starting before or in 2017 and all ending after 2017 during the period (2014-2020)**

| Type of Research | Environment Protection, Pollution Control and Environment Technology | Land Use and Facilities Management | Energy and Environmental Sustainability | Climate Change and Response To Natural And Technical Disasters | Biodiversity | Agriculture, Food Security, Fisheries and Livestock | Water | Wastewater | Total |
|---|---|---|---|---|---|---|---|---|---|
| Projects | 11 | 2 | 25 | 2 | 1 | 3 | 7 | 1 | 52 |
| 2014-2018 | 1 | | | | 1 | 1 | 1 | | 4 |
| 2015-2018 | 2 | | 3 | | | | 2 | 1 | 8 |
| 2015-2019 | 1 | | 2 | 1 | | | | | 4 |
| 2015-2020 | 1 | | 1 | | | | | | 2 |
| 2016-2018 | | | 2 | | | | | | 2 |
| 2016-2019 | 2 | 2 | 15 | | | 2 | 2 | | 23 |
| 2016-2020 | | | | | | | 1 | | 1 |
| 2017-2018 | 2 | | | 1 | | | | | 3 |
| 2017-2019 | | | 1 | | | | | | 1 |
| 2017-2020 | 1 | | | | | | 1 | | 2 |
| 2018-2019 | 1 | | 1 | | | | | | 2 |
| Bachelor, Master and Ph.D. | | | | 1 | | | | | 1 |
| 2015-2018 | | | | 1 | | | | | 1 |

Source: data collected from entities targeted in data collection process.

# 5. Legislation, Environmental 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.

## *5.1 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. Table (4.14) below 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 2012-2017.

The relative importance of the legislation was as follows: ministerial decrees and laws constitute 38.5% each, Emiri decisions constitute 15.4%, and decrees and laws constitute 7.7% in 2017.

The relative importance of international and regional agreements and treaties in 2017 was also 66.7% of total number of ministerial decrees, decisions and laws related to these agreements.

**Table 4.14: Number of legislations issued for the environment protection and management by type of legislation, 2012-2017**

| 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 |
| **2012** | 0 | 0 | 5 | 7 | 0 | 12 |
| **2013** | 1 | 0 | 5 | 8 | 0 | 14 |
| **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 |

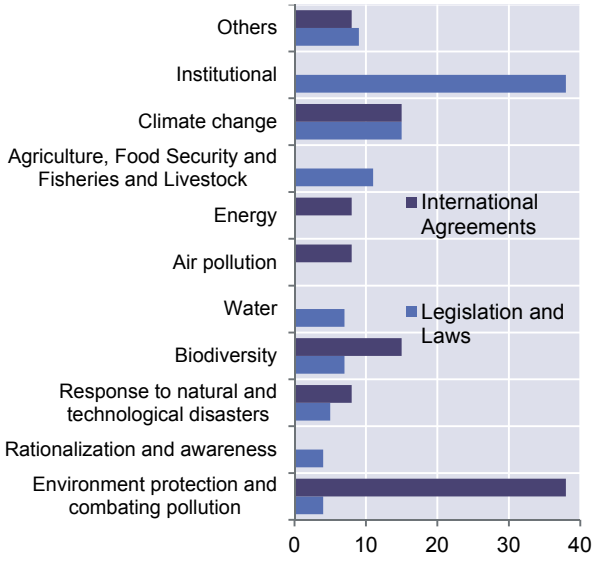
**Table 4.15: Number of treaties related to the environment protection and management by type of treaty legislation, 2012-2017**

| 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 |
| **2012** | 0 | 0 | 1 | 0 | 0 | 1 |
| **2013** | 0 | 0 | 5 | 0 | 0 | 5 |
| **2014** | 0 | 0 | 1 | 0 | 0 | 1 |
| **2015** | 1 | 0 | 4 | 0 | 0 | 5 |
| **2016** | 0 | 0 | 5 | 0 | 0 | 5 |
| **2017** | 0 | 0 | 1 | 0 | 0 | 1 |

With respect to issued international and regional legislation, laws, conventions and agreements during the period 2012-2017, by the environmental field, Figure (4.3) below indicates that the Emiri and ministerial decisions on the organization and restructuring of the institutions concerned with the environment protection and management reaped the highest percentage, followed by the ministerial decisions related to climate change, at 15%. In third place came the ministerial decisions on agriculture, food security, fisheries and livestock at 11%.

The results of the international conventions indicate that the environment protection and pollution control attained 38%, followed by the agreements on climate change and biodiversity at 15% each. In third place came the agreements on air pollution, energy and response to natural disaster at 8% each.

**Figure 4.3: Relative distribution of legislations and international agreements on the environment protection by environmental field and type of legislation, 2012-2017**



### *5.2 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.

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.

# 6. 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.

### Box 15: EIA of New Projects in Relation to the Environment and Public Health

The following programs/projects have emanated from the NDS to promote economic and technical efficiency:

**Program/Project:**

- Additional public health services.

**Goal**:

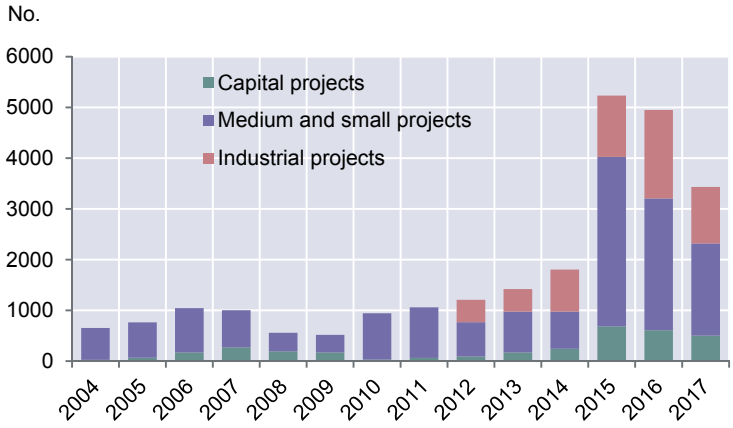
- Implement EIA on health in all projects that affect public health.

**Output**: - Provide public health with additional needs.

The results in Figure (4.4) below show a rise in the number of projects subject to EIA in response to the environment conditions, amounting to 3,432 projects in 2017 compared 442 projects in 2012, an increase of approximately fourfold.

The highest rise ratio was in the major projects, increasing in 2017 eight times higher than in 2012, followed by the small and medium projects which increased threefold in 2017 compared to 2012. In third place came the industrial projects, which doubled in 2017 vis-à-vis 2012.

**Figure 4.4: Number of new projects subject to EIA by type of project, 2004-2017**




Source: Ministry of Municipality and Environment

# 7. 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 provide 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.

The national strategies-related knowledge and skill building programs assert the importance of the education and scientific research role in the achievement of different types of human development. The Box below delineates the relation of education to the environment and the National Development Strategy.

**Box 16: Environmental Education in Relation to National Development Strategy**

The following programs/projects have emanated from the National Development Strategy within the environment protection program for the coming generations:

**Program/Project:**

Effective and productive scientific research.

**Goals:**

- Establish a national strategy that pinpoints priority areas for the scientific research and development.
- Increase the number of published scientific papers, as well as patents.

**Output:**

- Achieve a higher level of scientific innovation.

**The environmental education in relation to the SDGs 2030**

- Inclusion of climate change issues in national curricula.

## *7.1 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.

In this regard, the table below shows the number of students enrolled in universities and colleges in the State of Qatar by sex, university, college and environmental specialization during the academic years 2012/13-2016/17. The results show that the number of students enrolled has increased more recently than in previous years during the period 2012-2017, reaching 103 male students and 192 female students 192 in 2017, an annual growth rate of 24% for males, and 21% for females from 2012-2013. In terms of the number of students enrolled by university and college, the number of students enrolled in Qatar University for different educational levels was the highest compared to the number of students enrolled in other educational institutions, amounting to 233 male and female students, a percentage of 85% of total number of students enrolled in educational institutions for environmental specialties.

**Table 4.16: Number of students enrolled in universities and colleges by sex, university, college and environment specialization during the academic years 2012/13–2016/17**

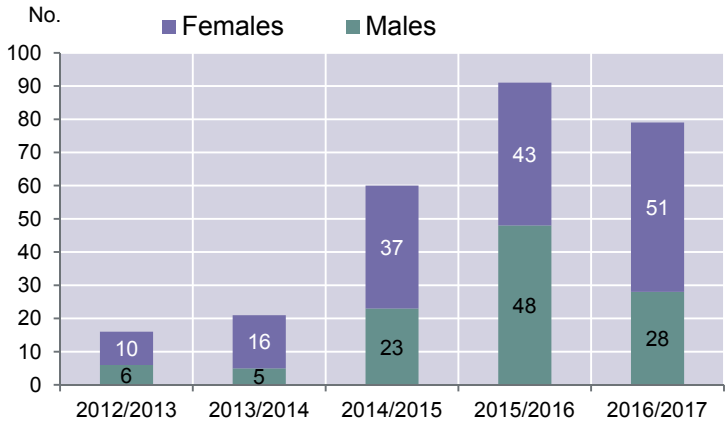
| Environment-Related Educational Specialization | 2013/2012 | | 2014/2013 | | 2015/2014 | | 2016/2015 | | 2017/2016 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | M | F | M | F | M | F | M | F |
| Meteorology | 1 | 9 | 2 | 7 | 9 | 3 | 11 | 7 | 2 | 4 |
| HSE | 1 | 0 | 1 | 0 | 1 | 0 | 17 | 7 | 0 | 4 |
| Health and Safety – Public Health | 0 | 0 | 7 | 17 | 0 | 0 | 0 | 0 | 0 | 0 |
| Health and Safety: Food Security and Inspection | 0 | 0 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Archeology | … | … | 5 | 8 | 5 | 8 | 8 | 7 | 4 | 2 |
| Conservation | … | … | 5 | 9 | 3 | 12 | 0 | 0 | 0 | 0 |
| Environment Sciences | 34 | 51 | 45 | 73 | 58 | 105 | 57 | 124 | 24 | 120 |
| Master in Environment Sciences | 1 | 16 | 2 | 15 | 4 | 11 | 7 | 11 | 10 | 17 |
| Master in Environmental Engineering | 7 | 7 | 6 | 10 | 14 | 13 | 0 | 0 | 17 | 17 |
| Master in Urban Planning and Design | 0 | 8 | 1 | 15 | 3 | 21 | 0 | 0 | 4 | 26 |
| PhD in Urban Planning and Design | 0 | 0 | 0 | 2 | 1 | 3 | 3 | 28 | 1 | 2 |
| Total | 44 | 91 | 78 | 158 | 98 | 176 | 103 | 184 | 80 | 192 |

Source: Public and private universities

Similarly, Figure (4.5) on the number of graduates majoring in environmental specializations increased during the period 2012/13–2016/17, shows that both male and female graduates amounted to 28 and 51 respectively in 2016/17.

In terms of the number of graduates by educational institution, the number of graduates from Qatar University with its different educational levels was the highest compared to the number of graduates from other educational institutions, amounting to 79 male and females graduates, i.e. 82%.

**Figure 4.5: Number of graduates in environment-specialized majors from universities and colleges by sex, 2012/2013-2016/2017**




## *7.2 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.

Table (4.17) 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 25% 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 43% 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 4.17: Number of environment units in science subject in primary and preparatory levels, 2017**

| Grade | Environmental Units | Overall Units | Percentage of Environmental Units to Total Units | Biotic Components* | Abiotic Components** |
|---|---|---|---|---|---|
| First Semester | | | | | |
| First | 2 | 8 | 25% | 2 | 0 |
| Grade 5 | 3 | 7 | 43% | 3 | 0 |
| Grade 6 | 3 | 7 | 43% | 2 | 1 |
| Grade 7 | 3 | 8 | 38% | 3 | 0 |
| Grade 8 | 4 | 8 | 50% | 1 | 3 |
| Grade 9 | 6 | 9 | 67% | 3 | 3 |
| Second Semester | | | | | |
| First | 2 | 8 | 25% | 2 | 0 |
| Grade 3 | 2 | 3 | 67% | 1 | 0 |
| Grade 4 | 3 | 4 | 75% | 1 | 2 |
| Grade 5 | 5 | 6 | 83% | 3 | 2 |
| Grade 6 | 5 | 5 | 100% | 3 | 3 |
| Grade 7 | 5 | 8 | 63% | 2 | 3 |
| Grade 8 | 3 | 7 | 43% | 1 | 2 |
| Grade 9 | 1 | 9 | 11% | 0 | 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.

Table (4.18) below shows the number of environmental units that were included in biology, physics and chemistry in the secondary school during 2017, 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.

The environmental units in biology in grade 11 advanced came in second place, with a percentage of 75% of total biology units in both semesters.

With regard to the percentage of environmental units in physics, the results indicate that grade 11 advanced had the highest percentage, during the second semester, reaching 75% of total physics units in the second semester. In second place came

grade 12 both foundation and advanced, with 50% of total physics units in the second semester.

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 4.18: Number of environmental units in secondary level in biology, physics and chemistry, 2017**

| Grade | Environmental Units | Overall Units | Percentage of Environmental Units to Total Units | Biotic Components* | Abiotic Components** |
|---|---|---|---|---|---|
| **Biology (First Semester)** | | | | | |
| Grade 11 (foundation) | 3 | 3 | 100% | 1 | 2 |
| Grade 11 (advanced) | 3 | 4 | 75% | 0 | 3 |
| Grade 12 (advanced) | 2 | 3 | 67% | 0 | 2 |
| **Biology (Second Semester)** | | | | | |
| Grade 10 (foundation) | 2 | 3 | 50% | 1 | 1 |
| Grade 11 (foundation) | 3 | 3 | 67% | 0 | 3 |
| Grade 12 (foundation) | 2 | 3 | 67% | 1 | 1 |
| Grade 11 (advanced) | 4 | 4 | 75% | 1 | 3 |
| Grade 12 (advanced) | 2 | 4 | 50% | 0 | 2 |
| **Physics (First Semester)** | | | | | |
| Grade 11 (foundation) | 1 | 3 | 33% | 0 | 1 |
| **Physics (Second Semester)** | | | | | |
| Grade 12 (foundation) | 1 | 2 | 50% | 0 | 1 |
| Grade 11 (advanced) | 2 | 3 | 67% | 0 | 02 |
| Grade 12 (advanced) | 1 | 2 | 50% | 0 | 1 |
| **Chemistry (First Semester)** | | | | | |
| Grade 11 (foundation) | 2 | 3 | 67% | 0 | 2 |
| Grade 12 (foundation) | 1 | 3 | 33% | 0 | 1 |
| Grade 11 (advanced) | 2 | 3 | 67% | 0 | 2 |
| Grade 12 (advanced) | 1 | 4 | 25% | 0 | 1 |
| **Chemistry (Second Semester)** | | | | | |
| Grade 10 | 2 | 3 | 67% | 0 | 2 |
| Grade 12 (foundation) | 2 | 3 | 67% | 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.

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.

Table (4.19) below shows the number of environmental units in social science and general culture subjects in primary, preparatory and secondary levels during 2017. The results indicate that the percentage of environmental units in social science was the highest in the secondary level (grades 11 and 12), with an average percentage of 57% for all secondary grades (foundation and advanced) of total units of social science during the second semester. This was followed by the average percentages of the environmental units in social science in the preparatory level (Grades 7 to 9). The percentage of environmental units in the social science in the primary level (grades 3 to 6) came third with an average of 39% of total units of social science during the second semester.

The results indicate that the percentage of the environmental units in the general culture subject in grade 11 both foundation and advanced was the highest, amounting to 33% of total general culture units in the first semester. This was followed by the percentage of environmental units in the general culture subject in the preparatory level, reaching 28% of total general culture units in the first semester.

**Table 4.19: Number of environmental units in primary, preparatory and secondary levels in social sciences and general knowledge, 2017**

| Grade | Environmental Units | Overall Units | Percentage of Environmental Units to Total Units | Biotic Components* | Abiotic Components** |
|---|---|---|---|---|---|
| Social Sciences (First Semester) | | | | | |
| Grade 3 | 3 | 6 | 50% | 0 | 3 |
| Grade 4 | 2 | 6 | 33% | 0 | 2 |
| Grade 5 | 2 | 6 | 33% | 0 | 2 |
| Grade 6 | 2 | 5 | 40% | 1 | 1 |
| Grade 7 | 2 | 6 | 33% | 1 | 1 |
| Grade 8 | 2 | 6 | 33% | 1 | 1 |
| Grade 9 | 4 | 6 | 67% | 3 | 1 |
| Grade 10 | 4 | 6 | 67% | 1 | 3 |
| Grade 11 (foundation) | 2 | 4 | 50% | 1 | 1 |
| Grade 12 (foundation) | 2 | 4 | 50% | 2 | 0 |
| Grade 11 (advanced) | 2 | 4 | 50% | 1 | 1 |
| Grade 12 (advanced) | 2 | 2 | 100% | 0 | 2 |

| Grade | Environmental Units | Overall Units | Percentage of Environmental Units to Total Units | Biotic Components* | Abiotic Components** |
|---|---|---|---|---|---|
| General Knowledge (First Semester) | | | | | |
| Grade 6 | 2 | 6 | 33% | 2 | 0 |
| Grade 8 | 1 | 6 | 17% | 1 | 0 |
| Grade 9 | 2 | 6 | 33% | 0 | 2 |
| Grade 10 | 2 | 6 | 33% | 0 | 2 |
| Grade 11 (foundation) | 1 | 4 | 25% | 0 | 1 |
| Grade 12 (foundation) | 2 | 4 | 50% | 0 | 2 |
| Grade 11 (advanced) | 1 | 4 | 25% | 0 | 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.

## *7.3 Scientific Research, Projects and Academic Program Research on Different Environmental Activity Fields*

Scientific research, projects and academic program research have been monitored on different environmental activities carried out by national research institutions, sometimes in cooperation with regional and international research institutions on various environmental activities, such as water, wastewater, waste, biodiversity, climate change and other environmental fields. In terms of the types of scientific research, projects and academic program research, different types of research, such as scientific papers, research projects and research of different academic fields, have been distinguished, as well as papers presented in conferences, capacity building programs and various research articles.

These data were divided into three main groups, according to the time period in which the research was conducted. Thus, they are divided based on the year in which the research was conducted, and based on the time period covered by the research, which exceeded one year. The third group included the time periods that exceeded the period of this report, as most of which ended after 2017.

In terms of results, it is clear from the scientific research conducted by various research institutions that the dominant field of research in 2017 was in the field of water, making up 15% of total research in various environmental activities. By type of research within the field of water research, the results indicate that the highest type of research was the scientific papers, constituting 48% of total water research.

In second place came research on agriculture, food security, fisheries and livestock, accounting for 14% of all research in various environmental activities.

In general, the highest type of research in 2017 was the scientific papers in various fields of environmental research, accounting for 59.3% of total fields of environmental research.

The results of scientific research, projects and academic program research in environmental activities, which include different annual periods starting and ending during the period (2012-2017), indicate that the scientific papers were the highest in number, with 52% of total types of scientific research, projects and academic program research. The percentage of scientific papers on biodiversity research was the highest with 26.4% of total scientific papers on different environmental research fields, followed by the percentage of scientific papers on agriculture, food security, fisheries and livestock by 20.8% of total scientific papers on different environmental research fields.

The results on the number of scientific research, projects and academic program research in environmental activities, which include different annual periods starting before or in 2017 and all ending after 2017 during the period (2014-2020), show that the period (2016-2019) was the highest annual period in terms of projects, with about 44.3% of total projects during the period (2014-2020). As for the type of projects during this period, the projects of energy and environmental sustainability were the highest in number with a percentage of 65.2% of total projects during the period (2016-2019).

# 8. 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.

## *8.1 Environment Service-Related Industries*

Table (4.20) below delineates 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, the total value added is negative representing production value minus goods/services supplies.

**Figure 4.6 Activities of environment service-related industries, 2015-2017**

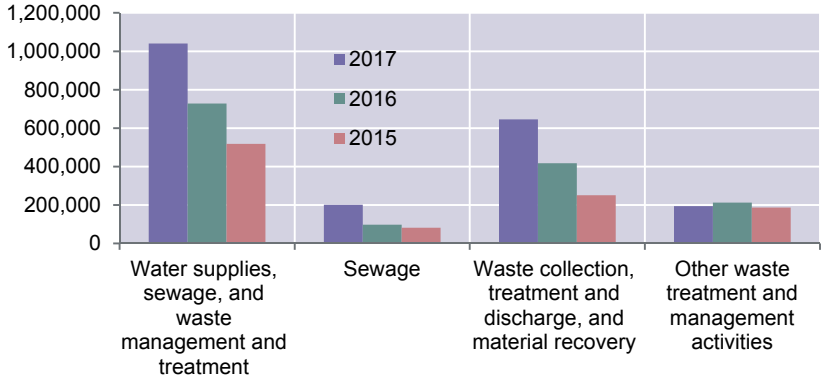


**Table 4.20: Environment protection-related industries by economic activity and value added, 2017**

| 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 | 630,046 | 38,709 | 668,755 | 371,639 | 222,574 | 149,065 | 1,040,394 | 159,469 | 880,925 |
| **37** | Sewage | 119,616 | 10,219 | 129,835 | 71,470 | 53,894 | 17,576 | 201,305 | 82,947 | 118,358 |
| 3700 | Sewage | 119,616 | 10,219 | 129,835 | 71,470 | 53,894 | 17,576 | 201,305 | 82,947 | 118,358 |
| **38** | Waste collection, treatment and discharge, and material recovery | 367,101 | 20,571 | 387,672 | 257,746 | 156,920 | 100,826 | 645,418 | 75,761 | 569,657 |
| 3811 | Non-hazardous waste collection | 43,687 | 5,620 | 49,307 | 79,836 | 51,550 | 28,286 | 129,143 | 327 | 128,816 |
| 3821 | Non-hazardous waste treatment and discharge | 251,463 | 5,535 | 256,998 | 117,571 | 79,802 | 37,769 | 374,569 | 13 | 374,556 |
| 3822 | Hazardous waste treatment and discharge | 54,852 | 1,851 | 56,703 | 17,550 | 17,455 | 95 | 74,253 | 74,253 | |
| 3830 | Material recovery | 17,099 | 7,565 | 24,664 | 42,789 | 8,113 | 34,676 | 67,453 | 1,168 | 66,285 |
| **39** | Other waste treatment and management activities | 143,329 | 7,919 | 151,248 | 42,423 | 11,760 | 30,663 | 193,671 | 761 | 192,910 |
| 3900 | Other waste treatment and management activities | 143,329 | 7,919 | 151,248 | 42,423 | 11,760 | 30,663 | 193,671 | 761 | 192,910 |

Source: PSA – Annual Economic Statistics Bulletin/Energy and Industry

## *8.2 Alternatives that Provide 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.

Table (4.21) below shows 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 35 technical jobs, apart from the other accompanying jobs, such as the administrators, accountants, sales representatives and service and support staff.

Table 4.21: Indicators of the cooling process, 2017

| Economic Activity | Capacity of basic – combined cooling plants (TR) | Water used($m^3$) | 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 $m^3$/ year) using treated water for cooling |
|---|---|---|---|---|---|---|
| Supply of central cooling service | 222,500 | 361,477 | 409,628 | 269,534 | 148,244 | 1,681 |
| Commercial | 60,550 | 479,497 | 141,709 | 56,911 | 25,610 | 237 |
| Hotels | 22,650 | 8,700 | 42,362 | 17,029 | 7,663 | 411 |
| Education | 163,500 | 799,044 | 82,162 | 32,708 | 14,719 | |
| Transport | 61,940 | 1,201,241 | 131,759 | 28,788 | 14,279 | |
| Health | 44,000 | 50,237 | 56,736 | 23,562 | 10,603 | |
| Cultural | 16,100 | 77,182 | 17,637 | 7,055 | 3,175 | |
| Sports | 69,600 | 344,524 | 56,566 | 22,849 | 10,282 | |
| Real estate development | 87,550 | 783,078 | 128,413 | 52,651 | 23,693 | 423 |
| Total | 748,390 | 4,104,980 | 1,066,973 | 511,087 | 258,267 | 2,752 |

Source: Data collection from targeted agencies.

# 9. 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 (2012-2017).

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 2012-2017. 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 (2012-2017). 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.

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# Appendices

**Environment-Related International Conventions 1971-2018**

| 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) |

| Year | Type of Convention |
|---|---|
| 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 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) |
| **Multilateral Agreement** | |
| 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 Organisation 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) |

| Year | Type of Convention |
|---|---|
| 2011 | Statute of the GCC Emergency Management Center (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 |
| 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 |

| Year | Type of Convention |
|---|---|
| 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 |

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