



مركز الإحصاء - أبوظبي
STATISTICS CENTRE - ABU DHABI



Environmental Statistics 2011

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Foreword

This report presents various environmental statistics of the Emirate of Abu Dhabi in 2011, including climate statistics, air statistics, air quality and pollutant emissions. It also contains statistics covering energy, water, food safety and occupational health as well as waste statistics. The key sources of data used in this report are the National Center of Meteorology and Seismology, Environment Agency - Abu Dhabi, Abu Dhabi National Oil Company - ADNOC, Abu Dhabi Water & Electricity Authority - ADWEA, Abu Dhabi Water and Electricity Company - ADWEC, Abu Dhabi Distribution Company, Al Ain Distribution Company, Abu Dhabi Sewerage Services Company (ADSSC), Health Authority and the Center for waste Management - Abu Dhabi.

The "Explanatory Notes" section at the end of this report provides an explanation of the key terms and technical concepts used in this publication. Readers are encouraged to refer to that section in conjunction with reading the statistics and information outlined in the publication.

Key points

1. Climate

The National Center of Meteorology and Seismology provides Statistics Center - Abu Dhabi with climate data from stations throughout the Emirate of Abu Dhabi. The Statistics Centre – Abu Dhabi then process it and produce climate data classified into four main areas Abu Dhabi, Al Ain, Al Gharbia and the lands. The Emirate of Abu Dhabi has a desert climate with high temperatures, especially in summer. Abu Dhabi is located in the dry tropical zone, where Tropic of Cancer passes in the southern part of the Emirate. Moreover, high temperature in summer causes high relative humidity, especially in coastal areas. The winter of Abu Dhabi is generally warm as temperatures drop to low levels. Coastal strip, the desert interior and areas of higher elevation all together form up the topography of the Emirate with a variation in temperatures between the areas. Seasonal northerly winds blow across the UAE helping to ameliorate the weather when they are not loaded with dust, in addition to the brief moisture-laden south-easterly winds. The wind often blows from south, southeast and southwest or north, northwest and northeast. Another characteristic of the Emirate's weather is the high rate of water evaporation due to several factors, including wind speed, blowing force, high temperatures and low rainfall.

Temperatures

Abu Dhabi climate shows variation in temperatures in each season of the year. Table (1.1) displays the change in average temperatures, where the lowest degree was 17.5 °C (recorded in December in Al Ain), while the highest temperature was 37.0 °C (recorded in Al Gharbia in August). Figure (1) illustrates the average maximum and minimum temperature values in Abu Dhabi, where it shows that the average maximum temperature is 45 °C while the minimum average temperature is 13 °C. Statistical tables number (1 - 4) in the Annex display the change of absolute maximum and minimum temperatures in addition to average maximum and minimum for each region by month.

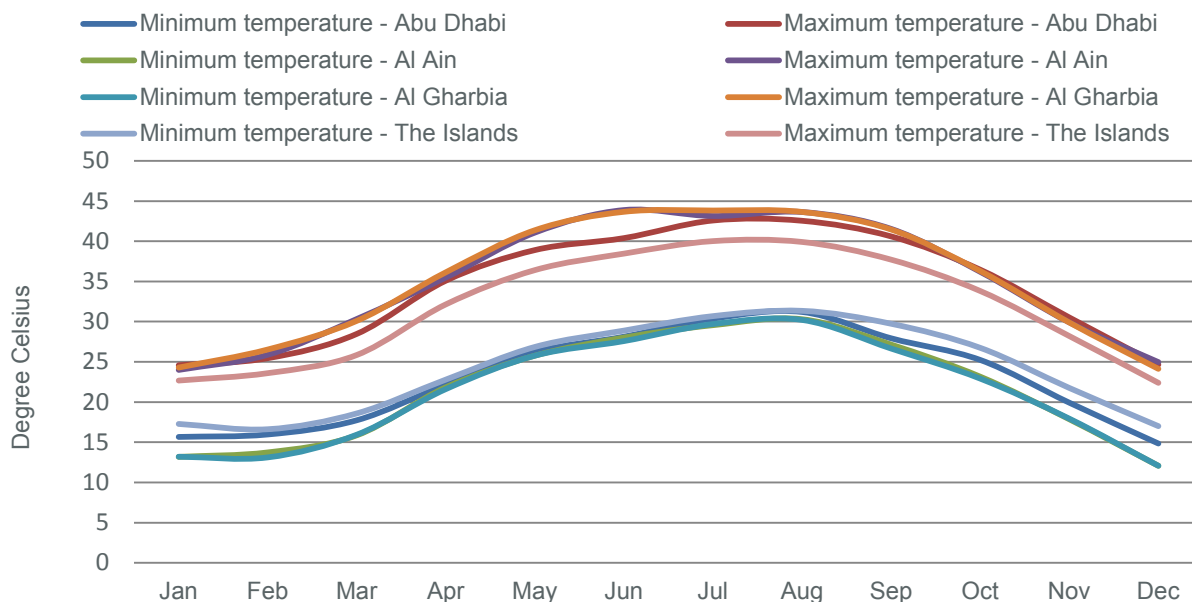
Table (1.1): Average air temperature by region and month - 2011

Degree Celsius

Month	Abu Dhabi	Al Ain	Al Gharbia	The Islands
January	20.1	18.5	18.7	19.9
February	20.7	18.7	19.9	19.9
March	22.8	21.6	22.8	21.9
April	28.2	26.8	28.9	26.8
May	32.2	31.3	33.8	31.1
June	33.9	33.7	35.8	33.1
July	35.8	34.1	36.8	34.7
August	36.2	35.0	37.0	35.3
September	33.9	32.4	34.1	33.6
October	30.6	28.1	29.7	30.2
November	25.2	22.6	24.1	25.0
December	19.9	17.5	17.9	19.8

Source: Statistics Centre- Abu Dhabi

Chart (1): Average maximum and minimum air temperature by region and month - 2011



Source : Statistics Centre- Abu Dhabi

Rainfall

Abu Dhabi is characterized by scanty and abrupt rainfall, which occurs few times during winter time in different parts of the Emirate; it also rains during spring and summer seasons on the mountain, which is located mostly in Al Ain region. The average annual rainfall in the Emirate of Abu Dhabi declined from 23.2 mm in 2010 to 21.5 mm in 2011. Statistical tables (5 - 6) show data in details on the total monthly rainfall and heaviest fall in one day by month and region.

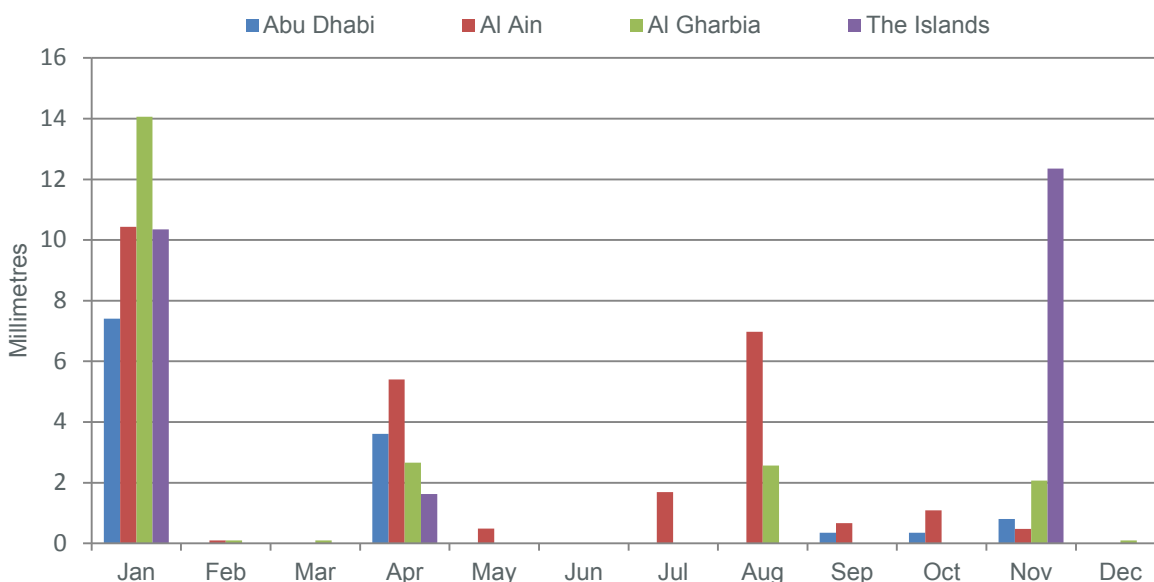
Table (1.2): Average rainfall by region and month - 2011

Millimeters

Month	Abu Dhabi	Al Ain	Al Gharbia	The Islands
January	7.4	10.4	14.1	10.4
February	0.0	0.0	Trace	0.0
March	0.0	0.0	Trace	0.0
April	3.6	5.4	2.7	1.6
May	0.0	0.5	0.0	0.0
June	0.0	0.0	0.0	0.0
July	0.0	1.7	0.0	0.0
August	0.0	7.0	2.6	0.0
September	Trace	Trace	0.0	0.0
October	Trace	1.1	0.0	0.0
November	Trace	Trace	2.1	12.4
December	0.0	0.0	Trace	0.0

Source: Statistics Centre- Abu Dhabi

Chart (2): Average rainfall by region and month - 2011



Source: Statistics Centre- Abu Dhabi

Relative humidity

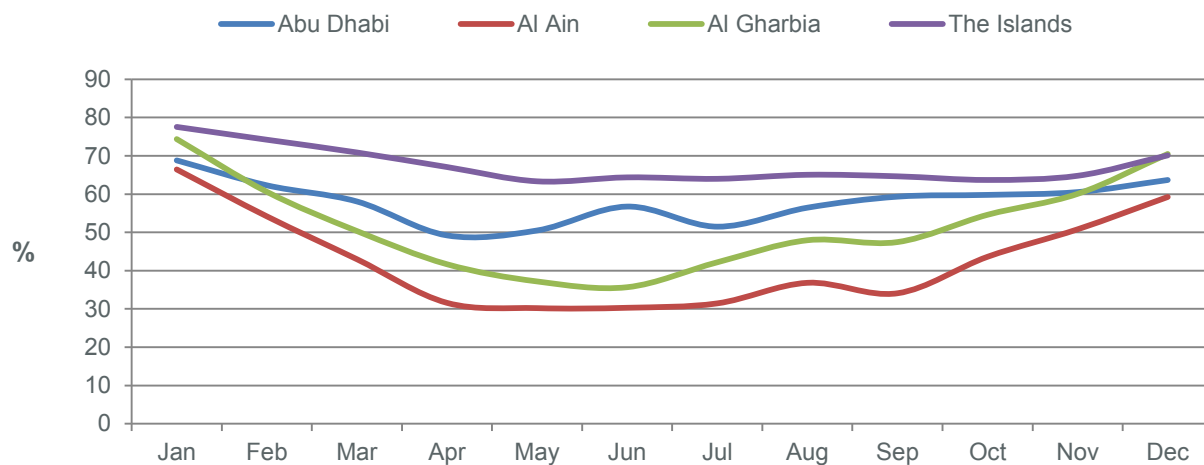
Coastal areas and islands of the Emirate of Abu Dhabi have high humidity compared with inland areas. Table (1.3) displays values of relative humidity, showing the impact of geographic location and season change. The highest average relative humidity was recorded during January in the islands of the Emirate, while the lowest value was recorded in May and June in Al Ain ranging between 30.2 and 30.3 percent. Statistical tables (7 - 10) show absolute maximum and minimum relative humidity and its averages by month and region.

Table (1.3): Average relative humidity by region and month - 2011

Month	Abu Dhabi	Al Ain	Al Gharbia	The Islands
January	68.8	66.4	74.4	77.6
February	62.3	54.2	60.6	74.2
March	58.1	43.0	50.4	70.9
April	49.2	31.6	41.7	67.1
May	50.5	30.2	37.2	63.3
June	56.7	30.3	35.7	64.4
July	51.5	31.5	42.2	64.0
August	56.5	36.8	47.9	65.1
September	59.3	34.1	47.5	64.6
October	59.8	43.6	54.6	63.7
November	60.5	50.8	60.1	64.8
December	63.7	59.3	70.5	70.1

Source: Statistics Centre- Abu Dhabi

Chart (3): Average relative humidity by region and month – 2011



Source: Statistics Centre- Abu Dhabi

Atmospheric Pressure

Table (1.4) reflects that the average atmospheric pressure in the Emirate of Abu Dhabi during summer season is low; the lowest value was recorded in July 2011 at 996.8 Hectopascal. Atmospheric pressure begins to rise gradually when winter approaches, with the highest value recorded in December at 1019.5 Hectopascal.

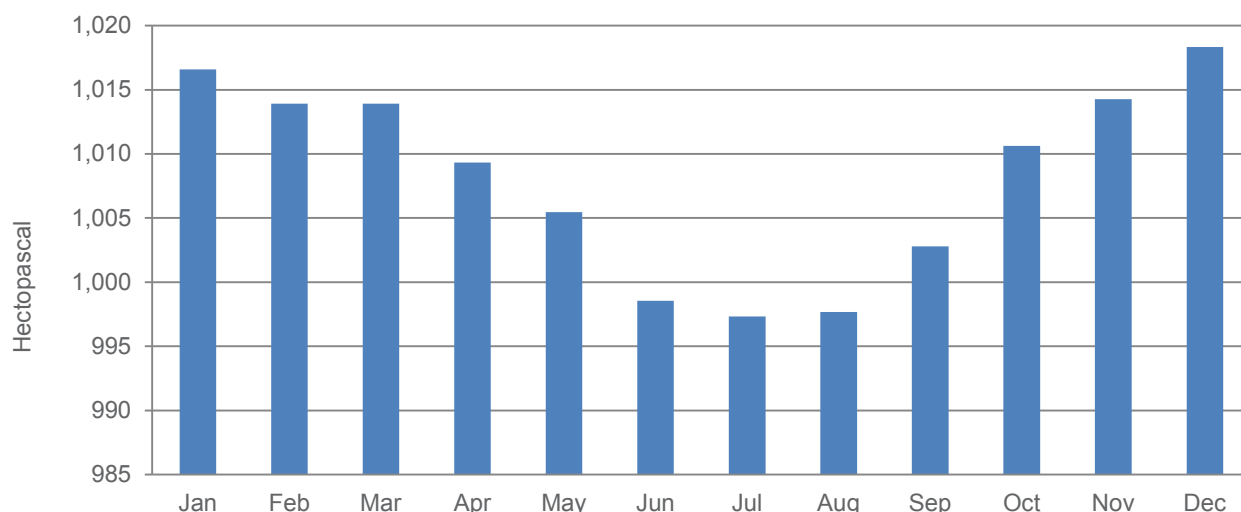
Table (1.4): Average atmospheric pressure by region and month - 2011

Hectopascal

Month	Abu Dhabi	Al Ain	Al Gharbia	The Islands
January	1,016.0	1,016.3	1,016.5	1,017.5
February	1,013.3	1,013.4	1,014.1	1,014.9
March	1,013.4	1,013.3	1,014.1	1,014.8
April	1,009.0	1,009.3	1,009.5	1,009.4
May	1,005.1	1,004.8	1,005.8	1,006.1
June	998.0	998.2	998.7	999.3
July	996.8	997.5	997.1	997.9
August	997.3	997.6	997.6	998.2
September	1,002.4	1,002.6	1,002.8	1,003.4
October	1,010.1	1,010.5	1,010.8	1,011.2
November	1,013.8	1,013.8	1,014.5	1,015.0
December	1,017.5	1,017.6	1,018.7	1,019.5

Source: Statistics Centre- Abu Dhabi

Chart (4): Average atmospheric pressure by month - 2011



Source: Statistics Centre- Abu Dhabi

Wind speed

The highest wind speed average in 2011 was seen in the Islands of the Emirate in March at 10.2 knots, while the lowest average was recorded in Al Ain in January at 5.4 knots, as shown in Table (1.5). Generally, there are two types of wind blowing over Abu Dhabi; the northern wind, which is dry and is mostly loaded with dust but it soothes air temperature and the eastern wind, which is short and very hot as it blows from the Empty Quarter, KSA. Non- seasonal southerly, south easterly, westerly and north westerly winds blow occasionally across the Emirate. Average wind speed is obviously higher in Abu Dhabi Islands and the open areas of Al Gharbia region than in the city of Abu Dhabi where high rise buildings and trees act as winds breaks. Statistical tables (11 - 14) show the maximum values and averages of wind speed by month and region.

Table (1.5): Average wind speed by region and month - 2011

Month	Abu Dhabi	Al Ain	Al Gharbia	The Islands
January	6.0	5.4	6.5	7.8
February	7.4	6.8	7.6	8.9
March	7.6	6.8	8.3	10.2
April	7.0	7.4	7.7	8.1
May	6.6	6.8	7.6	8.2
June	6.4	6.4	7.6	7.7
July	6.6	6.7	7.0	7.2
August	6.0	5.8	6.8	6.5
September	5.7	5.1	6.2	6.9
October	5.8	5.5	6.0	7.1
November	5.5	5.3	6.8	8.0
December	6.0	5.0	7.3	8.5

Source: Statistics Centre- Abu Dhabi

*Knot = 1.15 mph

Solar radiation

The sky of Abu Dhabi Emirate is cloudless almost all year around, prolonging the hours of sunshine and increasing the amount of solar radiation which is currently used to generate electrical energy from solar plants. During the 2011 summer, as shown in Table (1.6), the highest day length was 11.2 hours in Abu Dhabi region and 11.5 hours in Al Ain region. During the winter of the same year, the day length in Abu Dhabi and Al Ain regions declined to 6.7 hours and 8.6 hours, respectively. Table (1.7) illustrates the daily average of solar radiation, where the highest value was about 7,229 W / m²/ h (recorded in Abu Dhabi region). Statistical tables (15 - 18) show the maximum and minimum values of daily solar radiation intensity by month and region.

Table (1.6): Average daily sunshine in Abu Dhabi and Al Ain by month - 2011

Hours

Month	Abu Dhabi	Al Ain
January	6.7	8.6
February	8.5	9.3
March	9.2	10.1
April	8.8	10.5
May	11.0	11.2
June	11.2	11.5
July	10.6	11.1
August	10.4	10.8
September	10.0	10.5
October	9.4	9.8
November	8.5	9.2
December	8.5	8.8

Source: Statistics Centre- Abu Dhabi

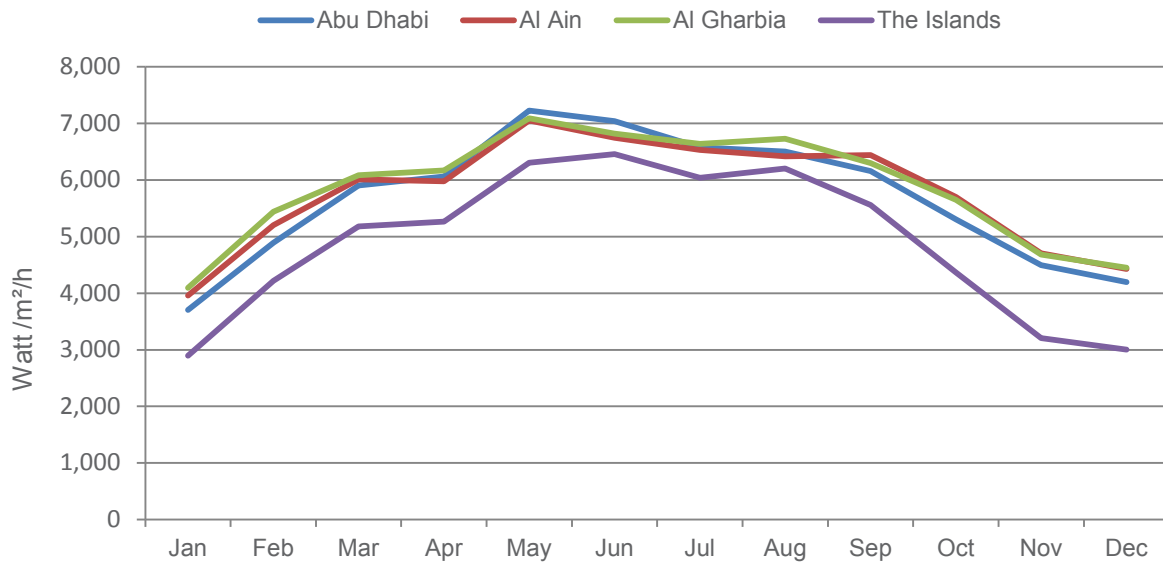
Table (1.7): Average daily total solar radiation by region and month - 2011

Watt/ m²/h

Month	Abu Dhabi	Al Ain	Al Gharbia	The Islands
January	3,702	3,957	4,096	2,898
February	4,893	5,204	5,442	4,218
March	5,902	6,013	6,083	5,179
April	6,060	5,979	6,168	5,266
May	7,229	7,054	7,092	6,305
June	7,039	6,747	6,818	6,460
July	6,574	6,529	6,637	6,040
August	6,501	6,415	6,728	6,204
September	6,159	6,441	6,300	5,561
October	5,304	5,700	5,648	4,366
November	4,496	4,703	4,683	3,205
December	4,195	4,427	4,448	3,005

Source: Statistics Centre- Abu Dhabi

Chart (5): Average daily total solar radiation by region and month - 2011



Source: Statistics Centre- Abu Dhabi

2. Air statistics

The Abu Dhabi government pays tireless efforts to improve air quality and to control harmful emissions; entities and organizations were established to protect environment from the dangers of pollutants, such as reducing fuel combustion by generating electrical energy from renewable sources like sun and wind. The Government of Abu Dhabi Emirate has issued strict laws and legislation to help reduce air pollution and emissions and mitigate their impacts in order to maintain the health of those who live in the Emirate. In this regard, the Council of Ministers issued Decree No. 12 of 2006 on Regulation Concerning Protection of Air from Pollution which binding on both entities and individuals with pollutant types and maximum limits permitted.

Air pollution figures in the Emirate of Abu Dhabi are generally within the accepted range. However, the readings vary with different locations and activities. Stations close to roads record high rates of pollution due to emissions from vehicle exhausts. Likewise, readings taken within the vicinity of oil and industrial activities, for example the industrial area of Mussafah, are the highest in the Emirate.

Air quality in urban areas

Indicators to measure air quality in urban areas are deemed to be one of the most important indicators of sustainable development all over the world; the indicator aims at measuring the availability of healthy and safe environment for residents on the territory of the Emirate of Abu Dhabi. Table (2.1) shows that the average concentration of sulphur dioxide did not exceed the permitted limits as the maximum annual average concentration in urban areas was nine micrograms/ cubic meters in 2011. The annual maximum allowed concentration is 60 micrograms/ cubic meter. This applies to other pollutants except particulate matter as readings were higher than the normal averages as a result of changing weather and dust-laden winds during the year. Statistical tables (19 - 22) show air quality indicators by type, region and the location of the station.

Table (2.1): Annual average of air pollution indicators in urban areas by region and station, 2011

Microgram/m³

Indicator (annual maximum allowable limit)	Abu Dhabi		Al Ain	Al Gharbia
	Khalifa School	Baniyas School	Al Ain School	Bida Zayed
Sulphur dioxide (60 mcg/m ³)	7	9	9	7
Nitrogen dioxide	29	28	27	17
Ground level ozone	72	59	61	73
Particulate matter – PM10	137	203	138	171

Source: Statistics Centre- Abu Dhabi

Table (2.2) proves that carbon monoxide concentration in 2011 did not change much compared with 2010. The annual average concentration was 0.9 mg / cubic metre, a 10 percent decline compared with 2010 in a roadside station in Abu Dhabi. The concentration in a roadside station near Al Ain was one mg/ cubic metre, an increase of 10 per cent.

Table (2.2): Annual average of carbon monoxide concentration in ambient air by regionMilligram/m³

Station Location	2008	2009	2010	2011
Abu Dhabi				
Road Side - Hamdan Street	1.40	1.10	1.00	0.90
Al Ain				
Road Side - Al Ain Street	2.20	1.40	0.90	1.00

Source: Environment Agency - Abu Dhabi

Table (2.3) shows the annual average noise levels in 2011, where some regions in the Emirate recorded the same levels of noise such as the roadside stations in Abu Dhabi and Al Ain. Urban regions in the Emirate witnessed an increase recording 55.5, 50.7, and 51.3 Decibels in Abu Dhabi, Al Ain and Al Gharbia regions respectively.

Table (2.3): Annual average of noise Level by region

Decibels

Station Location	2008	2009	2010	2011
Abu Dhabi				
City Centre - Khadija School	57.8	57.6	57.4	59.6
Urban/ Residential - Khalifa School	50.9	52.3	53.0	54.2
Road Side - Hamdan Street	68.9	65.5	66.6	66.6
Urban/ Residential - Baniyas School	49.7	51.0	53.7	55.5
Industrial - Mussafah	54.9	49.6	48.3	46.0
Al Ain				
Urban/ Residential - Al Ain School	49.7	49.7	48.9	50.7
Road Side - Al Ain Street	62.2	62.1	61.6	62.4
Al Gharbia				
Urban/ Residential - Bida Zayed	53.2	54.3	na	51.3
City Centre - Gayathi School	49.6	50.7	50.6	53.0
Regional Background - Liwa Oasis	54.4	53.7	50.6	46.1

Source: Environment Agency - Abu Dhabi

Air pollutant emissions - oil and gas sector

Total air pollutant emissions sum up together the emissions of sulphur dioxide, nitrogen oxides and volatile organic compounds. Table (2.4) and Chart (6) show that the total emissions from oil and gas sector decreased by 6.2 percent during the period from 2005 until 2011, where the total emissions were 359,550 tons. As a result, the emissions per capita declined to 39 percent during the same period, as shown in table (2.5). Statistical tables (23 - 25) show the amount of emissions by type of pollutant and by business sectors in Abu Dhabi National Oil Company.

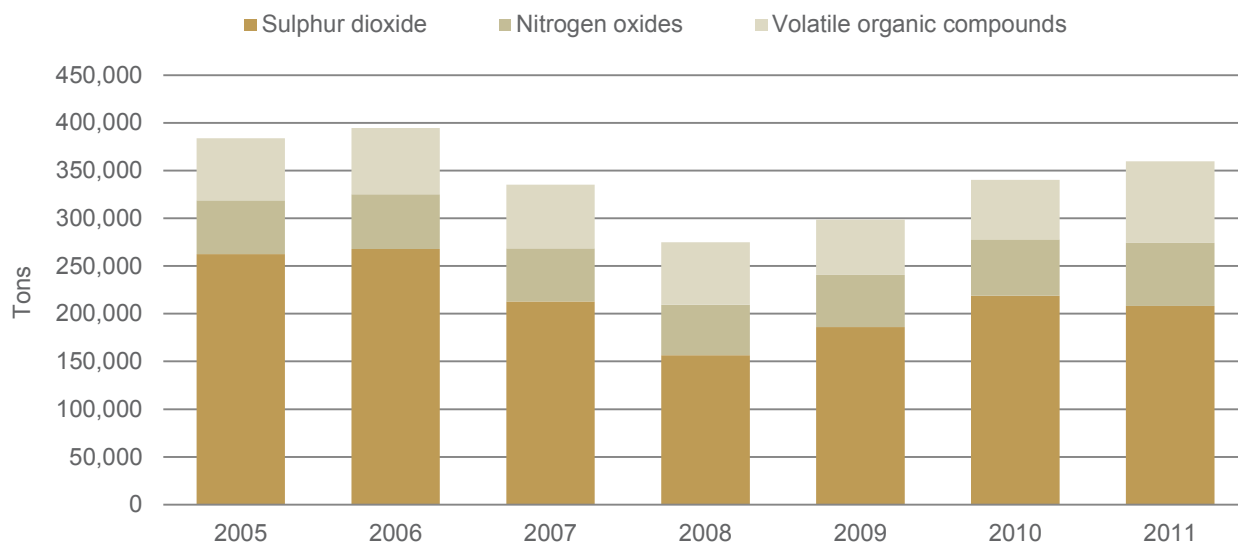
Table (2.4): Air pollutant total emissions – oil and gas

Tons

Pollutant	2005	2009	2010	2011
Total	383,679	298,651	340,093	359,550
Sulphur dioxide (SO ₂)	262,539	185,870	219,022	208,025
Nitrogen oxides (NO _x)	56,225	54,782	58,901	66,105
Volatile organic compounds (VOC)	64,915	57,999	62,170	85,420

Source: Abu Dhabi National Oil Company - ADNOC

Chart (6): Air pollutant total emissions - oil and gas sector



Source: Abu Dhabi National Oil Company - ADNOC

Table (2.5): Per capita air pollutant total emissions - oil and gas sector

Tons

Pollutant	2005	2006	2007	2008	2009	2010	2011
Total	0.279	0.270	0.213	0.162	0.164	0.173	0.170
Sulphur Dioxide (SO ₂)	0.191	0.183	0.135	0.092	0.102	0.111	0.098
Nitrogen Oxides (NO _x)	0.041	0.039	0.035	0.031	0.030	0.030	0.031
Volatile Organic Compounds (VOC)	0.047	0.047	0.042	0.039	0.032	0.032	0.040

Source: Statistics Centre – Abu Dhabi

Carbon Dioxide Emissions – Oil and Gas Sector

Table (2.6) illustrates the change in carbon dioxide emissions during the period from 2005 to 2011 of oil and gas sector. Gas emissions in 2011 totalled 27.9 million tons, while the emission per capita from oil and gas sector was 13.2 million tons in the same year. Statistical tables (26 - 27) display carbon dioxide emissions and per capita carbon dioxide emissions by business sectors in Abu Dhabi National Oil Company.

Table (2.6): Carbon dioxide emissions - oil and gas sector

Item	2006	2007	2008	2009	2010	2011
Carbon dioxide emissions (million tons)	23.0	22.0	21.0	21.0	23.0	27.9
Per capita carbon dioxide emissions (tons)	15.7	14.0	12.4	11.5	11.7	13.2

Source: Abu Dhabi National Oil Company – ADNOC, Statistics Centre- Abu Dhabi

3. Energy statistics

Energy statistics enjoy a great significance locally and internationally. As an essential factor in achieving people's needs, efforts had been made to monitor the energy situation and to identify the amount of the demand. In 2011, electricity consumption totaled 43,250 GWH, an increase of 10 percent than 2010. The annual and summer power transmission system availability in the Emirate of Abu Dhabi was 98.97 percent and 99.39 percent respectively during the same year.

Electricity Consumption

According to 2011 estimates, electricity consumption the Emirate totaled 43,251GWH, where Abu Dhabi accounted for 64 per cent of total consumption, while Al Ain and Al Gharbia consumed 24 percent and 12 percent respectively. By sector, the domestic sector accounted for the largest share at 30.7 percent of total electricity consumption, followed by the commercial sector at 28.8 per cent. The industrial sector came last with only 3 percent of the total electricity consumption in the Emirate.

Table (3.1): Electricity consumption by region

MWH

Region	2005	2006	2007	2008	2009	2010	2011*
Total consumption**	25,423,862	27,323,017	29,342,214	31,480,854	34,716,166	39,173,140	43,250,919
Abu Dhabi	16,158,411	17,376,073	18,577,267	19,803,499	22,062,262	24,850,010	26,897,768
Al Ain	6,849,131	7,091,412	7,528,700	7,881,926	8,474,342	9,081,380	7,011,402
Al Gharbia	2,416,320	2,855,532	3,236,247	3,795,429	4,179,562	5,241,750	9,341,749

Source: Abu Dhabi Water and Electricity Company (ADWEC)

*Estimates

**Consumption includes internal electrical consumption by power stations and technical losses through the network

Table (3.2): Electricity consumption by economic sector

MWH

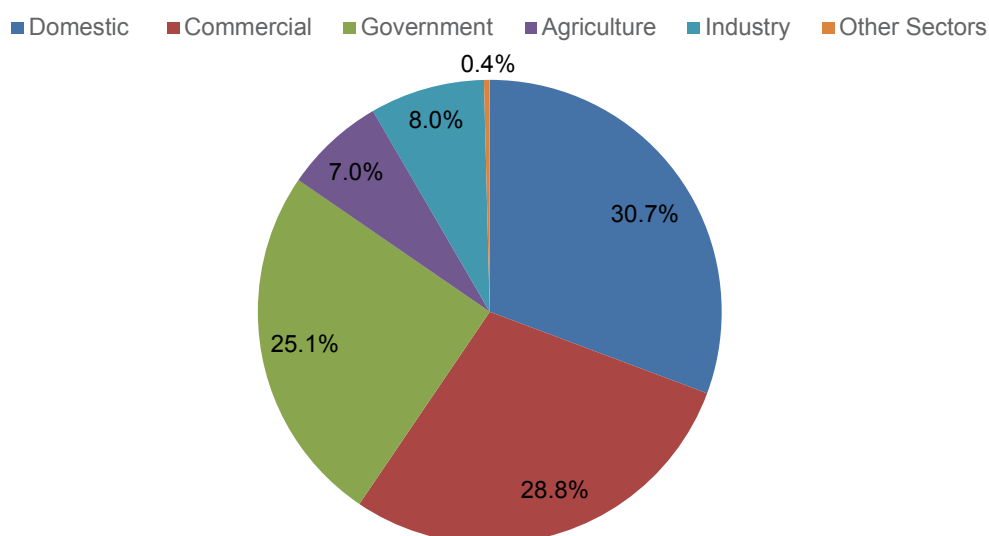
Sector	2005	2006	2007	2008	2009	2010	2011*
Total**	25,423,862	27,323,017	29,342,214	31,480,854	34,716,166	39,173,140	43,250,919
Domestic	9,919,427	10,660,405	11,448,220	12,281,327	13,544,932	14,045,202	13,278,032
Commercial	7,917,862	8,509,324	9,138,171	9,803,173	10,811,804	12,573,879	12,456,264
Government	4,326,170	4,649,333	4,992,923	5,356,267	5,907,364	6,290,204	10,855,981
Agriculture	2,292,501	2,463,750	2,645,824	2,838,365	3,130,400	3,223,131	3,027,564
Industry	752,456	808,664	868,425	934,976	1,027,475	2,811,665	3,460,074
Other Sectors	215,447	231,540	248,651	266,746	294,191	229,059	173,004

Source: Abu Dhabi Distribution Company, Al Ain Distribution Company

*Estimates

**Consumption includes internal electrical consumption by power stations and technical losses through the network

Chart (7): Percentage distribution of electricity consumption by sector - 2011



Source: Statistics Centre- Abu Dhabi

Interruptions in Electricity Supply Network

The number of electricity interruptions increases normally during the summer period due to the high network loads. In August 2011, the number of interruptions totaled 3,574. The highest number of customers experienced electricity interruptions was 73,116 customers in September 2011. Statistical tables (28 - 30) illustrate the number and duration of interruptions by month and region.

Table (3.4): Number and duration of interruptions in electricity supply - 2011

Month	Number of interruptions	Interruption duration (thousand minutes)	Number of customers with interruption in electricity supply
Total	25,055	2,624,512	655,066
January	1,917	262,639	67,496
February	1,420	196,959	47,946
March	1,659	193,125	56,908
April	1,834	234,799	52,541
May	2,480	228,149	48,038
June	2,798	228,956	47,010
July	3,163	247,801	60,926
August	3,574	279,286	69,206
September	2,006	183,591	73,116
October	1,632	185,040	52,144
November	1,189	156,065	35,227
December	1,383	228,102	44,508

Source: Abu Dhabi Water and Electricity Authority

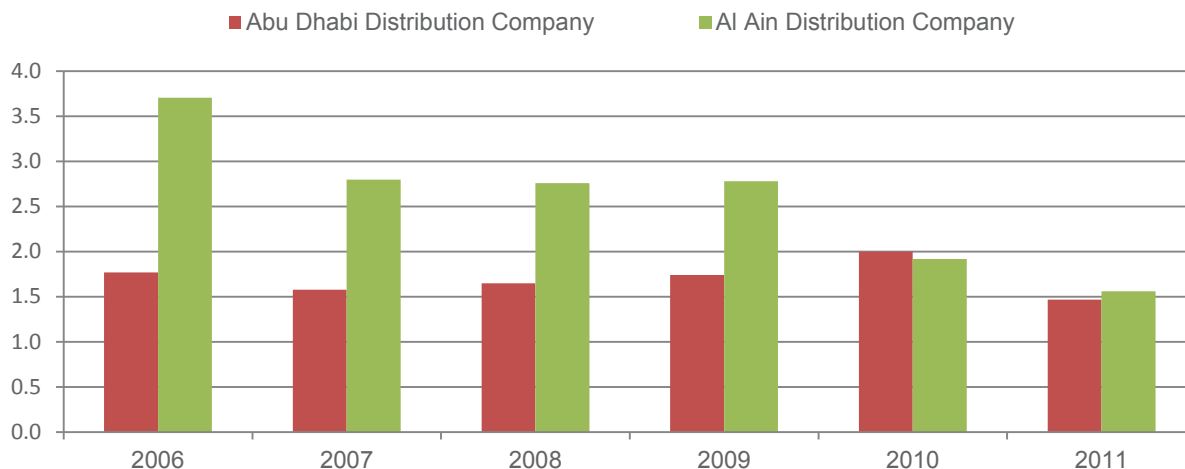
Performance indicators of power system reliability

Establishments involved in generating and distributing electricity usually measure their performance through performance indicators, known as Key Performance Indicators (KPIs). KPIs measure the achievements level. Performance in this type of establishments is measured via two key indices:

System Average Interruption Frequency Index (SAIFI)

The system average interruption frequency Index is a factor that measures the average number of interruptions experienced by each customer in the electricity supply service. In 2011, Abu Dhabi Distribution Company's SAIFI decreased by 36 percent, while Al Ain Distribution Company's SAIFI decreased by 23 percent.

Chart (8): SAIFI by electricity Distribution Company



Source: Abu Dhabi Distribution Company, Al Ain Distribution Company

System Average Interruption Duration Index (SAIDI)

This index measures the annual average interruption durations in minutes per customer in the electricity supply service. In 2011, Abu Dhabi Distribution Company's SAIDI decreased by 26 percent, while Al Ain Distribution Company's SAIDI decreased by 49.2 percent.

Chart (9): SAIDI by Electricity Distribution Company



Source: Abu Dhabi Distribution Company, Al Ain Distribution Company

Power Transmission System Availability

Transmission system availability is the summation of the availabilities of individual circuits of the main interconnected transmission system expressed as a percentage of the total number of circuits. A circuit is defined as an overhead line, cable, transformer, or any combination of these plant items controlled by one or more circuit breakers.

Table (3.5) displays the annual and summer power transmission system availability in Abu Dhabi Emirate. Electrical consumption reaches its maximum in summer. In order to meet the increasing demand for electricity, distribution companies increase the transmission system availability during summer period. Power availability during summer was 99.39 percent, while annual power availability was 98.97 percent, an increase of 0.33 per cent. Statistical table (31) shows power transmission availability in Abu Dhabi Emirate by month.

Table (3.5): Annual and summer power transmission system availability

%

Item	2005	2006	2007	2008	2009	2010	2011
Summer Availability	99.92	99.63	99.52	99.34	99.63	99.02	99.39
Annual Availability	98.56	98.88	98.90	98.46	98.10	98.64	98.97

Source: Abu Dhabi Water and Electricity Authority

3. Water statistics

Water statistics is considered one of the most important branches of environmental statistics. Water statistics include water resources and types as well the amount consumed and wastewater statistics. Abu Dhabi government seeks to optimum utilization of water resources, conservation of natural resources and to meet the growing need for water in various areas.

Desalinated water in the Emirate of Abu Dhabi in 2011 totaled 999.2 MCM, 961.5 MCM of them were consumed. According to the estimates of the Environment Agency - Abu Dhabi, operating wells in the Emirate amounted to 71,165 wells. The average withdrawal of groundwater totaled about 2,217.90 MCM, while wastewater amounted to 259.7 MCM, 93.6 percent of them were treated and 133.5 MCM of them were re-used to irrigate green plantings in the Emirate.

Water production and consumption

In 2011, desalinated water in Emirate of Abu Dhabi increased to 999.2 MCM, an increase of 3.8 per cent compared with 2010. Annual consumption of desalinated water amounted to 961.5 MCM, making an increase of 10.1 per cent to meet the population growth in the Emirate. Table (4.1) shows that per capita consumption equals 1.2 cubic metre/ day.

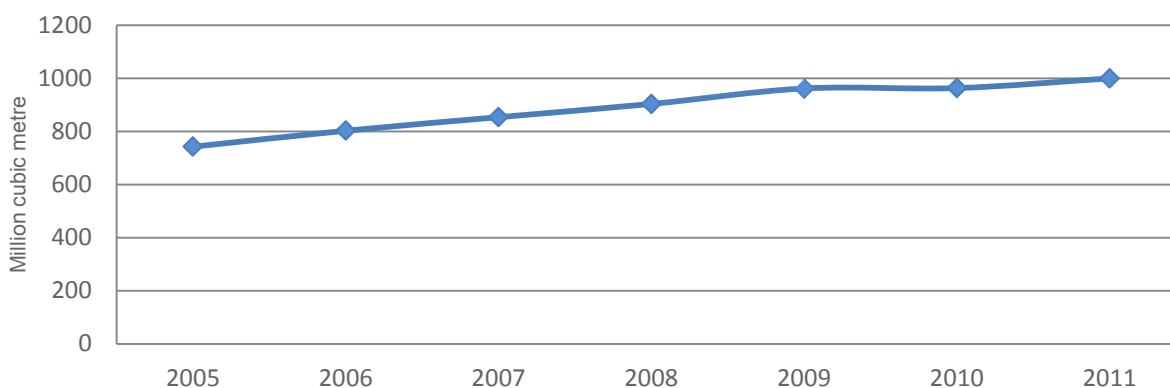
Table (4.1): Production and consumption of desalinated water

Million cubic metre

Item	2005	2006	2007	2008	2009	2010	2011
Total of available desalinated water	742.1	802.2	853.3	903.1	961.3	962.8	999.2
Production	636.9	670.5	719.4	784.5	845.4	834.5	854.6
Supply from Al - Fujairah Station	105.2	131.7	133.9	118.6	115.9	128.3	144.6
Consumption	667.0	722.1	756.7	773.8	790.0	873.0	961.5
Daily consumption	1.8	2.0	2.1	2.1	2.2	2.4	2.6
Daily average per capita (cubic metres)	1.3	1.4	1.3	1.2	1.2	1.2	1.2

Source: Abu Dhabi Water and Electricity Company (ADWEC) - Statistics centre –Abu Dhabi

Chart (10): Total of available desalinated water



Source: Abu Dhabi Water and Electricity Company (ADWEC)

Consumption of desalinated water by sector

Table (4.2) shows that consumption of desalinated water by region increased in 2011 by 10 percent compared to 2010. Abu Dhabi region consumed 62 percent of the total consumption. The Table (4.3) also displays consumption by sector, where domestic sector comes in the first rank with 54.3 percent of the total consumption in all sectors in 2011, followed by the government sector with 22.2 percent, the commercial sector with 15.7 percent, and the agriculture sector with 3.2 percent, whereas the least consumption was recorded for the industrial sector with 1.9 percent of the total consumption.

Table (4.2): Consumption of desalinated water by region

Million cubic metre

Region	2005	2006	2007	2008	2009	2010	2011
Total consumption	667.0	722.1	756.7	773.8	790.0	873.0	961.5
Abu Dhabi	413.9	481.1	469.5	480.1	490.2	529.0	592.6
Al Ain	161.2	153.5	182.8	186.9	190.9	232.2	259.1
Al Gharbia	92.0	87.6	104.3	106.7	108.9	111.7	109.9

Source: Abu Dhabi Water and Electricity Company (ADWEC)

Table (4.3): Consumption of desalinated water by sector

Million cubic metre

Sector	2005	2006	2007	2008	2009	2010	2011
Total	667.0	722.1	756.7	773.8	790.0	873.0	961.5
Domestic sector	456.0	493.7	517.2	528.9	540.1	596.2	522.2
Commercial	63.7	69.0	72.3	73.9	75.5	82.3	150.5
Government	112.3	121.6	127.4	130.3	133.0	146.3	213.8
Agriculture	22.8	24.7	25.9	26.5	27.0	32.4	30.7
Industry	4.5	4.9	5.1	5.2	5.3	5.7	17.9
Other Sectors	7.7	8.4	8.8	9.0	9.1	10.1	26.4

Source: Abu Dhabi Distribution Company, Al Ain Distribution Company

Water transmission system availability

Water transmission system availability is calculated in percentage in terms of the summation of the availabilities of transmission system components, such as water transmission lines, storage tanks and pumps. Table (4.4) presents water the annual and summer transmission system availability in the Emirate of Abu Dhabi from 2005 to 2011. The table also shows that the summer transmission system availability increased by 2.8 percent, while annual transmission system availability increased by 1.65 percent. Statistical table (32) displays the monthly transmission system availability.

Table (4.4): Annual and summer water transmission system availability

%

Item	2005	2006	2007	2008	2009	2010	2011
Summer Availability	95.57	95.60	96.90	93.78	96.74	99.02	98.37
Annual Availability	95.72	95.68	96.29	94.55	96.02	98.64	97.85

Source: Abu Dhabi Water and Electricity Authority

Groundwater

Groundwater wells

Table (4.5) illustrates that the total number of working wells in Abu Dhabi Emirate amounted to 93,360 wells, out of which 71,165 wells are operating. Operating wells in Al Ain city constituted about 47 percent of Abu Dhabi Emirate's total working wells, followed by Al Gharbia region by 40 percent, and Abu Dhabi city came last with 13 percent.

Table (4.5): Number of working and non-working wells by region

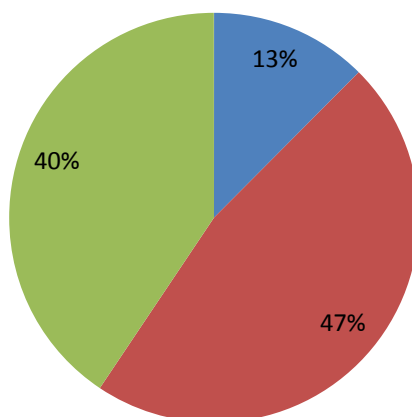
Region	2005	2006	2007	2008	2009	2010*	2011*
Total							
Working wells	74,870	72,040	71,290	69,250	65,290	68,200	71,165
Non-working wells	41,050	38,140	36,270	34,840	31,330	21,800	22,195
Abu Dhabi							
Working wells	4,240	3,990	3,880	3,780	2,980	8,500	9,050
Non-working wells	2,130	1,980	1,540	1,160	1,100	1,500	1,615
Al Ain							
Working wells	41,650	40,870	40,870	39,820	35,460	32,000	33,500
Non-working wells	22,250	20,360	19,600	18,760	16,350	11,000	11,150
Al Gharbia							
Working wells	28,980	27,180	26,540	25,650	26,850	27,700	28,615
Non-working wells	16,670	15,800	15,130	14,920	13,880	9,300	9,430

Source: Environment Agency - Abu Dhabi

*Estimates

Chart (11): Percentage distribution of number of working wells by region - 2011*

■ Abu Dhabi ■ Al Ain ■ Al Gharbia



Source: Statistics Centre- Abu Dhabi

* Estimates

Average withdrawal of groundwater

In 2011, the average withdrawal of groundwater decreased by 1.4 percent compared to 2010 in order to maintain this significant source of water. Table (4.6) shows high averages of groundwater withdrawal in Al Ain and Al Gharbia regions by 56 and 40 percent respectively, while the city of Abu Dhabi accounted for 4 percent. The average annual withdrawal has been continuously decreasing since 2005 where it decreased by 22.5 percent during the period 2005-2011.

Table (4.6): Average withdrawal of groundwater by region

Million cubic metre

Region	2005	2006	2007	2008	2009	2010	2011
Total*	2,862.1	2,736.8	2,668.8	2,585.6	2,400.0	2,250.9	2,217.9
Abu Dhabi	158.2	148.3	134.6	122.7	101.3	78.0	77.0
Al Ain	1,570.0	1,520.9	1,499.1	1,455.1	1,286.9	1,260.8	1,251.6
Al Gharbia	1,133.9	1,067.6	1,035.1	1,007.7	1,011.7	912.0	889.3

Source: Environment Agency - Abu Dhabi

* Figures may not sum up to totals due to rounding

Groundwater reserves

Table (4.7) illustrates a decrease in the groundwater reserves in the Emirate of Abu Dhabi during the period between 2005-2011 by 1.7 per cent. Water type is determined based on the quantity of dissolved salts it contains. Data shows that 79 percent of the water in Abu Dhabi is saline. Abu Dhabi government is keen on rationalizing consumption of groundwater as an important natural resource of water.

Table (4.7): Amount of groundwater reserves by type

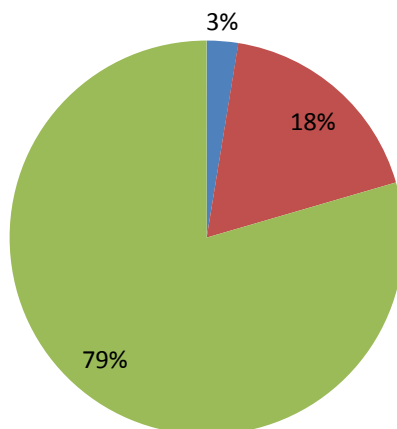
Million cubic metre

Type	2005	2006	2007	2008	2009	2010	2011
Total	646,750	644,490	642,350	640,280	638,410	636,620	635,620
Fresh groundwater	16,250	16,290	16,350	16,380	16,410	16,420	16,520
Brackish groundwater	119,000	117,500	116,600	115,300	114,800	114,000	113,350
Saline groundwater	511,500	510,700	509,400	508,600	507,200	506,200	505,750

Source: Environment Agency - Abu Dhabi

Chart (12): Percentage distributions of groundwater reserves by type - 2011

■ Fresh Groundwater ■ Brackish Groundwater ■ Saline Groundwater



Source: Statistics Centre- Abu Dhabi

Non-conventional water resources

The amount of non-conventional water resources including the total amount of consumed desalinated water and the wastewater in 2011 totaled 1,095 MCM, an increase of 9.6 percent compared with 2010.

Table (4.8): Total non-conventional water resources by type

Million cubic metre

Type	2005	2006	2007	2008	2009	2010	2011
Total	770.0	828.6	874.0	897.9	909.6	999.3	1,095.0
Desalinated water consumption	667.0	722.1	756.7	773.8	790.0	873.0	961.5
Quantity of treated wastewater reuse	103.0	106.5	117.3	124.1	119.6	126.3	133.5

Source: Statistics Centre - Abu Dhabi

Water consumption in irrigation of agricultural areas

As a result of the efforts made by Abu Dhabi government to rationalize the use of water in the irrigation of agricultural areas and to deploy advanced methods to increase irrigation efficiency and reduce wastage of water, average water consumption per agricultural hectare in 2011 decreased to 2,382.1 MCM despite the increase of agricultural areas, a decrease of 1.36 percent as shown in Table (4.9).

Table (4.9): Total consumption of water in the irrigation of agricultural areas

(Million cubic metre)

Item	2008	2009	2010	2011
Groundwater consumption	2,585.6	2,400.0	2,250.9	2,217.9
Desalinated water consumption	26.5	41.3	34.9	30.7
Treated wastewater reuse	124.1	119.6	126.3	133.5
Total consumption	2,736.2	2,560.9	2,412.1	2,382.1
Cultivated area* (hectare)	235,169.1	235,741.6	234,954.8	235,235.0
Average water consumption per agricultural hectare (<i>cubic meters</i>)	11,635	10,863.2	10,266.2	10,126.5
% Reduction of Water Consumption per Agricultural Hectare	-	6.63	5.50	1.36

Source: Statistics Centre - Abu Dhabi, Environment Agency - Abu Dhabi, Abu Dhabi Food Control Authority, Abu Dhabi Sewerage Services Company, Municipality of Abu Dhabi City, Al Ain City Municipality, Western Region Municipality

* Includes cultivated areas of plant holdings, forests, and parks.

Wastewater

Wastewater treatment is one way of utilizing water and diversifying its sources, especially when water resources are scarce. Since 2005 until 2011, the quantity of wastewater inflow in the Abu Dhabi Emirate totalled 259.7 MCM, an increase of 6.9 percent. 93.6 percent of the quantity was treated, while the quantity of the reused treated wastewater accounted for 51.4 percent. Statistical tables (33 - 35) show the quantity of the wastewater inflow, treated and reused by region.

Water treatment plants in 2011 produced 1356.05 MCM. Statistical tables (36 - 38) displays the capacity of conventional and non-conventional water treatment plants by region.

With the increasing demand on wastewater treatment and reuse in the Emirate of Abu Dhabi, the environmental monitoring level and health standards of wastewater treatment, reuse or disposal also increased. There are several parameters that are examined in the process of wastewater treatment, such as the daily amount of dry sludge and the concentrations of biochemical oxygen demand and suspended solids.

In 2011, the daily production of dry sludge decreased by 10.3 percent compared with 2010, whereas the concentration of suspended solids increased by 5.9 percent to reach about 103 tons per day. Statistical tables (41 - 39) illustrate measurements of wastewater quality by region.

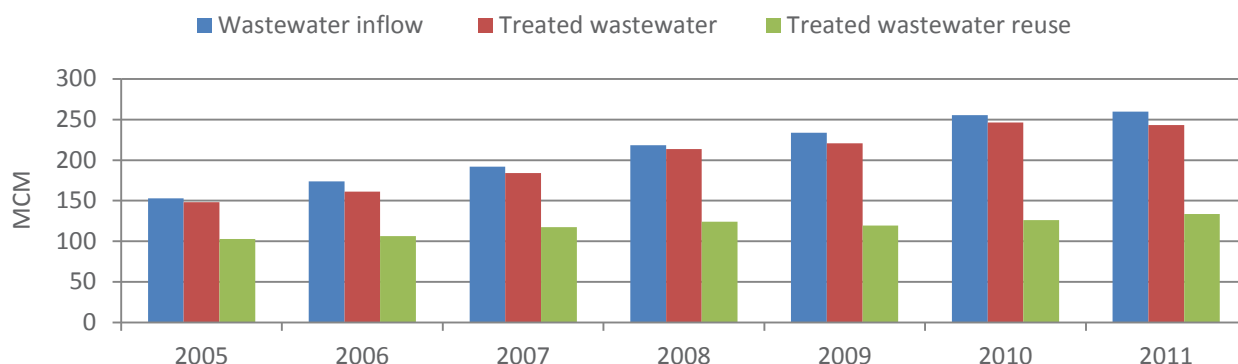
Table (4.10): Wastewater statistics

Million cubic metre

Item	2005	2006	2007	2008	2009	2010	2011
Wastewater inflow	153.1	173.7	192.0	218.5	233.8	255.5	259.7
Treated wastewater	148.3	161.2	184.3	213.8	220.9	246.6	243.1
Treated wastewater reuse	103.0	106.5	117.3	124.1	119.6	126.3	133.5

Source: Abu Dhabi Sewerage Services Company

Chart (13): Quantity of wastewater



Source: Abu Dhabi Sewerage Services Company

Table (4.11): Total wastewater treatment plants capacity

Million cubic metre

Item	2005	2006	2007	2008	2009	2010	2011
Total wastewater treatment plants capacity	135.774	135.774	135.774	135.774	183.198	511.363	1,356.05
Total conventional wastewater treatment plants capacity	134.391	134.391	134.391	134.391	171.605	488.780	388.0
Total non-conventional wastewater treatment plants capacity	1.383	1.383	1.383	1.383	11.593	22.583	61.550

Source: Abu Dhabi Sewerage Services Company

Table (4.12): Wastewater quality

Region	2006	2007	2008	2009	2010	2011
Average daily amount of dry sludge (ton/day)	97.73	112.24	128.66	164.83	135.63	149.63
Average daily concentration of BOD (kg/day)	82,071.12	88,757.22	104,495.08	115,726.45	119,011.71	107,694
Average daily concentration of suspended solids (ton/day)	69.47	81.28	91.32	89.94	97.38	103.11

Source: Abu Dhabi Sewerage Services Company

Marine waters quality

The table below presents readings of Abu Dhabi city marine waters quality in terms of temperature, salinity, dissolved oxygen, in addition to nutrients, such as phosphate, nitrates, and others. The readings have been taken at monitoring stations at certain depths in twelve regions.

The waters off the Emirate of Abu Dhabi are fairly nutrient-rich. Nutrient inputs into the sea from dust to sand storms, sewage discharges and land runoff near-shore areas. Examples of important nutrients in the sea water essential for the life and growth of plants and phytoplankton include nitrites, nitrates, ammonia, phosphates, and silicates. Generally, nutrients level rises in closed areas where it is difficult for water renewal to occur or in industrial zones which have intensive human activities.

The salinity in the Arabian Gulf is relatively high because of combined influence of restricted exchange of Gulf waters with the open ocean, the high evaporation rates result from high temperatures, and the desalination industry. The salinity in marine waters in the city of Abu Dhabi in 2011 ranges between 29-74 Practical Salinity Unit (psu).

Regarding dissolved oxygen, most of the readings taken are between 4-5.5 mg/litre and these are ideal levels for supporting the life of marine living organisms.

The following table (4.13) contains the physical and chemical measurements along with nutrients concentration of the marine waters of Abu Dhabi city.

Table (4.13): Marine waters quality in the city Abu Dhabi - 2011

Region number	Location	Max. Depth (m)	Secchi Depth	(pH)	Salinity (psu)	Temperature (°C)	Dissolved Oxygen (mg/L)	Biochemical Oxygen Demand (BOD) (mg/L)
1	N24°15'39.2" E054°23'25.3"	4	4.25	8.19	47.29	27.34	5.54	9.33
2	N24°18'54.4" E054°30'32.5"	5	2.16	7.82	37.44	29.12	2.15	12.75
3	N24°22'15.2" E054°27'47.1"	6	4.33	8.11	45.53	28.11	4.94	9.83
4	N24°26'53.7" E054°26'44.6"	4	4.41	8	45.28	28.11	5.06	10.75
5	N24°26'41.4" E054°25'09.5"	-	-	7.81	29.77	28.74	5.02	8.5
6	N24°24'05.2" E054°30'10.6"	-	-	7.95	43.77	28.09	4.92	10.41
7	N24°25'42.6" E054°22'30.2"	4	-	8.07	44.7	27.67	4.71	7.66
8	N24°27'56.0" E054°18'15.9"	5	-	8.06	43.66	27.83	4.8	9.08
9	N24°28'38.4" E054°20'35.7"	6	-	8.04	43.37	27.56	5	8.75
10	N24°27'18.3" E054°19'42.4"	5	6.79	8.03	43.24	27.82	4.61	8
11	N24°30'34.9" E054°22'23.0"	5	6.75	8.02	43.23	28.3	4.63	8.41
12	N24°28'15.16" E054°29'25.1"	8	8.66	8.06	46.25	28.91	4.67	5.33

Source: Environment Agency – Abu Dhabi

Table (4.14): Concentration of natural nutrients in marine waters - 2011

Microgram/litre

Region number	Location	Chlorophyll	Phosphate PO ₄	Silicate SiO ₃	Nitrate NO ₃	Nitrite NO ₂
1	N24°39.2'015 E054°23'25.3"	10.30	596.67	756.66	955.83	30.00
2	N24°54.4'018 E054°30'32.5"	17.30	4206.67	3625.83	10306.67	2793.00
3	N24°15.2'022 E054°27'47.1"	8.18	430.00	562.50	319.09	17.50
4	N24°53.7'026 E054°26'44.6"	3.19	330.00	1940.83	1124.17	44.16
5	N24°41.4'026 E054°25'09.5"	2.38	455.00	8543.33	5838.33	60.83
6	N24°05.2'024 E054°30'10.6"	2.23	1008.33	4485.83	3589.17	117.50
7	N24°42.6'025 E054°22'30.2"	1.65	184.17	476.66	260.00	20.83
8	N24°56.0'027 E054°18'15.9"	0.89	331.67	372.50	366.67	0.00
9	N24°38.4'028 E054°20'35.7"	0.97	252.50	652.50	290.83	5.00
10	N24°18.3'027 E054°19'42.4"	1.35	243.33	1200.33	483.33	18.33
11	N24°34.9'030 E054°22'23.0"	1.62	195.83	1008.33	394.17	2.50
12	N24°15.16'28 E054°29'25.1"	1.08	705.83	486.66	360.83	10.00

Source: Environment Agency – Abu Dhabi

5. Health and safety statistics

Maintaining public health is the core base in improving living standards in developed countries, therefore governments establish regulatory bodies and institutions that work to ensure the safety of food, and in return they sought to improve medical and therapeutic services to ensure the preservation of public health. Food safety deals with food preparation and storage. It aims at preventing food poisoning and foodborne illnesses and the preparation of plans and working methods to solve problems facing various business sectors in the Emirate. It also aims at providing secure working environments through identifying and controlling risks and minimizing the possibility of accidents occurrence.

In 2011, there were 71 cases of fatal occupational incidents and 12 fatal road traffic injuries in the Emirate of Abu Dhabi. Moreover, there were 1,356 cases of foodborne illnesses and food poisoning caused by consuming foods or drinks contaminated with bacteria and viruses. Typhoid accounted for the largest share of poisoning cases, claiming 394 victims or 26.6 percent of the total cases of poisoning during the year 2011.

Food poisoning and foodborne illnesses

Food poisoning is defined as an illness caused by consuming foods or drinks contaminated with bacteria, viruses, or poisons, with different severity levels that may sometimes cause death. Symptoms of food poisoning usually include nausea, vomiting, and abdominal cramps, diarrhea, fever, shivering, and others. Such symptoms may affect one person or a group of people who have had the same contaminated foods or drinks. As a result of the increasing number of problems related to food safety and consumer worries, governments exert huge efforts to improve food safety and human health.

In 2011 there were 1,356 cases of food poisoning and foodborne illnesses. Typhoid accounted for the largest share of poisoning cases, claiming 394 or 29 percent of the total cases of poisoning.

Table (5.1): Number of food poisoning and foodborne illnesses by type

Type	2007	2008	2009	2010	2011
Total	1,051	489	1,114	1,259	1,356
Salmonella	128	47	205	90	na
Other food poisoning	215	85	309	471	667
Typhoid fever	77	117	133	335	394
Viral hepatitis A	211	212	181	193	138
Giardia lamblia	170	na	36	55	82
Bacillary dysentery	71	na	52	51	na
Bacterial dysentery	na	na	123	na	na
Paratyphoid fever	5	12	30	12	na
Brucellosis	69	na	45	52	75
Other	105	16	na	na	na

Source: Health Authority - Abu Dhabi

Occupational health and safety

Occupational health and safety aims at promoting and enhancing secure working environments, preserving the health of employees who are involved in the various economic activities. This will result in increasing the productivity of the individual and the optimum utilization of human resources; it will also identify risks faced by workers, while measuring the severity and periodicity of these risks.

Occupational injury deaths

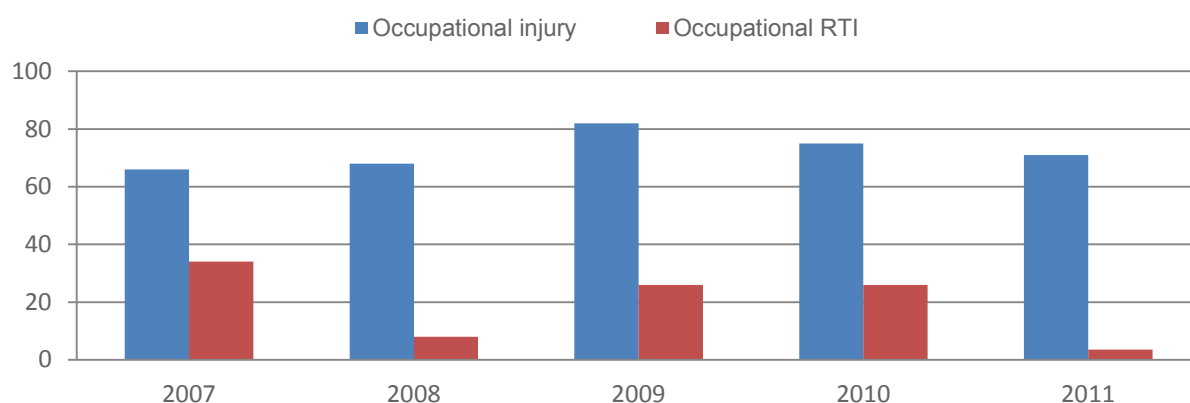
Table (5.2) shows that number of death toll caused by occupational injuries in Abu Dhabi in 2011 decreased significantly by 17.8 percent compared with 2010, whereas the number of deaths caused by occupational road traffic accounted for 3.6 percent of total road traffic injury deaths.

Table (5.2): Occupational Injury Deaths

Injury Category	2007	2008	2009	2010	2011
Total	100	76	108	101	83
Occupational injury	66	68	82	75	71
Road traffic injury (RTI)	34	8	26	26	12
% occupational RTI from total RTI	8.0	1.9	6.0	7.4	3.6

Source: Health Authority - Abu Dhabi, Statistics Centre - Abu Dhabi

Chart (15): Number of Occupational Injury Deaths by type



Source: Health Authority - Abu Dhabi

Occupational health and safety statistics – Water and electricity production sector

Table (5.3) proves that 2011 data doesn't include any fatality or disability incidents. Lost time injury incidents totaled 12 incidents per million man-hours worked in the water and electricity production sector, a decrease of 45.5 percent. The registered near miss cases were 1,355 cases. While, the reportable case frequency (TRCF) was 0.33 per cent. The lost time injury severity rate (LTISR) was 7.51 as shown in Table (5.4)

Table (5.3): Number of occupational health and safety incidents - water and electricity production sector

Item	2005	2006	2007	2008	2009	2010	2011
Fatality incidents	1	2	0	3	3	6	0
Fatality non recordable	0	0	0	0	0	0	0
Disability incident	0	0	0	0	0	1	0
Lost time injury incidents	9	15	18	27	19	22	12
Medical treatment case	5	18	43	290	531	472	8
Restricted workday case	0	2	2	3	4	1	0
Journey incident	0	0	0	0	3	0	10
Reporting dangerous occurrence	0	5	6	6	9	4	0
Road traffic incidents	44	14	15	15	8	3	1
Near miss	47	96	281	1014	1,1495	596	1,355

Source: Abu Dhabi Water and Electricity Authority - ADWEA

Table (5.4): Rate of injuries and incidents registered per million man-hours worked - water and electricity production sector

Item	2005	2006	2007	2008	2009	2010	2011
Number of Working Hours (<i>Million Hours</i>)	9.85	20.99	25.08	36.85	50.57	42.13	36.08
Lost Time Injury Frequency Rate (LTIFR)	0.91	0.71	0.72	0.73	0.38	0.52	0.33
Lost Time Injury Severity Rate (LTISR)	2.10	4.20	14.40	6.10	4.70	17.10	7.51
Total Reportable Case Frequency (TRCF)*	0.10	1.00	1.70	8.00	10.60	11.30	0.50

Source: Abu Dhabi Water and Electricity Authority - ADWEA

*Includes Fatal Accident Rate (FAR)

Occupational health and safety statistics – Oil and gas sector

The working hours in oil and gas sector increased in 2011, causing in return a rise in the number of fatality and disability incidents and lost time injury incidents as shown in in Table (5.5). The lost time injury incidents rate remain on the same level as in 2010, while the total reportable case frequency (TRCF) was 0.58 as shown in Table (5.6).

Table (5.5): Number of occupational health and safety incidents - oil and gas sector

Item	2005	2006	2007	2008	2009	2010	2011
Fatality incidents	6	5	4	4	7	4	18
Fatality non recordable	na	8	5	9	7	11	19
Disability incident	0	0	2	2	1	0	17
Lost time injury incidents	53	57	58	68	75	66	110
Medical treatment case	123	107	141	114	93	144	279
Restricted workday case	41	42	53	48	44	58	1
Journey incident	na	na	na	na	na	na	na
Reporting dangerous occurrence	na	na	na	na	na	na	na
Occurrence of occupational disease	na	na	na	na	na	na	na
Road traffic incidents	171	93	116	169	135	177	284
Near miss	na	na	na	na	24,419	30,186	50,624

Source: Abu Dhabi National Oil Company - ADNOC

Table (5.6): Rate of injuries and incidents registered per million man-hours worked - oil and gas sector

Item	2005	2006	2007	2008	2009	2010	2011
Number of working hours (<i>million hours</i>)	171	191	230	298	313	355	588.54
Lost time injury frequency rate (LTIFR)	0.31	0.30	0.25	0.23	0.24	0.19	0.19
Lost time injury severity rate (LTISR)	na	na	na	na	na	na	na
Total reportable case frequency (TRCF)	1.27	1.08	1.09	0.79	0.68	0.76	0.58
Fatal accident rate (FAR)	3.50	2.62	1.74	1.34	2.23	1.13	3.06

Source: Abu Dhabi National Oil Company - ADNOC

Occupational health and safety statistics – Sewerage services

Table (5.7) shows that Abu Dhabi Sewerage services activity recorded one fatal incident, six lost time injury incidents and one traffic incident. The lost time injury frequency rate (LTIFR) was 0.56, with a lost time injury severity rate (LTISR) at 8.89, while the total reportable case frequency (TRCF) was 0.63 as shown in Table (5.8).

Table (5.7): Number of occupational health and safety incidents - sewerage services

Item	2007	2008	2009	2010	2011
Fatality Incidents	1	1	1	2	1
Fatality Non Recordable	0	0	0	0	0
Disability Incident	0	0	0	0	0
Lost Time Injury Incidents	2	2	6	0	6
Medical Treatment Case	0	0	0	0	0
Restricted Workday Case	0	0	0	0	6
Journey Incident	0	0	0	0	0
Reporting Dangerous Occurrence	0	0	1	2	0
Occurrence of Occupational Disease	0	0	0	0	0
Road Traffic Incidents	0	0	0	1	1
Near miss	0	0	182	244	165

Source: Abu Dhabi Sewerage Services Company

Table (5.8): Rate of injuries and incidents registered per million man-hours worked - sewerage services

Item	2007	2008	2009	2010	2011
Number of Working Hours (<i>Million Hours</i>)	2.44	5.33	12.34	15.77	9.572
Lost Time Injury Frequency Rate (LTIFR)	0.16	0.91	0.729	0.00	0.56
Lost Time Injury Severity Rate (LTISR)	0.41	1.82	7.309	0.00	8.89
Total Reportable Case Frequency (TRCF)	0.00	1.82	0.92	0.118	0.63
Fatal Accident Rate (FAR)	0.08	0.91	0.46	0.051	0.1

Source: Abu Dhabi Sewerage Services Company

6. Waste statistics

Abu Dhabi government ensures applying the proper and sustainable use of natural resources and encourages decreasing the production of waste from its sources, in addition to monitoring all activities related to waste management in order to overcome the environmental and economic damages resulted from improper disposal of waste. Improper disposal of waste may result in polluting ground and sea water and harming both coastal and urban areas. Even if waste is disposed through the proper means of imbedding, it requires large areas of land which may not be available for many countries. Consequently, an increasing need for safe and effective waste management system emerges along with waste recycling that conserves the environment and contributes economic benefits to society and its economic sectors. The total amount of waste in 2011 was about 10.3 million tons of which 57 percent was transferred to dumpsites and 37 percent was recycled.

Solid waste

The total amount of the waste generated daily in 2011 was about 28.3 thousand tons. The demolition and construction activity accounts for 73.8 percent of total waste generated, whereas the amount of solid municipal waste reached about 1,105 thousand tons of which 65.7 percent was in the Abu Dhabi region.

Table (6.1): Non-hazardous solid waste generation by region and source activity - 2011*

Tons

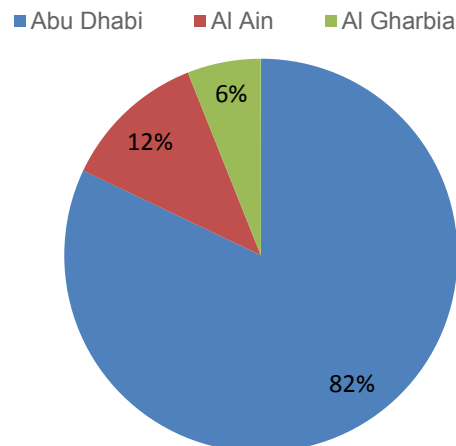
Source	Total	Abu Dhabi	Al Ain	Al Gharbia
Grand total	10,336,635	8,484,489	1,226,421	625,725
Daily average	28,320	23,245	3,360	1,714
Construction and demolition	7,624,575	6,785,331	724,914	114,330
Commercial and industrial Waste	643,338	590,808	37,080	15,450
Agricultural Waste	816,069	239,166	175,203	401,700
Municipal Solid Waste	1,105,602	726,768	287,679	91,155
Other **	147,051	142,416	1,545	3,090

Source: The Centre of Waste Management - Abu Dhabi

* Does not include waste of oil and gas sector

** Include solid waste from sewage treatment and tires waste

Chart (16): Percentage distribution of non-hazardous solid waste generation by region - 2011

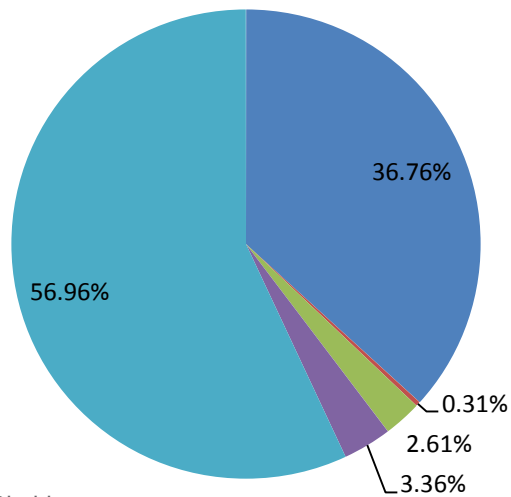


Source: Statistics Centre – Abu Dhabi

With the development of waste generated from various activities treatment weightiness in the Emirate of Abu Dhabi, recycled waste reached 37 percent in 2011, while waste transferred to dumpsite reached 57 percent of the total waste generated in Abu Dhabi emirate. As shown in the chart 17.

Chart (17): Percentage distribution of non-hazardous solid waste by disposal method - 2011

■ Recycling ■ Incineration ■ Composting ■ Landfill ■ Dumpsite



Source: Statistics Centre – Abu Dhabi

Statistical Tables

Table 1: Air temperature by month - Abu Dhabi - 2011

Degree Celsius

Month	Monthly average	Absolute minimum	Average minimum	Absolute maximum	Average maximum
January	20.1	6.7	15.7	30.3	24.6
February	20.7	8.9	16.0	34.8	25.5
March	22.8	9.5	17.7	39.5	28.5
April	28.2	14.2	22.2	41.3	35.1
May	32.2	18.5	26.2	46.9	38.9
June	33.9	23.2	28.1	48.3	40.4
July	35.8	25.3	30.4	49.0	42.6
August	36.2	26.0	31.2	48.9	42.5
September	33.9	20.0	27.9	45.4	40.6
October	30.6	15.6	25.2	42.9	36.5
November	25.2	11.4	19.9	36.1	30.5
December	19.9	6.2	14.8	28.0	24.7

Source: Statistics Centre – Abu Dhabi

Table 2: Air temperature by month – Al Ain - 2011

Degree Celsius

Month	Monthly average	Absolute minimum	Average minimum	Absolute maximum	Average maximum
January	18.5	6.0	13.2	30.8	24.0
February	18.7	5.9	13.7	37.6	25.9
March	21.6	7.6	15.9	39.0	30.3
April	26.8	13.8	21.8	41.9	35.5
May	31.3	17.6	25.8	48.9	41.1
June	33.7	20.2	28.0	49.7	43.9
July	34.1	18.7	29.6	48.9	43.1
August	35.0	22.4	30.3	49.1	43.6
September	32.4	22.2	27.1	46.3	41.5
October	28.1	17.5	23.2	43.5	36.2
November	22.6	12.4	17.9	37.4	29.9
December	17.5	6.0	12.1	30.4	25.0

Source: Statistics Centre – Abu Dhabi

Table 3: Air temperature by month – Al Gharbia - 2011

Degree Celsius

Month	Monthly average	Absolute minimum	Average minimum	Absolute maximum	Average maximum
January	18.7	5.6	13.2	31.8	24.3
February	19.9	5.0	13.1	37.3	26.5
March	22.8	9.0	15.9	40.8	30.1
April	28.9	15.5	21.6	41.8	36.1
May	33.8	17.8	25.8	48.6	41.4
June	35.8	23.2	27.6	49.1	43.7
July	36.8	24.6	29.7	49.4	43.8
August	37.0	25.3	30.2	49.9	43.6
September	34.1	21.4	26.7	46.4	41.5
October	29.7	15.4	22.9	43.4	36.3
November	24.1	9.8	17.9	36.1	29.9
December	17.9	4.2	12.1	28.7	24.1

Source: Statistics Centre – Abu Dhabi

Table 4: Air temperature by month – The Islands - 2011

Degree Celsius

Month	Monthly average	Absolute minimum	Average minimum	Absolute maximum	Average maximum
January	19.9	12.2	17.3	30.8	22.7
February	19.9	10.9	16.6	35.6	23.6
March	21.9	11.2	18.6	37.6	25.9
April	26.8	16.3	22.8	42.2	32.2
May	31.1	20.0	26.9	48.1	36.4
June	33.1	24.1	28.9	45.4	38.5
July	34.7	25.4	30.7	47.2	40.0
August	35.3	25.7	31.3	47.8	39.9
September	33.6	22.2	29.7	43.0	37.7
October	30.2	20.2	26.7	40.0	33.8
November	25.0	13.9	21.8	35.0	28.2
December	19.8	8.4	17.0	25.7	22.4

Source: Statistics Centre – Abu Dhabi

Table 5: Rainfall in Abu Dhabi and Al Ain regions by month - 2011

Millimetres

Month	Abu Dhabi		Al Ain	
	Heaviest fall in one day	Total for month	Heaviest fall in one day	Total for month
January	7.4	29.6	9.2	93.9
February	Trace	Trace	Trace	Trace
March	0.0	0.0	0.0	0.0
April	7.2	14.4	8.8	48.7
May	0.0	0.0	2.4	4.4
June	0.0	0.0	0.0	0.0
July	0.0	0.0	11.0	15.2
August	0.0	0.0	21.2	62.8
September	1.4	1.4	4.4	6.0
October	1.4	1.4	3.2	9.8
November	1.2	3.2	3.2	3.8
December	0.0	0.0	0.0	0.0

Source: Statistics Centre – Abu Dhabi

Table 6: Rainfall in Al Gharbia and The Islands by month - 2011

Millimetres

Month	Al Gharbia		The Islands	
	Heaviest fall in one day	Total for month	Heaviest fall in one day	Total for month
January	41.0	84.4	16.6	41.4
February	Trace	Trace	0.0	0.0
March	0.6	1.0	0.0	0.0
April	7.0	16.0	1.8	6.5
May	0.0	0.0	0.0	0.0
June	0.0	0.0	0.0	0.0
July	0.0	0.0	0.0	0.0
August	10.2	15.4	0.0	0.0
September	0.0	0.0	0.0	0.0
October	0.0	0.0	0.0	0.0
November	4.2	12.4	32.6	49.4
December	Trace	Trace	0.0	0.0

Source: Statistics Centre – Abu Dhabi

Table 7: Relative humidity by month - Abu Dhabi - 2011

%

Month	Monthly average	Absolute minimum	Average minimum	Absolute maximum	Average maximum
January	68.8	26.0	48.8	100.0	83.7
February	62.3	7.7	40.2	100.0	80.4
March	58.1	4.0	34.3	100.0	78.0
April	49.2	6.2	24.1	100.0	72.1
May	50.5	3.5	26.3	100.0	72.8
June	56.7	6.0	30.5	100.0	78.7
July	51.5	6.1	24.9	100.0	74.6
August	56.5	8.0	30.4	100.0	77.1
September	59.3	6.9	29.0	100.0	82.1
October	59.8	7.2	33.7	100.0	80.0
November	60.5	11.0	38.9	100.0	78.9
December	63.7	11.0	43.9	100.0	81.0

Source: Statistics Centre – Abu Dhabi

Table 8 : Relative humidity by month - Al Ain - 2011

%

Month	Monthly average	Absolute minimum	Average minimum	Absolute maximum	Average maximum
January	66.4	4.9	39.7	100.0	91.5
February	54.2	1.0	26.6	100.0	84.8
March	43.0	1.0	16.2	100.0	74.8
April	31.6	1.0	12.7	100.0	59.1
May	30.2	2.2	10.9	100.0	56.1
June	30.3	1.0	8.5	100.0	58.8
July	31.5	2.4	13.0	100.0	57.2
August	36.8	2.6	16.7	100.0	61.5
September	34.1	1.1	9.9	100.0	65.7
October	43.6	3.7	17.4	100.0	75.2
November	50.8	6.7	27.1	100.0	78.7
December	59.3	1.0	29.9	100.0	88.2

Source: Statistics Centre – Abu Dhabi

Table 9: Relative humidity by month - Al Gharbia - 2011

%

Month	Monthly average	Absolute minimum	Average minimum	Absolute maximum	Average maximum
January	74.4	4.3	46.2	100.0	95.8
February	60.6	2.1	29.9	100.0	91.5
March	50.4	3.9	22.1	100.0	81.7
April	41.7	5.8	16.5	100.0	71.9
May	37.2	1.7	15.1	100.0	65.8
June	35.7	1.1	13.3	100.0	65.2
July	42.2	1.7	17.1	100.0	70.9
August	47.9	2.2	23.8	100.0	76.8
September	47.5	10.6	19.1	100.0	80.1
October	54.6	14.9	25.6	100.0	85.1
November	60.1	14.8	35.3	100.0	86.2
December	70.5	27.7	40.8	100.0	94.5

Source: Statistics Centre – Abu Dhabi

Table 10: Relative humidity by month – The Islands - 2011

%

Month	Monthly average	Absolute minimum	Average minimum	Absolute maximum	Average maximum
January	77.6	26.0	62.3	100.0	87.4
February	74.2	7.7	53.3	100.0	87.7
March	70.9	4.0	48.5	100.0	88.1
April	67.1	6.2	35.4	100.0	88.2
May	63.3	3.5	35.5	100.0	86.8
June	64.4	6.0	35.6	100.0	87.2
July	64.0	6.1	34.4	100.0	86.5
August	65.1	8.0	39.6	100.0	86.3
September	64.6	6.9	41.7	100.0	84.7
October	63.7	7.2	45.7	100.0	80.7
November	64.8	11.0	47.6	100.0	81.8
December	70.1	11.0	54.9	100.0	85.2

Source: Statistics Centre – Abu Dhabi

Table 11: Wind speed by month - Abu Dhabi - 2011

Knot*

Month	Average	Absolute maximum	Average maximum
January	6.0	25.9	11.8
February	7.4	27.0	13.8
March	7.6	21.8	13.2
April	7.0	26.0	14.3
May	6.6	20.6	13.6
June	6.4	20.9	12.9
July	6.6	20.0	13.3
August	6.0	20.0	12.6
September	5.7	20.5	12.2
October	5.8	21.6	12.1
November	5.5	22.5	11.0
December	6.0	17.5	11.4

Source: Statistics Centre – Abu Dhabi

*Knot = 1.15 mph

Table 12: Wind speed by month - Al Ain - 2011

Knot*

Month	Average	Absolute maximum	Average maximum
January	5.4	35.8	11.8
February	6.8	38.6	14.3
March	6.8	30.2	13.9
April	7.4	38.3	15.6
May	6.8	35.6	15.8
June	6.4	36.7	14.6
July	6.7	35.7	14.9
August	5.8	31.0	13.7
September	5.1	29.6	12.6
October	5.5	29.1	12.7
November	5.3	25.4	11.0
December	5.0	26.9	10.5

Source: Statistics Centre – Abu Dhabi

*Knot = 1.15 mph

Table 13: Wind speed by month - Al Gharbia - 2011

Knot*

Month	Average	Absolute maximum	Average maximum
January	6.5	26.9	12.8
February	7.6	30.6	14.9
March	8.3	31.6	15.4
April	7.7	38.7	16.0
May	7.6	27.6	16.3
June	7.6	32.5	16.3
July	7.0	24.9	14.8
August	6.8	30.4	15.1
September	6.2	26.8	13.5
October	6.0	29.6	12.9
November	6.8	32.7	13.3
December	7.3	26.4	12.9

Source: Statistics Centre – Abu Dhabi

*Knot = 1.15 mph

Table 14: Wind speed by month - The Islands - 2011

Knot*

Month	Average	Absolute maximum	Average maximum
January	7.8	33.6	13.7
February	8.9	33.6	15.4
March	10.2	28.1	15.7
April	8.1	35.8	14.9
May	8.2	24.4	14.5
June	7.7	26.6	14.4
July	7.2	23.2	13.4
August	6.5	26.0	12.9
September	6.9	21.9	12.7
October	7.1	25.0	12.4
November	8.0	30.3	13.9
December	8.5	25.2	13.5

Source: Statistics Centre – Abu Dhabi

*Knot = 1.15 mph

Table 15: Daily total solar radiation by month - Abu Dhabi - 2011Watt/ m²/h

Month	Average	Minimum	Maximum
January	3,702	611	5,160
February	4,893	3,060	5,940
March	5,902	2,558	7,230
April	6,060	2,256	8,050
May	7,229	5,219	8,110
June	7,039	5,823	8,130
July	6,574	4,230	7,620
August	6,501	3,008	7,640
September	6,159	4,849	7,130
October	5,304	4,415	6,190
November	4,496	2,890	5,320
December	4,195	3,124	4,820

Source: Statistics Centre – Abu Dhabi

Table 16: Daily total solar radiation by month – Al Ain - 2011Watt/ m²/h

Month	Average	Minimum	Maximum
January	3,957	661	5,845
February	5,204	2,260	6,572
March	6,013	2,042	7,478
April	5,979	2,166	8,254
May	7,054	996	8,638
June	6,747	5,564	8,332
July	6,529	4,629	7,930
August	6,415	3,363	7,793
September	6,441	3,711	7,634
October	5,700	3,998	6,717
November	4,703	2,886	5,654
December	4,427	3,224	5,178

Source: Statistics Centre – Abu Dhabi

Table 17: Daily total solar radiation by month - Al Gharbia - 2011Watt/ m²/h

Month	Average	Minimum	Maximum
January	4,096	502	5,464
February	5,442	3,691	6,687
March	6,083	1,732	7,791
April	6,168	2,448	8,784
May	7,092	4,821	8,484
June	6,818	6,283	8,008
July	6,637	2,642	7,890
August	6,728	3,648	7,989
September	6,300	4,365	7,168
October	5,648	2,969	6,462
November	4,683	2,319	5,606
December	4,448	3,261	4,975

Source: Statistics Centre – Abu Dhabi

Table 18: Daily total solar radiation by month – The Islands - 2011Watt/ m²/h

Month	Average	Minimum	Maximum
January	2,898	361	5,212
February	4,218	1,635	6,120
March	5,179	1,555	6,978
April	5,266	2,216	7,933
May	6,305	4,700	7,694
June	6,460	4,845	7,675
July	6,040	3,916	7,580
August	6,204	4,529	7,740
September	5,561	3,645	6,561
October	4,366	2,397	5,800
November	3,205	1,083	5,455
December	3,005	856	4,939

Source: Statistics Centre – Abu Dhabi

Table 19: Annual average of sulphur dioxide concentration in ambient air by regionMicrogram/m³

Station Location	2008	2009	2010	2011
Abu Dhabi				
City Centre - Khadija School	11	9	10	8
Urban/ Residential - Khalifa School	11	6	8	7
Road Side - Hamdan Street	13	7	10	7
Urban/ Residential - Baniyas School	29	7	13	9
Industrial - Mussafah	6	19	7	7
Al Ain				
Urban/ Residential - Al Ain School	6	3	5	9
Road Side - Al Ain Street	7	4	6	7
Al Gharbia				
Urban/ Residential - Bida Zayed	8	3	8	7
City Centre - Gayathi School	7	7	6	5
Regional Background - Liwa Oasis	4	3	5	5

Source: Environment Agency - Abu Dhabi

* The annual maximum allowable limit for sulphur dioxide average concentration is 60 mcg/m³**Table 20: Annual average of nitrogen dioxide concentration in ambient air by region**Microgram/m³

Station Location	2008	2009	2010	2011
Abu Dhabi				
City Centre - Khadija School	46	36	53	30
Urban/ Residential - Khalifa School	42	41	40	29
Road Side-Hamdan Street	21	49	59	46
Urban/ Residential - Baniyas School	24	27	31	28
Industrial-Mussafah	46	53	59	50
Al Ain				
Urban/ Residential - Al Ain School	54	na	29	27
Road Side - Al Ain Street	26	45	35	39
Al Gharbia				
Urban/ Residential - Bida Zayed	na	16	17	17
City Centre - Gayathi School	13	17	11	13
Regional Background - Liwa Oasis	2	3	4	4

Source: Environment Agency - Abu Dhabi

Table 21: Annual average of ground level ozone concentration in ambient air by regionMicrogram/m³

Station Location	2008	2009	2010	2011
Abu Dhabi				
City Centre - Khadija School	42	45	59	67
Urban/ Residential - Khalifa School	32	34	54	72
Urban/ Residential - Baniyas School	35	33	52	59
Al Ain				
Urban/ Residential - Al Ain School	33	27	38	61
Al Gharbia				
Urban/ Residential - Bida Zayed	45	47	68	73
City Centre - Gayathi School	53	54	88	81
Regional background - Liwa Oasis	71	44	82	93

Source: Environment Agency - Abu Dhabi

Table 22: Annual average of particulate matter (PM10) concentration in ambient air by regionMicrogram/m³

Station Location	2008	2009	2010	2011
Abu Dhabi				
City Centre - Khadija School	133	152	133	140
Urban/ Residential - Khalifa School	90	98	72	137
Road Side - Hamdan Street	124	148	143	128
Urban/ Residential - Baniyas School	72	71	189	203
Industrial - Mussafah	195	209	227	184
Al Ain				
Urban/ Residential - Al Ain School	92	115	72	138
Road Side - Al Ain Street	132	147	151	143
Al Gharbia				
Urban/ Residential - Bida Zayed	118	149	102	171
City Centre - Gayathi School	170	143	128	169
Regional Background - Liwa Oasis	159	147	153	168

Source: Environment Agency - Abu Dhabi

Table 23: Sulphur dioxide emissions – oil and gas sector

Tons

Business Sector	2005	2006	2007	2008	2009	2010	2011
Total	262,539	267,739	212,722	156,674	185,870	219,022	208,025
Exploration and production	103,516	103,415	88,390	45,619	76,641	153,500	147,263
Independent operators**	*	*	*	*	*	52,790	45,076
Shared services**	**	**	**	**	**	74	NA
Marketing and refining	10,040	10,185	10,075	11,506	11,271	12,318	15,183
Gas processing	148,743	153,900	114,045	99,349	97,780	*	*
Petrochemicals	240	239	212	200	178	340	503

Source : Abu Dhabi National Oil Company - ADNOC

* Included with exploration and production

** New business sector

Table 24: Nitrogen oxides emissions - oil and gas sector

Tons

Business Sector	2005	2006	2007	2008	2009	2010	2011
Total	56,225	57,332	55,881	52,755	54,782	58,901	66,105
Exploration and production	16,655	17,359	16,287	15,045	17,670	29,288	33,999
Independent operators**	*	*	*	*	*	2,336	2,427
Shared services**	**	**	**	**	**	802	NA
Marketing and refining	17,795	18,523	19,596	20,253	20,031	23,430	26,079
Gas processing	20,263	19,956	18,473	16,004	15,696	*	*
Petrochemicals	1,512	1,494	1,525	1,453	1,385	3,045	3,600

Source: Abu Dhabi National Oil Company - ADNOC

* Included with exploration and production

** New business sector

Table 25: Volatile organic compounds emissions - oil and gas sector

Tons

Business Sector	2005	2006	2007	2008	2009	2010	2011
Total	64,915	69,339	66,698	65,475	57,999	62,170	85,420
Exploration and production	47,490	51,476	50,532	50,404	42,835	51,464	55,003
Independent operators**	*	*	*	*	*	1,166	1,013
Marketing and refining	8,222	8,401	8,430	8,310	8,343	7,808	27,692
Gas processing	8,503	8,754	7,027	5,978	6,206	*	*
Petrochemicals	700	708	709	783	615	1,732	1,712

Source: Abu Dhabi National Oil Company - ADNOC

* Included with exploration and production

** New business sector

Table 26: Carbon dioxide emissions - oil and gas sector

Million tons

Business Sector	2006	2007	2008	2009	2010	2011*
Total	23.0	22.0	21.0	21.0	23.0	27.9
Exploration and Production	16.0	15.0	15.0	14.0	15.0	17.1
Independent Operators	1.0	1.0	1.0	1.0	1.0	1.0
Marketing & Refining	5.0	5.0	4.0	5.0	4.0	6.3
Petrochemicals	1.0	1.0	1.0	1.0	3.0	3.4

Source: Abu Dhabi National Oil Company - ADNOC

* Total includes shared services sector

Table 27: Per capita carbon dioxide emissions - oil and gas sector

Tons

Business Sector	2006	2007	2008	2009	2010	2011*
Total	15.73	13.99	12.39	11.50	11.68	13.20
Exploration and Production	10.95	9.53	8.85	7.66	7.62	8.10
Independent Operators	0.68	0.64	0.59	0.55	0.51	0.48
Marketing & Refining	3.42	3.18	2.36	2.74	2.03	2.99
Petrochemicals	0.68	0.64	0.59	0.55	1.52	1.61

Source: Statistics Centre- Abu Dhabi

* Total includes shared services sector

Table 28: Number and duration of interruptions in electricity supply - Abu Dhabi - 2011

Month	Number of interruptions	Interruption duration (Thousand minutes)	Number of customers with interruption in electricity supply
Total	11,083	1,478,819	371,750
January	879	165,648	42,302
February	744	132,190	33,235
March	716	121,000	30,736
April	834	150,565	30,199
May	1,173	119,628	29,506
June	1,068	109,957	27,374
July	1,437	116,472	36,335
August	1,279	93,120	31,517
September	868	88,814	31,038
October	775	117,606	33,148
November	592	102,588	20,608
December	718	161,231	25,752

Source: Abu Dhabi Water and Electricity Authority

Table 29: Number and duration of interruptions in electricity supply - Al Ain - 2011

Month	Number of interruptions	Interruption duration (Thousand minutes)	Number of customers with interruption in electricity supply
Total	11,194	1,126,973	178,618
January	802	95,071	15,229
February	536	62,849	8,443
March	737	70,505	12,379
April	786	83,634	14,373
May	1,114	107,561	13,496
June	1,458	117,319	12,644
July	1,370	130,369	16,035
August	1,862	186,166	28,126
September	898	91,537	27,042
October	665	65,514	11,118
November	440	51,677	7,145
December	526	64,771	12,588

Source: Abu Dhabi Water and Electricity Authority

Table 30: Number and duration of interruptions in electricity supply - Al Gharbia - 2011

Month	Number of interruptions	Interruption duration (Thousand minutes)	Number of customers with interruption in electricity supply
Total	2,778	18,720	104,698
January	236	1,920	9,965
February	140	1,920	6,268
March	206	1,620	13,793
April	214	600	7,969
May	193	960	5,036
June	272	1,680	6,992
July	356	960	8,556
August	433	na	9,563
September	240	3,240	15,036
October	192	1,920	7,878
November	157	1,800	7,474
December	139	2,100	6,168

Source: Abu Dhabi Water and Electricity Authority

Table 31: Power transmission system availability by month - Abu Dhabi Emirate

(%)

Month	2005	2006	2007	2008	2009	2010	2011
January	97.55	97.36	98.71	97.93	96.09	98.13	98.46
February	96.78	97.36	98.45	98.00	96.05	98.30	98.24
March	96.64	97.32	98.62	98.42	96.84	98.08	98.10
April	97.23	98.38	98.50	98.16	97.21	98.35	98.88
May	98.23	99.14	99.20	98.70	96.67	98.14	99.27
June	99.37	99.09	98.99	98.33	97.54	98.70	99.40
July	99.83	99.67	99.11	99.30	98.32	99.06	99.44
August	99.92	99.63	99.52	99.34	99.63	99.30	99.52
September	99.86	99.54	99.61	99.18	99.31	99.44	99.31
October	99.48	99.49	99.09	99.03	99.67	99.24	99.18
November	98.84	98.97	98.51	97.17	99.57	98.47	99.07
December	98.09	99.12	98.33	97.91	99.23	98.44	98.77

Source: Abu Dhabi Water and Electricity Authority

Table 32: Water transmission system availability by Month - Abu Dhabi Emirate

%

Month	2005	2006	2007	2008	2009	2010	2011
January	95.80	95.80	95.75	95.84	94.88	97.28	97.21
February	94.69	95.72	95.54	95.86	94.50	97.43	97.17
March	95.91	95.62	95.55	95.31	94.52	96.98	97.37
April	95.51	95.80	95.57	94.69	95.15	99.24	97.08
May	95.83	95.97	95.69	94.60	96.24	99.58	98.18
June	96.28	95.60	96.97	94.99	96.17	99.34	98.40
July	96.02	95.74	96.88	93.32	96.51	97.74	98.45
August	95.57	95.60	96.90	93.78	96.74	97.33	98.46
September	95.82	95.69	96.59	93.82	97.01	97.55	98.36
October	95.76	95.46	96.89	93.76	96.87	96.70	98.32
November	95.60	95.47	96.49	94.10	96.88	96.86	97.69
December	95.80	95.72	96.68	94.53	96.75	96.56	97.49

Source: Abu Dhabi Water and Electricity Authority

Table 33: Quantity of wastewater inflow by region

Million Cubic Metres

Region	2005	2006	2007	2008	2009	2010	2011
Total*	153.1	173.7	192.0	218.5	233.8	255.5	259.65
Abu Dhabi	119.4	131.4	142.87	160.4	173.1	188.8	185.94
Al Ain	33.7	37.4	42.08	50.5	52.1	57.3	62.83
Al Gharbia	na	4.9	7.09	7.6	8.7	9.4	10.88

Source: Abu Dhabi Sewerage Services Company

* Figures may not sum up to totals due to rounding

Table 34 : Quantity of treated wastewater by region

Million Cubic Metres

Region	2005	2006	2007	2008	2009	2010	2011
Total	148.3	161.2	184.3	213.8	220.9	246.6	243.1
Abu Dhabi	113.9	123.0	136.5	156.3	165.2	183.0	181.0
Al Ain	33.0	36.7	41.4	50.0	48.1	54.8	52.3
Al Gharbia	1.4	1.5	6.4	7.5	7.6	8.8	9.8

Source: Abu Dhabi Sewerage Services Company

Table 35: Quantity of treated wastewater reuse by region

Million Cubic Metres

Region	2005	2006	2007	2008	2009	2010	2011
Total	103.0	106.5	117.3	124.1	119.6	126.3	133.5
Abu Dhabi	69.7	70.1	74.2	73.3	71.7	65.5	73.0
Al Ain	31.9	34.8	37.8	45.3	40.6	52.0	51.5
Al Gharbia	1.4	1.6	5.3	5.5	7.3	8.8	9.0

Source: Abu Dhabi Sewerage Services Company

Table 36: Total wastewater treatment plants capacity by region

Million Cubic Metres

Region	2005	2006	2007	2008	2009	2010	2011
Total	135.774	135.774	135.774	135.774	183.198	511.363	1,356.05
Abu Dhabi	95.872	95.872	95.872	95.872	130.320	360.260	987.00
Al Ain	29.426	29.426	29.426	29.426	41.585	139.760	338.00
Al Gharbia	10.476	10.476	10.476	10.476	11.293	11.343	31.05

Source: Abu Dhabi Sewerage Services Company

Table 37: Total Conventional wastewater treatment plants capacity by region

Million Cubic Metres

Region	2005	2006	2007	2008	2009	2010	2011
Total	134.391	134.391	134.391	134.391	171.605	488.780	1,294.50
Abu Dhabi	95.872	95.872	95.872	95.872	124.845	343.830	942.00
Al Ain	29.211	29.211	29.211	29.211	35.690	133.870	321.60
Al Gharbia	9.308	9.308	9.308	9.308	11.070	11.080	30.90

Source: Abu Dhabi Sewerage Services Company

Table 38: Total non-conventional wastewater treatment plants capacity by region

Million Cubic Metres

Region	2005	2006	2007	2008	2009	2010	2011
Total	1.383	1.383	1.383	1.383	11.593	22.583	61.550
Abu Dhabi	na	na	na	na	5.475	16.430	45.000
Al Ain	0.215	0.215	0.215	0.215	5.895	5.890	16.400
Al Gharbia	1.168	1.168	1.168	1.168	0.223	0.263	0.150

Source: Abu Dhabi Sewerage Services Company

Table 39: Average daily amount of dry sludge by region

(Tons/day)

Region	2006	2007	2008	2009	2010	2011
Total	97.73	112.24	128.66	164.83	135.63	149.63
Abu Dhabi	73.23	82.22	95.88	122.09	100.49	110.05
Al Ain	24.20	28.96	28.02	40.67	29.95	33.56
Al Gharbia	0.30	1.05	4.75	2.08	5.18	6.02

Source: Abu Dhabi Sewerage Services Company

Table 40: Average daily concentration of BOD by region

kg/day

Region	2006	2007	2008	2009	2010	2011
Total	82,071.12	88,757.22	104,495.08	115,726.45	119,011.71	107,694
Abu Dhabi	54,944.22	59,758.01	73,790.92	75,900.60	87,930.76	79,673
Al Ain	23,957.90	24,193.40	25,597.46	33,104.24	26,683.20	23,885
Al Gharbia	3,169.00	4,805.81	5,106.70	6,721.62	4,397.75	4,136

Source: Abu Dhabi Sewerage Services Company

Table 41: Average daily concentration of suspended solids by region

Tons/day

Region	2006	2007	2008	2009	2010	2011
Total	69.47	81.28	91.32	89.94	97.38	103.11
Abu Dhabi	47.08	54.08	69.73	70.04	73.06	71.828
Al Ain	22.09	26.16	18.14	19.90	20.74	28.274
Al Gharbia	0.29	1.04	3.45	na	3.59	3.012

Source: Abu Dhabi Sewerage Services Company

Explanatory Notes

Glossary

This report contains certain terms specific to waste and necessary when analyzing the waste statistics of Abu Dhabi Emirate. They include the following terms:

Environment:

The whole external conditions which affect the life, growth, and the existence of a living organism on earth including climate, air, water, soil, metals, and the living organisms.

Environmental statistics:

Statistics that describe the state and trends of the environment covering the natural environment (air/climate, water, land/soil) and living organisms in their ecosystems and human settlements. Environmental statistics are integrative in nature, measuring human activities and natural events that affect the environment, the impact of these activities and events, and the social responses to environmental impacts. Broad definitions include environmental indicators, indices and accounting ⁽²⁾.

1. Climate

Atmospheric pressure:

The weight of the air column that extends from the surface of the ground until the end of the atmosphere of the Earth. Air pressure is one of the most important weather elements. The difference in atmospheric pressure leads to the emergence of descendant force which is the main cause of air movement from one place to another and that is wind. Thus transferring energy from one place to another and causing fluctuations in weather and climate.

Atmospheric pressure at sea level is equivalent to the mercury column of height 76 cm. and the atmospheric pressure is inversely proportional to the degree of air temperature. When temperature rises, air expands and density decreases, then decreasing the weight and pressure, and vice versa. If temperature decreases, air shrinks and gains weight, the pressure rises. Also air pressure rises or decreases with increasing or decreasing the altitude from sea level.

Average rainfall:

The average of the amounts of falling rain in millimeter within one month or year.

Climate:

The condition of weather at a particular location or region over a long period of time that can be a month, a year, a season, or several years. It is the long-term result in the atmosphere including elements, such as temperature, solar radiation humidity, rainfall, atmospheric pressure, wind speed and direction, and the variations of these elements.

Heaviest fall:

The highest amount of rainfall in millimeter on a certain location within one month or year (a period of time).

Relative humidity:

It is a percentage of water vapor mass per unit volume of air relative to the mass of water vapor necessary to satisfy the same volume unit, at the same temperature and atmospheric pressure.

Relative humidity % = (Actual water vapor pressure / Saturation water vapor pressure) * 100 OR

Relative humidity % = (Specific humidity / Saturation specific humidity) * 100

The relative humidity changes during the day depending on temperature because the saturation

vapor pressure is controlled by temperature. Relative humidity is low during the day and rises gradually to reach its highest levels in the last hours of the night at the minimum temperatures. Sometimes the saturation may lead to formation of dew, if temperature is higher than zero degree centigrade or frost if the temperature is below zero centigrade.

Solar radiation

A set of ethereal radiation from the sun such as light and radiant heat, and others.

Sunshine:

It is the number of hours of sunshine during the day time. It is measured in the period where sun light is not veiled as a result of clouds, fog or particles stuck (e.g., smog).

Winds:

It is the horizontal movement of air, and air either moves up or down causing what is known as updrafts and downdrafts. The sun is the primary source of climatic changes on earth as the sun rays heat and stretch the air and consequently its pressure decreases and winds move from areas with high atmospheric pressure to areas of low atmospheric pressure. Because the earth rotates around itself, the wind does not blow go directly from high pressure areas to low pressure, but deviates to the right direction in the northern hemisphere and to the left direction in the southern hemisphere because of the "Coriolis effect" resulting from the earth's rotation on its axis.

2. Air Statistics

Air Pollution:

The presence of contaminant or pollutant substances a pollutant in air that do not disperse properly and interfere with human health or welfare, or produce other harmful environmental effects ⁽²⁾.

Annual mean concentration:

Arithmetic mean over all valid measurements for the respective year ⁽¹⁾.

Carbon Dioxide (CO₂):

Colorless, odorless and non-poisonous gas that results from fossil fuel combustion and is normally a part of ambient air. It is also produced in the respiration of living organisms (plants and animals), and considered to be the main greenhouse gas, contributing to climate change ⁽²⁾.

Carbon dioxide emissions (per Capita):

Carbon dioxide emissions per capita is the total amount of carbon dioxide emitted by a country as a consequence of human (production and consumption) activities, divided by the population of the country. This include emissions of carbon dioxide include emissions from consumption of solid, liquid and gas fuels; cement production; and gas flaring. National reporting to the United Nations Framework Convention on Climate Change, which follows the Intergovernmental Panel on Climate Change guidelines, is based on national emission inventories and covers all sources of anthropogenic carbon dioxide emissions as well as carbon sinks (such as forests). Carbon dioxide emissions per capita are calculated by dividing carbon dioxide emissions by the number of people in the national population ⁽¹⁾.

Carbon Monoxide (CO):

Colorless, odorless and poisonous gas produced by incomplete fossil fuel combustion. Carbon monoxide combines with the hemoglobin of human beings, reducing its oxygen carrying capacity, with effects harmful to human beings ⁽²⁾.

Decibel:

The unit of sound measurement on a logarithmic scale, with sound approximately doubling in loudness for every increase of 10 decibels ⁽²⁾.

Ground Level Ozone (O3):

Ozone presents as a secondary pollutant in the lower atmosphere, where its formation can be enhanced by other pollutants. It is highly toxic at levels above 0.1 parts per million (p.p.m.) ⁽²⁾.

Nitrogen dioxide (NO2):

A reddish - brown very toxic gas with a strong irritating smell. When present in high concentrations, it causes serious damage to the lungs. Nitrogen dioxide is an oxidant which reacts in air forming nitric acid causing corrosion in addition to the formation of toxic organic nitrates that contribute to the production of ground-level ozone and smog.

Nitrogen oxides (NOx):

product of combustion from transportation and stationary sources. It is a major contributor to acid despositions and the formation of ground level ozone in the troposphere ⁽²⁾.

Noise:

Audible sound from traffic, construction and so on that may generate unpleasant and harmful effects (hearing loss). It is measured in decibels ⁽²⁾.

Ozone (O3):

Pungent, colorless, toxic gas that contains three atoms of oxygen in each molecule. It occurs naturally at a concentration of about 0.01 parts per million (p.p.m.) of air. Levels of 0.1 p.p.m. ppm are considered to be toxic. In the stratosphere, ozone provides a protective layer shielding the earth from the harmful effects of ultraviolet radiation on human beings and other biota. In the troposphere, it is a major component of photochemical smog, which seriously affects the human respiratory system ⁽²⁾.

Particulates

Fine liquid or solid particles, such as dust, smoke, mist, fumes or smog found in air or emissions ⁽²⁾.

Remote regions/ background site:

Monitoring stations far from any industrial or densely populated area ⁽¹⁾.

Sulphur dioxide (SO2):

heavy, pungent colourless gas formed by the combustion of fossil fuels. It is harmful to human beings and vegetation, and contributes to the acidity in precipitation ⁽²⁾.

Suspended particulate matter (SPM10):

Finely divided solids or liquids, less than 10 µm (micrometers), that may be dispersed through the air from combustion processes, industrial activities or natural sources ⁽¹⁾.

Volatile Organic Compounds

Organic compounds that evaporate readily and contribute to air pollution mainly through the production of photochemical oxidants ⁽²⁾.

Volatile organic compounds except for methane (NMVOCs):

They are These are emissions produced mainly in fuel combustion and in processes that use solvents or solvent-based products such as painting, metal degreasing etc. Several of these chemicals are harmful to human health if inhaled, ingested, drunk or get in contact with skin. NM-VOCs are significant precursors to ground level ozone formation. NM-VOCs are the sum of all hydrocarbon air pollutants except methane ⁽¹⁾.

3. Energy statistics

The system average interruption index (SAIFI):

The average number of interruptions experienced by each customer in the electricity supply service.

The system average duration index (SAIDI):

The average number interruptions duration in minutes experienced by each customer in the electricity supply service.

Power Transmission System Availability:

Transmission System Availability is calculated in terms of the summation of the availabilities of individual circuits of the main interconnected transmission system expressed as a percentage of the total number of circuits. A circuit is defined as an overhead line, cable, transformer, or any combination of these plant items controlled by one or more circuit breakers.

4. Water statistics

Advanced treatment:

Process capable of reducing specific constituents in wastewater not normally achieved by other treatment options. It covers all unit operations that are not considered to be mechanical or biological ⁽¹⁾.

Biochemical oxygen demands (BOD)

Amount of dissolved oxygen required by organisms for the aerobic decomposition of organic matter present in water. This is measured at 20 degrees Celsius for a period of five days. The parameter yields information on the degree of water pollution with organic matter ⁽³⁾.

Biological treatment:

Wastewater treatment employing aerobic and anaerobic micro-organisms that results in decanted effluents and separate sludge containing microbial mass together with pollutants. Biological treatment processes are also used in combination or in conjunction with mechanical treatment ⁽¹⁾.

Brackish water

Water containing salt at a concentration significantly lower than that of sea water. The concentration of total dissolved salts is usually in the range of 1,000 -10,000 milligrams per litre (mg/l) ⁽³⁾.

Desalinated Water:

Total volume of water obtained from desalination of (i.e., removal of salt from) seawater and brackish water ⁽³⁾.

Fresh groundwater:

Water which is being held in, and can usually be recovered from, or via, an underground formation. All permanent and temporary deposits of water, both artificially charged and naturally occurring in the subsoil, of at least sufficient quality for use ⁽³⁾.

Freshwater:

Freshwater is water that contains only minimal quantities of dissolved salts, especially sodium chloride, thus distinguishing it from sea water or brackish water ⁽¹⁾.

Mechanical treatment:

Treatment of a physical and mechanical nature that results in decanted effluents and separate sludge. Mechanical processes are also used in combination and/or in conjunction with biological and advanced unit operations. Mechanical treatment includes processes as sedimentation, flotation, etc ⁽¹⁾.

Sea water:

Sea water is water from a sea or ocean. On average, sea water in the world's oceans has a salinity of ~3.5 per cent. This means that for every 1 litre (1000 ml) of sea water there are 35 grams of salts (mostly, but not entirely, sodium chloride) dissolved in it ⁽³⁾.

Sewage sludge productio (dry matter)

The accumulated settled solids, either moist or mixed, with a liquid component as a result of natural or artificial processes, that have been separated from various types of waste water during treatment ⁽³⁾.

Total public water supply:

Water supplied by economic units engaged in collection, purification and distribution of water (including desalting of sea water to produce water as the principal product of interest, and excluding system operation for agricultural purposes and treatment of waste water solely in order to prevent pollution.) It corresponds to ISIC division 41. Deliveries of water from one public supply undertaking to another are excluded ⁽¹⁾.

Total reuse of freshwater:

Freshwater that has undergone wastewater treatment and is deliverable to a user as reclaimed wastewater. This means the direct supply of treated effluent to the use. Excluded is wastewater discharged into watercourse and used again downstream ⁽¹⁾.

Total wastewater generated:

The quantity of water in cubic meters (m³) that is discharged due to being of no further immediate value to the purpose for which it was used or in the pursuit of which it was produced because of its quality, quantity or time of occurrence ⁽¹⁾.

Total wastewater treatment:

Process to render waste water fit to meet applicable environmental standards or other quality norms for recycling or reuse ⁽¹⁾.

Treated in other treatment plants:

Treatment of wastewater in any non-public treatment plants, i.e. industrial wastewater plants. Excluded from 'Other wastewater treatment' is treatment in under independent treatment facilities such as septic tanks ⁽¹⁾.

Treatment in independent treatment facilities:

Individual private treatment facilities to treat domestic and other wastewater in cases where a public waste water network is not available or not justified either because it would produce no environmental benefits. Examples of such systems are treatment in wastewater tanks ⁽¹⁾.

Wastewater treated in public treatment plants:

All treatment of wastewater in municipal treatment plants by official authorities, or by private companies for local authorities, whose main purpose is wastewater treatment ⁽¹⁾.

Water transmission system availability:

Water Transmission System Availability is calculated in percentage in terms of the summation of the availabilities of transmission system components, such as pumps, water transmission lines, storage tanks, and surge vessels.

5. Health and safety statistics**Food poisoning:**

Any illness caused by infection or poisoning resulting from food or water consumption. Food poisoning may affect individuals or group of people who have consumed the same contaminated food or drinks that contained harmful substance (toxin) or pathogens (bacteria, virus, and parasite) or

chemical or allergic substances. Food poisoning has various factors and symptoms.

Occupational health and safety:

A discipline concerned with protecting the health and safety of people engaged with work by fostering a safe illness and accident-free environment. In other words, it is a set of procedure and rules within legislative framework aiming at protecting man from injures and possessions from being damaged or lost.

Occupational accident:

The harm that happens to a worker because of an accident is defined as "injury" as a direct result of an accident to that labor. Occupational accident is defined as work-related injury that occurs to the worker at the workplace or because of it, is also one of the injuries occurring to workers on their way to work or returning from work, provided that the labor used the regular route without interruption or deviation. The occupational diseases are also considered as work injuries.

6. Waste statistics

Agriculture wastes:

All waste from agricultural and forestry activities ⁽¹⁾.

Composting:

A biological process that submits biodegradable waste to anaerobic or aerobic decomposition, and that results in a product that is recovered ⁽¹⁾.

Construction waste:

All waste from construction activities. This category refers to waste generated in ISIC division 45 ⁽¹⁾.

Hazardous waste:

Wastes that, owing to their toxic, infectious, radioactive or flammable properties pose a substantial actual or potential hazard to the health of humans and other living organisms and the environment ⁽¹⁾.

Incineration:

Controlled burning of waste materials with or without energy restoration ⁽¹⁾.

Incineration plants:

Facilities for burning waste under controlled conditions, with or without energy recovery ⁽¹⁾.

Industrial waste:

Include wastes from mine, quarries, manufacturing industries, energy production, and construction ⁽¹⁾.

Landfills:

Sites that manage the final placement of waste in or on the land in a controlled or uncontrolled way ⁽¹⁾.

Landfilled waste:

This includes all amounts of waste transferred to landfill, either directly, or after sorting and/or treatment, as well as residues from recovery and disposal operations for dispatch to landfill. Landfill is the final placement of waste into or onto the land in a controlled or uncontrolled way. The definition covers both in-house landfills, where a generator of waste is carries out its own waste disposal on site) as well as in external landfills ⁽¹⁾.

Liquid waste:

Liquid products or outputs resulting from the use of water produced by manufacturing processes and leftover industrial materials, such as oils that are disposed of by on-site treatment, sewage network, dumping into the sea or via other disposal routes.

Municipal waste:

Municipal waste includes household waste and similar waste. The definition also includes bulky waste (e.g. white goods, old furniture, mattresses) and yard waste, leaves, grass clippings, street sweepings, the content of litter containers, and market cleansing waste, if managed as waste. It includes waste originating from: households, commerce and trade, small businesses, office buildings and institutions (schools, hospitals, government buildings). It also includes waste from selected municipal services, i.e. waste from park and garden maintenance, waste from street cleaning services (street sweepings, the content of litter containers, market cleansing waste), if managed as waste. The definition excludes waste from municipal sewage network and treatment, municipal construction and demolition waste ⁽¹⁾.

Municipal waste collected:

Municipal waste collected by or on behalf of municipalities, as well as municipal waste collected by the private sector. It includes mixed household waste, and fractions collected separately for recovery operations (through door-to-door collection and/or through voluntary deposits) ⁽¹⁾.

Municipal waste generated:

This amount is the sum of the amount of municipal waste collected plus the estimated amount of municipal waste from areas not served by a municipal waste collection service ⁽¹⁾.

Municipal waste managed in a country:

The amount of municipal waste collected in the country -amount exported before treatment or disposal + amount imported for treatment or disposal ⁽¹⁾.

Oil spill:

Oil, discharged accidentally or intentionally, that floats on the surface of water bodies as a discrete mass and is carried by the wind, currents and tides. Oil spills can be partially controlled by chemical dispersion, combustion, mechanical containment and adsorption. They have destructive effects on coastal ecosystems ⁽²⁾.

Other (waste treatment/disposal):

Any other final treatment or disposal different from recycling (composting), incineration and landfill. Permanent storage of waste is included here ⁽¹⁾.

Recycling:

Reusing of waste materials in production process by restoring them from wastes, except reusing as fuel ⁽¹⁾.

Treatment Plants:

Facilities for the physical, thermal, chemical, or biological processing of waste that change the characteristics of the waste in order to reduce its volume or hazardous nature, facilitate its handling, or enhance recycling. Composting plants are included in this type of treatment ⁽¹⁾.

Wastes:

Materials that are not prime products (that is, products produced for the market) for which the generator has no further use in terms of his/her own purposes of production, transformation or consumption, and of which he/she wants to dispose, with the exception of wastes recycled or reused in place of production (i.e. establishments) and wastes discharged directly to water or ambient air ⁽¹⁾.

Data sources

Data are obtained from The Centre of Waste Management – Abu Dhabi. The data are processed and passed to Statistic Centre – Abu Dhabi for further editing and compilation

Abbreviations used

AADC	Al Ain Distribution Company
ADDC	Abu Dhabi Distribution Company
ADWEA	Abu Dhabi Water and Electricity Authority
BOD	Biochemical Oxygen Demand
EAD	Environment Agency - Abu Dhabi
GWH	Gega Watt Hour
KSA	Kingdom of Saudi Arabi
L	Litre
mcg	Microgram
mg	Milligram
mph	Mile per Hour
MWH	Mega Watt Hour
Na	Not Available
SAIDI	System Average Interruption Duration
SAIFI	System Average Interruption Frequency Index

Notes on tables

Unless otherwise indicated, all tables in this publication relate to the Emirate of Abu Dhabi. However, when mentioned in table titles or within table cells "Abu Dhabi" refers only to the Region of Abu Dhabi and not the whole Emirate.

Due to rounding, totals may not equal the sum of component parts.

Symbols used

°C Degree Celsius

More information and next release

For more information about environmental statistics and other official statistics, please visit the statistics link on the SCAD website at <http://www.scad.ae>

The next release is expected in October 2013 for 2012 data.

References

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2. United Nation Statistics Division (UNSD). (1997). Glossary of environment statistics (F, No 67). New York
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