مـركـز الإحـصـاء ـ أبـوظـبي
STATISTICS CENTRE - ABU DHABI

Annual Bulletin of
Environmental Statistics 2009

Issued in December 2010

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Environmental Statistics 2009

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Contents

Foreword

In the midst of the growing interest in the environmental issues at international level, environmental indicators have become one of the forefronts priorities of the developed statistical systems in the world. Therefore, the Statistics Centre – Abu Dhabi seeks to build a modern comprehensive environmental database that contributes effectively to promoting environmental knowledge and providing the necessary indicators to monitor and evaluate the sustainable development programs in the Emirate of Abu Dhabi at all levels.

In this context, the Statistics Centre – Abu Dhabi is pleased to provide decision and policy makers, businessmen, researchers, and all those concerned with environmental statistics and indicators in the Emirate of Abu Dhabi with the second issue of the «Annual Bulletin of Environmental Statistics», which accurately present environmental indicators of the Emirate of Abu Dhabi in 2009.

The bulletin deals in details with various environmental-related aspects, and its importance lies in containing a large number of indicators and analytical measurements that help monitor, evaluate, and study the environmental situation in a more specialized manner as well as in in-depth analysis of the impacts. Thus, the publication helps in developing integrated development plans and strategies to achieve the programs of sustainable development included in Abu Dhabi 2030 vision.

This bulletin is based on the belief of the Statistics Centre – Abu Dhabi that the preservation of the environment is a collective responsibility and a national duty, and that the natural resources and wildlife in Abu Dhabi reveals its identity and civilization.

As we provide you with second issue of the «Annual Bulletin of Environmental Statistics» of the Emirate of Abu Dhabi, we would like to extend our sincere thanks and appreciation to authorities and institutions which save no effort to provide us with data and information requested by the Centre. We would also like to say that we welcome all remarks and suggestions that aim at developing this bulletin and issuing it in the best way possible in its future issues.

All the Best,

Butti Ahmed Mohammed Butti Al Qubaisi
Director - General

Summary of Environmental Indicators

The bulletin includes many tables of statistical data for 2009 environmental indicators. The following are important key indicators:

Climate Statistics

Indicator	Value	Unit
Average Minimum Temperature	22.6	Centigrade Celsius
Average Minimum Relative Humidity	33.0	Percentage
Average Rainfall Amount	81.8	Millimeter
Average Maximum Temperature	33.7	Centigrade Celsius
Average Maximum Relative Humidity	79.8	Percentage
Average Atmospheric Pressure	1009.5	Hectopascal

Air Statistics

Indicator	Value	Unit
Air Pollutant Total Emissions- Oil and Gas Sector	298681	Ton
Per Capita Carbon Dioxide Emission – Oil and Gas Sector	24.35	Ton
Carbon Dioxide Emissions – Oil and Gas Sector	40.01	Million Ton

Energy Statistics

Indicator	Value	Unit
Total Consumption of Electricity in the Emirate of Abu Dhabi	24213591	Megawatt/ Hour
Number of Interruptions in Electricity Supply	29305	Interruption
Duration of Interruptions in Electricity Supply	134304	Minute

Water Statistics

Indicator	Value	Unit
Groundwater Consumption	527926	Million Imperial Gallon
Desalinated Water Consumption	173782.58	Million Imperial Gallon
Water Consumption Per One Cultivated Hectare	7674688.4	Imperial Gallon
Quantity of Wastewater Produced and Treated	219.55	Million Cubic Meter
Total Non-Conventional Water Resources	937.76	Million Cubic Meter

Health and Safety Statistics

Indicator	Value	Unit
Number of Food Poisoning Cases in the Emirate of Abu Dhabi	677	Case
Total Recordable Incident Rate – Oil and Gas Sector	0.68	Incident Per million Hours Worked
Total Recordable Incident Rate – Water and Electricity Sector	5.1	Incident Per million Hours Worked

Waste Statistics

Indicator	Value	Unit
Amount of Solid Waste Generated (2008)	5,240,390	Ton
Amount of Liquid Waste (2008)	1,604,969,904	Cubic Meter
Amount of Oil Spills	599	Cubic Meter

Introduction

Environmental issues have been on top of the world issues raised for discussion in the international community and they even surpass other issues in priority, giving more attention for countries to protect the environment and establish the necessary institutions for this purpose.

As a result of the industrial revolution, accelerated development in all aspects of life, and the increase in consumption, the world witnesses a continuous increase in the rates of energy consumption of various types and the depletion of natural resources, the matter which has led to the increase of pollution rates resulting from gas emissions and wastes, and therefore causing the phenomenon of climate change and other environmental problems. Consequently, new obstacles and constraints for economic and social welfare sustainable development have appeared. The deterioration of the environment does not only affect human beings, but also the whole ecosystem and biological systems including plants and animals since the term «environment» can be defined as the whole external conditions affecting the life, growth, and the existence of a living organism.

In this context, this environmental statistics bulletin has been prepared. The methodology adopted for this bulletin is based on the collection of data available from different administrative sources through models designed for this purpose. Such data has been divided into sections, classified, processed, and extracted, and therefore analyzed by using descriptive analysis. The bulletin has been divided into six chapters including climate, air, energy, water, health and safety, and waste statistics, and these chapters cover the important elements of the natural environment such as, air, water and earth which are considered us life essentials .

Chapter One

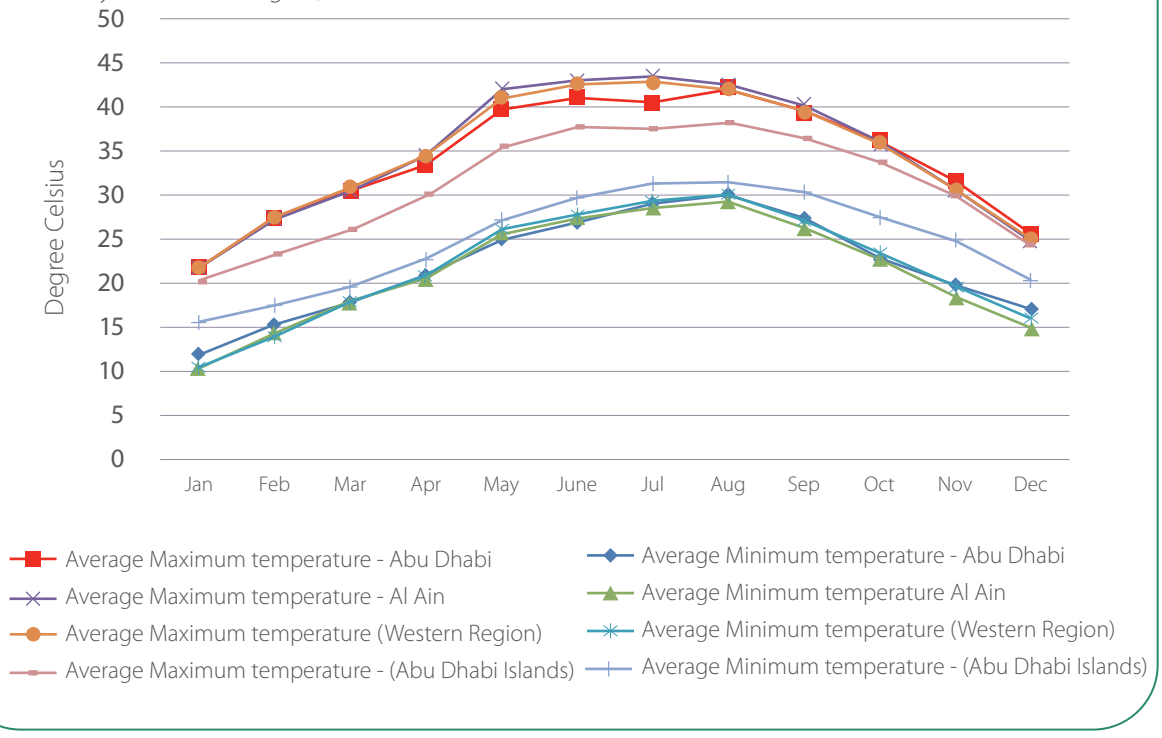
1. Climate Statistics

1.1 Air Temperature

1.1.1 Air Temperature in the Emirate of Abu Dhabi

The emirate of Abu Dhabi is characterized by dry and sunny subtropical climate, all the year round. In summer, temperature and humidity rise due to the emirate's proximity to the Arabian Gulf, while winter is warm but tends to be cold at times. Although the climate of Abu Dhabi is extremely hot in general, it exhibits wide variations throughout the year.

Figure (1.1) Average Maximum and Minimum Air Temperature in the Emirate of Abu Dhabi by Month and Region, 2009



1.1.1.1 Air Temperature in the City of Abu Dhabi

Monthly average maximum temperature ranged from 21.9° C in January to 42.4° C in August in 2009, whereas monthly average minimum temperature ranged between 12.0° C in January and 30.1° C in August in the same year. The maximum temperature recorded in 2009 was 49.4° C, while the minimum temperature was 4.6° C.

1.1 Air Temperature by Month – City of Abu Dhabi , 2009

(Degree Celsius)

Month	Absolute Minimum	Average Minimum	Absolute Maximum	Average Maximum
January	4.6	12.0	29.2	21.9
February	7.6	15.3	38.3	27.4
March	9.0	17.9	41.5	30.5
April	13.6	20.9	43.2	33.6
May	19.4	25.0	49.2	39.9
June	20.8	27.0	48.4	41.2
July	24.7	29.1	49.4	40.6
August	26.0	30.1	47.3	42.4
September	21.9	27.5	46.3	39.4
October	17.4	22.7	41.8	36.3
November	13.3	19.8	38.0	31.6
December	11.7	17.1	31.4	25.7

Source: National Centre for Meteorology and Seismology

1.1.1.2 Air Temperature in the City of Al Ain

Monthly average maximum temperature in Al Ain in the year 2009 ranged from 21.6° C in January to 43.5° C in July, whereas monthly average minimum temperature ranged between 10.4° C in January and 29.6° C in August. The maximum temperature recorded in 2009 was 49.3° C while the minimum temperature was 5° C.

1.2 Air Temperature by Month – City of Al Ain, 2009

(Degree Celsius)

Month	Absolute Minimum	Average Minimum	Absolute Maximum	Average Maximum
January	5.0	10.4	29.5	21.6
February	5.8	14.6	36.7	27.3
March	8.3	18.0	37.6	30.4
April	11.2	20.7	42.8	34.5
May	18.1	25.9	49.3	42.1
June	21.0	27.6	48.8	43.2
July	25.0	28.8	48.9	43.5
August	23.6	29.6	47.3	42.7
September	19.0	26.5	45.7	40.2
October	19.5	22.9	42.0	35.9
November	11.5	18.5	37.1	30.5
December	10.1	15.0	39.0	24.6

Source: National Centre for Meteorology and Seismology

1.1.1.3 Air Temperature in the Western Region

Monthly average maximum temperatures in the Western Region in 2009 ranged from 21.8° C in January to 42.8° C in July, whereas monthly average minimum temperature ranged between 10.5° C in January and 30.2° C in August. The maximum temperature recorded in 2009 was 50.2° C, while the minimum temperature recorded in the same year was 3.1° C.

1.3 Air Temperature by Month - Western Region, 2009

(Degree Celsius)

Month	Absolute Minimum	Average Minimum	Absolute Maximum	Average Maximum
January	3.1	10.5	30.4	21.8
February	6.8	14.0	39.0	27.6
March	9.3	17.9	41.7	31.0
April	13.8	20.9	45.2	34.4
May	17.0	26.1	50.2	41.1
June	19.9	27.8	49.7	42.7
July	24.2	29.4	49.7	42.8
August	25.4	30.2	49.1	42.0
September	21.2	27.0	47.3	39.4
October	16.3	23.4	42.6	36.0
November	12.7	19.5	38.7	30.6
December	8.0	16.0	32.8	25.0

Source: National Centre for Meteorology and Seismology

1.1.1.4 Air Temperature in Abu Dhabi Islands

In 2009, monthly average maximum temperature in Abu Dhabi Islands ranged from 20.4° C in January to 38.3° C in August, whereas monthly average minimum temperatures ranged between 15.4° C in January and 31.5° C in August. The maximum temperature recorded in 2009 was 44.9° C while the minimum temperature was 12.0° C.

1.4 Average Air Temperature by Month - Abu Dhabi Islands, 2009

(Degree Celsius)

Month	Absolute Minimum	Average Minimum	Absolute Maximum	Average Maximum
January	12.0	15.4	25.6	20.4
February	13.6	17.5	32.6	23.4
March	15.1	19.6	36.2	26.1
April	17.3	22.7	42.9	30.1
May	24.6	27.1	44.9	35.5
June	27.2	29.7	44.4	37.9
July	28.9	31.3	42.9	37.6
August	28.8	31.5	44.3	38.3
September	26.6	30.4	39.7	36.7
October	25.3	27.5	36.3	33.9
November	20.7	24.9	38.3	30.0
December	17.0	20.3	28.6	24.1

Source: National Centre for Meteorology and Seismology

1.2 Rainfall

Rainfall in the Emirate of Abu Dhabi is scanty and abrupt, which is the typical pattern of rainfall in desert regions, with the bulk falling within short periods of rainy days in winter. In 2009, the Emirate witnessed some bouts of rain in spring, especially in March and April.

Average annual rainfall in the Emirate of Abu Dhabi in 2009 was 81.8 mm, with the city of Abu Dhabi receiving an average of 116 mm in rainy months, while the highest monthly average was 71.5 mm, recorded in December.

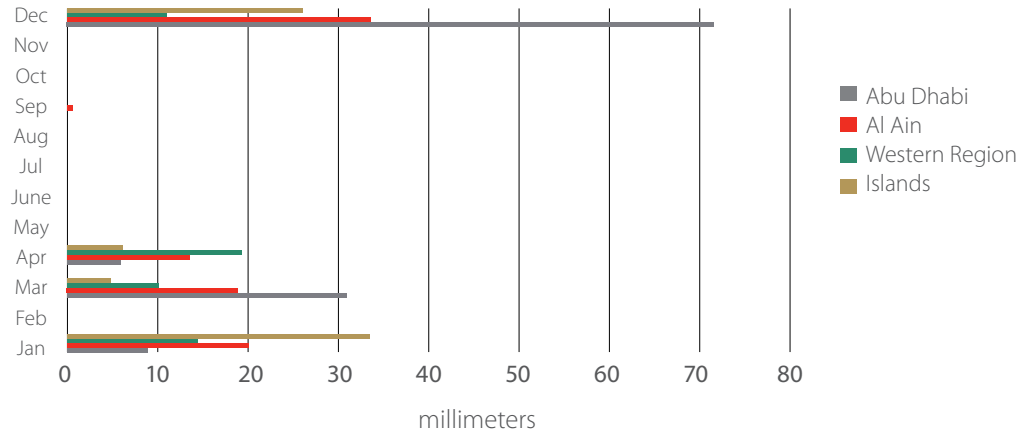
1.5 Monthly Rainfall in the Emirate of Abu Dhabi by Region, 2009

(millimeters)

Month	Abu Dhabi		Al Ain		Western Region		Abu Dhabi Islands	
	Total for Month	Heaviest Fall in one Day	Total for Month	Heaviest Fall in one Day	Total for Month	Heaviest Fall in one Day	Total for Month	Heaviest Fall in one Day
January	15.0	39.3	32.0	140.2	44.2	115.6	35.8	66.8
February	0.6	0.6	0.0	0.0	0.2	0.2	0.0	0.0
March	36.4	153.6	51.0	132.4	25.8	79.8	4.4	9.4
April	6.8	29.0	20.4	94.4	51.8	155.2	7.2	12.0
May	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
June	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
July	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0
August	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
September	0.0	0.0	0.0	4.4	0.0	0.0	0.0	0.0
October	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
November	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
December	73.0	357.4	53.2	233.7	19.6	87.4	19.4	51.6

Source: National Centre for Meteorology and Seismology

Figure (1.2) Average Rainfall in the Emirate of Abu Dhabi by Month and Region, 2009



1.3 Relative Humidity

1.3.1 Relative Humidity in the Emirate of Abu Dhabi

Humidity in the Emirate of Abu Dhabi is relatively high, especially in coastal areas compared to the inland regions of the Emirate. In 2009, average annual relative humidity was 56% and ranged between 25% and 85%. This calls attention to the importance of utilizing this high level of humidity in providing renewable freshwater resources through the use of appropriate condensation techniques.

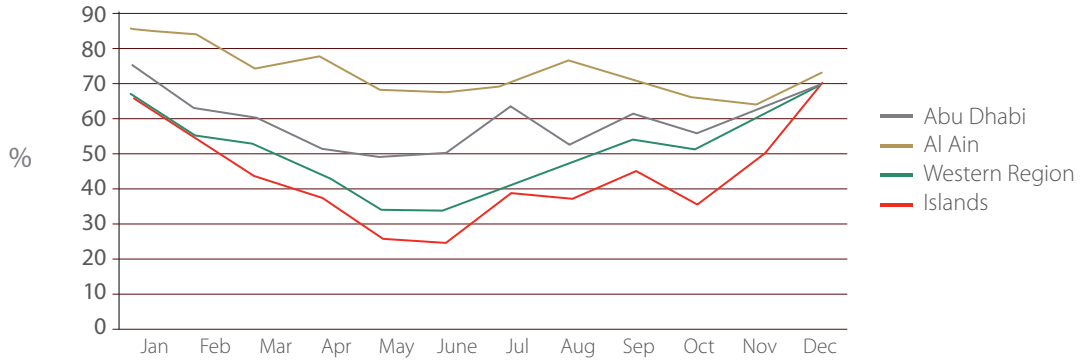
1.6 Average Relative Humidity by Month and Region, 2009

(%)

Month	Abu Dhabi	AL Ain	Western Region	Abu Dhabi Islands
January	74.0	64.5	66.7	84.9
February	62.5	52.9	55.4	83.0
March	59.0	42.1	51.9	74.1
April	51.5	36.8	43.8	76.9
May	48.9	24.7	34.4	67.8
June	50.1	24.7	33.5	66.7
July	61.8	38.2	40.4	68.7
August	52.7	37.2	47.7	75.7
September	60.1	44.2	53.4	70.2
October	55.6	34.5	50.8	65.5
November	61.6	49.0	59.1	63.7
December	68.7	68.9	68.4	72.3

Source: National Centre for Meteorology and Seismology

Figure (1.3) Average Relative Humidity in the Emirate of Abu Dhabi by Month and Region



1.3.1.1 Relative Humidity in the City of Abu Dhabi

The city of Abu Dhabi did not witness a significant change in average maximum relative humidity throughout the year 2009. Average maximum relative humidity in winter and summer was 88% and 79% respectively, unlike average minimum relative humidity which showed noticeable monthly variations, reaching a peak of 46% in winter and dropping to 29% in summer.

1.7 Relative Humidity by Month – City of Abu Dhabi, 2009

(%)

Month	Monthly Average	Absolute Minimum	Average Minimum	Absolute Maximum	Average Maximum
January	74.0	17.8	50.0	100.0	92.0
February	62.5	9.6	37.6	100.0	85.1
March	59.0	4.7	27.7	100.0	77.9
April	51.5	1.6	26.0	100.0	77.3
May	48.9	1.1	22.8	100.0	74.1
June	50.1	1.0	23.0	100.0	77.6
July	61.8	2.0	35.7	100.0	85.0
August	52.7	2.8	26.9	100.0	73.9
September	60.1	7.4	33.6	100.0	84.0
October	55.6	6.2	26.4	100.0	81.6
November	61.6	8.0	36.6	100.0	82.6
December	68.7	22.5	49.4	100.0	85.9

Source: National Centre for Meteorology and Seismology

1.3.1.2 Relative Humidity in the City of Al Ain

Averages of maximum and minimum relative humidity differed markedly between winter and summer in the city of Al Ain. throughout 2009. Average maximum relative humidity was 87% in winter and 61% in summer, while the average minimum relative humidity fell from 35% in winter to 13% in summer.

1.8 Relative Humidity by Month – City of Al Ain , 2009

(%)

Month	Monthly Average	Absolute Minimum	Average Minimum	Absolute Maximum	Average Maximum
January	64.5	2.1	35.9	100.0	91.6
February	52.9	1.5	26.9	100.0	79.1
March	42.1	3.9	20.5	100.0	68.0
April	36.8	1.1	16.8	100.0	62.9
May	24.7	1.0	8.6	100.0	47.3
June	24.7	1.1	8.0	94.0	50.0
July	38.2	1.0	14.0	100.0	70.7
August	37.2	2.1	18.0	100.0	61.9
September	44.2	3.0	17.6	100.0	77.0
October	34.5	4.3	13.4	97.0	63.5
November	49.0	2.0	25.3	100.0	77.3
December	68.9	1.2	43.5	100.0	89.8

Source: National Centre for Meteorology and Seismology

1.3.1.3 Relative Humidity in the Western Region

In 2009, average maximum relative humidity in the Western Region was 87% in winter and 69% in summer, while average minimum relative humidity, reached 39% in winter and decreased to 17% in summer, which shows a noticeable seasonal variation in RH.

1.9 Relative Humidity by Month - Western Region, 2009

(%)

Month	Monthly Average	Absolute Minimum	Average Minimum	Absolute Maximum	Average Maximum
January	66.7	11.9	40.6	100.0	91.2
February	55.4	4.7	30.8	100.0	83.1
March	51.9	3.5	25.9	100.0	78.7
April	43.8	0.8	19.8	99.9	72.4
May	34.4	1.0	13.1	99.2	60.5
June	33.5	1.0	11.2	100.0	62.9
July	40.4	1.3	16.9	99.4	69.2
August	47.7	2.0	23.8	99.3	75.1
September	53.4	4.1	24.1	99.8	84.5
October	50.8	1.8	20.8	100.0	80.7
November	59.1	7.1	33.1	100.0	85.6
December	68.4	19.2	46.2	100.0	87.2

Source: National Centre for Meteorology and Seismology

1.3.1.4 Relative Humidity in Abu Dhabi Islands

In comparison to the other regions of the Emirate of Abu Dhabi, Abu Dhabi Islands recorded the highest level of relative humidity in 2009 winter, especially in January and February, when average maximum relative humidity reached 92% and 91% respectively while minimum relative humidity ranged between 66% in winter and 45% in summer.

1.10 Relative Humidity by Month – Abu Dhabi Islands, 2009

(%)

Month	Monthly Average	Absolute Minimum	Average Minimum	Absolute Maximum	Average Maximum
January	84.9	30.5	72.7	100.0	94.9
February	83.0	15.3	68.0	100.0	96.2
March	74.1	26.1	61.8	100.0	96.0
April	76.9	14.5	56.3	100.0	94.6
May	67.8	9.6	39.9	100.0	93.4
June	66.7	10.8	35.3	100.0	92.8
July	68.7	14.4	46.9	100.0	88.2
August	75.7	25.8	51.5	100.0	93.0
September	70.2	31.4	52.1	100.0	87.2
October	65.5	15.7	45.1	100.0	83.9
November	63.7	18.8	47.2	100.0	79.8
December	72.3	34.3	58.3	100.0	85.4

Source: National Centre for Meteorology and Seismology

1.4 Atmospheric Pressure

1.4.1 Atmospheric Pressure in the Emirate of Abu Dhabi

Differences in atmospheric pressure result from the variations in the amounts of heat on earth, which lead to the formation of Centres of low and high atmospheric pressure. Abu Dhabi winter is characterized by high average atmospheric pressure, unlike its summer, during which pressure levels drop due to the increase in air temperatures. Atmospheric pressure reaches its peak levels in winter, especially in January, when pressure readings climbed to 1020 hectopascal in 2009, thereafter decreasing gradually, reaching a minimum of 997 hectopascal in July, at which point the downward trend reverses and pressure readings start to increase gradually once again.

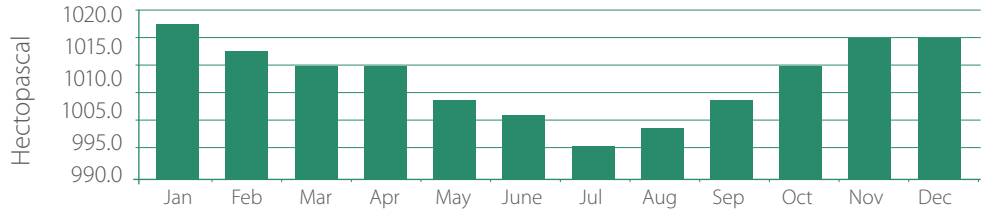
1.11 Average Atmospheric Pressure by Month and Region, 2009

(Hectopascal)

Month	Abu Dhabi	AL Ain	Western Region	Abu Dhabi Islands
January	1,018.4	1,018.4	1,019.6	1,020.0
February	1,014.5	1,015.3	1,015.6	1,015.7
March	1,012.5	1,012.3	1,012.8	1,013.0
April	1,010.8	1,011.1	1,011.3	1,011.0
May	1,005.3	1,005.7	1,006.0	1,006.1
June	1,002.0	1,002.4	1,002.6	1,002.8
July	996.8	997.2	997.5	997.9
August	1,000.0	1,000.8	1,000.5	1,001.3
September	1,005.4	1,005.8	1,005.8	1,005.9
October	1,011.5	1,012.3	1,012.0	1,011.8
November	1,014.3	1,015.2	1,015.0	1,014.9
December	1,015.7	1,017.1	1,017.3	1,017.2

Source: National Centre for Meteorology and Seismology

Figure (1.4)Average Atmospheric Pressure in the Emirate of Abu Dhabi by Month and Region, 2009



1.5 Wind Speed

1.5.1 Wind Speed in the Emirate of Abu Dhabi

Two types of winds blow over the Emirate of Abu Dhabi, namely, dry northerly winds often loaded with dust but sometimes ameliorate the weather, and the easterly winds coming from the Al-Rub' Al Khali (the Empty Quarter) from the Kingdom of Saudi Arabia. The latter is brief and extremely hot. Non-seasonal southerly, south easterly, westerly and north westerly winds blow occasionally across the Emirate. Average wind speed is obviously higher in the open areas of Western Region and Abu Dhabi Islands than in the city of Abu Dhabi where high rise buildings and trees act as winds breaks, a phenomenon observed also in the case of the mountainous terrain of Al Ain. The highest average wind speed recorded in 2009 was 9.2 knots in the months of February and March in the Abu Dhabi Islands, whereas the lowest wind speed was 5.0 knot recorded in December in the city of Al Ain.

1.12 Average Wind Speed by Month and Region, 2009

(Knot*)

Month	Abu Dhabi	AL Ain	Western Region	Abu Dhabi Islands
January	5.7	5.3	7.6	8.3
February	6.6	6.2	8.4	9.2
March	7.7	7.3	7.2	9.2
April	6.7	6.6	6.3	7.7
May	6.5	6.9	7.0	7.6
June	6.8	6.6	8.3	6.6
July	6.0	5.7	7.2	8.5
August	6.5	6.1	7.2	6.2
September	6.0	5.6	6.7	7.1
October	5.3	5.7	6.0	5.1
November	5.3	5.2	6.7	6.3
December	5.8	5.0	6.3	8.2

*Knot=1.15 mph

Source: National Centre for Meteorology and Seismology

1.13 Wind Speed by Month – City of Abu Dhabi , 2009

(Knot*)

Month	Average	Absolute Maximum	Average Maximum
January	5.7	29.5	11.6
February	6.6	28.1	12.9
March	7.7	36.9	15.9
April	6.7	41.7	13.9
May	6.5	24.3	14.2
June	6.8	24.5	14.7
July	6.0	19.7	12.8
August	6.5	30.3	13.6
September	6.0	19.9	13.0
October	5.3	19.9	12.0
November	5.3	20.2	10.9
December	5.8	37.0	12.1

*Knot=1.15 mph

Source: National Centre for Meteorology and Seismology

1.14 Wind Speed by Month – City of Al Ain, 2009

(Knot*)

Month	Average	Absolute Maximum	Average Maximum
January	5.3	22.2	11.2
February	6.2	28.0	12.9
March	7.3	33.0	14.9
April	6.6	30.1	14.0
May	6.9	29.6	15.3
June	6.6	27.0	14.8
July	5.7	28.0	13.6
August	6.1	25.9	13.5
September	5.6	20.3	12.8
October	5.7	23.0	12.9
November	5.2	20.7	11.4
December	5.0	29.0	11.3

*Knot=1.15 mph

Source: National Centre for Meteorology and Seismology

1.15 Wind Speed by Month - Western Region, 2009

(Knot*)

Month	Average	Absolute Maximum	Average Maximum
January	7.6	40.04	14.28
February	8.4	37.50	15.17
March	7.2	32.00	14.28
April	6.3	32.30	13.85
May	7.0	29.30	15.95
June	8.3	30.60	16.92
July	7.2	28.60	15.83
August	7.2	35.10	15.20
September	6.7	28.50	14.44
October	6.0	21.20	12.23
November	6.7	27.80	13.23
December	6.3	26.80	12.32

*Knot=1.15 mph

Source: National Centre for Meteorology and Seismology

1.16 Wind Speed by Month – Abu Dhabi Islands, 2009

(Knot*)

Month	Average	Absolute Maximum	Average Maximum
January	8.3	27.6	13.7
February	9.2	32.9	15.0
March	9.2	33.3	15.5
April	7.7	23.7	14.1
May	7.6	24.6	13.7
June	6.6	21.8	12.4
July	8.5	23.7	14.3
August	6.2	21.3	11.4
September	7.1	20.6	12.6
October	5.1	19.2	10.4
November	6.3	18.8	11.5
December	8.2	29.8	14.0

Knot=1.15 mph

Source: National Centre for Meteorology and Seismology

1.6 Solar Radiation

The sky of Abu Dhabi Emirate is cloudless almost all year around, which prolongs the hours of sunshine and increases the amount of solar radiation per unit area, leading to an increase in temperatures and evaporation rates. By providing data about the number of sunshine hours, we can have information about day lengths and cloudy periods when the sunshine decreases to a certain level. In the summer of 2009, average sunshine hours were 10.7 and 10.1 in the cities of Abu Dhabi and Al Ain respectively, compared with 8.1 and 8.6 hours in the winter of the same year, respectively.

1.17 Average Daily Sunshine by Month and Region, 2009 (hour)

Month	Abu Dhabi	Al Ain
January	7.4	8.6
February	9.0	8.9
March	8.4	7.8
April	9.8	9.8
May	11.1	10.9
June	11.2	10.8
July	10.3	9.0
August	10.2	9.5
September	10.2	10.2
October	9.5	9.7
November	8.8	9.2
December	7.0	7.7

Source: National Centre for Meteorology and Seismology

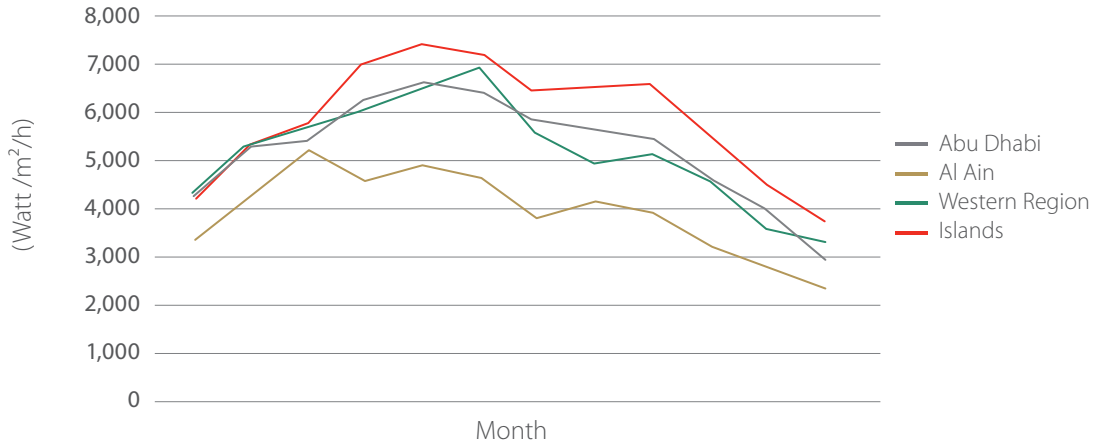
1.18 Average Daily Total Solar Radiation by Month and Region, 2009

(Watt /m²/h)

Month	Abu Dhabi	Al Ain	Western Region	Islands
January	4,223	4,245	4,375	3,311
February	5,253	5,330	5,337	4,207
March	5,438	5,772	5,755	5,192
April	6,226	7,003	6,099	4,575
May	6,600	7,337	6,626	4,881
June	6,429	7,124	6,949	4,604
July	5,765	6,399	5,533	3,835
August	5,562	6,495	4,933	4,081
September	5,421	6,552	5,084	3,969
October	4,637	5,673	4,556	3,169
November	3,984	4,487	3,542	2,694
December	2,934	3,692	3,281	2,282

Source: National Centre for Meteorology and Seismology

Figure (1.5) Average Daily Total Solar Radiation by Month and Region, 2009



1.19 Daily Total Solar Radiation by Month – City of Abu Dhabi, 2009

(Watt /m²/h)

Month	Minimum	Maximum	Average
January	1,205	5,810	4,223
February	3,735	6,406	5,253
March	1,823	7,238	5,438
April	803	8,140	6,226
May	613	8,310	6,600
June	1,395	8,380	6,429
July	878	7,770	5,765
August	922	7,460	5,562
September	1,860	7,090	5,421
October	698	6,490	4,637
November	508	5,250	3,984
December	78	4,656	2,934

Source: National Centre for Meteorology and Seismology

1.20 Daily Total Solar Radiation by Month – City of Al Ain, 2009

(Watt /m²/h)

Month	Minimum	Maximum	Average
January	1,419	5,646	4,245
February	3,938	6,544	5,330
March	1,461	6,949	5,772
April	3,493	8,437	7,003
May	1,675	8,559	7,337
June	3,295	8,539	7,124
July	1,162	8,065	6,399
August	1,796	7,491	6,495
September	3,139	7,254	6,552
October	2,503	6,546	5,673
November	1,048	5,368	4,487
December	67	4,944	3,692

Source: National Centre for Meteorology and Seismology

1.21 Daily Total Solar Radiation by Month - Western Region, 2009

(Watt /m²/h)

Month	Minimum	Maximum	Average
January	894	5,845	4,375
February	2,818	6,429	5,337
March	1,543	7,319	5,755
April	667	7,811	6,099
May	179	8,198	6,626
June	3,306	8,095	6,949
July	125	7,617	5,533
August	1,242	6,935	4,933
September	802	6,978	5,084
October	1,106	6,575	4,556
November	534	5,217	3,542
December	69	4,763	3,281

Source: National Centre for Meteorology and Seismology

1.22 Daily Total Solar Radiation by Month – Abu Dhabi Islands, 2009

(Watt /m^2/h)

Month	Minimum	Maximum	Average
January	1,183	5,101	3,311
February	2,671	5,046	4,207
March	2,088	7,011	5,192
April	447	7,414	4,575
May	2,486	7,470	4,881
June	2,530	7,393	4,604
July	47	6,397	3,835
August	193	7,153	4,081
September	1,686	6,806	3,969
October	274	5,838	3,169
November	875	4,829	2,694
December	182	4,648	2,282

Source: National Centre for Meteorology and Seismology

Chapter Two

2. Air Statistics

Preliminary estimations of the World Health Organization (WHO) show that more than 2 million premature deaths occur all over the world because of air pollution. Accordingly, air pollution constitutes a serious threat to human health. The WHO has issued several guidelines related to air pollutants concentration in ambient air, such as sulphur dioxide, nitrogen dioxide, carbon monoxide, and particulate matter so as to measure and limit the impact of this problem worldwide.

In the context of its efforts to enhance environment protection and control, the Federal Government of the United Arab Emirates and the Government of Abu Dhabi Emirate have issued strict laws and legislation to help reduce air pollution and emissions and mitigate their impacts. 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.

At a local level, most of air pollutant concentrations did not exceed the maximum local limit allowed, except for particulate matter whose concentration was found to be 12 times the maximum permissible limit in the Emirate. The maximum reading recorded for particulate matter in ambient air was 1902 microgram/cubic meter (mcg/m3) and that was in the city of Abu Dhabi, which definitely can contribute to a significant increase in pulmonary diseases. The maximum readings for sulphur dioxide and nitrogen dioxide concentration were in the city of Abu Dhabi too, and they were 330 and 321 mcg/m3, respectively.

2.1 Sulphur Dioxide

2.1.1 Sulphur Dioxide Concentration in Ambient Air

In 2009, sulphur dioxide concentration in ambient air did not exceed the permitted limit; however, there is a general increase in the maximum readings recorded in industrial and traffic congestion areas. The peak level was recorded in the city of Abu Dhabi at 330 mcg/m3. The maximum readings of 31 and 179 mcg/m3 were recorded Al Ain Street and the Western Region down town respectively.

2.1 Sulphur Dioxide Concentrations in Ambient Air in the Emirate of Abu Dhabi by Region, 2008 – 2009

(Mcg/m3)

Location	Objective (WHO)	Objective (Environment Agency – AD)	2008			2009		
			Avg.	Max	Min	Avg.	Max	Min
Abu Dhabi	500 mcg/m3 in 10 min	350 mcg/m3 in 1 hour						
Down Town - Khadeja School			10	173	~	9	86	0.3
Urban/ Residential – Khalifa School			8	149	~	6	31	0.2
Road Side - Hamdan Street			7	138	~	7	112	0.2
Urban/ Residential Baniyas School			24	156	0.03	7	37	0.03
Industrial - Mussafah			3	72	0.03	19	330	0.3
Al Ain								
Urban/ Residential - Al Ain School			4	123	0.03	3	19	0.2
Road Side-Al Ain Street			23	91	0.03	4	31	0.1
Western Region								
Urban/ Residential-Bida Zayed			5	105	0.05	3	38	0.1
Down Town - Gayathi School			5	125	0.05	7	179	0.1
Regional Background - Liwa Oasis			5	124	0.05	3	66	0.1

(~) Under detection limit

2.1.2 Sulphur Dioxide Emissions – Oil and Gas Sector

Total sulphur dioxide emissions from the oil and gas sector in the Abu Dhabi Emirate reached 185870 tons in 2009. The SO2 emissions generated by the Abu Dhabi National Oil Company (ADNOC) have increased by 18.6%, compared to the emissions released in 2008. This rise is due to a 68% increase in the emissions of the exploration and production sub-sector.

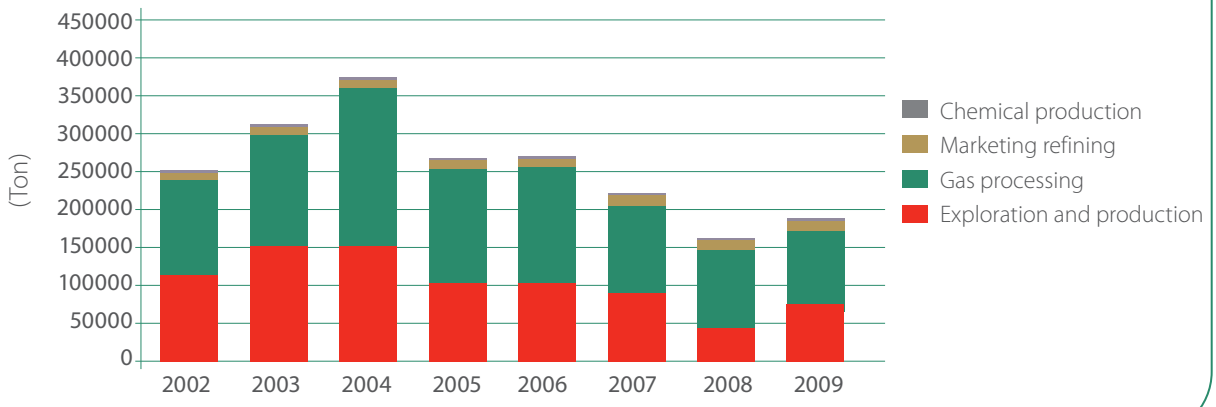
2.2 Emissions of Sulphur Dioxide by sub-sector in the Emirate of Abu Dhabi - Oil and Gas Sector, 2002-2009

(Ton)

Year	Exploration and Production	Gas Processing	Marketing Refining	Chemical Production	Total
2002	115174	125053	9536	184	**249947**
2003	152636	145979	10159	210	**308984**
2004	150422	210019	10693	194	**371328**
2005	103516	148743	10040	240	**262539**
2006	103415	153900	10185	239	**267739**
2007	88390	114045	10075	212	**212722**
2008	45619	99349	11506	200	**156674**
2009	76641	97780	11271	178	**185870**

Source: Abu Dhabi National Oil Company - ADNOC

Figure (2.1) Emissions of Sulphur Dioxide by Business-sector in the Emirate of Abu Dhabi - Oil and Gas Sector 2002-2009



2.2 Nitrogen Oxides

2.2.1 Nitrogen Dioxide Concentration in Ambient Air

The year 2009 witnessed an increase in the maximum concentrations of nitrogen dioxides in the ambient air in the Emirate of Abu Dhabi. In 2008, the peak concentration recorded was 187 mcg/m3, compared with 321 mcg/m3 in 2009. These two readings were both recorded in the industrial area of Mussafah, where industrial activities lead to an increase in the concentration of the gas. High concentrations are also recorded in residential and traffic congestion areas, unlike the case of Liwa Oasis in the Western Region as it is remote from pollution sources.

2.3 Nitrogen Dioxide Concentrations in Ambient Air in the Emirate of Abu Dhabi by Region, 2008-2009

(Mcg/m3)

Location	Objective (WHO)	Objective (Environment Agency – AD)	2008			2009		
			Avg.	Max	Min	Avg.	Max	Min
Abu Dhabi	500 mcg/m3 in 10 min	350 mcg/m3 in 1 hour						
Down Town - Khadeja School			22	168	~	36	159	0.4
Urban/ Residential – Khalifa school			39	175	0.04	41	240	0.2
Road Side - Hamdan Street			21	179	~	49	270	0.9
Urban/ Residential Baniyas School			20	181	~	27	132	0.2
Industrial - Mussafah			46	187	~	53	321	1.5
Al Ain								
Urban/ Residential - Al Ain School			34	114	0.08	-	-	-
Road Side-Al Ain street			16	147	~	45	234	1.6
Western Region								
Urban/ Residential - Bida Zayed			4	22	0.08	16	289	0.2
Down Town- Gayathi School			8	73	0.09	17	282	0.01
Regional Background-Liwa Oasis			3	32	~	3	33	0.01

(~) Under detection limit

(-) Data Not Available

Source: Environment Agency - Abu Dhabi

2.2.2 Nitrogen Oxides Emission – Oil and Gas Sector

In 2009, ADNOC increased its emissions from nitrogen oxides by 3.8%. Total emission reached 54782 tons, due mainly to the emissions from the exploration and production Business Sector, which grew by 17.4%, despite the efforts made by other subsectors to reduce their emissions as shown in the table below.

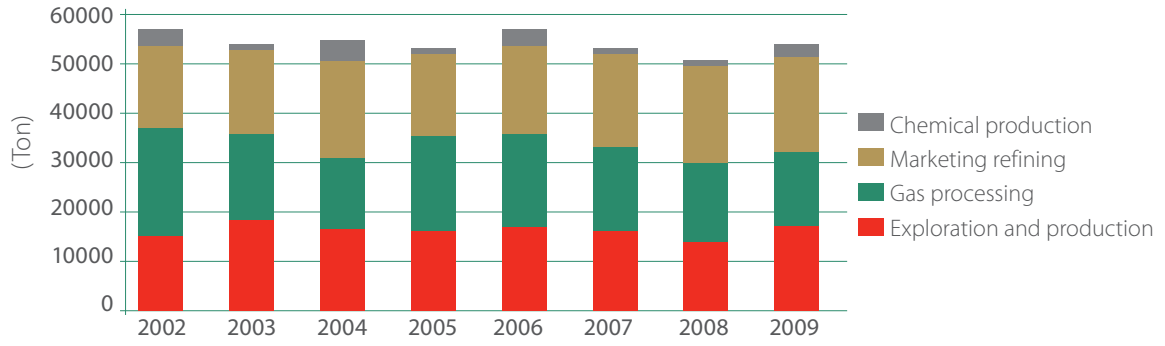
2.4 Emissions of Nitrogen Oxides by Sub-sector in the Emirate of Abu Dhabi – Oil and Gas Sector, 2002-2009

(Ton)

Year	Exploration and Production	Gas Processing	Marketing Refining	Chemical Production	Total
2002	15517	23186	17430	1272	**57405**
2003	18935	18406	18433	1247	**57021**
2004	16956	14465	19173	1282	**55176**
2005	16655	20263	17795	1512	**56225**
2006	17359	19956	18523	1494	**57332**
2007	16287	18473	19596	1525	**55881**
2008	15045	16004	20253	1453	**52755**
2009	17670	15696	20031	1385	**54782**

Source: Abu Dhabi National Oil Company - ADNOC

Figure (2.2) Emissions of Nitrogen Oxides by Business Sector in the Emirate of Abu Dhabi - Oil and Gas Sector 2002-2009



2.3 Volatile Organic Compounds

2.3.1 Methane Concentration in Ambient Air

The concentration of methane is generally high in the urban areas of Abu Dhabi, which recorded a peak value of 41.12 mcg/m3, compared with a maximum concentration of 4.13 mcg/m3 in down town Al Ain in 2008.

2.5 Methane Concentration in Ambient Air in the Emirate of Abu Dhabi by Region,2009-2008

(Mcg/m3)

Location	2008			2009		
	Avg.	Max	Min	Avg.	Max	Min
Abu Dhabi						
Down Town – Kadeja School	1.91	5.29	0.01	0.73	3.5	0.01
Urban/ Residential – Khalifa School	4.90	29.28	0.00	-	-	-
Road Side - Hamdan Street	0.86	1.49	0.49	1.14	2.71	0.28
Urban/ Residential Baniyas School	1.51	41.12	0.13	-	-	-
Industrial – Mussafah	1.79	3.28	0.29	-	-	-
Al Ain						
Urban/ Residential - Al Ain School	1.58	4.13	0.67	-	-	-
Road Side - Al Ain Street	3.17	7.70	0.97	0.67	1.58	0.011
Western Region						
Urban/ Residential - Bida Zayed	1.90	21.51	0.07	-	-	-
Down Town - Gayathi School	1.81	6.81	0.01	0.63	1.3	0.14
Regional Background - Liwa Oasis	1.35	16.53	0.48	-	-	-

(-) Data Not Available

Source: Environment Agency - Abu Dhabi

2.3.2 Volatile Organic Compounds Emissions – Oil and Gas Sector

In 2009, the oil and gas sector was able to achieve a significant reduction in its emissions of volatile organic compounds (VOC's), cutting them down by 11.42% compared to the previous year as indicated in the table below.

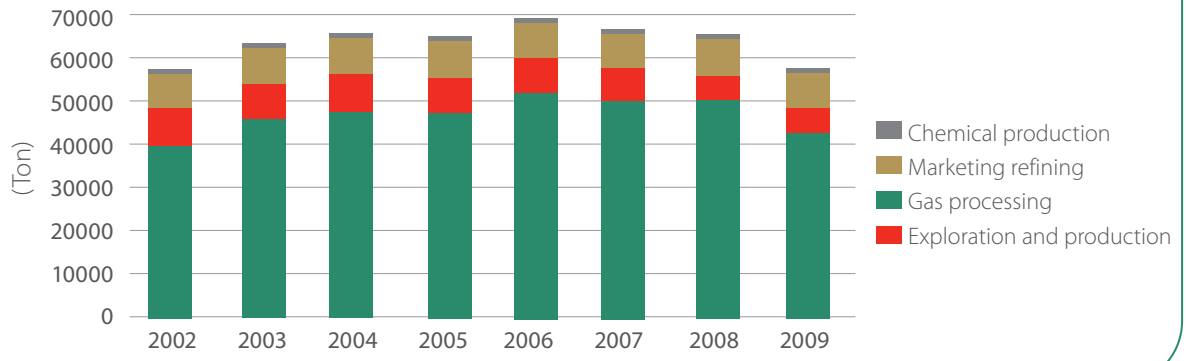
2.6 Emissions of Volatile Organic Compounds by Sub-sector in the Emirate of Abu Dhabi – Oil and Gas Sector, 2002-2009

(Ton)

Year	Exploration and Production	Gas Processing	Marketing Refining	Chemical Production	Total
2002	39821	9022	8185	201	**57229**
2003	46133	8335	8218	659	**63345**
2004	47720	9076	8205	717	**65718**
2005	47490	8503	8222	700	**64915**
2006	51476	8754	8401	708	**69339**
2007	50532	7027	8430	709	**66698**
2008	50404	5978	8310	783	**65475**
2009	42835	6206	8343	615	**57999**

Source: Abu Dhabi National Oil Company – ADNOC

Figure (2.3) Emissions of Volatile Organic Compounds by Business Sector in the Emirate of Abu Dhabi - Oil and Gas Sector 2002-2009



2.4 Ground Level Ozone

2.4.1 Ground Level Ozone Concentration in Ambient Air

In 2009, pollution with ground-level ozone increased in the residential areas of Abu Dhabi Emirate. The peak level in Abu Dhabi city increased from 133 mcg/m3 in 2008 to 184 mcg/m3 in 2009, whereas in the Western Region it dropped significantly from 167 mcg/m3 in 2008 to 120 mcg/m3 in 2009.

2.7 Ground level Ozone Concentration in Ambient Air in the Emirate of Abu Dhabi by Region, 2008-2009

(mcg/m3)

Location	Objective (WHO)	Objective (Environment Agency – AD)	2008			2009		
			Avg.	Max	Min	Avg.	Max	Min
Abu Dhabi	100 mcg/m3 in 1 hour	200 mcg/m3 in 1 hour						
Down Town – Kadeja School			35	133.01	0.02	45	184	0.3
Urban/ Residential – Khalifa School			37	153.15	1.53	34	129	0.8
Urban/ Residential Baniyas School			33	135.18	0.49	33	149	0.7
Al Ain								
Urban/ Residential - Al Ain School			30	137.04	0.37	27	140	0.2
Western Region								
Urban/ Residential - Bida Zayed			47	166.54	0.00	47	120	0.6
Down Town- Gayathi School			54	163.3	1.65	54	156	2.3
Regional Background - Liwa Oassis			76	153.64	2.62	44	107	22.3

Source: Environment Agency - Abu Dhabi

2.5 Particulate Matters

2.5.1 Particulate Matter Concentration in Ambient Air

There was a significant increase in 2009 in the concentration of particulate matter in the Emirate of Abu Dhabi, with the peak levels sometimes exceeding the permissible limit by many folds which have negative effects on health in general The highest average reading, recorded in the industrial area of Mussafah, was 209 mcg/m3, while the maximum value (1902 mcg/m3) was recorded in Hamdan Street.

2.8 Particulate Matter Concentration in Ambient Air in the Emirate of Abu Dhabi by Region, 2008-2009

(mcg/m3)

Location	Objective (WHO)	Objective (Environment Agency – AD)	2008			2009		
			Avg.	Max	Min	Avg.	Max	Min
Abu Dhabi	100 mcg/m3 in 1 hour	200 mcg/m3 in 1 hour						
Down Town - Kadeja School			139.05	1020.81	10.10	152	1862	6.5
Urban/ Residential – Khalifa School			97.68	1020.48	10.10	98	666	10.2
Road Side - Hamdan Street			134.27	1026.18	10.15	148	1902	6.0
Urban/ Residential Baniyas School			97.27	1024.08	11.60	71	580	9.4
Industrial - Mussafah			286.95	1025.43	13.82	209	1060	7.4
Al Ain								
Urban/ Residential - Al Ain School			116.99	1026.58	10.10	115	825	8.2
Road Side - Al Ain Street			199.84	1032.76	6.10	147	1039	18.6
Western Region								
Urban/ Residential - Bida Zayed			143.28	1024.78	10.10	149	1359	11.2
Down Town - Gayathi School			208.79	1022.27	10.10	143	1624	11.9
Regional Background - Liwa Oassis			194.52	1025.71	10.07	147	828	10.5

Source: Environment Agency - Abu Dhabi

2.6 Hydrogen Sulphide

2.6.1 Hydrogen Sulphide Concentration in Ambient Air

The concentrations of hydrogen sulphide in the Emirate of Abu Dhabi are generally low and remain within the normal limits, yet they increase in residential areas. The maximum reading for hydrogen sulphide concentration in 2009 reached 49 mcg/m3.

2.9 Hydrogen Sulphide Concentration in Ambient Air in the Emirate of Abu Dhabi by Region, 2008-2009

Location	2008			2009		
	Avg.	Max	Min	Avg.	Max	Min
Abu Dhabi						
Down Town - Kadeja School	2.63	14.94	0.01	0.87	7.67	0.10
Urban/ Residential – Khalifa School	2.73	71.02	0.00	5.24	49.35	0.04
Urban/ Residential Baniyas School	2.01	110.67	0.01	0.73	2.3	0.01
Industrial - Mussafah	2.66	24.72	0.07	-	-	-
Al Ain						
Urban/ Residential - Al Ain School	1.69	51.61	0.01	1.75	13.36	0.07
Western Region						
Urban/ Residential - Bida Zayed	2.49	20.48	0.01	1.83	9.35	0.08
Regional Background - Liwa Oasis	1.26	44.51	0.01	1.75	13.36	0.07

(-) Data Not Available

Source: Environment Agency - Abu Dhabi

2.7 Carbon Monoxide

2.7.1 Carbon Monoxide Concentration in Ambient Air

Carbon monoxide concentrations decreased in the streets of Abu Dhabi and Al Ain cities from an average of 1.94 and 2.41 milligram/cubic meter (mg/m3) in 2008 to 1.1 and 1.4 in 2009 respectively.

2.10 Carbon Monoxide Concentration in Ambient Air in the Emirate of Abu Dhabi by Region, 2008 -2009

(mg/m3)

Location	Objective (Environment Agency – AD)	2008			2009		
		Avg.	Max	Min	Avg.	Max	Min
Abu Dhabi Road Side-Hamdan Street	30 milligram / m3 in 1 hour	1.94	10.54	0.36	1.10	5.40	0.07
Al Ain Road Side-Al Ain street		2.41	13.27	0.82	1.40	7.90	0.11

Source: Environment Agency - Abu Dhabi

2.8 Noise Pollution

The following table shows the permissible noise levels in the Emirate of Abu Dhabi according to region and activity:

2.11 Noise Level Guideline in the Emirate of Abu Dhabi

(dBA)

Area	Limits Allowed	
	Day (7 a.m. – 8 p.m.)	Night (8 p.m. – 7 a.m.)
Residential areas with light traffic congestion	40-50	30-40
Residential areas in downtown	45-55	35-45
Residential areas with commercial establishments or residential areas near highways	50-60	40-50
Commercial Area and Downtown	55-65	45-55
Industrial Areas (Heavy Industry)	60-70	50-60

Source: Environment Agency – Abu Dhabi

2.8.1 Noise in Ambient Air

Although the average noise levels have decreased in the Emirate of Abu Dhabi in 2009, they were still above the permissible levels. The maximum levels of noise recorded, increased noticeably in most regions of the Emirate. Noise levels in Baniyas reached 51 dBA, compared with 62 and 54 dBA in Al Ain city and Beda Zayed in the Western Region, respectively.

2.12 Noise in the Emirate of Abu Dhabi by Region, 2008-2009

(dBA)

Location	2008			2009		
	Avg.	Max	Min	Avg.	Max	Min
Abu Dhabi						
Down Town – Kadeja School	58	65	52	58	65	52
Urban/ Residential – Khalifa School	51	66	46	52	66	46
Road Side – Hamdan Street	69	75	62	66	69	59
Urban/ Residential Baniyas School	49	74	41	51	79	40
Industrial - Mussafah	55	66	43	50	79	40
Al Ain						
Urban/ Residential - Al Ain School	50	58	45	50	67	43
Road Side - Al Ain Street	62	71	51	62	80	52
Western Region						
Urban/ Residential - Bida Zayed	53	70	48	54	70	50
Down Town - Gayathi School	51	63	45	51	67	43
Regional Background - Liwa Oasis	54	68	42	54	68	42

Source: Environment Agency - Abu Dhabi

2.9 Air Pollutants Total Emissions from the Oil and Gas Sector

Total emissions from the oil and gas sector increased by 8.64% in 2009 compared with 2008. Total emissions refer to the combined emissions of sulphur dioxide, volatile organic compounds and nitrogen oxides generated by the activities of the oil and gas sector.

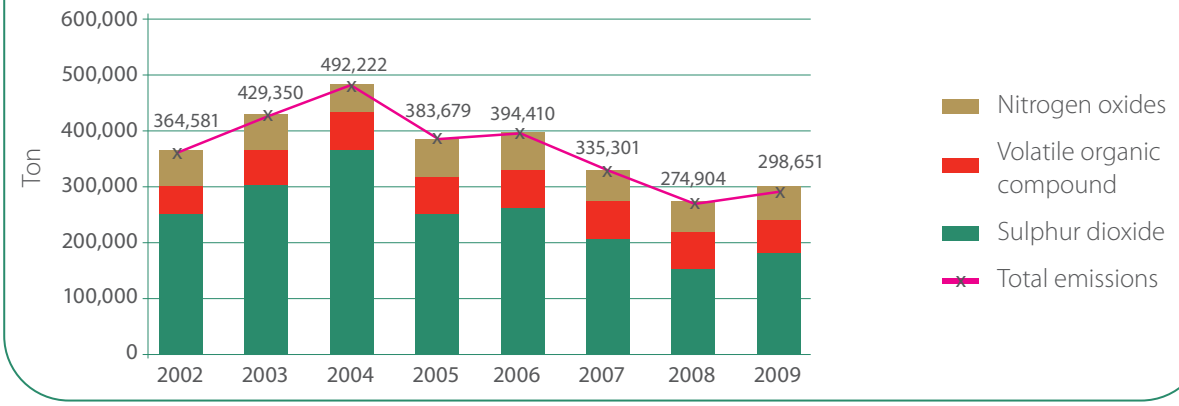
2.13 Air Pollutants Total Emissions in the Emirate of Abu Dhabi – Oil and Gas Sector, 2002 - 2009

(Ton)

Year	Sulphur Dioxide	Volatile Organic Compounds	Nitrogen Oxides	Total Emissions
2002	249946	57229	57405	364581
2003	308984	63345	57021	429350
2004	371328	65718	55176	492222
2005	262539	64915	56225	383679
2006	267739	69339	57332	394410
2007	212722	66698	55881	335301
2008	156674	65475	52755	274904
2009	185870	57999	54782	298651

Source: Abu Dhabi National Oil Company - ADNOC

Figure (2.4) Total Air Pollutants Emissions in the Emirate of Abu Dhabi- Oil and Gas Sector 2002-2009



2.10 Carbon Dioxide Emissions – Oil and Gas Sector

Annual emissions of Carbon Dioxide from the oil and gas sector per capita, the main cause of global warming, increased by 71% in 2009, reaching 24.35 tons.

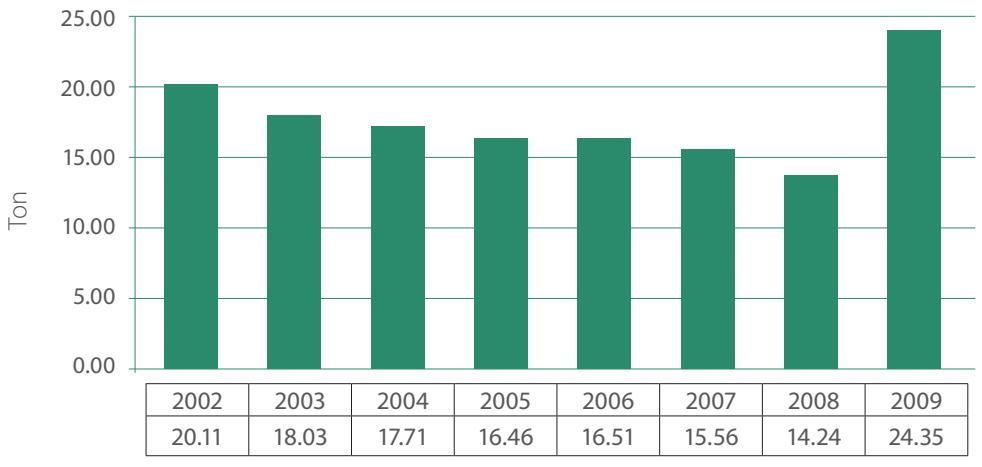
2.14 Carbon Dioxide (GHG) Emissions in the Emirate of Abu Dhabi – Oil and Gas Sector, 2002-2009

(Million ton)

year	Exploration and production	Gas processing	Marketing refining	Chemical	Total
2002	6.11	12.47	4.13	1.52	24.23
2003	6.1	10.6	4.45	1.55	22.70
2004	6.22	10.7	4.51	1.87	23.29
2005	5.73	11.71	4.24	1.36	23.03
2006	6.05	11.4	4.84	1.5	23.79
2007	5.95	10.37	5.07	1.68	23.43
2008	5.65	10.67	4.47	1.59	22.40
2009	11.2	15.77	10.66	2.38	40.01

Source: Abu Dhabi National Oil Company - ADNOC

Figure (2.5) Emissions of Carbon Dioxide Per Capita - Oil and Gas Sector 2002-2009



Chapter Three

3. Energy Statistics

Power production and consumption is one of the most important components of environmental statistics since energy plays an important role in fulfilling essential human needs as well as in realizing the social, economic, and environmental aspects related to sustainable development.

In 2009, electricity production in the Emirate of Abu Dhabi was estimated at about 39,189 gigawatt hour (GWh), whereas the total electricity consumed was 24,213 GWh, out of which the agricultural sector consumed 2,183 GWh, the domestic sector consumed 9,447 GWh, the industrial sector consumed about 716 GWh, and the government and commercial sector consumed 4,120 and 7,540 GWh, respectively.

3.1 Electricity Consumption in the Emirate of Abu Dhabi

The domestic sector accounted for the largest proportion (39%) of total electricity consumption, followed by the commercial sector (31%) and the industrial sector, which accounted for only 3% of total consumption. It is worth mentioning that electricity consumption increases in summer, compared with winter, because air conditioners are operat for longer periods.

3.1 Electricity Consumption in the Emirate of Abu Dhabi by Sector, 2009*

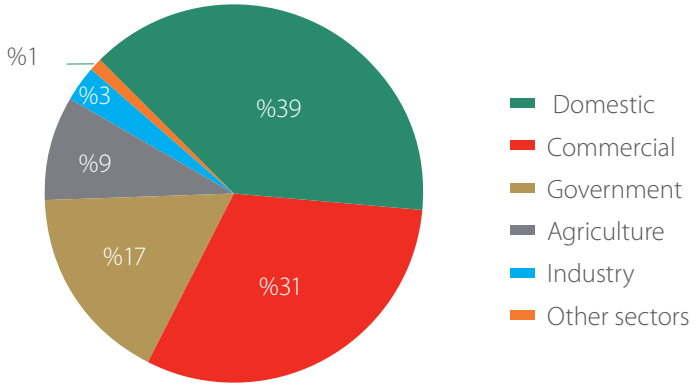
(MGh)

Sector	Abu Dhabi	Al Ain	Western Region & Islands	Total
Total	**15,392,749**	**7,065,744**	**1,755,098**	**24,213,591**
Domestic	6,004,311	2,781,854	661,059	**9,447,224**
Commercial	6,201,169	1,167,699	172,082	**7,540,950**
Government	2,421,572	1,231,969	466,686	**4,120,227**
Agriculture	88,016	1,657,306	438,048	**2,183,370**
Industry	571,933	139,527	5,172	**716,632**
Other Sectors	105,748	87,389	12,051	**205,188**

* Estimation

Source: Statistics Centre – Abu Dhabi

Figure (3.1) Electricity Consumption by sector in the Emirate of Abu Dhabi by Sector , 2009



3.2 Number of Customers in Electricity Network

By the end of 2009, the number of customers to the electricity network in the Emirate of Abu Dhabi increased by 6.7% compared to the same period of 2008. This increase is greatly related to the 17.2 % increase in the number of customers in the Western Region reaching a total number of 24,054 customers

2.3 Number of Customers in Electricity Network, 2008-2009

Region	Abu Dhabi		Al Ain		Western Region		Total	
Month	2008	2009	2008	2009	2008	2009	2008	2009
January	196,383	205,431	97,171	100,863	20,375	20,681	**313,929**	**326,975**
February	197,079	207,196	97,480	101,391	20,369	20,789	**314,928**	**329,376**
March	197,535	208,128	97,841	101,903	20,369	21,152	**315,745**	**331,183**
April	198,197	208,774	98,231	102,414	20,383	23,924	**316,811**	**335,112**
May	199,485	210,108	98,556	102,808	20,409	24,030	**318,450**	**336,946**
June	200,101	210,958	98,861	103,451	20,430	24,031	**319,392**	**338,440**
July	200,987	211,318	99,206	104,763	20,434	23,965	**320,627**	**340,046**
August	201,833	212,217	99,613	105,116	20,413	24,231	**321,859**	**341,564**
September	202,397	213,175	99,973	105,850	20,476	24,262	**322,846**	**343,287**
October	203,675	213,669	100,130	106,196	20,488	24,100	**324,293**	**343,965**
November	204,708	214,479	100,365	108,373	20,506	24,104	**325,579**	**346,956**
December	204,912	215,143	100,641	108,716	20,524	24,054	**326,077**	**347,913**

Source: Abu Dhabi Water and Electricity Authority

3.3 Interruptions in Electricity Supply Network

The number of electricity interruptions increases in summer and in August 2009, about 83000 customers experienced 4,127 interruptions in the Emirate of Abu Dhabi; however, the duration of interruptions was not relatively long as it was in December where 2,503 interruptions occurred for 75,935 customers with a total duration of 20 million minutes. It is worth noting that interruptions may reoccur several times for the same customer.

3.3 Number and Duration of Interruptions in Electricity Supply by Month and Region, 2009

Month	Abu Dhabi			Al Ain			Western Region			Total		
	Interruption Duration (Thousand minute)	Number of Customers with interruption in Electricity Supply	Number of Interruptions	Interruption Duration (Thousand minute)	Number of Customers with interruption in Electricity Supply	Number of Interruptions	Interruption Duration (Thousand minute)	Number of Customers with interruption in Electricity Supply	Number of Interruptions	Interruption Duration (Thousand minute)	Number of Customers with interruption in Electricity Supply	Number of Interruptions
January	5,508	20,823	644	2,677	31,734	998	979	8,376	160	**9,164**	**60,933**	**1,802**
February	5,333	16,982	593	1,430	18,436	679	818	8,242	136	**7,580**	**43,660**	**1,408**
March	7,645	29,082	762	1,949	22,439	1,041	1,172	13,520	170	**10,766**	**65,041**	**1,973**
April	8,405	26,008	854	1,603	19,213	1,090	1,061	5,937	198	**11,068**	**51,158**	**2,142**
May	6,466	22,074	1,108	2,463	22,135	1,468	848	5,292	182	**9,777**	**49,501**	**2,758**
June	8,209	26,699	1,396	2,387	27,201	1,443	815	5,016	216	**11,412**	**58,916**	**3,055**
July	9,009	27,993	1,581	2,634	30,556	1,852	681	4,553	208	**12,324**	**63,102**	**3,641**
August	8,608	44,336	2,023	2,519	28,977	1,755	1,426	9,767	349	**12,553**	**83,080**	**4,127**
September	6,201	26,984	1,103	1,706	22,318	1,176	1,179	6,216	213	**9,086**	**55,518**	**2,492**
October	6,637	28,165	800	1,902	23,940	905	952	5,048	164	**9,490**	**57,153**	**1,869**
November	7,759	24,541	730	2,360	21,713	666	964	7,485	139	**11,083**	**53,739**	**1,535**
December	14,856	32,496	1,126	3,443	32,695	1,184	1,701	10,744	193	**20,000**	**75,935**	**2,503**
Total	**94,635**	**326,183**	**12,720**	**27,073**	**301,357**	**14,257**	**12,596**	**90,196**	**2,328**	**134,304**	**717,736**	**29,305**

Source: Abu Dhabi Water and Electricity Authority

3.4 Performance Indicators of Power System Reliability

Electricity transmission companies usually measure their performance trough qualitative and quantitative criteria and evaluate their projects on the basis of certain performance indicators, known as Key Performance Indicators (KPIs). Once companies clearly define their operational objectives, KPIs can be used to measure their achievements level.

When electricity is generated and distributed through distribution systems, its performance and efficiency are measured via two key indices:

3.4.1 System Reliability KPI's

This system includes a number of elements that are useful for all plans used in estimating annual electricity demand so as to draw up development plans for electricity production and distribution in the Emirate.

3.4.1.1 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 2009, the highest averages in the cities of Abu Dhabi and Al Ain were 0.21 and 0.31 respectively. As for the Emirate of Abu Dhabi, the highest average number of interruption recorded was 0.33.

3.4 System Average Interruption Frequency Index (SAIFI) by Region, 2009

Region	Abu Dhabi	Al Ain	Western Region	Abu Dhabi Emirate
January	0.10	0.31	0.41	**0.27**
February	0.08	0.18	0.40	**0.22**
March	0.14	0.22	0.64	**0.33**
April	0.12	0.19	0.25	**0.19**
May	0.11	0.22	0.22	**0.18**
June	0.13	0.26	0.21	**0.20**
July	0.13	0.29	0.19	**0.20**
August	0.21	0.28	0.40	**0.30**
September	0.13	0.21	0.26	**0.20**
October	0.13	0.23	0.21	**0.19**
November	0.11	0.20	0.31	**0.21**
December	0.15	0.30	0.45	**0.30**

Source: Abu Dhabi Water and Electricity Authority

3.4.1.2. System Average Interruption Duration Index (SAIDI)

This index measures the annual average interruption durations in minutes per costumer in the electricity supply service. The highest averages in 2009 were 69 minutes in the city of Abu Dhabi, 31 minutes in the city of Al Ain, and 70 minutes in the Western Region.

3.5 System Average Interruption Duration Index (SAIDI), 2009

(Minute)

Region	Abu Dhabi	Al Ain	Western Region	Abu Dhabi Emirate
January	26.81	26.54	47.32	**33.56**
February	25.74	14.10	39.34	**26.39**
March	36.73	19.13	55.42	**37.09**
April	40.26	15.65	44.35	**33.42**
May	30.78	23.96	35.27	**30.00**
June	38.91	23.08	33.93	**31.97**
July	42.63	25.14	28.41	**32.06**
August	40.56	23.96	58.87	**41.13**
September	29.09	16.12	48.61	**31.27**
October	31.06	17.91	39.50	**29.49**
November	36.18	21.78	39.98	**32.64**
December	69.05	31.67	70.73	**57.15**

Source: Abu Dhabi Water and Electricity Authority

3.4.2 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.

The following table presents the monthly availability of the power transmission system in the Emirate of Abu Dhabi from 2004 to 2009. The table shows that in the beginning of 2009 there was an evident decrease in the system availability followed by a steady increase from April until it reached 99.7% in October in the same year.

3.6 Monthly Power Transmission System Availability in the Emirate of Abu Dhabi, 2004 - 2009

(%)

Month	2004	2005	2006	2007	2008	2009
January	97.50	97.55	97.36	98.71	97.93	96.09
February	96.78	96.78	97.36	98.45	98.00	96.05
March	96.96	96.64	97.32	98.62	98.42	96.84
April	97.55	97.23	98.38	98.50	98.16	97.21
May	98.74	98.23	99.14	99.20	98.70	96.67
June	99.10	99.37	99.09	98.99	98.33	97.54
July	99.63	99.83	99.67	99.11	99.30	98.32
August	99.93	99.92	99.63	99.52	99.34	99.63
September	99.05	99.86	99.54	99.61	99.18	99.31
October	97.40	99.48	99.49	99.09	99.03	99.67
November	98.45	98.84	98.97	98.51	97.17	99.57
December	97.04	98.09	99.12	98.33	97.91	99.23

Source: Abu Dhabi Water and Electricity Authority

The following table includes both the annual network availability and the summer availability when electricity consumption reaches its peaks and, in response, companies working in electricity distribution in the Emirate of Abu Dhabi increase their availabilities to the highest levels to meet the increasing demand.

3.7 Annual and Summer Power Transmission System Availability in the Emirate of Abu Dhabi, 2004-2009

(%)

Item	2004	2005	2006	2007	2008	2009
Summer Availability	99.93	99.92	99.63	99.52	99.34	99.63
Annual Availability	98.93	98.56	98.88	98.90	98.46	98.10

Source: Abu Dhabi Water and Electricity Authority

Chapter Four

4. Water Statistics

Water has many usages in everyday life. It is an important factor for economic and social development and improvement of the living conditions. Water receives very a great deal of international and local attention due to the increase in water demand that accompanies the increase in population along with the issues of water scarcity and irrational use of water. Water resources in the Emirate of Abu Dhabi come from Aflaj (springs), wells, desalinated water plants, and sewage treatment.

In 2009, production desalinated water in the Emirate of Abu Dhabi was 211,448 million imperial gallons, out of which 173,781 million imperial gallons were consumed. The domestic consumption of desalinated water reached 118,798 and the agricultural sector's consumption was 5,944 million imperial gallons while the daily consupation was 476 million imparied gallons. The number of working wells is 65,290 whereas the number of non-working wells is 31,330. The withdrawal average of underground water reached 527,935.9 million imperial gallons.

4.1 Water Production and Consumption in the Emirate of Abu Dhabi

The Emirate of Abu Dhabi has witnessed a noticeable increase in the production as well as in the consumption of desalinated water since 2005. In 2009, the consumption increased by 2.1% and reached about a total of 173,781 million imperial gallons.

4.1 Production and Consumption of Desalinated Water in the Emirate of Abu Dhabi, 2005-2009

(Million Imperial Gallon)

Item	2005	2006	2007	2008	2009
Total of Available Desalinated Water	**163,241**	**176,457**	**187,703**	**198,648**	**211,448**
Production	140,100	147,495	158,251	172,565	185,955
Supply from Al - Fujairah Station	23,141	28,962	29,452	26,083	25,493
Consumption	146,727	158,849	166,440	170,202	173,782*
Daily Consumption	402	435	456	465	476*

* Estimation

Source: Abu Dhabi Water and Electricity Authority

Figure (4.1) Production of Desalinated Water in the Emirate of Abu Dhabi, 2000-2009

4.2 Consumption of Desalinated Water by Sector in the Emirate of Abu Dhabi

In 2009, the domestic sector has the highest proportion of the total desalinated water consumption with 68.4%, followed by the government sector with 16.8%, the commercial sector with 9.6%, and the agricultural sector with 3.4%. The industrial sector consumed the least by 0.68%.

4.2 Consumption of Desalinated Water by Sector in the Emirate of Abu Dhabi, 2009*

(Million Imperial Gallon)

Sector	Abu Dhabi	Al Ain	Western Region & Islands	Total
Total	**107,837**	**41,986**	**23,959**	**173,782***
Residential	70,150	29,014	19,634	**118,798**
Commercial	13,982	1,667	952	**16,601**
Government	20,667	5,619	2,969	**29,255**
Agriculture	675	5,236	32	**5,943**
Industry	851	-	323	**1,174**
Other Sectors	1,512	450	49	**2,011**

* Estimation

Source: Statistics Centre – Abu Dhabi

4.3 Water Transmission System Availability in the Emirate of Abu Dhabi

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.

The following table presents water transmission system availability in the Emirate of Abu Dhabi by month from 2004 to 2009. It is noticeable that availability in 2009 started low unlike the previous years, and it started increasing from April until it reached the maximum in September with 97.01%, the highest percentage since 2004.

4.3 Monthly Water Transmission System Availability in the Emirate of Abu Dhabi, 2004 -2009

(%)

Month	2004	2005	2006	2007	2008	2009
January	95.32	95.80	95.80	95.75	95.84	94.88
February	95.18	94.69	95.72	95.54	95.86	94.50
March	94.90	95.91	95.62	95.55	95.31	94.52
April	94.31	95.51	95.80	95.57	94.69	95.15
May	95.72	95.83	95.97	95.69	94.60	96.24
June	96.18	96.28	95.60	96.97	94.99	96.17
July	95.72	96.02	95.74	96.88	93.32	96.51
August	95.32	95.57	95.60	96.90	93.78	96.74
September	95.54	95.82	95.69	96.59	93.82	97.01
October	94.53	95.76	95.46	96.89	93.76	96.87
November	94.86	95.60	95.47	96.49	94.10	96.88
December	94.92	95.80	95.72	96.68	94.53	96.75

Source: Abu Dhabi Water and Electricity Authority

4.4 Annual and summer Water Transmission System in the Emirate of Abu Dhabi, 2004-2009

(%)

Item	2004	2005	2006	2007	2008	2009
Summer Availability	95.32	95.57	95.60	96.90	93.78	96.74
Annual Availability	95.21	95.72	95.68	96.29	94.55	96.02

Source: Abu Dhabi Water and Electricity Authority

4.4 Groundwater

4.4.1 Groundwater Wells in the Emirate of Abu Dhabi

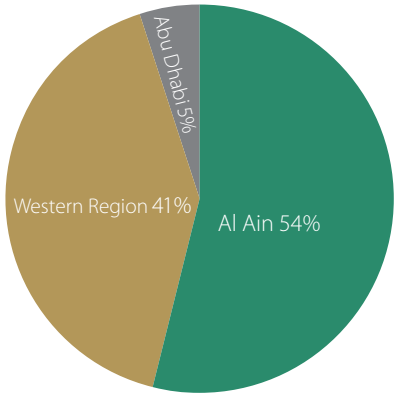
The percentage of working wells in Al Ain was 54.3%, followed by the Western Region with 41.12%, and Abu Dhabi city came last with 4.6% of the total number of working wells in the Abu Dhabi Emirate in the year 2009. In comparison to 2008, the total number of wells in the Emirate decreased by 5.7%.

4.5 Number of Working and non Working Wells in the Emirate of Abu Dhabi, 2005-2009

Region	2005	2006	2007	2008	2009
Abu Dhabi Emirate					
Working	74870	72040	71290	69250	65290
Not working	41050	38140	36270	34840	31330
Abu Dhabi					
Working	4240	3990	3880	3780	2980
Not working	2130	1980	1540	1160	1100
Al Ain					
Working	41650	40870	40870	39820	35460
Not working	22250	20360	19600	18760	16350
Western Region					
Working	28980	27180	26540	25650	26850
Not working	16670	15800	15130	14920	13880

Source: Environment Agency - Abu Dhabi

Figure (4.2) Percentage Distribution of Number of Working Wells in the Emirate of Abu Dhabi, 2009



4.4.2 Average Withdrawal of Groundwater

High groundwater withdrawing averages occur in the city of Al Ain, constituting more than half of the average annual withdrawal average in the Emirate of Abu Dhabi, given the concentration of agriculture, followed by the Western Region. In 2009, the averages of groundwater withdrawing were 53.6% and 42.2% for the city of Al Ain and Western Region respectively, whereas Abu Dhabi city›s share was 4.2% of the annual total.

The table below shows that groundwater withdrawing average has been continuously decreasing in the different regions of the Emirate of Abu Dhabi since 2005, and that is due to the decline in the number of working wells and the directions given towards the preservation of natural resources.

5.6 Average Withdrawal of Groundwater in the Emirate of Abu Dhabi by Region, 2005-2009

(Million Gallon)

Region	Abu Dhabi	Al Ain	Western Region	Abu Dhabi Emirate
2005	34,805.3	345,345.6	249,428.9	**629,579.8**
2006	32,619.7	334,557.1	234,840.0	**602,016.8**
2007	29,614.6	329,761.0	227,682.4	**587,058.0**
2008	26,991.8	320,077.7	221,672.1	**568,741.6**
2009	22,292.8	283,086.8	222,546.3	**527,925.9**

Source: Environment Agency - Abu Dhabi

4.5 Water Consumption in the Irrigation of agricultural Areas

Water consumption per hectare of agricultural areas decreased in 2009 by 7.01% compared to that of 2008 which also decreased by 5.66% from the consumption in the year 2007. This decrease in the percentages is due to a decline in the total amount of water used in the irrigation of agricultural areas when at the same time these areas increased in 2008 and 2009.

4.7 Total Consumption of Water Used to Irrigate Agricultural Areas in the Emirate of Abu Dhabi, 2007-2009

Record	2007	2008	2009
Underground water consumption (Million Imperial Gallon)	587,057.9	568,741.6	527,925.9
Desalinated water consumption (Million Imperial Gallon)	2,892.1	5,821.2	5,943.6
Wastewater reuse (Million Imperial Gallon)	25,775.5	29,233.9	32,489.4
Total (Million Imperial Gallon)	**615,725.5**	**603,796.7**	**566,358.9**
Agricultural area (Hectare)	70,374.8	73,151.2	73,795.7
Water consumption per hectare	8,749,234.1	8,254,091.5	7674,688.4
% reduction of agriculture water consumption per hectare	-	%5.66	%7.01

Source: Environment Agency, Abu Dhabi Food Control Authority, Abu Dhabi Sewerage Services Company, Abu Dhabi Water and Electricity Authority

4.6 Sewage in the Emirate of Abu Dhabi

Wastewater production and treatment in the Emirate of Abu Dhabi increased during the period from 2005 to 2009 and the city of Abu Dhabi significantly contributed to this increase. In 2009, the city of Abu Dhabi›s share of wastewater production and treatment in the Emirate reached 77%, marking a total increase by 4%, while Al Ain and Western Region›s contributions constituted of 19% and 4% of the total respectively.

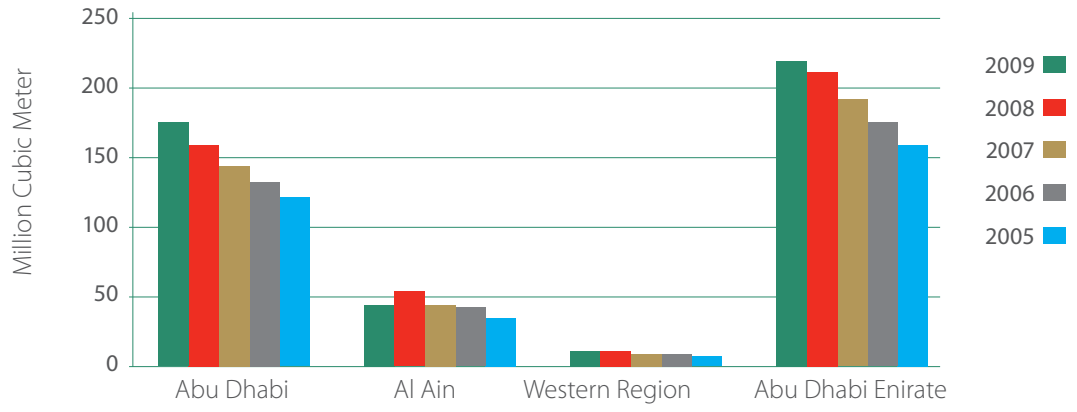
4.8 Quantity of Sewage Generated and Treated in the Emirate of Abu Dhabi by Region, 2005-2009

(Million Cubic Meter)

Region	2005	2006	2007	2008	2009
Abu Dhabi Emirate	**157.5**	**173.7**	**191.5**	**217.1**	**219.6**
Abu Dhabi	119.7	131.4	142.9	158.4	168.7
Al Ain	33.7	37.4	41.5	51.3	42.35
Western Region	4.1	4.9	7.1	7.4	8.5

Source: Abu Dhabi Sewerage Services Company

Figure (4.3) Quantity of Sewage Generated and Treated in the Emirate of Abu Dhabi by Region, 2005-2009



4.9 Quantity of Sewage Treated and Reused in the Emirate of Abu Dhabi by Region, 2005-2009

(Million Cubic Meter)

Region	2005	2006	2007	2008	2009
Abu Dhabi Emirate	**103.0**	**106.5**	**117.3**	**133.1**	**147.7**
Abu Dhabi	69.7	70.1	74.2	82.2	99.8
Al Ain	31.9	34.8	37.8	45.3	40.6
Western Region	1.4	1.6	5.3	5.6	7.3

Source: Abu Dhabi Sewerage Services Company

4.10 Total Wastewater Treatment Plants Capacity by Region, 2005-2009

(Million Cubic Meter)

Region	2005	2006	2007	2008	2009
Abu Dhabi Emirate	**135.774**	**135.774**	**135.774**	**135.774**	**183.198**
Abu Dhabi	95.872	95.872	95.872	95.872	130.320
Al Ain	29.426	29.426	29.426	29.426	41.585
Western Region	10.476	10.476	10.476	10.476	11.293

Source: Abu Dhabi Sewerage Services Company

4.11 Total Conventional Wastewater Treatment Plants Capacity by Region, 2005-2009

(Million Cubic Meter)

Region	2005	2006	2007	2008	2009
Abu Dhabi Emirate	**134.391**	**134.391**	**134.391**	**134.391**	**171.605**
Abu Dhabi	95.872	95.872	95.872	95.872	124.845
Al Ain	29.211	29.211	29.211	29.211	35.690
Western Region	9.308	9.308	9.308	9.308	11.070

Source: Abu Dhabi Sewerage Services Company

4.12 Total Non-Conventional Wastewater Treatment Plants Capacity by Region, 2005-2009

(Million Cubic Meter)

Region	2005	2006	2007	2008	2009
Abu Dhabi Emirate	**1.383**	**1.383**	**1.383**	**1.383**	**11.593**
Abu Dhabi	-	-	-	-	5.475
Al Ain	0.215	0.215	0.215	0.215	5.895
Western Region	1.168	1.168	1.168	1.168	0.223

Source: Abu Dhabi Sewerage Services Company

4.7 Marine Water Quality in the City of Abu Dhabi

In 2009, the quality of marine waters was studied in terms of temperature, salinity, acidity, dissolved oxygen, in addition to nutrients, such as phosphate, nitrates, and others. The readings have been taken at monitoring stations at certain depths in eleven regions identified in the attached map.

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. Such areas are reflected on the map and they are 2, 3, and 4. Area number 4 has a high level of nutrients since it is an industrial zone (Musafah).

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 water in the city of Abu Dhabi ranges between 43-53 Practical Salinity Unit (psu).

Regarding dissolved oxygen, most of the readings taken exceed 5 mg/liter and these are ideal levels for supporting the life of marine living organisms.

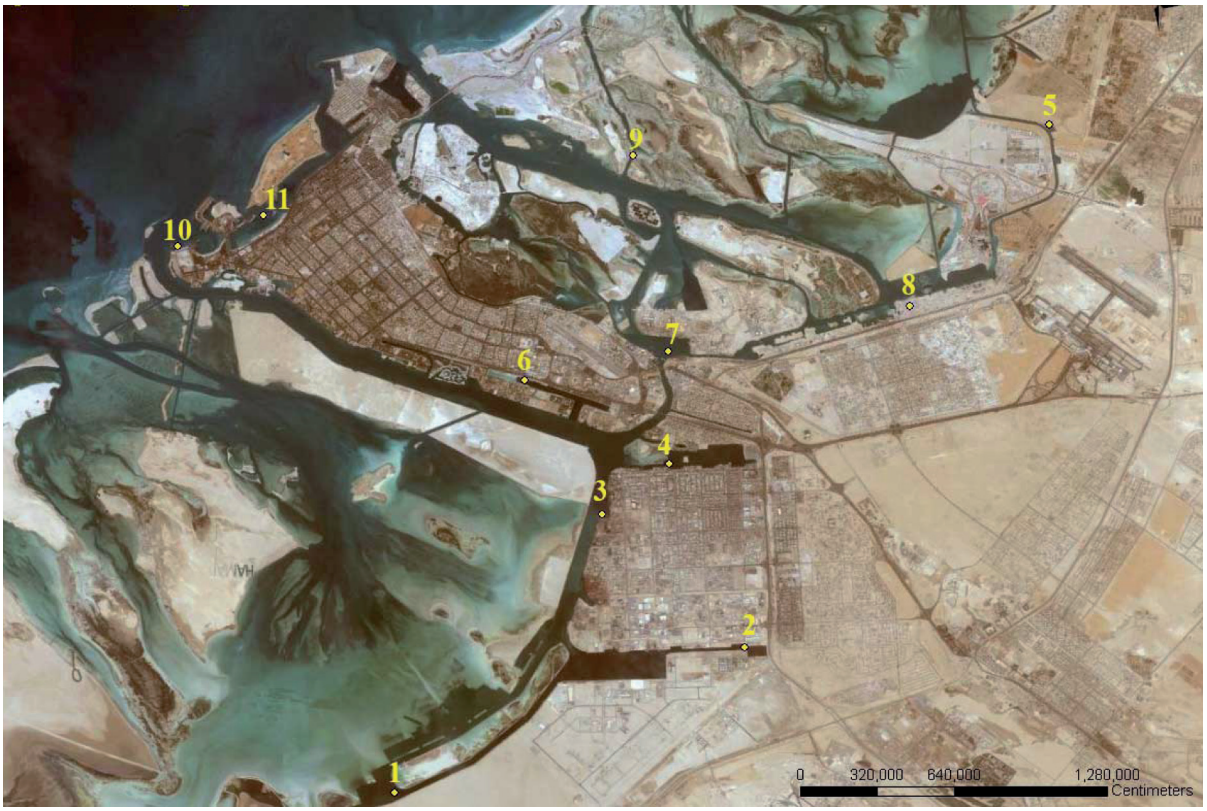
The following table contains the physical and chemical measurements along with nutrients concentration off the marine water of Abu Dhabi according to the locations of the samples taken as identified on the map.

4.13 Marine Water Quality in the City Abu Dhabi, 2009

Region number	Max. Depth	Secchi Depth	Acidity (pH)	Salinity	Temperature	Dissolved Oxygen	Phosphate PO_4	Silicate Sio_4	Nitrate NO_3	Nitrite NO_2	Ammonia NH_3
	(meter)			(psu)	(C^o)	milligram / liter	(Microgram / Liter)				
1	7	1.24	7,79	52,53	30,25	5,47	198,33	1138,33	2960	76,67	51,67
2	5	0.74	7,69	42,73	30,53	6,88	2256,67	6799,67	12968,33	3555	1588,33
3	6,5	1.27	7,78	50,56	30,77	5,47	130	1040	1056,67	95	13,33
4	5	1.24	7,84	50,95	30,81	5,5	100	1328	1905	60	10
5	5	1.58	7,81	49,62	30,64	5,74	136,67	3126,67	458,33	31,67	13,33
6	4,5	1.58	7,73	50,03	31,06	5,17	116,67	1368,33	1860	33,33	8,33
7	5	1.68	7,7	52,29	30,95	5,12	85	2240	1085	25	11,67
8	6	2.03	7,72	48,87	29,29	5,02	67,5	1090	458,33	25	6,67
9	8	2.39	7,79	46,88	31,07	5,21	75	376,67	1850	25	10
10	6	1.93	7,76	46,53	31,12	5,53	65	623,33	1335	25	10
11	5,5	2.19	7,74	46,24	31,41	4,9	100	1616,67	1638,33	20	56,67

Source: Environment Agency – Abu Dhabi

Figure (4.4) Marine Water Quality in the City of Abu Dhabi, 2009



Chapter Five

5. Health and Safety Statistics

Health and safety statistics include food safety and food poisoning statistics that affect humans and nutrition. They also include statistics on occupational health and safety which directs attention to sectors where occupational accidents and injuries occur so that appropriate measures can be taken to minimize such incidence through effective security and safety systems.

5.1 Food Poisoning

The term 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.

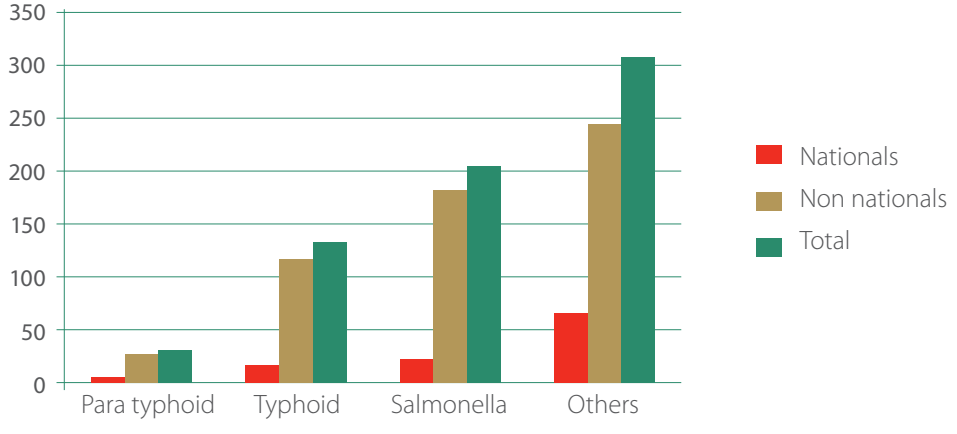
In 2009, 677 people suffered from food poisoning in the Emirate of Abu Dhabi, from which 107 cases were nationals and 570 cases were non-nationals, at a rate of 41.18 cases per 100 thousand person residents in the Emirate. Salmonella accounted for the largest share of food poisoning cases, claiming 205 victim or 30% of the total cases of food poisoning.

5.1 Number of Food Poisoning Cases by Type and Nationality, 2009

Type of Poisoning	Rate/ 100,000	National	Non-Nationals	Total
Total	**41.18**	**107**	**570**	**677**
Para Typhoid	1.82	4	26	30
Typhoid	8.09	16	117	133
Salmonella	12.47	22	183	205
Other food Poisoning	18.80	65	244	309

Source: Health Authority - Abu Dhabi

Figure (5.1) Number of Food Poisoning Cases in the Emirate of Abu Dhabi by Type and Nationality, 2009



5.2 Occupational Health and Safety

Occupational health and safety is one of the vital elements that must be included in any strategy, or any establishment or entity, whether this entity is industrial, agricultural, educational, environmental, recreational, or a service entity. The importance of providing occupational health and safety statistics lies in the role it plays in monitoring injuries and accidents to reduce the risk of machines and equipments on workers through analyzing and classifying the injuries, setting rules, and spreading awareness in order to protect the labour force and reduce the costs and consequences of such injuries, and hence increase the production.

5.2.1 Road and Occupational Injuries

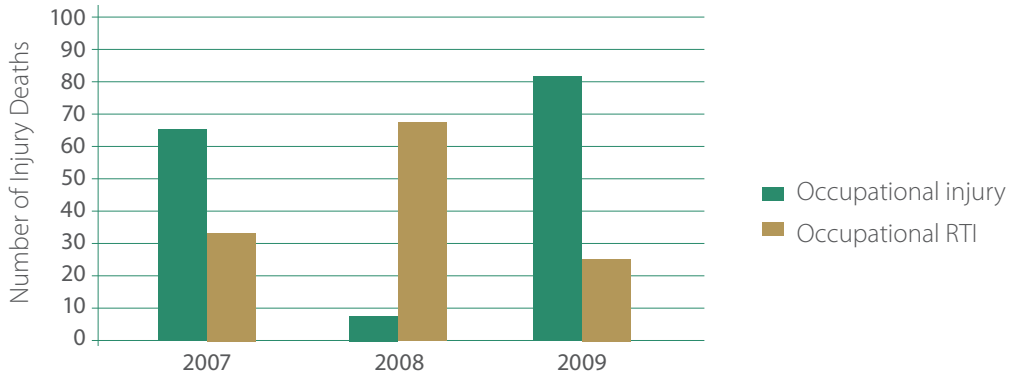
In 2009, the number of deaths caused by occupational injuries in the Emirate of Abu Dhabi was 82, whereas the number of deaths caused by occupational road traffic injuries was 26 (4.8% of total injury deaths). In the same year, 3 deaths were reported in the water and electricity sector and 7 deaths in the oil and gas sector.

5.2 Number of Injury Deaths in Emirate of Abu Dhabi, 2007-2009

Injury Category	2007	2008	2009
Total	**527**	**498**	**538**
Road Traffic Injury (RTI)	427	422	430
Occupational Injury	66	8	82
Occupational RTI	34	68	26

Source: Health Authority - Abu Dhabi

Figure (5.2) Number of Injury Deaths in the Emirate of Abu Dhabi , 2007-2009



5.2.2 Occupational Health and Safety Statistics – Water and Electricity Sector

Total Recordable Incident Rate (RTIR) per million hours worked increased during the three last years from 2.64 in 2006 to 5.1 in 2009 in the companies working under Abu Dhabi Water and Electricity Authority (ADWEA) in the Emirate of Abu Dhabi. In 2009, Lost Time Incidents (LTIs) increased by about 21% compared to the previous year. These are incidents where the injured person has to be absent from work for some time according to the severity of the injury.

5.3 Health and Safety Statistics - Water and Electricity Sector, 2006-2009

Item	2006	2007	2008	2009
Exposure hours (million Hours)	16.29	17.50	21.34	52.81
Fatality	1	0	1	3
Fatal Accident Rate (FAR)	0.06	0	0.04	0.1
Disability	0	0	0	0
Fatality Non-Recordable	0	0	0	0
Lost Time Incident (LTI)	12	9	15	19
Lost Days	232	186	250	236
Lost Time Incident Frequency (LTIF)	0.75	0.51	0.7	0.93
Restricted Work Day Case (RWDC)	15	7	0	0
Total Recordable Incident Rate (TRIR)	2.64	2.4	2.07	5.10
3rd Party Accidents	1	1	1	0

Source: Abu Dhabi Water and electricity Authority

Figure (5.3) Total Recordable Incident Rate - Water and Electricity Sector 2006-2009

5.2.3 Occupational Health and Safety Statistics – Oil and Gas Sector

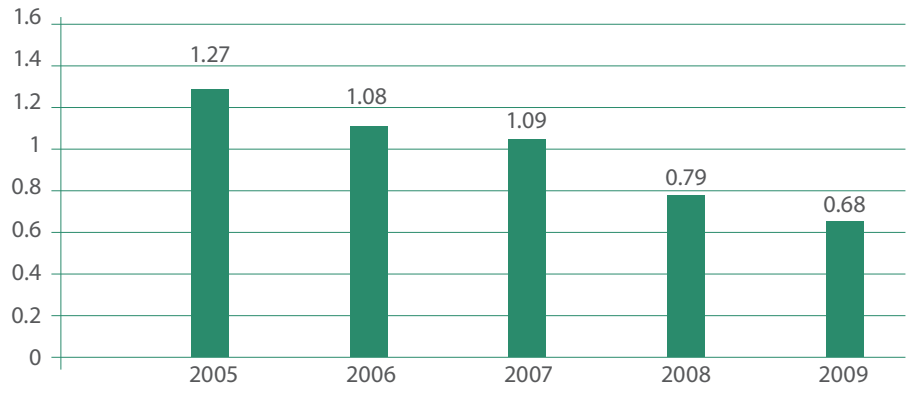
According to the occupational health and safety statistics of Abu Dhabi National Oil Company (ADNOC) and its groups, Total Recordable Incident Rate (RTIR) per million hours worked is decreasing despite the increase in exposure hours. ADNOC reduced its Total Recordable Incident Rate from 1.27 per one million hours worked in 2005 to 0.68 in 2009, decreasing injury rates by 46%. On the other hand, the number of fatalities increased from 4 in 2008 to 7 in 2009. Lost time incidents in 2009 also increased by 10.3% from 68 to 75 incidents.

5.4 Health and Safety Statistics in the Emirate of Abu Dhabi - Oil and Gas Sector 2005-2009

Item	2005	2006	2007	2008	2009
Exposure hours (million Hours)	171	191	230	298	313
Fatality	6	5	4	4	7
Fatal Accident Rate (FAR)	3.5	2.62	1.74	1.34	2.23
Disability	0	0	2	2	1
Fatality Non-Recordable	-	8	5	9	7
Lost Time Incident (LTI)	53	57	58	68	75
Lost Days	1952	1645	2081	1663	2372
Lost Time Incident Frequency (LTIF)	0.31	0.3	0.25	0.23	0.24
Restricted Work Day Case (RWDC)	41	42	53	50	44
Total Recordable Incident Rate (TRIR)	1.27	1.08	1.09	0.79	0.68
3rd Party Accidents	0	0	0	0	0

Source: Abu Dhabi National Oil Company - ADNOC

Figure (5.4) Health and Safety Statistics in the Emirate of Abu Dhabi - Oil and Gas Sector 2005 -2009



Chapter Six

6. Waste

Solid waste, with all its composition, is regarded as one of the important environmental issues that capture the attention of many countries around the world in the present time. In addition to the health and environmental harms or hazards that might be caused by the spread and accumulation of waste, improper disposal of waste may result in contamination of groundwater when it is land filled, in polluting the atmosphere with harmful gases when it is burned, or in contaminating the sea, lakes, and rivers when it is thrown into them. Furthermore, even if waste is disposed through the right means of imbedding, it requires large areas of land which may not be available for many countries.

Development, growth, and the increase in population are usually correlated with an increase in the quantity of waste generated. Due to the ongoing growth in the different economic, industrial, and service sectors in the Emirate of Abu Dhabi, the Emirate faces a big challenge with regard to waste generation and disposal methods. Thus, providing statistics on wastes is important to provide a clear image of reality so as to take proper and practical measurements and solutions.

6.1 Solid Waste in the Emirate of Abu Dhabi

In 2009, the Statistics Centre – Abu Dhabi has conducted a waste survey for the year 2008 data covering several sectors, such as construction, services, commercial, transport, and communication. The survey results are presented in the following table:

6.1 Estimates of Waste in the Emirate of Abu Dhabi by Type of Source Activity, 2008

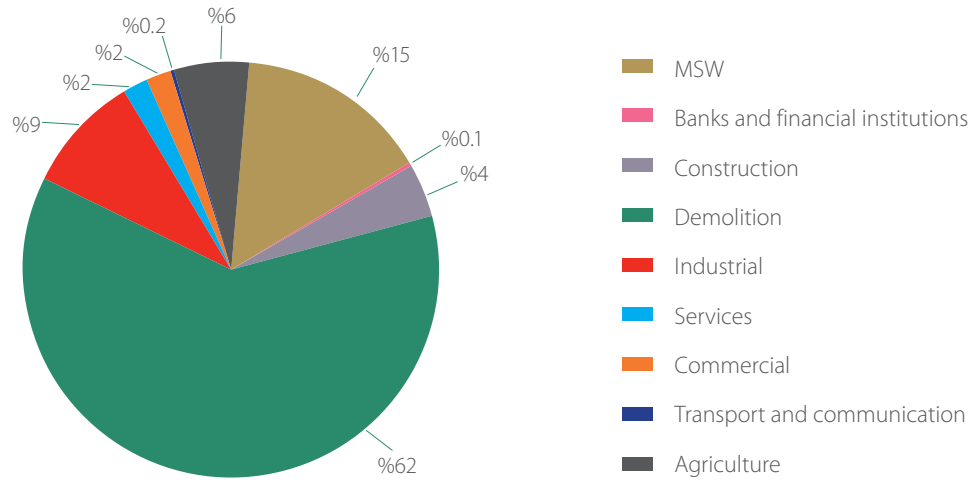
(Ton)

Source	Quantity	Daily Average
MSW*	780,609	2,139
Banks and Financial Institutions	3,444	9
Construction	217,929	597
Demolition*	3,218,303	8,817
Industrial	489,250	1,340
Services	125,358	343
Commercial	101,270	277
Transport and Communication	10,098	28
Agriculture*	294,129	806
Total	**5,240,390**	**14,357**

* Estimations of the Centre of Waste Management – Abu Dhabi (2008 Inventory)

Source: Statistics Centre – Abu Dhabi

Figure (6.1) Percentage Distribution of Amount of Waste in the Emirate of Abu Dhabi by Type of Source Activity, 2008

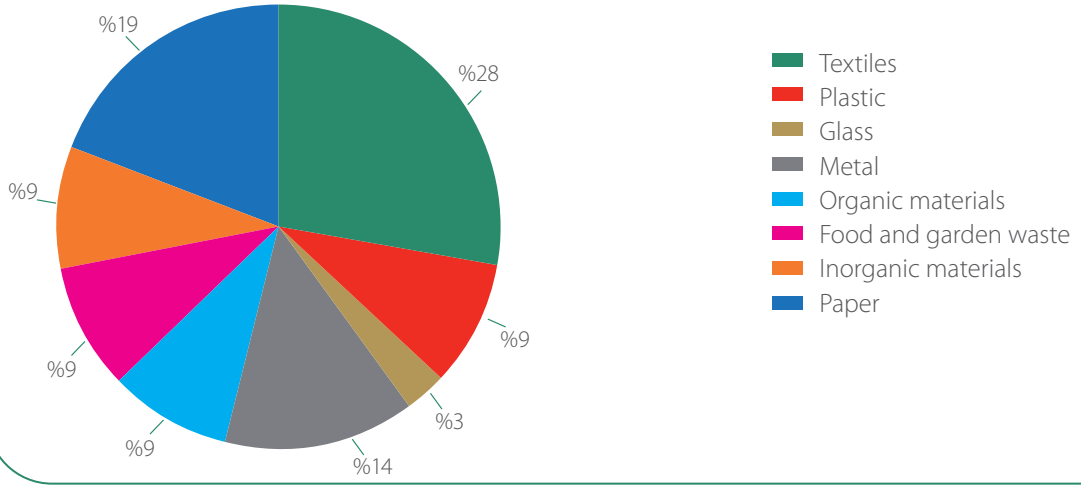


Source: Statistics Centre – Abu Dhabi

6.1.1 Solid Waste from the Industrial Sector

Total amount of solid waste generated from the industrial sector in 2008 was about 489,250 tons, of which textiles constituted 28%, paper constituted 19%, metal waste constituted 14%, and the other remaining waste constituted about 39% of the total amount of waste.

Figure (6.2) Percentage Distribution of Amount of Wastes Generated by Industrial Sector in the Emirate of Abu Dhabi , 2008



Source: Statistics Centre – Abu Dhabi

Survey results indicate that industrial establishments dispose of waste using several methods. A number of 7530 establishments dispose of their wastes through waste containers, while 1033 establishments dispose of waste by selling. There were 140 establishments recycling waste. It is important to mention that many of these establishments dispose of waste by more than one of the methods mentioned.

6.2 Number of Industrial Establishments According to Solid Waste Disposal Method in the Emirate of Abu Dhabi, 2008

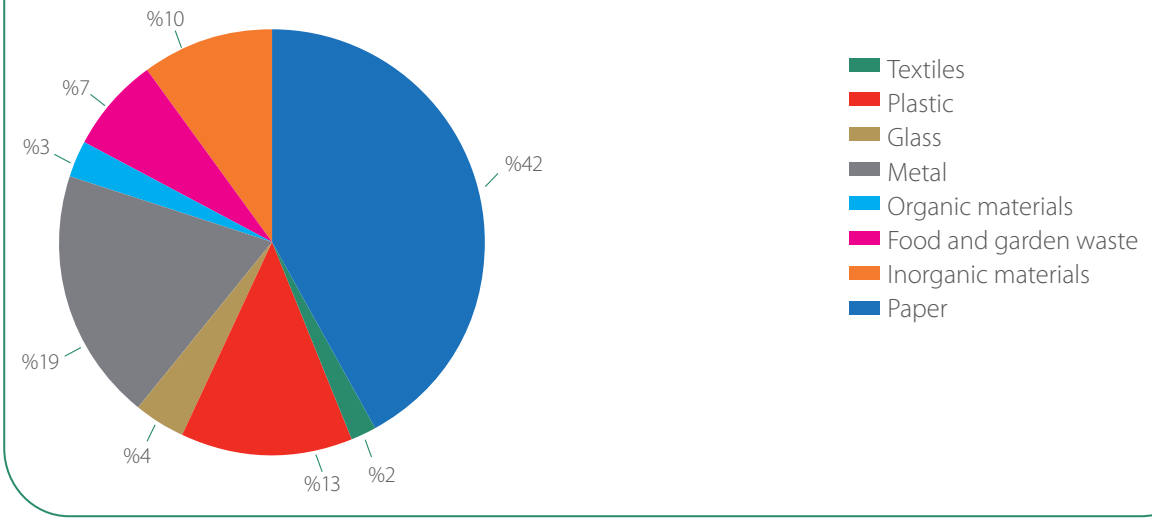
Disposal Method	Waste Container	Imbedding	Recycle	Compost	Selling	Landfills	Other
Number of Establishments	7530	14	140	4	1033	1	54

Source: Statistics Centre – Abu Dhabi

6.1.2 Solid Waste from the Construction Sector

The amount of solid waste generated from the construction sector in 2008 was 217,929 tons, of which paper waste constituted 19%, metal waste constituted 19%, plastic waste constituted 13%, and the remaining other waste constituted about 26% of the total amount of waste from the construction sector.

Figure (6.3) Percentage Distribution of Amount of Waste Generated by Construction Sector in the Emirate of Abu Dhabi, 2008



Source: Statistics Centre – Abu Dhabi

A number of 9,755 construction establishments dispose of waste through waste containers, while a number of 605 establishments dispose of waste by selling. There were 43 establishments that dispose of waste through recycling companies. It is worth mentioning that the establishments may use several disposal methods of those mentioned below.

6.3 Number of Construction Establishments According to Solid Waste Disposal Method in the Emirate of Abu Dhabi, 2008

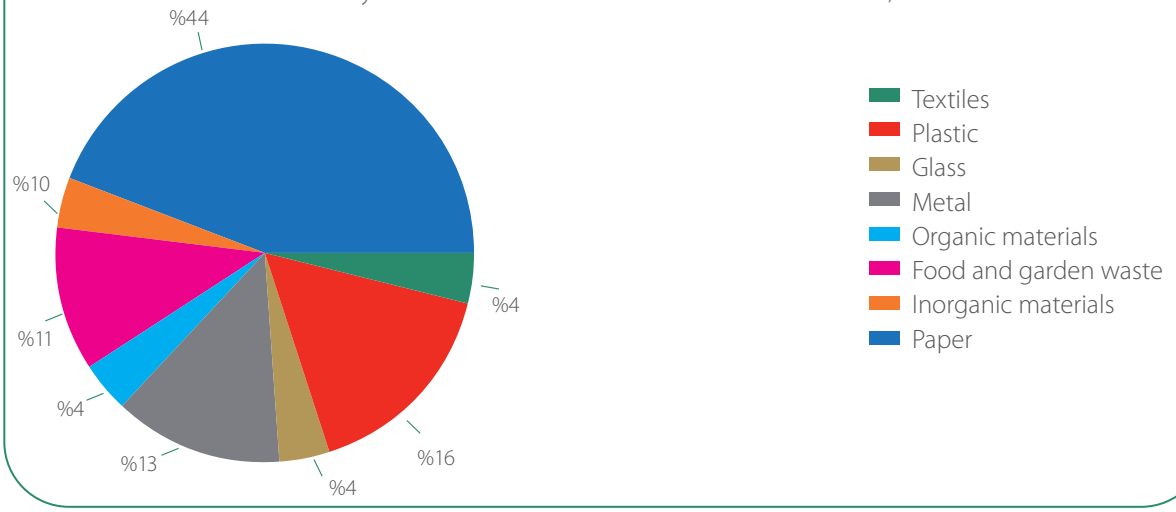
Disposal Method	Waste Container	Imbedding	Recycle	Compost	Selling	Landfills	Other
Number of Establishments	9755	23	43	1	605	1	49

Source: Statistics Centre – Abu Dhabi

6.1.3 Solid Waste from the Commercial Sector

The total amount of solid waste generated from the commercial sector was 101,270 tons, consisting of 44% paper, 16% plastic, 13% metal, and 27% of other types of waste.

Figure (6.4) Percentage Distribution of Amount of Waste Generated by Commercial Sector in the Emirate of Abu Dhabi , 2008



Source: Statistics Centre – Abu Dhabi

The number of commercial entities which dispose of wastes through waste containers was 28144, while the number of entities selling waste was 2060. There were 222 entities which dispose of waste through recycling companies. An entity may dispose of its waste through many of the methods mentioned.

6.4 Number of Commercial Establishments According to Solid Waste Disposal Method in the Emirate of Abu Dhabi, 2008

Disposal Method	Waste Container	Imbedding	Recycle	Compost	Selling	Landfills	Other
Number of Establishments	28144	45	222	2	2060	0	3

Source: Statistics Centre – Abu Dhabi

6.2 Liquid Waste

The significance of liquid waste lies in the fact that it may contaminate land and water unless it is managed in such a manner as to protect the environment and community. Liquid waste is defined as liquid discharges resulting from the use of water. It includes domestic wastewater, rainwater drainage, and liquid waste produced by manufacturing processes or remnants of manufacturer materials, such as oils that are disposed of through on-site treatment, sewage network, discharging into the sea or elsewhere.

Realizing the threat that liquid waste poses to human health and the environment, and due the major role it plays in polluting soil, and surface and groundwater water resources, Statistics Centre – Abu Dhabi conducted a survey on liquid waste in the Emirate of Abu Dhabi according to different economic activities. The industrial sector was found to have the largest share (99.8%) of the total amount of liquid waste generated in the emirate.

Another type of liquid waste is oil spills, which can be defined as accidental spills of oils into the environment. If such spills are not controlled, serious environmental hazards may occur. Therefore, the Environment Agency – Abu Dhabi, and other industrial entities in the Emirate of Abu Dhabi manage the disposal and treatment of such spill through a number of programs and initiatives.

6.5 Amount of Liquid Waste in the Emirate of Abu Dhabi by Type of Source Activity, 2008

(Cubic Meter)

Source	Construction Sector	Industrial Sector	Services Sector	Commercial Sector	Transport and Communication Sector	Total
Amount	147,542	1,604,707,707	9,084	104,148	1,423	1,604,969,904

Source: Statistics Centre – Abu Dhabi

6.6 Amount of Oil Spills by ADNOC in the Emirate of Abu Dhabi, 2004 -2009

(Cubic Meter)

Year	2004	2005	2006	2007	2008	2009
Oil Spills	2.9	15.5	15	NA	113	599

Source: Abu Dhabi National Oil Company - ADNOC

Chapter Seven

7. Appendix

Environmental Concepts and Terminology

7.1 Environmental Statistics 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:

Environmental statistics are statistics that describe the state and trends of the environment covering the natural environment and living organisms in their ecosystems and human settlements. Environmental statistics are integrative in nature, measuring human activities and natural phenomena›s that affect the environment, and the social responses to these effects, including broad definitions of indicators and environmental accounting.

7.2 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.

Average Rainfall:

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

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) x 100 OR

Relative humidity % = (Specific humidity / Saturation specific humidity) x 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.

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 a mercury column of height 76 cm. and the atmospheric 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.

Precipitation:

It is the total volume of precipitation from the atmosphere, including rain, snow, hail and dew falling within the country in one year.

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.

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).

Solar Radiation

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

7.3 Air

Air Pollution:

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

Total Emissions:

Emissions or pollutants released into the atmosphere from fixed sources such as chimneys, and vents from the tops commercial or industrial facilities, and mobile sources (vehicles). Emissions from international air and marine transport are excluded.

Volatile Organic Compounds Except for Methane (Non-Methane VOCs):

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

Methane:

Colorless, odor-less and flammable gaseous hydrocarbon created by anaerobic decomposition of organic compounds. Methane is a potent greenhouse gas.

Nitrogen Oxides (NOx):

This term is used to refer to types of nitrogen oxides produced during combustion, namely Nitric Oxide (NO) and Nitrogen Dioxide (NO2). Nitrogen oxides contribute to the formation of acid deposits, smog, and ground-level ozone in the troposphere.

Nitric Oxide (NO):

A colorless flammable gas with mild odor. Although it is toxic to some extent, its smell is not strong enough to provide an alert. Nitric oxide is rapidly oxidized in air to form nitrogen dioxide.

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.

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.

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.

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

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.

Sulphur Dioxide (SO2):

It Sulphur dioxide is a colorless heavy gas with nasty smell, mainly produced by the combustion of fossil fuels. The gas is harmful to humans and plants and contributes to the acidity of rainfall.

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.

Noise:

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

Decibel:

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

Annual mean concentration:

Arithmetic mean over all valid measurements for the respective year.

Remote Regions (Far from Pollution):

Monitoring stations far from any industrial or densely populated area.

7.4 Energy

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.

7.5 Water

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.

Total Water Abstraction

Water removed from any source, either permanently or temporarily, during a specified period of time. Mine water and drainage water are included.

Desalinated Water:

Total volume of water obtained from desalination processes (from seawater, brackish water etc).

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.

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 pubic supply undertaking to another are excluded

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.

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.

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.

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.

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.

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.

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.

Total Wastewater Treatment:

Process to render waste water fit to meet applicable environmental standards or other quality norms for recycling or reuse. Three broad types of treatment are distinguished in the questionnaire: mechanical, biological and advanced. For the purpose of calculating the total amount of treated waste water, volumes reported should be shown only under the highest type of treatment to which it was subjected. Thus, waste water treated mechanically as well as biologically should be shown under biological treatment, and waste water treated in accordance with all three types should be reported under advanced treatment. Waste water treatment does not include the collection of waste water or storm water, even when no treatment will be possible without collection.

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.

7.6 Health and Safety

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.

7.7 Waste

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 waster or ambient air.

Agriculture (Forest) wastes:

All waste from agricultural and forestry activities

Industrial Waste:

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

Construction Waste:

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

Waste from Other Activities:

Include wastes produced by all other economic activities not mentioned in the previous sections.

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.

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.

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).

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. Management includes (a) collection, transportation, treatment and disposal of waste, (b) controlling and monitoring the production, collection, and disposal of waste, and (c) minimizing waste production through reusing and recycling process.

Recycling:

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

Composting:

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

Incineration:

Controlled burning of waste materials with or without energy restoration.

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.

Other (Waste Treatment/Disposal):

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

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.

Incineration Plants:

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

Landfills:

These are the sites designated for the final placement of waste in or on the land in a controlled or uncontrolled way.

Liquid Waste:

Liquid waste can be defined as liquid products or outputs resulting from the use of water, including domestic wastewater, rainwater drainage, liquid waste 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.

Oil Spill:

Accidental oil spills may cause extensive environmental damage if not controlled.

Note:

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