Economic and Social Commission for Western Asia

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ESCWA

Climate Change-Related Statistics in the Arab Region

A Proposed Set of Indicators

Special Issue of the Compendium of Environment Statistics in the Arab Region 2017

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Economic and Social Commission for Western Asia

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Preface

Climate change poses a considerable challenge to statistical measurement by countries and agencies. Statisticians face increasing demands for data from diverse stakeholders. The Paris Agreement, adopted on 12 December 2015, aims to limit global average temperature increases to below 2 degrees Celsius above pre-industrial levels, and to finance the reduction of greenhouse gas emissions, thus promoting climate-resilient development.

The Sustainable Development Goals (SDGs), set out by the United Nations in the 2030 Agenda for Sustainable Development, address climate change in SDG 13, which urges countries to take urgent action to combat climate change and its impacts. That requires new and improved statistics on resilience, adaptive capacity and resource mobilization. Several other SDG targets are also climate change-related.

In Arab countries, climate change and its effects represent a major challenge to sustainable development. Availability of reliable statistics is crucial for measuring and monitoring the economic and social effects of climate change at the national and regional levels.

This special issue of the publication series entitled *Compendium of Environment Statistics in the Arab Region* outlines the role that national statistical offices play in leading and coordinating climate change statistics. It also proposes a set of indicators for the Arab region, based on existing frameworks, to help formulate national climate change policies on emissions, drivers, impacts, mitigation and adaptation.

The proposed indicators were discussed at an expert group meeting on "Tracking progress towards the implementation of energy-related SDGs in the Arab region", held in Beirut on 24 and 25 January 2017. ESCWA took note of experts' comments in a revised list, which is included in the present publication.

ESCWA strives to improve the quality of its publications through suggestions and comments from readers. A publication and a readership questionnaire are available on the Statistics e-Publications website at http://data.escwa-stat.org/.

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Acronyms

CH_4	Methane
CO_2	Carbon dioxide
FDES	Framework for the Development of Environment Statistics
GDP	Gross domestic product
GHG	Greenhouse gas
HFC	Hydrofluorocarbon compounds
MDG	Millennium Development Goals
N_2O	Nitrous oxide
PFC	Perfluorocarbon compounds
SDGs	Sustainable Development Goals
SEEA-CF	System of Environmental-Economic Accounting -Central Framework
SF	Sendai Framework for Disaster Risk Reduction
SF_6	Sulphur hexafluoride
TFKCCS	Task Force on a Set of Key Climate Change-Related Statistics Using SEEA (of the United Nations Economic Commission for Europe)
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change

Executive Summary

To help improve climate change-related statistics collected by national statistical offices in the Arab region, the present study proposes a set of climate change-related indicators for all Arab countries. The indicators were chosen because they are relevant, straightforward, feasible and consistent with international recommendations.

Background

Climate change affects lives and disrupts economies globally. At the twenty-first Conference of the Parties to the United Nations Framework Convention on Climate Change, held in Paris in December 2015, representatives of 196 countries adopted a global agreement on climate change. By June 2017, 195 States parties to the Convention had signed the agreement, including 148 that ratified it. Global commitment to this agreement was reasserted at the twenty-second Conference of the Parties to the United Nations Framework Convention on Climate Change, held in Marrakesh, Morocco, in November 2016.

Climate change and its effects pose a major challenge to the Arab region's efforts to achieve sustainable development. They could undermine past successes and future prospects, although the region contributes less than 5 per cent to global greenhouse gas emissions.

SDG 13 urges countries to take urgent action to combat climate change and its impacts, which requires new and improved statistical measures on resilience, adaptive capacity and resource mobilization.

At its forty-seventh session held in 2016, the United Nations Statistical Commission urged countries to develop and strengthen climate change-related statistics.[1]

Reliable statistics are crucial for measuring and monitoring the economic and social effects of climate change at the national and regional levels. Currently, however, climate-related statistics in the Arab region are scarce, of poor quality, and not easily accessible.

National statistical offices in the Arab region are aware of the problem. They support the recommendations of the Statistical Commission, and have expressed interest in receiving assistance to build their capacity to respond to the need for better climate change-related statistics. The present study aims to provide such assistance.

Scope of climate change-related statistics

Based on reviews of several major statistical initiatives directly or indirectly related to the measurement of climate change, the scope of

climate change-related statistics can be defined through the following:

- **Drivers**: statistics describing human activities that are the drivers of emissions (for example, fossil fuel combustion);
- **Emissions**: statistics describing the human-induced emissions that contribute to climate change;
- **Impacts:** statistics describing the human and natural consequences of climate change (for example, deaths from extreme weather events, and changes in precipitation patterns);
- **Mitigation**: statistics describing human efforts to limit climate change (for example, energy efficiency measures);
- **Adaptation**: statistics on adaptation measures that help reduce vulnerability to climate change (for example, behavioural shifts such as individuals using less water, or farmers planting different crops).

Role of national statistical offices

National statistical offices play a key role in the development of climate change-related statistics. Even those that measure only economic and social phenomena already measure many variables of relevance to climate change. Data on industrial production and demographic trends, for example, are essential for understanding the drivers and effects of climate change. National statistical offices have many other strengths to build upon, including independence, long time-series, a commitment to data quality, transparency, and sound methodologies.

Moreover, national statistical offices in all countries are improving the quality of the statistical information they produce. Efforts in this regard include building awareness of official statistics, filling data gaps, improved timeliness, easier access to data, and better tools to help users understand statistics.

Recommendations

National statistical offices in the Arab region should prioritize developing climate change-related statistics, and cooperating with other relevant agencies and organizations. With regard to regional priorities, emphasis should be placed on statistics dealing with adaptation and mitigation; statistics dealing with emissions are a lower priority.

Arab national statistical offices and other relevant organizations in the region, such as the League of Arab States, are invited to consider the set of climate change-related indicators set out in the present study as the basis for an Arab set of climate change-related indicators. They were drawn from a set of indicators proposed by the United Nations Experts on Environmental-Economic Accounting, because of their relevance to the region and their conformity to global reporting standards and the SDGs. Nonetheless, any necessary changes to the set should be considered.[2] ESCWA will support their implementation.

Arab national statistical offices are invited to improve methodologies in the development of climate change-related statistics by incorporating recommendations on climate change-related statistics made by the Conference of European Statisticians of the Economic Commission for Europe and the

Statistical Commission. The following points should be considered:

(a) Increase the amount and quality of statistics available for green-house-gas inventory compilation and climate change analysis, especially those related to adaptation and mitigation. Most climate change-related statistics currently available in the region come from databases maintained by international organizations rather than national statistical offices. While useful, those statistics often do not reflect the real situation in the countries under consideration;
(b) Improve the infrastructure used by national statistical offices (classification systems, registers, definitions, frameworks) to better support compilation of climate-change related statistics. The following infrastructure needs should be considered, in particular:
    - include explicit references to environmental statistics in national laws governing national statistical offices;
    - develop new approaches for preserving confidentiality, so that users of climate change-related statistics can access microdata without compromising the privacy of individuals.
(c) Establish new partnerships between national statistical offices and other agencies to ensure that statistical offices can access the expertise and methodologies required for producing climate change-related statistics. To effectively develop climate change-related statistics, statistical offices should encourage contributions from sectors outside their traditional areas;
(d) Review the organizational structure of national statistical offices to ensure they have the capacity to support production of climate change-related statistics;
(e) Ensure that statistics are compiled upon well-founded and agreed principles, so as to guarantee consistency over time and across geographical areas, and to inform public policy.

The proposed list of 20 indicators should be tested in Arab countries to determine data compilation challenges, and to build upon successful pilots from other regions and sectors and adapt them to the local context.

Revised list of proposed climate change-related indicators for the Arab region

1	**Name:** *Total primary energy supply* **Area:** Drivers **Rationale for inclusion:** Energy use is the most important contributor to greenhouse gas emissions.
2	**Name:** *Share of fossil fuels in final energy consumption* **Area:** Drivers **Rationale for inclusion:** Fossil fuel combustion is the largest source of greenhouse gas emissions.
3	**Name:** *Public financial support for fossil fuel production and direct consumption* **Area:** Drivers **Rationale for inclusion:** Fossil fuel combustion is the largest source of greenhouse gas emissions. Subsidies reduce the cost of fossil fuels to consumers and, therefore, increase their consumption.
4	**Name:** *Energy intensity of the economy* **Area:** Drivers **Rationale for inclusion:** Energy use per unit of economic output is a useful means of tracking progress in decoupling growth of energy use from growth of the economy.
5	**Name:** *Total greenhouse gas emissions* **Climate change area of relevance:** Emissions **Rationale for inclusion:** Total greenhouse gas emissions represent the national contribution to the primary cause of human-induced climate change.
6	**Name:** *Carbon dioxide emissions from fuel combustion* **Area:** Emissions **Rationale for inclusion:** Fuel combustion, especially fossil fuel, is the largest source of carbon dioxide emissions, and carbon dioxide is the main greenhouse gas in terms of contribution to climate change.
7	**Name:** *Greenhouse gas emissions intensity of the economy* **Area:** Emissions **Rationale for inclusion:** Greenhouse gas emissions per unit of economic output are a useful means of tracking progress in decoupling growth of emissions from growth of the economy
8	**Name:** *Temperature departure from normal* **Area:** Impacts **Rationale for inclusion:** Departures of temperatures from historically normal levels are a means of tracking change in temperature over time. Surface air temperature is considered by the World Meteorological Organization-Global Climate Observing System as an essential climate variable.[a]
9	**Name:** *Precipitation departure from normal* **Area:** Impacts **Rationale for inclusion:** Departures of precipitation from historically normal levels are a means of tracking change in precipitation over time. Precipitation is considered by the World Meteorological Organization-Global Climate Observing System as an essential climate variable.
10	**Name:** *Share of agricultural land affected by drought* **Area:** Impacts **Rationale for inclusion:** Changes in precipitation patters associated with climate change are expected to lead to increased drought in the region.[b]
11	**Name:** *Level of water stress: freshwater withdrawal as a proportion of available freshwater resources* **Area:** Impacts **Rationale for inclusion:** Changes in precipitation as a result of climate change will change the availability of freshwater resources. Water is a key resource in the Arab region.

12	**Name:** *Number of deaths and missing persons attributed to hydrometeorological disasters, per 100,000 population* **Area:** Impacts **Rationale for inclusion:** Climate change is expected to increase global average surface temperatures, which is a particular concern in the Arab region where normal summertime temperatures are already high.
13	**Name:** *Occurrence of extreme weather events* **Area:** Impacts **Rationale for inclusion:** Climate change is expected to increase global average surface temperatures, which is a particular concern in the Arab region where normal summertime temperatures are already high, resulting in desertification, drought, floods, landslides, storm surges, soil erosion, and saline water intrusion.
14	**Name:** *Incidence and distribution of vector-borne and waterborne diseases* **Area:** Impacts **Rationale for inclusion:** Vector-borne disease transmission is expected to increase as a result of changes in temperature and rainfall patterns associated with climate change.
15	**Name:** *Renewable energy share in final energy consumption* **Area:** Mitigation **Rationale for inclusion:** Production of energy from renewable sources is a means of meeting energy needs without (or with substantially reduced)[c] greenhouse gas emissions.
16	**Name:** *Investments in energy efficiency and in renewable energies as a proportion of gross domestic product* **Area:** Mitigation **Rationale for inclusion:** Investments represent a measure of the effort on the part of Governments and business to address the need to maintain environmental quality. The share of these expenditures devoted to climate change mitigation is an indicator of how seriously climate change is considered.
17	**Name:** *Share of energy and transport related taxes as percentage of total taxes and social contributions* **Area:** Mitigation **Rationale for inclusion:** Taxes on energy and transportation products are a means of ensuring that their prices reflect the true social cost of their use, including the costs of damages associated with climate change.
18	**Name:** *Change in water use efficiency over time* **Area**: Adaptation **Rationale for inclusion**: This indicator is defined as the output over time of a given major sector per volume of net water withdrawn (showing the trend in water use efficiency). Following ISIC 4 coding, sectors are defined as agriculture, forestry and fishing (ISIC 4-A); manufacturing, constructions, mining and quarrying (ISIC 4-B, 4-C and 4-F); electricity industry (ISIC 4-D); and the municipal sector (ISIC 4-E).
19	**Name:** *Proportion of farmland area using sustainable management practices* **Area:** Adaptation **Rationale for inclusion:** To cope with changing temperature and precipitation patters owing to climate change, farmers will have to adopt new management practices that increase yields while requiring less water, and by increasing plant tolerance to heat and prolonged drought.
20	**Name:** *Adoption of disaster risk management strategies* **Area:** Adaptation **Rationale for inclusion:** Formal disaster risk reduction strategies are a means of ensuring that the impacts of climate change have the minimum possible effect on the wellbeing of individuals, society and the economy.

[a] https://public.wmo.int/en/programmes/global-climate-observing-system/essential-climate-variables.

[b] https://openknowledge.worldbank.org/handle/10986/12216.

[c] Some greenhouse gas emissions are associated with hydroelectric power production as a result of decomposition of vegetation on lands flooded for the creation of water reservoirs.

Introduction

To improve climate change-related statistics collected and coordinated by Arab national statistical offices, the present report proposes a set of climate change-related indicators for countries in the region. The indicators were chosen because they are relevant, straightforward, feasible and consistent with international recommendations.

The present report is structured as follows:

Chapter 1 sets out the scope of climate change-related statistics based on a review of several recent major international initiatives relevant to the measurement of climate change. Chapter 2 offers a rationale for the involvement of national statistical offices in developing climate change-related statistics, even offices with no previous experience in the area. Chapter 3 presents the proposed set of climate change-related indicators. Chapter 4 describes the approaches to climate change-related statistics in three countries used as case studies. Chapter 5 concludes with recommendations to national statistical offices.

Background

Climate change affects lives and disrupts economies globally. At the twenty-first Conference of the Parties to the United Nations Framework Convention on Climate Change, held in Paris in December 2015, representatives of 196 countries adopted a global agreement on climate change. States parties committed themselves to reducing greenhouse gas emissions to keep global warming below 2 degrees Celsius compared with the preindustrial era, and mobilize resources to finance adaptation. Global commitment to this agreement was reasserted at the twenty-second Conference of the Parties to the United Nations Framework Convention on Climate Change, held in Marrakesh, Morocco. The Paris Agreement came into effect in November 2016 to limit further temperature increases to 1.5 degrees Celsius. By June 2017, 148 parties had ratified the Agreement. Twenty 20 Arab countries have signed the Agreement, including 11 that have ratified it.[3]

Global reporting to the Framework Convention is limited to greenhouse gas inventories through national communications[4] and biennial update reports.[5] As at June 2016, seven Arab countries among non-Annex I parties had submitted their third national communication, and only four had submitted their biennial update reports (Lebanon, Mauritania, Morocco and Tunisia), providing information on national greenhouse gas inventories, mitigation actions, constraints and gaps, including support needed and received. However, the most recent data from national reports are for Morocco and Mauritania for 2012, but the

figures in those reports are slightly different from the global databases at the World Bank Group and the Carbon Dioxide Information Analysis Centre.

Most countries follow the approaches to data collection set out in the 1996 or the 2006 Guidelines for National Greenhouse Gas Inventories of the Intergovernmental Panel on Climate Change (IPCC). Data collection activities are established, adapted to countries' national circumstances, and reviewed periodically to ensure good practice.[6] The Guidelines list the sources of country-specific data, such as national statistics agencies, sectoral experts, stakeholder organizations, IPCC Emission Factor Database, national and international experts, international organizations that publish statistics, reference libraries, scientific and technical articles, universities, and national inventory reports from parties to the United Nations Framework Convention on Climate Change. In most Arab countries, however, national statistical offices are not members of the national committees on climate change.

Since the Paris Agreement came into effect, 19 Arab countries have prepared statements of their intended nationally determined contributions, although they are considered non-Annex I parties to the Framework Convention, and are thus not formally bound to reducing greenhouse gas emissions.[7]

Concerns were raised that global reporting about climate change should go beyond emissions, given that the scope of climate change is much wider and requires a monitoring framework that includes indicators on drivers, impacts, mitigation and adaptation, thus linking emissions to indicators on social, economic and environmental domains and, eventually, to sustainable development.

The United Nations Sustainable Development Goals address climate change in SDG 13, which urges countries to take urgent action to combat climate change and its impacts. SDG 13 has five targets that will be monitored through indicators, thus requiring new and improved statistical measures on resilience, adaptive capacity and resource mobilization.

At its forty-seventh session in 2016, the United Nations Statistical Commission urged countries to develop and strengthen climate change-related statistics. The Commission identified existing frameworks that could support countries' efforts in developing climate change statistics, including the Sendai Framework for Disaster Risk Reduction 2015-2030, the Recommendations on Climate Change-Related Statistics of the Conference of European Statisticians, and the multi-year programme of the Statistical Commission.[8]

Climate change hampers the Arab region's efforts to achieve sustainable development. Although the region contributes less than 5 per cent to global greenhouse gas emissions,[9] the following figures for the period 2005-2012 are cause for concern: an increase of 30 per cent in total greenhouse gas emissions excluding land-use change and forestry, and of 31 per cent including land-use change and forestry (annex III, tables AIII.1 and AIII.2); a 40 per cent increase in total carbon dioxide emissions

excluding land-use change and forestry, and 41 per cent including land-use change and forestry (annex III, tables AIII.3 and AIII.4); and a 12 per cent increase in per capita carbon dioxide emissions (annex III, table AIII.5).

In recent years, weather patterns have become more unpredictable. The region has been subject to extreme climate events, such as droughts, floods, dust storms and intense heat waves.[10] Record temperatures occurred in parts of the Middle East and North Africa, reaching 54 degrees Celsius in Mitribah, Kuwait, on 21 July 2016 - the highest temperature on record for Asia. Other extreme temperatures included 53.9 degrees Celsius in Basra, Iraq, while high temperatures were also reported in Libya, Morocco, Tunisia, and the United Arab Emirates.[11] Models using high-resolution regional climate model simulations have projected that extremes of wet-bulb temperature in the region around the Arabian Gulf are likely to approach and exceed a critical threshold, which defines a limit of survivability for human beings under the business-as-usual scenario of future greenhouse gas concentrations. In specific regional hotspot, climate change is likely to severely impact human habitability in the absence of significant mitigation.[12]

ESCWA, in collaboration with the League of Arab States and other United Nations organizations serving the Arab region, held a series of regional workshops to increase understanding and exchange on the concerns of Arab countries, and to prepare for global climate change negotiations.

ESCWA has also been leading the Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socioeconomic Vulnerability in the Arab Region (RICCAR). Analysis of climate projections and extreme climate indices for the region have shown a consistent warming trend, with a general increase in the frequency of warm days and longer summer periods across the region, more variable precipitation trends than those related to temperature, and more dominant drier conditions in the northern Maghreb.[13]

Reliable statistics are crucial to measuring and monitoring the economic and social effects of climate change at the national and regional levels. Researchers and policymakers in the region rely on those statistics to identify climate change impacts, and to formulate effective policies and strategies to mitigate them. Currently, however, climate-related statistics in the region are scarce, of poor quality and not easily accessible. National statistical offices in the Arab region are aware of the complexity of the climate change issue, and the challenge related to the compilation of the related statistics.

They requested support on developing climate change statistics at the working group of the ESCWA statistical committee WebEx videoconference (25 February 2016), in preparation for the forty-seventh session of the United Nations Statistical Commission. Working group participants discussed item 3 (k) on the agenda of the forty-seventh session: Report of the Secretary-General on climate change statistics,[14] and concluded the following:

- ESCWA member States support the recommendations on climate change included in the report;

- The report can serve to set global indicators on climate change;
- Climate change indicators should be aligned with the SDGs;
- Member States should promote training and support to build capacity on climate change statistics.

The points above are considered a mandate for ESCWA to provide guidance on a core set of regional climate change-related statistics, based on the work done by the Economic Commission for Europe and the recommendations of the Statistical Commission. The present report is one aspect of that assistance.

In line with its mandate, ESCWA included a chapter on "Air pollution and climate change" in the previous issue of the Compendium of Environment Statistics in the Arab Region, and has dedicated the present special issue of the Compendium to presenting the set of climate change-related indictors, for consideration by national statistical offices in Arab countries.

1. Scope of Climate Change-Related Statistics

Over the past 10 years, international organizations have tried to define and clarify the scope of statistics related to climate change (see box for climate change definitions). The most relevant recent climate change-related global policy initiatives, and the related indicator frameworks discussed within the context of a broader set of sustainable development issues are:

- The Sustainable Development Goals;
- The Sendai Framework for Disaster Risk Reduction;
- The Paris Agreement under the United Nations Framework Convention on Climate Change.

The main statistical frameworks for producing climate change-related statistics and an internationally comparable set of indicators are: the System of Environmental-Economic Accounting-Central Framework, and the United Nations Framework for the Development of Environment Statistics.

In recognition of the urgent need to deal with climate change as a global issue, and the consequent growing demand for climate change statistics, the first statistical community to address the need for official statistics was the Conference of European Statisticians of the United Nations Economic Commission for Europe (UNECE), which established a Task Force on climate change-related statistics[15] in 2011. The Task Force was mandated to define the scope of climate change-related statistics, analyse user needs and the relationships between producers and users, review existing statistics, examine the statistical infrastructure (standards, methods and mechanisms) used by national statistical offices to identify gaps and recommend priorities for its improvement, and identify practical steps to improve climate change-related statistics to better meet user needs.

Definitions of climate change

According to the International Panel on Climate Change, climate change refers to a statistically significant variation in climate averages or in their variability, persisting for an extended period (typically decades or longer). Climate change could be due to natural processes, or anthropogenic changes in the composition of the atmosphere or in land use.[a]

Article 1 of the United Nations Framework Convention on Climate Change defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods".[b] The Framework Convention therefore makes a distinction between climate change attributable to human activities altering the atmospheric composition, and climate variability in the short term attributable to natural causes.

[a] See www.ipcc.ch/ipccreports/tar/wg1/518.htm.

[b] See https://unfccc.int/resource/docs/convkp/conveng.pdf.

Later, the Task Force on a set of key climate change-related statistics using the System of Environmental-Economic Accounting (SEEA) was created by the Bureau of the Conference of European Statisticians in 2014, based on a proposal for follow-up work identified in the *Recommendations on Climate Change-related Statistics*.[16] The objective of the Task Force was to define an internationally comparable set of key climate change-related statistics and indicators that can be derived from the System of Environmental-Economic Accounting-Central Framework and other sources, such as the United Nations Framework for the Development of Environment Statistics.

A. Recommendations on climate change-related statistics

The scope of climate change-related statistics defined in the report of the Task Force on climate change-related statistics[17] adopted the definition of climate change developed by the United Nations Framework Convention on Climate Change (see box). It also endorsed the claim that climate change "will affect people around the world. Rising global temperatures are expected to raise sea levels, and change precipitation and other local climate conditions. Changing regional climate could alter forests, crop yields, and water supplies. It could also affect human health, animals, and many types of ecosystems".[18]

Among the concepts developed to establish the link between society and the environment are the Pressure-State Response which is primarily based on the concept of cause and effect phenomena, and the Driving Force Pressure State Impact Response model as an extension of the Pressure-State Response framework, adopted by the European Environmental Agency and the European Statistical Office in 1997.

Given the above, climate change-related statistics were defined as environmental, social and economic statistics that measured the following:

- **Drivers:** human causes of climate change that deal with sources of emissions;
- **Emissions:** Greenhouse gas emissions and their human causes; (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride);
- **Impacts**: consequences of climate change for human and natural systems including, among many others, more frequent and intense storms, changes in temperature and rainfall patterns, increased sea levels, and losses in forest and agricultural productivity;
- **Mitigation**: human efforts to avoid the human and natural consequences of climate change, such as using more energy-efficient technologies, increasing the share of renewable energy used and promoting renewable energies; and making older equipment more energy efficient and changing management practices or consumer behaviour;
- **Adaptation**: human efforts to adapt to the human and natural consequences of climate change.

The Task Force's report focused on the following recommendations to guide national statistical offices in the improvement of climate change-related statistics:

1. Improve the quality of statistics required for greenhouse gas emission inventories.
2. Engage with agencies responsible for greenhouse gas emission inventories.
3. Request the international statistical community to actively contribute to the work of the global greenhouse gas emission inventory systems.
4. Facilitate access to statistics needed for climate change analysis.
5. Improve the usefulness of existing environmental, social and economic statistics for climate change analysis.
6. Consider development of new statistics based on a review of the key data needs of climate change users.
7. Review existing classification systems, registers, definitions, statistical frameworks, products and services need to ensure that climate change analysis needs are appropriately addressed.
8. Gradually develop new partnerships, expertise and capacity to adopt new methodologies for producing climate change-related statistics.
9. Consider organizational changes in national statistical offices, in national statistical systems and the national system for greenhouse gas inventories, to support the production of climate change-related statistics.

Those recommendations are not equally relevant in all countries, and they all affect the resources required by national statistical offices and the allocation of these resources across statistical domains. To help national statistical offices prioritize recommendations, a simple spreadsheet tool was developed[19] where each recommendation can be rated according to the cost and time required for implementation and the expected impact on the quality of climate change-related statistics if it were implemented. The recommendations are then divided into categories: those that should be considered for immediate implementation, those to be tackled within two years, and those to be addressed beyond two years.

B. Task Force on a set of key climate change-related statistics using SEEA

Following the 2014 recommendations of the Task Force on climate change-related statistics, the Conference of European Statisticians recognized the urgent need to build upon those recommendations and to develop an internationally comparable set of climate change-related statistics and indicators. To that end, the Task Force on a set of key climate change-related statistics using SEEA[20] was formed in late 2014. Its mandate was to define a set of coherent and internationally comparable climate change-related statistics and indicators by doing the following:

- Reviewing related indicator initiatives;
- Exploring statistics or indicators that can be derived from SEEA, bearing in mind the need to align with other international statistical standards and initiatives, such as the Framework for the Development of Environment Statistics and the SDGs;
- Suggesting data sources for each indicator.

The Task Force on a set of key climate change-related statistics using SEEA[21] agreed to limit the number of indicators to a maximum of 40

for ease of interpretation, and proposed a set of 39 climate change-related indicators that were presented and discussed in October 2016.[22] Five main areas of climate change-related statistics recommended by the Task Force on climate change-related statistics were adopted: drivers, emissions, impacts, mitigation, and adaptation. Sub-areas were added to strengthen the links between the indicators and the main economic, social and environmental dimensions of climate change (table 1).

The complete list of proposed indicators is presented in table 2, along with an indication of the linkages between indicators and the SEEA, Framework for the Development of Environment Statistics and the Sendai Framework. About half of the proposed indicators have a direct link to SEEA; 10 are linked to SDG climate change-related indicators; and three are linked to indicators currently under discussion under the Sendai Framework.

The Task Force on a set of key climate change-related statistics using SEEA surveyed the national statistical offices of all UNECE member States in August 2016 to assess the availability of data for the proposed set of indicators. The survey results indicated the following:

- Indicators on drivers and emissions are generally feasible, but indicators on impacts, mitigation and adaption need more work;
- Many indicators require further methodological development;
- Most indictors are compiled not by national statistical offices but by other agencies, suggesting a need for close cooperation with those agencies.

Table 1. Summary of proposed climate change-related indicators

	Areas				
Sub-areas	Drivers	Emissions	Impacts	Mitigation	Adaptation
National total	4	3			
Production	3	2			
Consumption	1	2			
Physical conditions			2		
Land cover, ecosystems and biodiversity			2		
Land			1		
Extreme events and disasters			4		1
Water resources			1		1
Human settlements and environmental health			2		1
Agriculture, forestry and fishery			1		2
Energy resources				1	
Environment protection and resource management expenditures				1	
Environmental governance and regulation				4	
Total	**8**	**7**	**13**	**6**	**5**

Source: https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/bur/2016/October/06-Progress_report_set_of_climate_indicators_final.pdf.

Table 2. Proposed set of climate change-related indicators

Area	Sub-area	Indicator		Relation to other statistical/indicator frameworks
Drivers	National total	1	Total primary energy supply	FDES 2.2.2.a.4 SEEA-CF Energy
	National total	2	Share of fossil fuels in total primary energy supply	FDES 2.2.2.a.4 SEEA -CF Energy
	National total	3	Land use/cover change	FDES 1.2.1.a and 2.3.1.a SEEA -CF Land
	National total	4	Total support for fossil fuels/GDP	SEEA -CF Energy
	Production	5	Total energy intensity of production activities	SDG 7.3.1 FDES 2.2.2.a SEEA -CF Energy
	Production	6	Carbon intensity of energy for the economy	SEEA -CF Energy, Emissions
	Production	7	Emission intensity of agricultural commodities	FDES 2.5.4.a.1
	Consumption	8	Energy consumption by households/capita	FDES 2.2.2.a.c SEEA -CF Energy
Emissions	National total	9	Total GHG emissions	UNFCCC, FDES 3.1.1 SEEA -CF Emissions
	National total	10	CO_2 emissions from fuel combustion	UNFCCC, FDES 3.1.1.a.1 SEEA -CF Emissions
	National total	11	GHG emissions from land use	UNFCCC, FDES 3.1.1
	Production	12	Total GHG emission of production activities, residence based	FDES 3.1.1 SEEA -CF Emissions
	Production	13	GHG emission intensity of production activities	SEEA -CF Emissions
	Consumption	14	Direct GHG emissions from households	FDES 3.1.1 SEEA -CF Emissions
	Consumption	15	Carbon footprint	SEEA -CF Emissions
Impacts	Physical Conditions	16	Annual average surface temperature	FDES 1.1.1.a
	Physical Conditions	17	Percentage of land area suffering from unusual wet or dry conditions (Standard Precipitation Index)	
	Water resources	18	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	SDG 6.4.2 (tier 1) SEEA-CF Water
	Land, land cover, Ecosystems and biodiversity	19	Cumulative number of alien species	
	Land, land cover, Ecosystems and biodiversity	20	Carbon stock in soil	
	Land, land cover, Ecosystems and biodiversity	21	Proportion of land that is degraded over total land area	SDG 15.3.1(tier 3) SEEA-CF Land
	Extreme Events and Disasters	22	Number of deaths and missing persons attributed to hydrometeorological disasters, per 100,000 population	SDG 1.5.1 (tier 2), 11.5.1 (tier 2), 13.1.2 (tier 2) SF DRR A-1

Area	Sub-area	Indicator		Relation to other statistical/indicator frameworks
	Extreme Events and Disasters	23	Occurrence of extreme weather events	
	Extreme Events and Disasters	24	Direct economic loss attributed to hydro-meteorological disasters in relation to GDP	SDG 11.5.2 (tier 2) SF DRR C-1
	Extreme Events and Disasters	25	Number of housing units damaged and destroyed by climatological, hydrological and meteorological disasters	SF DRR B-4 FDES 4.1.2.c
	Human settlements and human health	26	Distribution of cases of vector-borne diseases (e.g. West Nile virus, malaria, Lyme disease)	FDES 5.2.3.a.1
	Human settlements and human health	27	Heat-related mortality	
	Agriculture, forestry and fishery	28	Direct agricultural losses from droughts, floods and other severe weather events	SF DRR C-2 FDES 2.3.1.a and 4.1.2.b
Mitigation	Energy resources	29	Renewable energy share in the total final energy use/consumption	SDG 7.2.1 (tier 1) SEEA -CF Energy FDES 2.2.2a.3
	Environment Protection and Resource Management Expenditure	30	Share of climate change mitigation expenditure relative to GDP	FDES 6.1.1.a SEEA-CF Protection expenditures
	Environmental Governance and Regulation	31	Share of energy and transport related taxes as percentage of total taxes and social contributions	FDES 6.2.2.b.1 SEEA 4.4
	Environmental Governance and Regulation	32	Total climate change related subsidies and similar transfers/GDP	FDES 6.2.2.b.2 SEEA-CF Protection expenditures
	Environmental Governance and Regulation	33	Average carbon price	
	Environmental Governance and Regulation	34	Mobilized amount of USD per year starting in 2020 accountable towards the $100 billion commitment	SDG 13a.1 (tier 3)
Adaptation	Adaptation expenditures	35	Share of government adaptation expenditure to GDP	FDES 6.1.1.a.1 SEEA-CF Protection expenditures
	Water resources	36	Change in water use efficiency over time	SDG 6.4.1 (tier 3) FDES 2.6.2.h SEEA-CF Water
	Human settlements and human health	37	Proportion of population living in dwellings with air conditioners or air conditioning	
	Agriculture, forestry and fishery	38	Progress towards sustainable forest management	SDG 15.2.1 (tier 3) FDES 2.3.1.b.3
	Agriculture, forestry and fishery	39	Proportion of agricultural area under productive and sustainable agriculture	SDG 2.4.1 (tier 3) FDES 2.3.1.a

Source: http://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/2016/mtg/Session_3_Set_of_indicators.xlsx.

C. Expert Group on Environment Statistics

At its fourth meeting in May 2017,[23] the Expert Group on Environment Statistics held a session on climate change and disaster related statistics where the UNECE, the Food and Agriculture Organization, the United Nations Framework Convention on Climate Change, Eurostat and the Economic and Social Commission for Asia and the Pacific presented their work in the area. Two working groups discussed the development of a global set of climate change statistics and indicators through a pilot survey on climate change-related statistics and indicators, which the United Nations Statistics Division prepared based on the work of the UNECE Task Force on a Set of Key Climate Change-Related Statistics Using SEEA. The working groups proposed the development of a core set of indicators as well as complementary indicators to cover issues specific to certain regions, and where data availability might be limited. Experts discussed the need to adjust indicators to reflect attribution and to include new topics that may be pertinent to developing countries, such as risk and vulnerability or oceans, and to expand on areas such as adaptation that are relevant to developing countries. Comments were made on the usefulness of showing the links between the Driving Force-Pressure-State-Impact-Response framework and other frameworks such as the Framework for the Development of Environment Statistics or SEEA.

D. Sustainable Development Goals

The SDGs are intended to set the international development agenda for the period 2015-2030, taking over from the Millennium Development Goals (MDGs) that were superseded in 2015. The 17 SDGs, 169 targets and 230 indicators of the 2030 Agenda for Sustainable Development seek to build on the MDGs and accomplish what they did not achieve.

The following SDGs touch upon climate change, either directly or indirectly:

- **Goal 1:** End poverty in all its forms everywhere.
- **Goal 2:** End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
- **Goal 6:** Ensure availability and sustainable management of water and sanitation for all.
- **Goal 7:** Ensure access to affordable, reliable, sustainable and modern energy for all.
- **Goal 9:** Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
- **Goal 11**: Make cities and human settlements inclusive, safe, resilient and sustainable.
- **Goal 12:** Ensure sustainable consumption and production patterns.
- **Goal 13:** Take urgent action to combat climate change and its impacts.
- **Goal 14:** Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
- **Goal 15:** Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.

SDG 13 is most directly relevant to climate change. The indicators associated with that goal are shown in table 3. The indicators are

restricted to the areas of impact, mitigation and adaptation. Drivers and emissions are not covered. Not all targets and indicators are relevant to all countries; for example, target 13.a is relevant only to developed countries, and target 13.b is relevant only to least-developed countries and to small-island States.

Relevant targets and indicators associated with other SDGs are listed in annex II to the present study. Like those associated with SDG 13, they relate mainly to impacts, adaptation and mitigation, although a few relate to emissions and drivers.

Table 3. Targets and indicators of SDG 13

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	13.1.1 Number of countries with national and local disaster risk reduction strategies
	13.1.2 Number of deaths, missing persons and persons affected by disaster per 100,000 people
13.2 Integrate climate change measures into national policies, strategies and planning	13.2.1 Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan that increases their ability to adapt to the adverse impacts of climate change and to foster climate resilience and low GHG emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other)
13.3 Improve education, awareness-raising, plus human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula
	13.3.2 Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
13.a Implement the commitment undertaken by developed-country parties to UNFCCC, with the goal of jointly mobilizing $100 billion annually by 2020. The aim is to address the needs of developing countries, in the context of meaningful mitigation actions and transparency in connection with the Green Climate Fund, to be capitalized as soon as possible	13.a.1 Mobilized amount of dollars per year starting in 2020, accountable towards the $100 billion commitment
13.b Promote mechanisms to raise capacity for effective climate change-related planning and management in least-developed countries and small-island developing states, including focusing on women, youth, local and marginalized communities	13.b.1 Number of least-developed countries and small-island developing states that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms to raise capacities for effective climate change-related planning and management, including focusing on women, youth, local and marginalized communities

Source: A/RES/70/1.

E. System of Environmental-Economic Accounting

The United Nations SEEA-Central Framework[24] is an accounting system for measuring the contribution of the environment to the economy, and the impact of the economy and human activity on the environment. It is designed to be compatible with the international standard for economic accounting, the System of National Accounts.[25] The SEEA-Central Framework has been officially translated into Arabic.[26] ESCWA has published a framework for economic accounting in the Arab region that considers priority accounts, mainly water, energy and land.[27]

While SEEA is not intended explicitly for climate change analysis, it includes a number of accounts that, if implemented in a country, would provide useful statistics and indicators for climate change analysis relating to the five areas specified (drivers, emissions, impacts, mitigation and adaptation):

- SEEA air emissions accounts provide data on the origin and destination of air emissions, including greenhouse gases (emissions);
- Energy flow accounts provide data on the supply and use of energy, both renewable and non-renewable (drivers);
- Water flow accounts provide data on water availability and use (impacts and drivers);
- Solid waste flow accounts provide data on sources of waste, incineration and landfill emissions of methane, a potent greenhouse gas (emissions);
- Water stock accounts provide data on the quantities of water available to meet economic and ecological demands (impacts);
- Forest stock accounts provide data on the quantities of timber and other forest products and services available to meet economic and ecological needs (impacts). They also provide a means for monitoring rates of deforestation, an important driver of climate change;
- Land stock accounts provide data on the quantities of different land types available within a country. They are useful for tracking the transition from one type of land to another; for example, the conversion of rangeland into desert as precipitation declines (impacts);
- Environmental protection expenditure accounts provide data on the expenditures related to various activities linked to mitigating the impacts of climate change: investments in energy-efficient equipment (mitigation), and expenditures on management of natural resources (mitigation);
- Environment goods and services accounts provide data on the supply of goods that are designed to improve energy efficiency or otherwise reduce greenhouse gas emissions. They are useful for measuring economic benefits in the form of innovation, job creation and trade that might be associated with climate change (mitigation);
- Accounts on environmental financial flows (taxes, subsidies, fines, fees, permits) provide a basis for analysing the use of market-based mechanisms to control greenhouse gas emissions (mitigation).

F. Framework for the Development of Environment Statistics

The United Nations Framework for the Development of Environment Statistics is a multipurpose conceptual and statistical framework that provides an organizing structure to guide the collection and compilation of environment statistics at the national level, whereas SEEA focuses on linkages between the economy and the environment. Due to its large coverage, this framework is a valuable tool providing a set of environmental topics and individual statistics on climate change. It comprises the following six main components, each containing climate-change related data:

- The environmental conditions and quality component provides data on the state of the atmosphere, temperature, precipitation, sea level and sea ice, water systems, desertification, soil and land cover, and biodiversity, among others (impacts);
- The environmental resources component provides data on stocks of fossil fuel, land, an biological and water resources, which are relevant to understanding both drivers of climate change (for example, deforestation) and its impacts (such as loss of water resources);
- The residuals (wastes) component provides data on emissions of greenhouse gases and other pollutants;
- The extreme events and disasters component provides data on the impacts of the changing climate on people, the economy and ecosystems as a result of weather-related disasters such as floods, hurricanes and extreme heat/cold (impacts);
- The human settlements and environmental health component provides data on the environment in which humans live and work, including data on population exposed to air pollution, vector-borne diseases and incidences, and morbidity and mortality related to climate change. Those data are relevant to understanding efforts to live with the impacts of climate change (adaptation), and the impacts themselves;
- The environmental protection, management and engagement component, which includes cost of climate change mitigation and adaptation measures (impacts).[28]

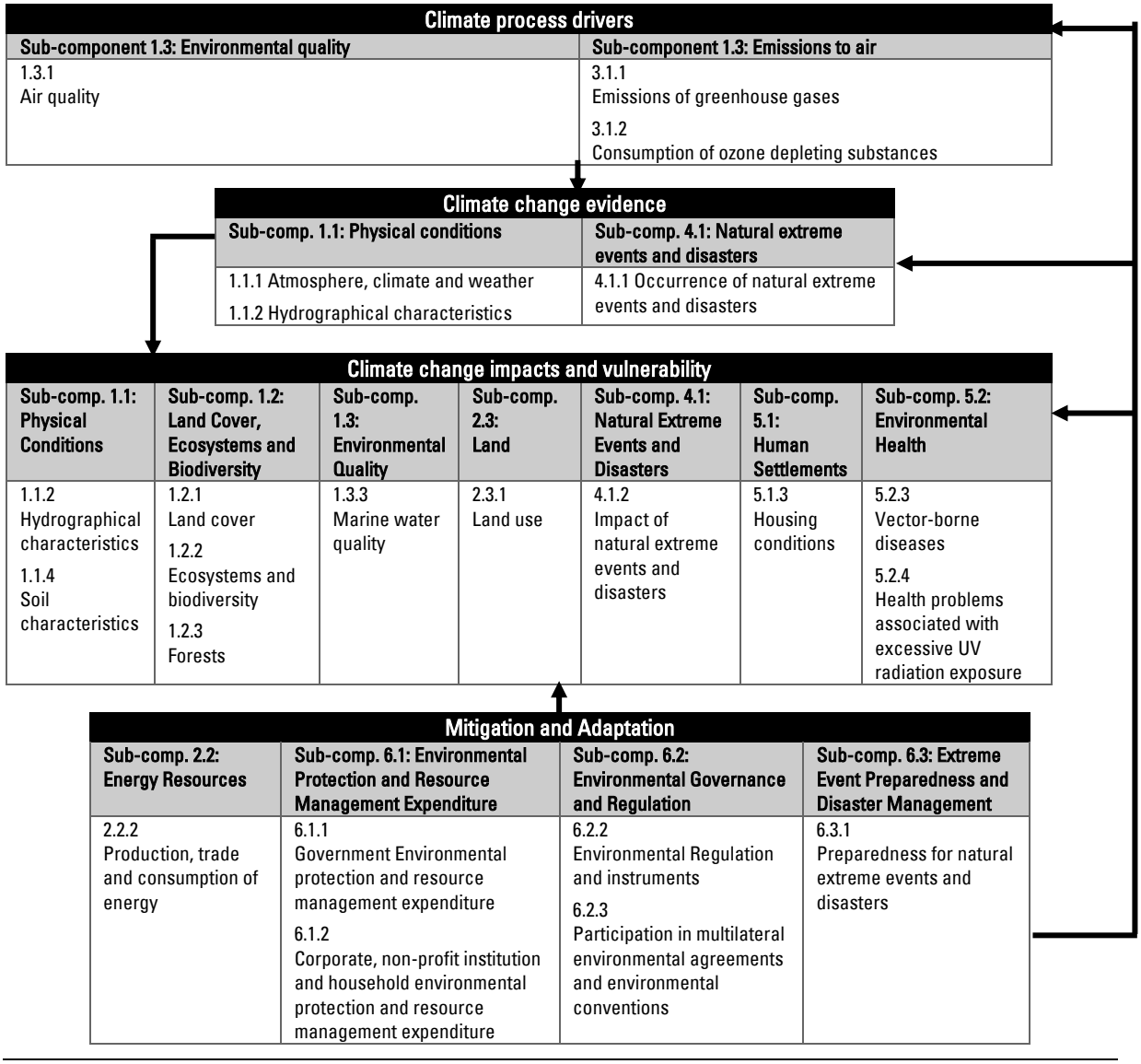
Figure 1 portrays the various components of this framework and their relation to climate change, organized in four blocks based on the sequence of climate change-related events used by the Intergovernmental Panel on Climate Change.

G. Sendai Framework for Disaster Risk Reduction

The Sendai Framework for Disaster Reduction, adopted in 2015, aims to substantially reduce risk, loss of life and loss of economic, cultural and environmental assets as a result of disasters. It applies to the risk of small-scale and large-scale, frequent and infrequent, and sudden and slow-onset disasters caused by natural or man-made hazards, and related environmental, technological, biological hazards and risks. It includes the following seven targets to prevent or reduce disaster risks between 2015 and 2030:

- To substantially reduce global disaster mortality;
- To substantially reduce the number of affected people globally;
- To reduce direct disaster economic loss in relation to global GDP;
- To substantially reduce disaster damage to critical infrastructure and disruption of basic services;
- To substantially increase the number of countries with national and local Sendai Framework strategies;
- To substantially increase the availability of and access to multi-hazard early warning systems and disaster-risk information and assessments.

Figure 1. FDES and its relation to climate change



Source: https://unstats.un.org/unsD/environment/FDES/FDES-2015-supporting-tools/FDES.pdf.

This framework includes a number of indicators for each target.[29] An eighth target has been developed but not yet agreed internationally. As shown in table 4, many indicators have been selected for consistency with SDG indicators, to minimize the reporting burden on countries and to facilitate comparability and cross-analysis. However, this framework includes more detailed indicators than the SDGs, for which disaster risk reduction is only one of many topics.

The indicators are collected by the United Nations Office for Disaster Risk Reduction in country disaster loss databases.[30] Set-up and updates of such databases in some Arab countries were supported under RICCAR, which ESCWA and its partners are implementing.[31]

H. Summary

Based on the preceding review of the various regional and global statistical initiatives directly or indirectly related to the measurement of climate change, the scope of climate change-related statistics is defined in the present document as:

- **Drivers**: statistics describing human activities (for example, fossil fuel combustion) that drive emissions;
- **Emissions**: statistics describing human-induced emissions of greenhouse gases that contribute to climate change;
- **Impacts**: statistics describing the human and natural consequences of climate change (for example, deaths from extreme weather events and changes in precipitation patterns);
- **Mitigation**: statistics describing human efforts to limit climate change (for example, energy efficiency measures);
- **Adaptation**: statistics describing human efforts to adapt to the impacts of climate change (for example change in water use efficiency over time).

Table 4. Targets and indicators of the Sendai Framework for Disaster Risk Reduction

Target A: To substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2020-2030 compared to 2005-2015		
A-1	Number of deaths and missing due to hazardous events per 100,000	SDG indicator
A-2	Number of deaths due to hazardous events	SDG indicator
A-3	Number of missing due to hazardous events	SDG indicator
Target B: To substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020-2030 compared to 2005-2015		
B-1	Number of affected people per 100,000.	SDG indicator
B-2	Number of injured or ill people due to hazardous events	SDG indicator
B-3	Number of people who left their places of residence due to hazardous events	-
B-3a	Number of evacuated people due to hazardous events	SDG indicator
B-3b	Number of relocated people due to hazardous events	SDG indicator
B-4	Number of people whose houses were damaged due to hazardous events	-
B-5	Number of people whose houses were destroyed due to hazardous events	-
B-6	Number of people who received food relief aid due to hazardous events	-

Target C: To reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030		
C-1	Direct economic loss due to hazardous events in relation to GDP	SDG indicator
C-2	Direct agricultural loss due to hazardous events	SDG indicator
C-3	Direct economic loss due to industrial facilities damaged or destroyed by hazardous events	-
C-4	Direct economic loss due to commercial facilities damaged or destroyed by hazardous events	-
C-5	Direct economic loss due to houses damaged by hazardous events	SDG indicator
C-6	Direct economic loss due to houses destroyed by hazardous events	SDG indicator
C-7	Direct economic loss due to damage to critical infrastructure caused by hazardous events	SDG indicator
Target D: To substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, through increased resilience and other measures		
D-1	Damage to critical infrastructure due to hazardous events	SDG indicator
D-2	Number of health facilities destroyed or damaged by hazardous events	SDG indicator
D-3	Number of educational facilities destroyed or damaged by hazardous events	SDG indicator
D-4	Number of transportation infrastructures destroyed or damaged by hazardous events	SDG indicator
D-5	Number of times basic services disrupted due to hazardous events	-
Target E: To substantially increase the number of countries with national and local SF strategies by 2020		
E-1	Number of countries that adopt and implement national SF strategies in line with SF 2015- 2030	SDG indicator
E-2	Percentage of local governments that adopt and implement local disaster risk reduction strategies in line with SF 2015-2030	SDG indicator
E-3	Number of countries that integrate climate and disaster risk into development planning	-
E-4	Number of countries that adopt and implement critical infrastructure protection plan	SDG indicator
Target F: To substantially enhance international help for developing countries through adequate and sustainable support to complement national actions for implementation of the framework by 2030 (target not yet accepted)		
Target G: To substantially increase the availability of, and access, to multi-hazard early warning systems and disaster risk information and assessments by 2030		
G-1	Number of countries that have multi-hazard early warning system	SDG indicator
G-2	Number of countries that have multi-hazard monitoring and forecasting system	-
G-3	Number of people covered by multi-hazard early warning system	-
G-4	Percentage of local governments having preparedness plan (including EWS response and evacuation components) or evacuation plan	-
G-5	Number of countries that have multi-hazard national risk assessment with results in an accessible, understandable and usable format	SDG indicator
G-6	Percentage of local governments that have multi-hazard risk assessment, with results in an accessible, understandable and usable format for stakeholders	-

Source: www.preventionweb.net/files/45466_indicatorspaperaugust2015final.pdf.

2. Role of National Statistical Offices in Climate Change-Related Statistics

Dealing with climate change requires reliable statistics. Although national statistical offices have greater experience measuring economic and social rather than environmental trends, they are responsible for much information on climate change.

The main drivers of climate change (greenhouse gas emissions from fossil fuels, agricultural and forestry practices, and manufacturing processes) are largely related to economic activities, which are a core focus for national statistical offices. Efforts to mitigate climate change are directed at changing production and consumption patterns, also central issues for statistical offices. To the extent that mitigation fails, the ensuing impacts and human efforts to adapt to climate change will fall heavily on the economy and society in general. Statistical offices can offer much in the way of relevant data. Even national statistical offices that analyse only economic and social phenomena measure many variables of relevance to climate change. Many now include measurement of the environment as part of their core activities.[32]

The close relationship between climate change and the traditional and emerging areas of focus for statistical offices is just one reason why they are important partners in addressing climate change. They also have many other strengths to build upon in improving climate change-related statistics. Given the controversial nature of public debate on climate change, independence is one such strength. Official statistics are a trusted source of information, because of the neutrality under which they are collected and published, which enables debate to focus on policies and other substantive issues rather than the statistics themselves.

Another strength of statistical offices is a commitment to time-series analysis. Official statistics have well-developed methods to adjust data so that changes over time can be properly analysed; for example, by removing the effects of seasonal variations and by imputing missing data. Those types of adjustments are important when investigating climate change, so that statistics can be compared over time.

Spatial analysis is another area of potential strength, if suitable geographic classifications and standards are in place. Many official statistics are collected with a spatial identifier, allowing them to be aggregated by geographic area. For example, using latitude and longitude coordinates for farms, it is possible to aggregate agriculture data for watershed basins rather than for traditional political areas such as provinces. Given that the impacts of climate change are likely to vary significantly between

regions, spatial analysis offers great potential for climate change analysis.

Other strengths of official statistics in the context of climate change analysis include the following:

- **Sound and transparent methodologies**: statistical offices make use of methodologies developed through global processes that ensure harmonized definitions, classifications and collection methods across countries;
- **Data quality**: statistical offices place a strong emphasis on data quality measured against internationally accepted criteria and complemented by metadata describing the methods used to collect the data and their limitations;
- **Conceptual and methodological coherence**: statistical offices ensure coherence across environmental, economic and social statistics, facilitating their integration and allowing greater understanding of the trade-offs required in addressing climate change;
- **Data collection tools and mandate**: statistical offices use well-developed tools and have a strong mandate for data collection that can be applied flexibly to the collection of a wide range of statistics.
- **Publication tools and standards**: statistical offices use well-developed tools for data publication, and have a commitment to equal access for all users.
- **Timeliness**: statistical offices have a tradition of producing data in a timely fashion according to regular (and often publicly pre-announced) schedules.

Not all strengths apply equally in all countries, but statistical offices in every country are noted for their efforts to produce high quality information. However, there is room to improve the relevance of official statistics for climate change analysis. Areas where improvements are required, and examples of where progress is being made, include the following:

- **Awareness**: not all users of climate change-related statistics are fully aware of the data available from statistical offices that might meet their needs. Similarly, statistical offices are not fully aware of the needs of the users of climate change-related statistics;
- **Data gaps**: gaps in existing official statistics hamper their use in climate change analysis. For example, data on energy use for household and private transportation purposes are often weak, as are data on the population and businesses at risk from climate change impacts;
- **Timeliness**: official environmental statistics are generally less timely than official economic or social statistics, making them less useful for analytical and policy needs. The decision of Statistics Netherlands to publish greenhouse gas data on a quarterly basis is a good example of improved timeliness;[33]
- **Accessibility**: although official statistics are generally easily accessed in aggregate form, that is not the case for microdata. For reasons of respondent privacy, users outside of statistical offices are usually prevented from accessing microdata that could improve the quality of their analyses. Creative ways are needed to permit access to microdata while preserving respondent privacy.

Statistics Canada's Centre for Data Development and Economic Research is one example of how that can be done;[34]

- **Interpretability**: climate change-related statistics should be easily interpreted by a range of users, including the general public. To achieve that, national statistical offices should provide clear, plain-language descriptions of relevant statistics. A good example is the series entitled *Agriculture and Climate Change Statistics,* published by the United Kingdom.[35]
- **Statistical office operations**: statistical offices collect data of many types across the domains of economic, social and environmental statistics. Data relevant to climate change are found in all those domains. Coordination of climate change-related statistics within statistical offices is rarely undertaken, however, leaving users with the challenge of dealing with several different entry points to obtain the data required. The Climate Change Data portal of the World Bank is one example;[36]
- **Methods and standards**: while statistical offices have long understood the need for common methods and standards to ensure comparability across statistical domains and jurisdictions, environmental statistics have only recently begun to benefit from that attitude. As noted above, one area where work is required is geographic standards to support spatial analysis. Another is standard classifications to guide the collection of data; for example, a standard classification of climate change mitigation activities;
- **Specific statistical outputs**: another strength of official statistics in the context of climate change analysis is the yearly energy balance for energy products and flows, which is a very important statistical product that statistical offices and their counterparts in energy ministries compile for policymaking on energy supply and demand. The information is very useful to calculate carbon dioxide emissions from reference methods and sectoral methodologies. ESCWA and other regional and international organizations have assisted national statistical offices and their counterparts in the region in compiling and disseminating yearly energy balance, according to international standards and classifications of economic activities such as the International Standard Industrial Classification of All Economic Activities, Rev.4[37] and the International Recommendations of Energy Statistics,[38] and in using the output of energy balance as input to greenhouse gas inventories from energy flow to improve inventory data.

3. Proposed Set of Climate Change-Related Indicators for the Arab Region

Drawing upon the various climate change-related statistics/indicator initiatives described in chapter 1, chapter 3 proposes a set of climate change-related indicators relevant to the Arab region. The following objectives were kept in mind:

- The need for consistency with international efforts to define climate change-related indicators;
- The need for indicators to be relevant to the Arab region, giving special attention to priority topics (energy, water, agriculture, land use, transportation and households), and to the differences between oil-producing and other countries;
- The need to keep the list of indicators as short as possible;
- The need to reflect climate change in all of its dimensions (emissions, drivers, mitigation, impacts and adaptation);
- The need for the indicators to be feasible, based on existing data sources and methods.

The originally proposed indicators for Arab countries (annex I to the present study) drew heavily on the more comprehensive set of climate change-related indicators proposed by the Task Force on a set of key climate change-related statistics using SEEA, as they are consistent with indicators for the SDGs, SEEA, the Framework for the Development of Environment Statistics and the Sendai Framework, and have already been subject to an international verification process that will continue through global consultation until an agreed set that takes into account regional contexts is formally adopted by the United Nations Statistical Commission in the near future. The indicators have been modified to reflect regional perspectives, and/or expanded to improve their clarity, completeness, consistency and relevance/feasibility for the Arab region.

Views of ESCWA member States on the proposed list

A draft study entitled "Official statistics in support of the climate change and energy related indicators for SDGs in the Arab region" was presented at an expert group meeting on tracking progress towards the implementation of energy-related SDGs in the Arab region, held in Beirut on 24 and 25 January 2017. The presentation included the framework, scope and list of proposed indicators with links to the SDGs and the Global Tracking Framework.

1. Consistency with other frameworks

Representatives from the World Bank, the International Energy Agency and the ESCWA energy team suggested that the indicators in the

proposed list be consistent with the Global Tracking Framework, Sustainable Energy for All, and SDG indicators wherever possible.

2. Countries' concerns and comments

On the indicators proposed under drivers and emissions, the representative of Bahrain, on behalf of the Gulf countries, expressed concerns about indicators related to fossil fuels and per capita indicators, as those indicators did not reflect "the real picture" in Gulf countries. He also mentioned that countries found difficulties applying consistent IPCCC methodologies.

ESCWA suggested keeping fossil fuel indicators for global reporting on climate change, since fossil fuels were responsible for roughly 90 per cent of all emissions. On impact-related indicators, the representative of Egypt said that floods and rising sea and river levels were of concern to Egypt, and suggested including a relevant indicator in the list of core indicators for Arab countries. Consequently, ESCWA included in the revised list under 'impacts' a new indicator on "Occurrence of extreme weather events" (table 5, indicator 13), and the effects of those events such as desertification, drought, floods, landslides, storm surge, soil erosion, and saline water intrusion.

In addition, representatives said that the indicator proposed in the original list (annex I) on "Incidence and distribution of vector-borne diseases" should include waterborne diseases, as the risks in Arab countries were clearly documented.[39] The indicator has therefore been redesignated as "Incidence and distribution of vector-borne and waterborne diseases" (table 5, indicator 14).

All four originally proposed indicators under mitigation were discussed and participants recommended aligning them with other global indicators, and developing indicators that were more region-specific.

Representatives of the World Bank, the International Energy Agency and ESCWA recommended replacing "Renewable energy share in final energy supply" with "Renewable energy share in the total final energy consumption", to ensure the indicator's consistency with Sustainable Energy for All and SDG 7.

Participants found that indicators related to taxes and environmental expenditure and pricing were not yet applicable in the Arab region. They proposed replacing the indicator on "Share of climate change mitigation expenditure relative to GDP" with the indicator on "Investments in energy efficiency and in renewable energies as a proportion of GDP", which is in line with means of implementation 7.b.1 of SDG 7.

The indicator "Share of energy and transport related taxes as percentage of total taxes and social contributions" was not considered relevant as core indicator in all Arab countries, as many countries do not have any form of tax system at all. Countries that find it relevant can add it as an additional indicator. In the same context, participants indicated that the indicator "Carbon pricing" was not applicable in the region. On adaptation proposed indicators, most

participants said that the indicator "Proportion of population living in dwellings with air conditioning" was not particularly relevant. A new adaptation indicator was added on "Change in water efficiency over time" (table 5, indicator 18). This is a key indicator for target 4 of SDG 6 on water efficiency and scarcity.

The revised list of proposed climate change-related indicators for the Arab region is presented in table 5. It comprises 20 indicators (4 on drivers, 3 on emissions, 7 on impacts, 3 on mitigation and 3 on adaptation).

For each indicator, the following information is provided:

- Name of the indicator, relevant dimension of climate change (drivers, emissions, impacts, mitigation or adaptation) and rationale for inclusion in the set;
- A short description of the indicator methodology, with links to external sites containing examples where possible;
- A short discussion of data availability at the international level to support the indicators, and indicator links to indicators proposed by Task Force on a set of key climate change-related statistics using SEEA, the SDGs, SEEA, the Framework for the Development of Environment Statistics, the Sendai Framework and the Expert Group on Environment Statistics.

Table 5. Revised list of proposed climate change-related indicators for the Arab region

		Indicator	Methodology	Data sources	Relation to other statistical/ indicator frameworks
Drivers	**1**	**Name:** *Total primary energy supply* **Area:** Drivers **Rationale for inclusion:** Energy use is the most important contributor to greenhouse gas emissions.	The indicator measures the total primary energy supplied (million tonnes of oil equivalent) to the domestic economy. Primary energy includes crude oil; natural gas; coal; hydroelectricity; nuclear electricity; wind electricity; solar electricity and heat; geothermal electricity and heat; biofuel/biowaste electricity and heat; waste product electricity and heat; and heat and other renewable electricity and heat. Supply equals domestic production less exports plus imports, plus net changes in inventories, plus changes in international marine and aviation bunkers.	Total primary energy supply is available for Arab countries from national sources, national statistical offices and/or ministries of energy and from the Energy Atlas of the International Energy Agency: http://energyatlas.iea.org/#!/tellmap/-1002896040	TFKCCS: 1 FDES 2.2.2.a.4 SEEA-CF Energy

		Indicator	Methodology	Data sources	Relation to other statistical/ indicator frameworks
	2	**Name:** *Share of fossil fuels in final energy consumption* **Area:** Drivers **Rationale for inclusion:** Fossil fuel combustion is the largest source of greenhouse gas emissions.	The indicator measures the share (percent) of fossil fuels (oil, coal and natural gas) in total primary energy supplied to the domestic economy (see indicator 4).	The share of fossil fuels in total energy consumption is available for Arab region countries from the World Bank development database: http://data.worldbank.org/indicator/EG.USE.COMM.FO.ZS	TFKCCS: 2 FDES 2.2.2.a.4 SEEA-CF Energy
	3	**Name:** *Public financial support for fossil fuel production and direct consumption* **Area:** Drivers **Rationale for inclusion:** Fossil fuel combustion is the largest source of greenhouse gas emissions. Subsidies reduce the cost of fossil fuels to consumers and, therefore, increase their consumption.	The indicator measures the value of public financial support (tax breaks, subsidies, transfers and other support mechanisms) supporting the extraction, distribution and use of fossil fuels expressed as a share of GDP.	Public financial support for fossil fuel production as a share of GDP is available for oil-producing Arab region countries[a] for the year 2014 from the IEA Fossil Fuel Subsidies Database: http://www.worldenergyoutlook.org/media/weowebsite/2015/Subsidies20122014.xlsx	TFKCCS: 4 SEEA -CF Energy
	4	**Name:** *Energy intensity of the economy* **Area:** Drivers **Rationale for inclusion:** Energy use per unit of economic output is a useful means of tracking progress in decoupling growth of energy use from growth of the economy	The indicator measures the total primary energy supplied to the domestic economy (see Indicator 4) per unit of GDP. To permit comparison between countries, two versions of the indicator should be compiled: one using GDP measured in local currency and one using GDP measured in U.S. dollars converted using purchasing power parities.	Total primary energy use per unit of GDP measured in U.S. dollars converted using purchasing power parities is available for Arab region countries from the World Bank development database: http://databank.worldbank.org/data/TPES-per-unit-of-GDP_Arab-region/id/251bbbf8	TFKCCS: 5 SDG 7.3.1 FDES 2.2.2.a, SEEA -CF Energy
Emissions	5	**Name:** *Total greenhouse gas emissions* **Climate change area of relevance:** Emissions **Rationale for inclusion:** Total GHG emissions represents the national contribution to the primary	Greenhouse gas emissions should be measured following the guidelines of the Framework Convention for Climate Change for non-Annex I countries of the Kyoto Protocol.[b] Total greenhouse gas emissions is the sum of CO_2 emissions (kilotonnes) plus CH_4, N_2O,	Data on total GHG emissions plus emissions of the individual gases (CO_2, CH_4, N_2O, HFCs, PFCs and SF_6) for Arab region countries are available from the World Bank development database at: http://databank.worldbank.org/data/Arab_GHG-	TFKCCS: 9 FDES 3.1.1 SEEA-CF Emissions

		Indicator	Methodology	Data sources	Relation to other statistical/ indicator frameworks
		cause of human-induced climate change	HFC, PFC and SF_6 emissions (kilotonnes of CO_2 equivalents).	emissions_total/id/97f9e292 From the IEA website: http://www.iea.org/statistics/topics/CO2emissions/	
	6	**Name:** *CO_2 emissions from fuel combustion* **Area:** Emissions **Rationale for inclusion:** Fuel combustion especially fossil fuel is the largest source of CO_2 emissions and CO_2 is the most important greenhouse gas in terms of contribution to climate change	CO_2 emissions from fuel combustion should be measured following the guidelines of the Framework Convention for Climate Change for non-Annex I countries of the Kyoto Protocol. CO_2 emissions should be measured in kilotonnes.	Data on CO_2 emissions from fossil fuel combustion for Arab region countries up to 2012 are available from the World Bank development database at: http://databank.worldbank.org/data/CO2-from-fossil-fuels_Arab-region/id/b6bf9be0	TFKCCS: 10 FDES 3.1.1.a.1, SEEA -CF Energy, SEEA-CF Emissions
	7	**Name:** *GHG emissions intensity of the economy* **Area:** Emissions **Rationale for inclusion:** Emissions per unit of economic output are a useful means of tracking progress in decoupling growth of emissions from growth of the economy	Greenhouse gas emissions intensity is measured as the ratio of total greenhouse gas emissions (see Indicator 1) divided by GDP measured in real (i.e., inflation adjusted) terms. To permit comparison between countries, two versions of the indicator should be compiled: one using GDP measured in local currency and one using GDP measured in U.S. dollars converted using purchasing power parities.	See Indicator 1 for data source for total greenhouse gas emissions. Real GDP in purchasing power parity adjusted U.S. dollars for Arab region countries: http://databank.worldbank.org/data/GDP_Arab-region_2011-US-dollars-PPP/id/22a0fc7c Real GDP in local currency for Arab region countries: http://databank.worldbank.org/data/GDP_Arab-region_local-currency/id/dc1db519	TFKCCS: 13 FDES 3.1.1 SEEA-CF Emissions
Impacts	8	**Name:** *Temperature departure from normal* **Area:** Impacts **Rationale for inclusion:** Departures of temperatures from historical normals are a means of tracking change in temperature over time. Surface air temperature is considered by the World Meteorological	The indicator measures the annual mean and seasonal mean, maximum and minimum temperature departures from the temperature "normal". The "normal" is the average value over a 30-year time period. Normals are usually available from national meteorology offices. For further information on the	No international data source for the Arab region countries is available for this indicator. National meteorological offices of individual Arab region countries should be able to furnish the required data.	FDES 1.1.1.

	Indicator	Methodology	Data sources	Relation to other statistical/ indicator frameworks
	Organization-Global Climate Observing System as an Essential Climate Variable.[c]	methodology for this indicator, see Statistics Canada (2011a).[d]		
9	**Name:** *Precipitation Departure from Normal* **Area:** Impacts **Rationale for inclusion:** Departures of precipitation from historical normals are a means of tracking change in precipitation over time. Precipitation is considered by the World Meteorological Organization-Global Climate Observing System as an Essential Climate Variable.[e]	The indicator measures the annual mean and seasonal mean, maximum and minimum precipitation departures from the precipitation "normal". The "normal" is the average value over a 30-year time period. Normals are usually available from national meteorology offices. For further information on the methodology for this indicator, see Statistics Canada (2011b).[f]	No international data source for the Arab region countries is available for this indicator. National meteorological offices of individual Arab region countries should be able to furnish the required data.	FDES 1.1.1
10	**Name:** *Share of agricultural land affected by drought* **Area:** Impacts **Rationale for inclusion:** Changes in precipitation patters associated with climate change are expected to lead to increased drought in the region (Verner, 2012).	This indicator measures the share of agriculture land (percent) that is affected by drought each year. For this purposes of this indicator, drought is defined as *a period in which the actual rainfall is significantly less than the average for the locale in question. Drought is characterized by decreased river bank heights, river volume, and/or groundwater levels.*[g]	No international data source for the Arab region countries is available for this indicator. National statistical offices or agriculture ministries of individual Arab region countries should be able to furnish the required data.	TFKCCS: 21 SDG 15.3.1 (tier 3) FDES 1.1.4.b
11	**Name:** *Level of water stress: freshwater withdrawal as a proportion of available freshwater resources* **Area:** Impacts **Rationale for inclusion:** Changes in precipitation as a result of climate change will change the availability of freshwater resources.	*Freshwater withdrawals* are the quantity of freshwater extracted from surface and groundwater for use in human activities. *Renewable freshwater resources* are equal to annual internal flow of water plus inflow of water from neighbouring territories expressed in cubic metres per capita. Internal flow is equal to precipitation falling	Freshwater withdrawals and renewable freshwater resources are available for Arab region countries from the AquaStat database of the Food and Agriculture Organisation: http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en[h]	TFKCCS: 18 SDG 6.4.2 FDES 2.6.1 and 2.6.2.a SEEA-CF Water

	Indicator	Methodology	Data sources	Relation to other statistical/ indicator frameworks
	Water is a key resource in the Arab region.	on the national territory less evapotranspiration; it can be measured as the total volume of river run-off and groundwater renewed in natural conditions. Inflow from neighbouring territories includes surface and groundwater entering the national territory by crossing the borders of neighbouring countries.		
12	**Name:** *Number of deaths and missing persons attributed to hydrometeorological disasters, per 100,000 population* **Area:** Impacts **Rationale for inclusion:** Climate change is expected to increase global average surface temperatures, which is a particular concern in the Arab region where normal summertime temperatures are already high.	This indicator measures the number of people who died during the disaster, or directly after, as a direct result of the hazardous event Missing: The number of people whose whereabouts is unknown since the hazardous event. It includes people who are presumed dead although there is no physical evidence. The data on number of deaths and number of missing are mutually exclusive. Professionals have the option of recording heat as the cause of death.[i]	Data and statistics are important in understanding the impacts and costs of disasters. UNISDR provides systematic disaster data collection and analysis can be used to inform policy decisions to help reduce disaster risks and build resilience http://www.unisdr.org/we/inform/disaster-statistics	TFKCCS: 22 SDG 1.5.1, 11.5.1 and 13.1.2 SF A1 FDES 4.1.2.a
13	**Name:** *Occurrence of extreme weather events* **Area:** Impacts **Rationale for inclusion:** Climate change is expected to increase global average surface temperatures, which is a particular concern in the Arab region where normal summertime temperatures are already high, resulting in desertification, drought, floods, landslides, storm surge, soil erosion, and saline water intrusion.	This indicator measures the annual number of extreme heat events in a country. Though there is no generally accepted definition of an extreme heat event (or "heatwave"), it is generally accepted that a heatwave is defined by a number (3-5) of consecutive days with daily maximum and/or minimum temperatures above a certain threshold. For example: - the US Environmental Protection Agency defines a heatwave as "a four-day period with an average temperature that would	UNISDR provides systematic disaster data collection and analysis can be used to inform policy decisions to help reduce disaster risks and build resilience http://www.unisdr.org/we/inform/disaster-statistics. National meteorological offices of individual Arab region countries should be able to furnish the required data.	TFKCCS: 23 FDES 4.1.1.a

	Indicator		Methodology	Data sources	Relation to other statistical/ indicator frameworks
			only be expected to occur once every 10 years, based on the historical record"; - Perkins and Alexander (2012) define a heatwave as three consecutive days with maximum (or minimum) daily temperatures above the 90th percentile for that calendar day (using a 15-day window centred on the calendar day) based on the historical climate normal. This definition can be applied only during the summer months to avoid "winter heat waves".		
	14	**Name:** *Incidence and distribution of vector-borne and waterborne diseases* **Area:** Impacts **Rationale for inclusion:** Vector-borne disease transmission is expected to increase as a result of changes in temperature and rainfall patterns associated with climate change.	This indicator tracks the annual incidence of vector-borne diseases (number of cases). Vector-borne diseases are those transmitted by living organisms that can transmit infectious diseases between humans or from animals to humans. Many of these "vectors" are bloodsucking insects, which ingest disease-producing microorganisms during a blood meal from an infected host (human or animal) and then inject it into a new, uninfected host during a subsequent blood meal.[j]	The estimated number of deaths in Arab region countries due to tropical diseases and malaria is available from the Global Health Data Exchange: The estimated number of heat-related deaths in Arab region countries is available from the Global Health Data Exchange: http://ghdx.healthdata.org/gbd-results-tool?params=querytool-permalink/207424b5f62567c0e9a0f3185f6a104e[k]	TFKCCS: 26 FDES 5.2.3.a.1
Mitigation	15	**Name:** *Renewable energy share in final energy consumption* **Area:** Mitigation **Rationale for inclusion:** Production of energy from renewable sources is a means of meeting energy	The indicator measures the share (percent) of renewable sources in final energy consumption (see Indicator 4). Renewable sources include hydroelectricity; wind electricity; solar electricity and heat; geothermal	The share of renewable sources in final energy consumption is available for Arab region countries from the Energy Atlas of the International Energy Agency:	TFKCCS: 30 SDG 7.2.1 FDES 2.2.2a.3

	Indicator	Methodology	Data sources	Relation to other statistical/ indicator frameworks
	needs without (or with substantially reduced)[l] greenhouse gas emissions.	electricity and heat; biofuel/biowaste electricity and heat; waste product electricity and heat; and heat and other renewable electricity and heat.	http://energyatlas.iea.org/#!/tellmap/-1076250891/3	
16	**Name:** *Investments in energy efficiency and in renewable energies as a proportion of GDP* **Area:** Mitigation **Rationale for inclusion:** Investments represent a measure of the effort on the part of governments and business to address the need to maintain environmental quality. The share of these expenditures devoted to climate change mitigation is an indicator of the seriousness with which climate change is considered.	This indicator measures the (governmental, private sector and households) investments related to increasing efficiency and renewable energies to reduce the sources or enhance the sinks of greenhouse gasses for the limitation or reduction of GHG emissions; expressed as a share of GDP Environmental protection expenditures is defined as all activities directly aimed at the prevention, reduction and elimination of pollution or any other degradation of the environment.[m] The international *Classification of Environmental Protection Activities and Expenditure*[n] includes expenditures for climate change mitigation under heading 1.2.2.	International data source for the Arab region countries is available for this indicator. IRENA, RECREEE, REN21 National statistical offices of individual Arab region countries may be able to furnish the required data.	FDES 6.1.1.a, SEEA-CF Protection expenditures
17	**Name:** *Share of energy and transport related taxes as percentage of total taxes and social contributions* **Area:** Mitigation **Rationale for inclusion:** Taxes on energy and transportation products are a means of ensuring that their prices reflect the true social cost of their use, including the costs of damages associated with climate change.	This indicator measures is the amount of energy and transport taxes collected by government; and expressed as a share against Total taxes and social contributions. Environmentally related taxes include taxes on 1) energy products for transport purposes (petrol and diesel) and for stationary purposes (fossil fuels and electricity); 2) motor vehicles and transport (one-off import or sales taxes, recurrent taxes on registration or road use and other transport taxes);	No international data source for the Arab region countries is available for this indicator. National statistical offices of individual Arab region countries may be able to furnish the required data.	TFKCCS: 31 FDES 6.2.2.b.1, SEEA-CF Protection expenditures

		Indicator	Methodology	Data sources	Relation to other statistical/ indicator frameworks
			3) waste management (final disposal, packaging and other waste-related product taxes); 4) ozone-depleting substances and 5) other environmentally related taxes.		
Adaptation	18	**Name:** *Change in water use efficiency over time* **Area**: Adaptation **Rationale** for inclusion: This indicator is defined as the output over time of a given major sector per volume of (net) water withdrawn (showing the trend in water use efficiency). Following ISIC 4 coding, sectors are defined as agriculture, forestry and fishing (ISIC 4-A); manufacturing, constructions, mining and quarrying (ISIC 4-B, 4-C and 4-F); electricity industry (ISIC 4-D); and the municipal sector (ISIC 4-**E).**	To be developed within the SDG context	SEEA water accounts Water statistics, FAOSTAT Data availability very low (24% of the countries participating in the data availability survey are already producing this indicator, another 17% may be able to produce it within 3 years time)	FDES 2.6.2.h SEEA-CF 3.5 (Physical flow accounts for water) SDG 6.4.1
	19	**Name:** *Proportion of farmland area using sustainable management practices* **Area:** Adaptation Rationale for inclusion: In order to cope with changing temperature and precipitation patters due to climate change, farmers will have to adopt new management practices that increase yields while requiring less water and increasing tolerance to heat and prolonged drought.	This indicator measures the share of farmland area (percent) on which farmers use any kind of sustainable management practice, including improved irrigation, conservation tillage, alteration of crop mixes and others.[o]	No international data source for the Arab region countries is available for this indicator. National statistical offices or agriculture ministries of individual Arab region countries may be able to furnish the required data.	TFKCCS: 39 SDG 2.4.1 FDES 2.3.1.a

	Indicator		Methodology	Data sources	Relation to other statistical/ indicator frameworks
	20	**Name:** *Adoption of disaster risk management strategies* **Area:** Adaptation **Rationale for inclusion:** Formal disaster risk reduction strategies are a means of ensuring that the impacts of climate change have the minimum possible effect on the well-being of individuals, society and the economy.	This indicator measures the share (percent) of relevant jurisdictions (national government, provincial governments, local governments) that have adopted formal disaster risk reduction strategies.	No international data source for the Arab region countries is available for this indicator. Disaster planning offices of individual Arab region countries may be able to furnish the required data.	SF E1 SDG 1.5.3

[a] Bahrain, Egypt, Iraq, Kuwait, Libya, Oman, Qatar, Saudi Arabia and the United Arab Emirates.

[b] See http://unfccc.int/national_reports/non-annex_i_natcom/items/2716.php.

[c] https://public.wmo.int/en/programmes/global-climate-observing-system/essential-climate-variables.

[d] http://www.statcan.gc.ca/pub/16-002-x/2011001/part-partie2-eng.htm (accessed 20 December 2016).

[e] https://public.wmo.int/en/programmes/global-climate-observing-system/essential-climate-variables.

[f] http://www.statcan.gc.ca/pub/16-002-x/2011003/part-partie3-eng.htm (accessed 20 December 2016).

[g] http://www.fao.org/nr/water/aquastat/data/glossary/search.html.

[h] Unlike with the World Bank's development database, queries cannot be saved on the AquaStat database.

[i] For further information, see https://health2016.globalchange.gov/temperature-related-death-and-illness.

[j] For more information, see http://www.who.int/mediacentre/factsheets/fs387/en/.

[k] Note that not all tropical diseases are necessarily vector-borne.

[l] Some greenhouse gas emissions are associated with hydroelectric power production as a result of decomposition of vegetation on lands flooded for the creation of water reservoirs.

[m] More specifically, environmental protection expenditures consist of outlays and other transactions related to: inputs for environmental protection activities (energy, raw materials and other intermediate inputs, wages and salaries, taxes linked to production, consumption of fixed capital); capital formation and the buying of land (investment) for environmental protection activities; outlays for buying environmental protection products; and transfers for environmental protection (subsidies, investment grants, international aid, donations, taxes earmarked for environmental protection, etc.). For more information, see http://ec.europa.eu/eurostat/web/environment/environmental-protection-expenditure.

[n] See http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Classification_of_environmental_protection_activities_(CEPA).

[o] For a full list of sustainable agricultural management practices focused on climate change adaptation, see annex 4C in Verner (2012).

4. Climate Change-Related Statistics in Other Countries

Chapter 4 examines the production of climate change-related statistics in Canada, Kazakhstan and Slovenia - countries chosen to reflect a range of national income levels and statistical capacity. In each case, the following points are addressed:

- National greenhouse gas inventory production;
- The role of the national statistical office;
- Innovative features of climate change-related statistics.

1. Canada

(a) National greenhouse gas inventory

In Canada, responsibility for the official national greenhouse gas inventory rests with Environment and Climate Change Canada, the federal ministry of the environment and climate change.[40] As an Annex I country to the United Nations Framework Convention on Climate Change, Canada is obliged to submit an annual official emission inventory to the United Nations. Environment and Climate Change Canada uses data from a number of other government agencies, much of which comes from Statistics Canada, the national statistics agency.

(b) Role of the national statistical office

In addition to providing much of the activity data[41] required to compile the national greenhouse gas emissions inventory, Statistics Canada produces a variety of other climate change-related statistics, including the following:

- Environmental accounts following the SEEA methodology: energy-use accounts and greenhouse gas emission accounts;[42] water-use accounts;[43] water stock (renewable water resource) accounts;[44] and, on an experimental basis, ecosystem accounts;[45]
- Basic energy statistics: national energy balance;[46]
- Basic environmental statistics: data on the use of sustainable management practices on farms;[47] data on environmental protection expenditures;[48] and data on revenues from sale of environmental technologies;[49]
- Special studies: trends in temperature, precipitation, snow cover, sea-ice extent and glacier mass balance.[50]

Table 6 provides an example of climate change-related statistics available from Statistics Canada. It shows the final use of energy and greenhouse gas emissions, in total and broken down by economic sector. Such statistics are valuable because they are classified using the same economic breakdown used in the System of National Accounts. That readily permits integration with national accounting data to calculate environmental efficiency indicators; for example, greenhouse emissions per unit of value added by sector. At a

more basic level, the figure in the highlighted cell (total greenhouse emissions) is that required to calculate indicator 1 (total greenhouse emissions) in the proposed set of Arab climate change-related statistics shown in table 5.

(c) Innovative features of climate change-related statistics

Statistics Canada is considering the creation of an environmental census that would provide a comprehensive and ongoing register of Canada's ecosystems. It could be used to measure and track the total value of assets and related ecosystem services. One year of seed funding has been provided to test feasibility and gauge interest from other federal departments. The initiative, if successful, could respond to the recommendation by the Conference of European Statisticians to develop statistics to monitor biodiversity and ecosystems.

Table 6. Energy use and greenhouse gas emissions in Canada, 2014

Sector	Energy use			Greenhouse gas emissions		
	Terajoules	Percentage of total	Percentage change from previous year	Kilotonnes	Percentage of total	Percentage change from previous year
Total, industries and households	11,888,438	100	1.2	768,238	100	0.5
Agriculture, forestry, fishing and hunting	316,079	2.7	-0.5	83,734	10.9	-1.1
Mining, quarrying, and oil and gas extraction	2,190,485	18.4	2.9	176,118	22.9	2.7
Utilities and construction	1,464,248	12.3	-0.9	94,833	12.3	-2.5
Manufacturing	2,417,070	20.3	1.6	127,343	16.6	-0.5
Wholesale and retail trade	330,365	2.8	-5.2	17,399	2.3	-5.5
Transportation and warehousing	1,032,952	8.7	3.3	68,993	9	3
Other services and public administration	1,281,840	10.8	-3.9	51,985	6.8	-3.6
Households	2,855,398	24	3.5	147,833	19.2	2.9

Source: Statistics Canada, Physical Flow Account for Energy Use, CANSIM Table 153-0113; and Statistics Canada, Physical Flow Account for Greenhouse Gas Emissions, CANSIM Table 153-0114.

2. Kazakhstan

(a) National greenhouse gas inventory

Kazakhstan has a somewhat unusual status with regard to the Framework Convention on Climate Change and the Kyoto Protocol. Kazakhstan is considered an Annex I party for the purposes of the Protocol but remains a non-Annex I party for the purposes of the Convention. For that reason, Kazakhstan is not obliged to prepare an annual national greenhouse gas emissions inventory in the same way as other Annex I countries. Rather, it must submit a 'national communication' to the Convention, for which the responsible agency is the Ministry of Environment and Water Protection. As in Canada, the national statistics office of Kazakhstan is an important source of data for national communication.

(b) Role of the national statistics agency

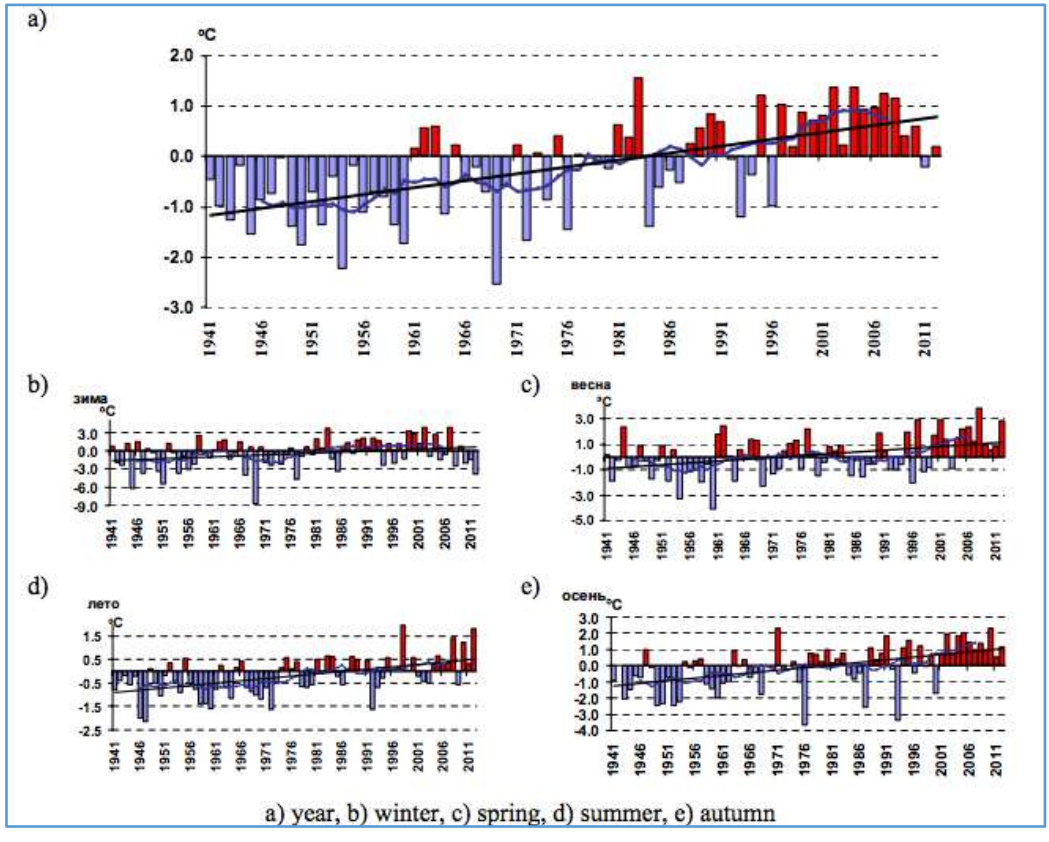
In addition to providing much of the activity data required for the preparation of the national communication to the Framework Convention, the Kazakhstan Committee on Statistics produces a variety of other climate change-related statistics, including the following:[51]

- Basic energy statistics: total primary energy supply, final energy consumption, energy intensity and renewable energy consumption;[52]
- Basic environmental statistics: long-term air temperature trends with departures from normal; long-term precipitation data with departures from normal; and greenhouse gas emissions.

(c) Innovative features of climate change-related statistics

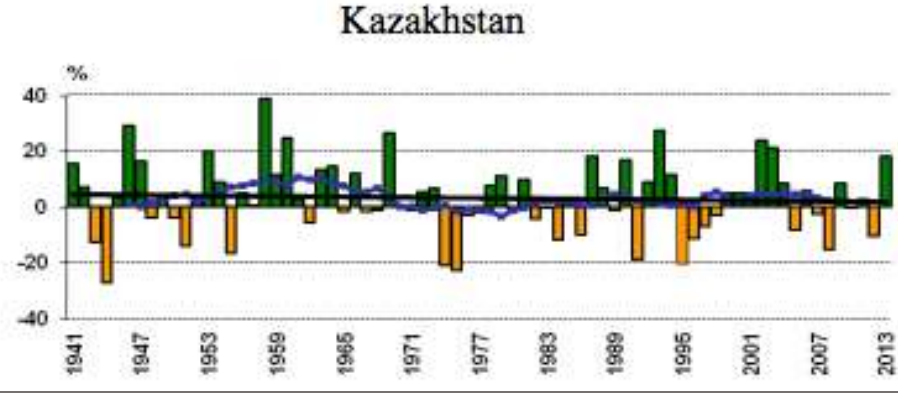
The national meteorological service of Kazakhstan has published reviews of climate change in Kazakhstan in a series of bulletins since 2008. The bulletins provide detailed long-term trends in temperature and precipitation in all regions of the country, plus detailed analyses of climate data.[53] Figure 2 provides an example of the analysis included in the bulletins. The trend in annual and seasonal (winter, spring, summer and autumn) temperature departures from the 1971 to 2000 normal for the period 1941 to 2012 are shown, along with an 11-year moving average trend line. In all cases, the trend line is upward, consistent with a warming climate. That is an example of what indicator 8 (temperature departure from normal) in the set of Arab climate change-related statistics proposed in table 5 would look like using data for a real country. The meteorological service of Kazakhstan also publishes data on the national precipitation departure from normal (indicator 9 in the set proposed in table 5). Unlike the trend in temperature, the precipitation departure from normal was not significantly different from zero in Kazakhstan from 1941 to 2013.

Figure 2. Temperature departure from normal, annual and by season in Kazakhstan, 1941-2012



Source: https://kazhydromet.kz/en/p/monitoring-klimata-kazahstana.

Figure 3. Precipitation departure from normal in Kazakhstan, 1941-2013



Source: https://kazhydromet.kz/en/p/monitoring-klimata-kazahstana.

3. Slovenia

(a) National greenhouse gas inventory

In Slovenia, responsibility for the official national greenhouse gas inventory rests with the Slovene Environment Agency.[54] As an Annex I country to the Kyoto Protocol, Slovenia is obliged to submit an annual official emission inventory. As in Canada and Kazakhstan, the Slovene Environment Agency works closely with the Statistical Office of the Republic of Slovenia to produce the greenhouse gas inventory. Data flows in both directions during the inventory production process. In the process of emission calculation, the Environment Agency estimates data on fuel use in agriculture and forestry, which it provides to the Statistical Office for inclusion in the national energy balance. The Statistical Office is involved in the international reviews of Slovenia's greenhouse gas inventory, to ensure data consistency and assess any improvements required. These flows are portrayed in figure 4.

(b) Role of the national statistics agency

In addition to providing activity data required to compile the national greenhouse gas emissions inventory, the Statistical Office produces a variety of other climate change-related statistics, including the following:

- Environmental accounts following the SEEA methodology: energy-use accounts; environmental taxation accounts; air emission accounts (including greenhouse gas); environmental protection expenditure accounts; and environmental goods and services sector accounts;[55]
- Basic environmental and energy statistics: data on, among other items, water use by industry and for irrigation.[56]

In producing those data, the Statistical Office makes use of administrative data from other agencies, including the following:

- Energy statistics: Ministry of Infrastructure, Energy Directorate;
- Agriculture statistics: Ministry of Agriculture, Forestry and Food; Agency for Agriculture Market and Rural Development; Administration for Food Safety, Veterinary and Plant Protection;
- Waste statistics: Ministry of the Environment.

The Statistical Office also uses modelling to produce statistics on energy consumption in households and by sector.

(c) Innovative features of climate change-related statistics

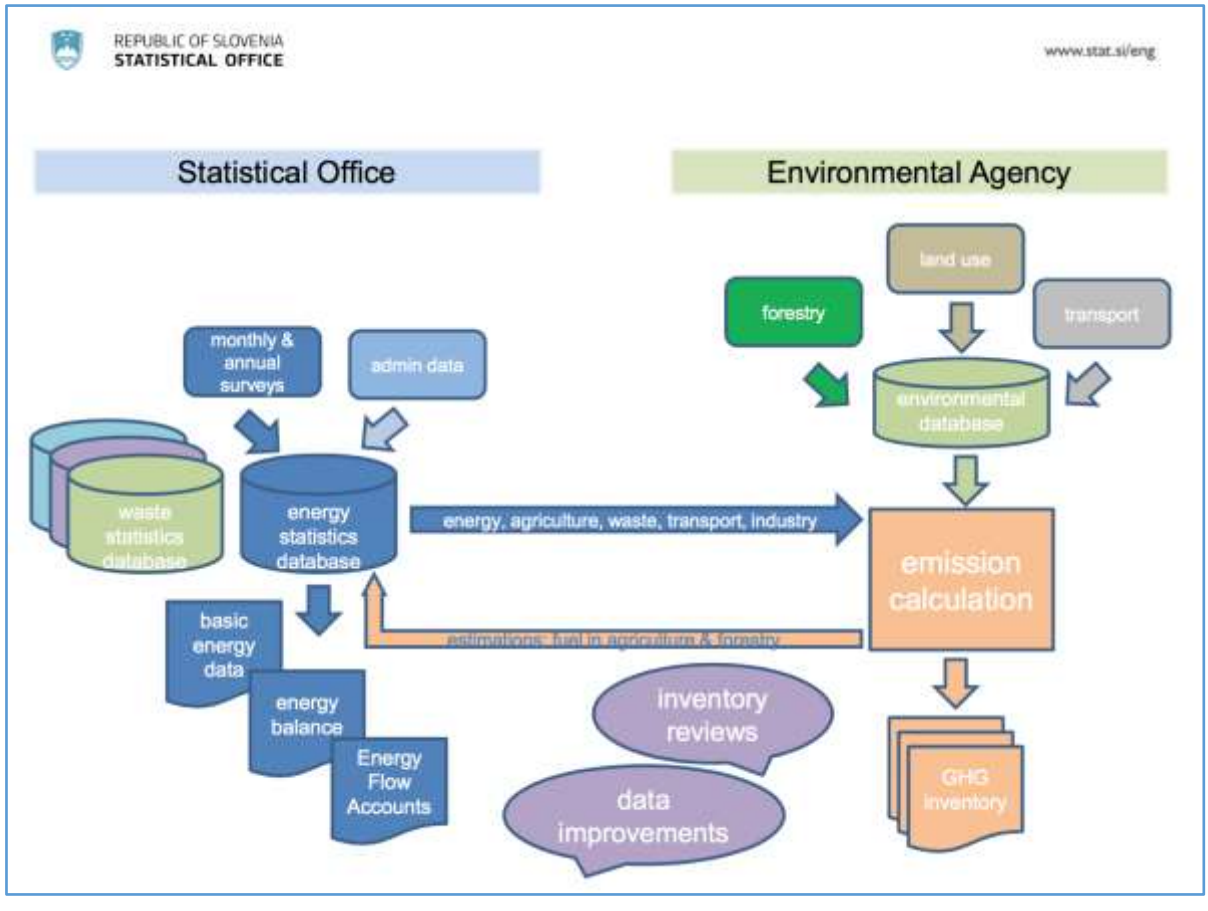
Slovenia is one of only a handful of countries to have produced a formal 'green growth' report following the framework developed by the Organization for Economic Cooperation and Development (OECD).[57] The report provides a comprehensive overview of green growth in Slovenia, focusing on the following indicators:

- Resource and environmental productivity;
- Natural resource base;
- Environmental quality of life;
- Economic opportunities and policy responses.

Several of the indicators are directly or indirectly relevant to climate change, including the following: indicators on energy and carbon

dioxide productivity; the indicator on freshwater resources; and the indicator on share of government budgetary appropriations or outlays on research and development earmarked for the environment and energy.[58]

Figure 4. Information flows in the Slovene greenhouse gas emission inventory process



Source: http://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.33/2016/mtg2/Sess3_Slovenia_National_Inventory_System.pdf.

5. Conclusions and Recommendations

Given the importance of climate change at the global level and in the Arab region, national statistical offices play an important role in the provision and coordination of climate change-related statistics. Their many strengths include transparency, methodological soundness and public accessibility. Climate change is a complex issue that requires contributions from all sectors of society. A great deal of data is needed to ensure success. Statistical offices can provide such data, even if this role falls outside their traditional areas of expertise.

Statistical offices play a key role to play in the development of climate change-related statistics. Even those that measure only economic and social phenomena already measure many variables of relevance to climate change. Data on industrial production and demographic trends, for example, are essential to understanding the drivers and effects of climate change. Statistical offices also have many other strengths to build upon, including independence, long time-series, a commitment to data quality, transparency, and sound methodologies. At the same time, statistical offices in all countries are improving upon the quality of the statistical information they produce. Efforts in this regard include building awareness of official statistics, filling data gaps, improved timeliness, easier access to data, and better tools to help users understand statistics.

With its mandate for statistical capacity-building in new areas, ESCWA has prepared the present study based on work by the Economic Commission for Europe and the Conference of European Statisticians, and their established task forces. The study presents the background and the existing international frameworks for climate change indicators from an official statistics perspective, and a proposed list of climate change-related indicators for the Arab region discussed during an expert group meeting in January 2017.

Recommendations

National statistical offices in the Arab region should prioritize developing climate change-related statistics, and cooperating with other relevant agencies and organizations. With regard to regional priorities, emphasis should be placed on statistics dealing with adaptation and mitigation; statistics dealing with emissions are a lower priority.

Arab national statistical offices and other relevant organizations in the region, such as the League of Arab States, are invited to consider the set of climate change-related indicators set out in the present study as the basis for an Arab set of climate change-related indicators. They were drawn from a set of indicators proposed by the United Nations Experts on Environmental-Economic Accounting, because of their relevance to the region and their conformity to global reporting standards and the SDGs. Nonetheless, any necessary changes

to the set should be considered.[59] ESCWA will support their implementation.

Arab national statistical offices are invited to improve methodologies in the development of climate change-related statistics by incorporating recommendations on climate change-related statistics made by the Conference of European Statisticians of the Economic Commission for Europe and the Statistical Commission. The following points should be considered:

(a) Increase the amount and quality of statistics available for green-house-gas inventory compilation and climate change analysis, especially those related to adaptation and mitigation. Most climate change-related statistics currently available in the region come from databases maintained by international organizations rather than national statistical offices. While useful, those statistics often do not reflect the real situation in the countries under consideration;
(b) Improve the infrastructure used by national statistical offices (classification systems, registers, definitions, frameworks) to better support compilation of climate-change related statistics. The following infrastructure needs should be considered, in particular:
- include explicit references to environmental statistics in national laws governing national statistical offices;
- develop new approaches for preserving confidentiality, so that users of climate change-related statistics can access microdata without compromising the privacy of individuals;

(c) Establish new partnerships between national statistical offices and other agencies to ensure that statistical offices can access the expertise and methodologies required for producing climate change-related statistics. To effectively develop climate change-related statistics, statistical offices should encourage contributions from sectors outside their traditional areas;
(d) Review the organizational structure of national statistical offices to ensure they have the capacity to support production of climate change-related statistics;
(e) Ensure that statistics are compiled upon well-founded and agreed principles, so as to guarantee consistency over time and across geographical areas, and to inform public policy.

The proposed list of 20 indicators should be tested in Arab countries to determine data compilation challenges, and to build upon successful pilots from other regions and sectors and adapt them to the local context.

Annex I. Original Set of Proposed Arab Climate Change-Related Indicators

Indicator		Methodology	Data sources	Relation to other statistical/ indicator frameworks
1	**Name:** *Total Greenhouse Gas Emissions* **Climate change area of relevance:** Emissions **Rationale for inclusion:** Total GHG emissions represents the national contribution to the primary cause of human-induced climate change	Greenhouse gas emissions should be measured following the guidelines of the Framework Convention for Climate Change for non-Annex I countries of the Kyoto Protocol.[a] Total greenhouse gas emissions is the sum of CO_2 emissions (kilotonnes) plus CH_4, N_2O, HFC, PFC and SF_6 emissions (kilotonnes of CO_2 equivalents).	Data on total GHG emissions plus emissions of the individual gases (CO_2, CH_4, N_2O, HFCs, PFCs and SF_6) for Arab region countries are available from the World Bank development database at: http://databank.worldbank.org/data/Arab_GHG-emissions_total/id/97f9e292	TFKCCS: 9 FDES 3.1.1 SEEA 3.6.3
2	**Name:** *CO_2 Emissions from Fossil Fuel Combustion* **Area:** Emissions **Rationale for inclusion:** Fossil fuel combustion is the largest source of CO_2 emissions and CO_2 is the most important greenhouse gas in terms of contribution to climate change	CO_2 emissions from fossil fuel combustion should be measured following the guidelines of the Framework Convention for Climate Change for non-Annex I countries of the Kyoto Protocol. CO_2 emissions should be measured in kilotonnes.	Data on CO_2 emissions from fossil fuel combustion for Arab region countries up to 2012 are available from the World Bank development database at: http://databank.worldbank.org/data/CO2-from-fossil-fuels_Arab-region/id/b6bf9be0	TFKCCS: 10 FDES 3.1.1.a.1, SEEA 3.6.3
3	**Name:** *GHG Emissions Intensity of the Economy* **Area:** Emissions **Rationale for inclusion:** Emissions per unit of	Greenhouse gas emissions intensity is measured as the ratio of total greenhouse gas emissions (see Indicator 1) divided by GDP measured in real (i.e., inflation adjusted) terms. To permit comparison between countries,	See Indicator 1 for data source for total greenhouse gas emissions. Real GDP in purchasing power parity adjusted U.S. dollars for Arab region countries: http://databank.worldbank.org/da	TFKCCS: 13 FDES 3.1.1 SEEA 3.6.3

Indicator		Methodology	Data sources	Relation to other statistical/ indicator frameworks
	economic output are a useful means of tracking progress in decoupling growth of emissions from growth of the economy	two versions of the indicator should be compiled: one using GDP measured in local currency and one using GDP measured in U.S. dollars converted using purchasing power parities.	ta/GDP_Arab-region_2011-US-dollars-PPP/id/22a0fc7c Real GDP in local currency for Arab region countries: http://databank.worldbank.org/data/GDP_Arab-region_local-currency/id/dc1db519	
4	**Name:** *Total Primary Energy Supply* **Area:** Drivers **Rationale for inclusion:** Energy use is the most important contributor to greenhouse gas emissions.	The indicator measures the total primary energy supplied (million tonnes of oil equivalent) to the domestic economy. Primary energy includes crude oil; natural gas; coal; hydroelectricity; nuclear electricity; wind electricity; solar electricity and heat; geothermal electricity and heat; biofuel/biowaste electricity and heat; waste product electricity and heat; and heat and other renewable electricity and heat. Supply equals domestic production less exports plus imports, plus net changes in inventories, plus changes in international marine and aviation bunkers.	Total primary energy supply is available for Arab region countries from the Energy Atlas of the International Energy Agency: http://energyatlas.iea.org/#!/tellmap/-1002896040	TFKCCS: 1 FDES 2.2.2.a.4 SEEA 3.4
5	**Name:** *Share of Fossil Fuels in Total Primary Energy Consumption* **Area:** Drivers **Rationale for inclusion:** Fossil fuel combustion is the largest source of greenhouse gas emissions.	The indicator measures the share (percent) of fossil fuels (oil, coal and natural gas) in total primary energy supplied to the domestic economy (see Indicator 4).	The share of fossil fuels in total primary energy supply is available for Arab region countries from the World Bank development database: http://databank.worldbank.org/data/Fossi-fuel-share-of-TPES_Arab-region/id/b700c357	TFKCCS: 2 FDES 2.2.2.a.4 SEEA 3.4
6	**Name:** *Public Financial Support for Fossil Fuel Production* **Area:** Drivers **Rationale for inclusion:** Fossil fuel combustion is the	The indicator measures the value of public financial support (tax breaks, subsidies, transfers and other support mechanisms) supporting the extraction, distribution and use of fossil fuels expressed as a share of GDP.	Public financial support for fossil fuel production as a share of GDP is available for oil-producing Arab region countries[b] for the year 2014 from the IEA Fossil Fuel Subsidies Database: http://www.worldenergyoutlook.org/media/weowebsite/2015/Subsidies20122014.xlsx	TFKCCS: 4 SEEA 4.4

Indicator		Methodology	Data sources	Relation to other statistical/ indicator frameworks
	largest source of greenhouse gas emissions. Subsidies reduce the cost of fossil fuels to consumers and, therefore, increase their consumption.			
7	**Name:** *Energy Intensity of the Economy* **Area:** Drivers **Rationale for inclusion:** Energy use per unit of economic output is a useful means of tracking progress in decoupling growth of energy use from growth of the economy	The indicator measures the total primary energy supplied to the domestic economy (see Indicator 4) per unit of GDP. To permit comparison between countries, two versions of the indicator should be compiled: one using GDP measured in local currency and one using GDP measured in U.S. dollars converted using purchasing power parities.	Total primary energy use per unit of GDP measured in U.S. dollars converted using purchasing power parities is available for Arab region countries from the World Bank development database: http://databank.worldbank.org/data/TPES-per-unit-of-GDP_Arab-region/id/251bbbf8	TFKCCS: 5 SDG 7.3.1 FDES 2.2.2.a, SEEA 3.4
8	**Name:** *Temperature Departure from Normal* **Area:** Impacts **Rationale for inclusion:** Departures of temperatures from historical normals are a means of tracking change in temperature over time. Surface air temperature is considered by the World Meteorological Organization-Global Climate Observing System as an Essential Climate Variable.[c]	The indicator measures the annual mean and seasonal mean, maximum and minimum temperature departures from the temperature "normal". The "normal" is the average value over a 30-year time period. Normals are usually available from national meteorology offices. For further information on the methodology for this indicator, see Statistics Canada (2011a).[d]	No international data source for the Arab region countries is available for this indicator. National meteorological offices of individual Arab region countries should be able to furnish the required data.	FDES 1.1.1.

Indicator		Methodology	Data sources	Relation to other statistical/ indicator frameworks
9	**Name:** *Precipitation Departure from Normal* **Area:** Impacts **Rationale for inclusion:** Departures of precipitation from historical normals are a means of tracking change in precipitation over time. Precipitation is considered by the World Meteorological Organization-Global Climate Observing System as an Essential Climate Variable.[e]	The indicator measures the annual mean and seasonal mean, maximum and minimum precipitation departures from the precipitation "normal". The "normal" is the average value over a 30-year time period. Normals are usually available from national meteorology offices. For further information on the methodology for this indicator, see Statistics Canada (2011b).[f]	No international data source for the Arab region countries is available for this indicator. National meteorological offices of individual Arab region countries should be able to furnish the required data.	FDES 1.1.1
10	**Name:** *Share of Agricultural Land Affected by Drought* **Area:** Impacts **Rationale for inclusion:** Changes in precipitation patters associated with climate change are expected to lead to increased drought in the region (Verner, 2012).	This indicator measures the share of agriculture land (percent) that is affected by drought each year. For this purposes of this indicator, drought is defined as *a period in which the actual rainfall is significantly less than the average for the locale in question. Drought is characterized by decreased river bank heights, river volume, and/or groundwater levels.*[g]	No international data source for the Arab region countries is available for this indicator. National statistical offices or agriculture ministries of individual Arab region countries should be able to furnish the required data.	TFKCCS: 21 SDG 15.3.1 (tier 3) FDES 1.1.4.b
11	**Name:** *Freshwater Withdrawals as a Share of Renewable Freshwater Resources* **Area:** Impacts **Rationale for inclusion:** Changes in precipitation as a result of climate	*Freshwater withdrawals* are the quantity of freshwater extracted from surface and groundwater for use in human activities. *Renewable freshwater resources* are equal to annual internal flow of water plus inflow of water from neighbouring territories expressed in cubic metres per capita. Internal flow is equal to precipitation falling on the	Freshwater withdrawals and renewable freshwater resources are available for Arab region countries from the AquaStat database of the Food and Agriculture Organization: http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en[h]	TFKCCS: 18 SDG 6.4.2 FDES 2.6.1 and 2.6.2.a SEEA 3.5 and 5.11

Indicator		Methodology	Data sources	Relation to other statistical/ indicator frameworks
	change will change the availability of freshwater resources. Water is a key resource in the Arab region.	national territory less evapotranspiration; it can be measured as the total volume of river run-off and groundwater renewed in natural conditions. Inflow from neighbouring territories includes surface and groundwater entering the national territory by crossing the borders of neighbouring countries.		
12	**Name:** *Number of Heat-related Deaths* **Area:** Impacts **Rationale for inclusion:** Climate change is expected to increase global average surface temperatures, which is a particular concern in the Arab region where normal summertime temperatures are already high.	This indicator measures the annual number of deaths attributable to high temperatures. When people are exposed to extreme heat, they can suffer from potentially deadly illnesses, such as heat exhaustion and heat stroke. Hot temperatures can also contribute to deaths from heart attacks, strokes, and other forms of cardiovascular disease. Death certificates give medical professionals the option of recording heat as the cause of death.[i]	The estimated number of heat-related deaths in Arab region countries is available from the Global Health Data Exchange: http://ghdx.healthdata.org/gbd-results-tool?params=querytool-permalink/fbc48ab698d649ffdde7a006bc01816a[j]	TFKCCS: 22 SDG 1.5.1, 11.5.1 and 13.1.2 SF A1 FDES 4.1.2.a
13	**Name:** *Number of Extreme Heat Events* **Area:** Impacts **Rationale for inclusion:** Climate change is expected to increase global average surface temperatures, which is a particular concern in the Arab region where normal summertime temperatures are already high.	This indicator measures the annual number of extreme heat events in a country. Though there is no generally accepted definition of an extreme heat event (or "heatwave"), it is generally accepted that a heatwave is defined by a number (3-5) of consecutive days with daily maximum and/or minimum temperatures above a certain threshold. For example: - the US Environmental Protection Agency defines a heatwave as "a four-day period with an average temperature that would only be expected to occur once every 10 years, based on the historical record";	No international data source for the Arab region countries is available for this indicator. National meteorological offices of individual Arab region countries should be able to furnish the required data.	TFKCCS: 23 FDES 4.1.1.a

Indicator		Methodology	Data sources	Relation to other statistical/ indicator frameworks
		- Perkins and Alexander (2012) define a heatwave as three consecutive days with maximum (or minimum) daily temperatures above the 90th percentile for that calendar day (using a 15-day window centred on the calendar day) based on the historical climate normal. This definition can be applied only during the summer months to avoid "winter heat waves".		
14	**Name:** *Incidence and Distribution of Vector-borne diseases* **Area:** Impacts **Rationale for inclusion:** Vector-borne disease transmission is expected to increase as a result of changes in temperature and rainfall patterns associated with climate change.	This indicator tracks the annual incidence of vector-borne diseases (number of cases). Vector-borne diseases are those transmitted by living organisms that can transmit infectious diseases between humans or from animals to humans. Many of these "vectors" are bloodsucking insects, which ingest disease-producing microorganisms during a blood meal from an infected host (human or animal) and then inject it into a new, uninfected host during a subsequent blood meal.[k]	The estimated number of deaths in Arab region countries due to tropical diseases and malaria is available from the Global Health Data Exchange: The estimated number of heat-related deaths in Arab region countries is available from the Global Health Data Exchange: http://ghdx.healthdata.org/gbd-results-tool?params=querytool-permalink/207424b5f62567c0e9a0f3185f6a104e[l]	TFKCCS: 26 FDES 5.2.3.a.1
15	**Name:** *Renewable Energy Share in Total Primary Energy Supply* **Area:** Mitigation **Rationale for inclusion:** Production of energy from renewable sources is a means of meeting energy needs without (or with substantially reduced)[m] greenhouse gas emissions.	The indicator measures the share (percent) of renewable sources in total primary energy supplied to the domestic economy (see Indicator 4). Renewable sources include hydroelectricity; wind electricity; solar electricity and heat; geothermal electricity and heat; biofuel/biowaste electricity and heat; waste product electricity and heat; and heat and other renewable electricity and heat.	The share of renewable sources in total primary energy supply is available for Arab region countries from the Energy Atlas of the International Energy Agency: http://energyatlas.iea.org/#!/tellmap/-1076250891/3	TFKCCS: 30 SDG 7.2.1 FDES 2.2.2a.3

Indicator		Methodology	Data sources	Relation to other statistical/ indicator frameworks
16	**Name:** *Share of Environmental Protection Expenditures Devoted to Climate Change Mitigation* **Area:** Mitigation **Rationale for inclusion:** Environmental protection expenditures represent a measure of the effort on the part of governments and business to address the need to maintain environmental quality. The share of these expenditures devoted to climate change is an indicator of the seriousness with which climate change is considered.	This indicator measures the share (percent) of business and government current and capital expenditures on environmental protection devoted to climate change mitigation. Environmental protection is defined as all activities directly aimed at the prevention, reduction and elimination of pollution or any other degradation of the environment.[n] The international *Classification of Environmental Protection Activities and Expenditure*[o] includes expenditures for climate change mitigation under heading 1.2.2.	No international data source for the Arab region countries is available for this indicator. National statistical offices of individual Arab region countries may be able to furnish the required data.	FDES 6.1.1.a, SEEA 4.4
17	**Name:** *Environmentally related tax revenue and structure by tax base* **Area:** Mitigation **Rationale for inclusion:** Taxes on energy and transportation products are a means of ensuring that their prices reflect the true social cost of their use, including the costs of damages	This indicator measures the annual environmentally related tax revenue as percentage of total tax revenue. Environmentally related taxes include taxes on 1) energy products for transport purposes (petrol and diesel) and for stationary purposes (fossil fuels and electricity); 2) motor vehicles and transport (one-off import or sales taxes, recurrent taxes on registration or road use and other transport taxes); 3) waste management (final disposal, packaging and other waste-related product taxes); 4) ozone-depleting substances and	No international data source for the Arab region countries is available for this indicator. National statistical offices of individual Arab region countries may be able to furnish the required data.	TFKCCS: 31 FDES 6.2.2.b.1, SEEA 4.4

Indicator		Methodology	Data sources	Relation to other statistical/ indicator frameworks
	associated with climate change.	5) other environmentally related taxes.		
18	**Name:** *Carbon Price*[p] **Area:** Mitigation **Rationale for inclusion:** Placing a price on emissions of CO_2 and other greenhouse gases is a means of ensuring users pay a price for fossil fuels and other products that includes the costs of damages associated with climate change.	This indicator measures the price paid for emissions of CO_2 and other greenhouse gases (value per tonne). To permit comparison between countries, two versions of the indicator should be compiled: one using GDP measured in local currency and one using GDP measured in U.S. dollars converted using purchasing power parities.	No international data source for the Arab region countries is available for this indicator. National statistical offices or finance ministries of individual Arab region countries may be able to furnish the required data.	TFKCCS: 33
19	**Name:** *Proportion of Population Living in Dwellings with Air Conditioning* **Area:** Adaptation **Rationale for inclusion:** Air conditioning is a means of reducing the heat stress associated with climate change.[q]	This indicator measures the share (percent) of households living in an air conditioned house or apartment.	No international data source for the Arab region countries is available for this indicator. National statistical offices or housing ministries of individual Arab region countries may be able to furnish the required data.	TFKCCS: 37
20	**Name:** *Proportion of Farmland Area using Sustainable Management Practices* **Area:** Adaptation Rationale for inclusion: In order to cope with changing temperature and precipitation patters due to climate change, farmers	This indicator measures the share of farmland area (percent) on which farmers use any kind of sustainable management practice, including improved irrigation, conservation tillage, alteration of crop mixes and others.[r]	No international data source for the Arab region countries is available for this indicator. National statistical offices or agriculture ministries of individual Arab region countries may be able to furnish the required data.	TFKCCS: 39 SDG 2.4.1 FDES 2.3.1.a

Indicator		Methodology	Data sources	Relation to other statistical/ indicator frameworks
	will have to adopt new management practices that increase yields while requiring less water and increasing tolerance to heat and prolonged drought.			

[a] See http://unfccc.int/national_reports/non-annex_i_natcom/items/2716.php.

[b] Bahrain, Egypt, Iraq, Kuwait, Libya, Oman, Qatar, Saudi Arabia and the United Arab Emirates.

[c] https://public.wmo.int/en/programmes/global-climate-observing-system/essential-climate-variables.

[d] http://www.statcan.gc.ca/pub/16-002-x/2011001/part-partie2-eng.htm (accessed 20 December 2016).

[e] https://public.wmo.int/en/programmes/global-climate-observing-system/essential-climate-variables.

[f] http://ww.statcan.gc.ca/pub/16-002-x/2011003/part-partie3-eng.htm (accessed 20 December 2016).

[g] http://www.fao.org/nr/water/aquastat/data/glossary/search.html?lang=en&submitBtn=-1&termId=4509.

[h] Unlike with the World Bank's development database, queries cannot be saved on the AquaStat database.

[i] For further information, see https://health2016.globalchange.gov/temperature-related-death-and-illness.

[j] The Global Health Data Exchange combines deaths related to extreme heat and extreme cold into a single category. It is assumed here that all such deaths in the Arab region are the result of extreme heat.

[k] For more information, see http://www.who.int/mediacentre/factsheets/fs387/en/.

[l] Note that not all tropical diseases are necessarily vector-borne.

[m] Some greenhouse gas emissions are associated with hydroelectric power production as a result of decomposition of vegetation on lands flooded for the creation of water reservoirs.

[n] More specifically, environmental protection expenditures consist of outlays and other transactions related to: inputs for environmental protection activities (energy, raw materials and other intermediate inputs, wages and salaries, taxes linked to production, consumption of fixed capital); capital formation and the buying of land (investment) for environmental protection activities; outlays for buying environmental protection products; and transfers for environmental protection (subsidies, investment grants, international aid, donations, taxes earmarked for environmental protection, etc.). For more information, see http://ec.europa.eu/eurostat/web/environment/environmental-protection-expenditure.

[o] See http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Classification_of_environmental_protection_activities_(CEPA).

[p] Although no Arab country makes use of a carbon tax to date, this indicator is maintained in the set for future reference.

[q] Air conditioning may also be a substantial contributor to climate change, as the equipment uses large quantities of electricity that, depending on the source of the electricity, may result in significant greenhouse gas emissions.

[r] For a full list of sustainable agricultural management practices focused on climate change adaptation, see annex 4C available from https://openknowledge.worldbank.org/handle/10986/12216.

Annex II. Sustainable Development Goals, Targets and Indicators Related to Climate Change (other than SDG 13)

Goal 1. End poverty in all its forms everywhere	
1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	1.5.1 Number of deaths, missing persons and persons affected by disaster per 100,000 people
	1.5.2 Direct disaster economic loss in relation to global gross domestic product (GDP)
	1.5.3 Number of countries with national and local disaster risk reduction strategies
	2.3.2 Average income of small-scale food producers, by sex and indigenous status
2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	2.4.1 Proportion of agricultural area under productive and sustainable agriculture
Goal 6. Ensure availability and sustainable management of water and sanitation for all	
6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1 Change in water-use efficiency over time
	6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	6.6.1 Change in the extent of water-related ecosystems over time
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all	
7.1 By 2030, ensure universal access to affordable, reliable and modern energy services	7.1.2 Proportion of population with primary reliance on clean fuels and technology
7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption
7.3 By 2030, double the global rate of improvement in energy efficiency	7.3.1 Energy intensity measured in terms of primary energy and GDP
7.a By 2030, enhance international cooperation to facilitate access	7.a.1 Mobilized amount of United States dollars per year starting in 2020

to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	accountable towards the $100 billion commitment
7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States and landlocked developing countries, in accordance with their respective programmes of support	7.b.1 Investments in energy efficiency as a percentage of GDP and the amount of foreign direct investment in financial transfer for infrastructure and technology to sustainable development services
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	
9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities	9.4.1 CO_2 emission per unit of value added
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable	
11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	11.5.1 Number of deaths, missing persons and persons affected by disaster per 100,000 people
	11.5.2 Direct disaster economic loss in relation to global GDP, including disaster damage to critical infrastructure and disruption of basic services
11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels	11.b.1 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030
	11.b.2 Number of countries with national and local disaster risk reduction strategies
Goal 12. Ensure sustainable consumption and production patterns	
12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in	12.8.1 Extent to which (i) global citizenship education and (ii) education for sustainable development (including climate change education) are mainstreamed in (a) national education policies; (b) curricula; (c)

harmony with nature	teacher education; and (d) student assessment
12.c Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities	12.c.1 Amount of fossil-fuel subsidies per unit of GDP (production and consumption) and as a proportion of total national expenditure on fossil fuels
Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development	
14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels	14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	
15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	15.1.1 Forest area as a proportion of total land area
	15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type
15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	15.2.1 Progress towards sustainable forest management
15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world	15.3.1 Proportion of land that is degraded over total land area

Annex III. Greenhouse Gas and Carbon Dioxide Emissions

Table AIII.1 Total greenhouse gas emissions excluding land-use change and forestry

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Algeria	119.09	116.78	123.53	128.45	131.25	136.49	142.51	150.97	155.75	166.24	167.85	173.98	187.33
Bahrain	21.38	22.01	23.01	23.64	23.74	26.62	28.66	29.00	31.11	31.53	32.70	32.82	33.25
Comoros	0.28	0.29	0.30	0.30	0.31	0.30	0.32	0.30	0.33	0.33	0.35	0.39	0.40
Djibouti	1.10	1.06	1.15	1.17	1.16	1.17	1.17	1.21	1.25	1.22	1.28	1.24	2.58
Egypt	169.87	181.93	190.81	198.42	210.72	231.52	240.08	256.09	267.71	271.89	275.16	281.34	288.19
Iraq	185.31	184.66	181.07	170.61	165.59	175.14	163.64	174.90	187.54	210.69	227.87	242.87	257.09
Jordan	19.41	19.56	21.26	20.93	22.88	24.39	24.87	26.28	25.94	26.40	26.14	27.44	27.42
Kuwait	137.43	145.14	152.11	160.20	167.54	179.39	179.14	178.90	183.96	191.22	190.63	195.60	202.50
Lebanon	18.03	19.33	19.24	19.66	20.09	19.39	18.01	16.77	20.85	24.77	23.99	24.45	24.34
Libya	102.69	106.60	111.00	113.69	117.58	123.41	125.83	124.83	131.95	137.96	141.91	119.80	130.60
Mauritania	8.28	8.52	8.49	8.64	9.08	9.18	9.22	9.56	9.07	9.93	10.36	10.41	10.64
Morocco	50.56	54.25	55.83	55.97	60.14	63.71	64.89	66.64	69.28	68.98	72.11	76.01	71.44
Oman	63.11	65.37	66.28	66.52	65.59	66.13	75.50	80.41	90.05	95.87	99.96	108.11	109.32
Qatar	27.33	29.23	33.49	35.18	38.81	48.25	52.48	58.43	63.23	68.35	73.01	75.92	85.25
Saudi Arabia	279.70	286.60	303.98	317.38	335.48	352.08	370.09	388.87	418.33	437.74	478.26	498.30	526.97
Sudan	118.67	116.33	127.91	129.87	133.71	141.02	137.82	147.12	147.76	151.07	146.97	152.22	148.62
Syrian Arab Republic	75.98	75.03	77.29	77.24	80.74	90.58	94.25	98.07	98.58	92.68	92.04	89.46	73.76
Tunisia	28.38	29.12	28.98	29.30	30.46	31.41	32.16	32.54	33.26	33.83	35.59	34.22	31.53

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
United Arab Emirates	115.85	116.04	127.43	134.81	141.02	145.14	154.09	166.11	188.88	192.08	196.80	203.09	216.26
Yemen	20.43	21.97	22.12	24.94	26.15	27.19	27.43	30.24	31.14	33.17	35.40	31.10	29.84
Arab Countries	1562.90	1599.81	1675.29	1716.94	1782.03	1892.52	1942.14	2037.25	2155.96	2245.95	2328.37	2378.78	2457.35
World	33886.62	34257.15	34852.07	36152.10	37607.35	38781.93	39889.97	41135.07	41525.00	41236.89	42968.09	44190.65	44815.54

Sources: CAIT Climate Data Explorer. 2015. Washington, DC: World Resources Institute. Available from http://cait.wri.org.

Boden, T.A., G. Marland, and R.J. Andres. 2015. Global, Regional, and National Fossil-Fuel CO2 Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi 10.3334/CDIAC/00001_V2015 Available from http://cdiac.ornl.gov/trends/emis/overview_2011.html.

Food and Agriculture Organization of the United Nations (FAO). 2014. FAOSTAT Emissions Database. Rome, Italy: FAO. Available from http://faostat3.fao.org/download/G1/*/E.

International Energy Agency (IEA). 014. CO2 Emissions from Fuel Combustion (2014 edition). Paris, France: OECD/IEA. Available from http://www.oecd-ilibrary.org/docserver/download/6114281e.pdf?expires=1503384692&id=id&accname=ocid195767&checksum=9E6222573429384C9EB447B496DF976D.

World Bank. 2014. World Development Indicators 2014. Washington, DC. Available from http://data.worldbank.org/ (accessed 18 May 2015).

U.S. Energy Information Administration (EIA). 2014. International Energy Statistics Washington, DC: U.S. Department of Energy. Available from http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8.

U.S. Environmental Protection Agency (EPA). 2012. "Global Non-CO2 GHG Emissions: 1990-2030." Washington, DC: EPA. Available from http://www.epa.gov/climatechange/EPAactivities/economics/nonco2projections.html.

Table AIII.2 Total greenhouse gas emissions including land-use change and forestry

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Algeria	121.01	118.25	125.02	129.96	132.73	138.04	144.10	152.80	157.36	167.74	169.32	175.62	189.08
Bahrain	21.38	22.00	23.01	23.64	23.74	26.61	28.66	29.00	31.11	31.52	32.70	32.82	33.25
Comoros	0.47	0.61	0.63	0.63	0.63	0.63	0.63	0.59	0.61	0.59	0.59	0.61	0.60
Djibouti	1.10	1.06	1.15	1.17	1.16	1.17	1.17	1.21	1.25	1.22	1.28	1.24	2.58
Egypt	169.32	181.35	190.22	197.83	210.13	230.93	239.86	255.87	267.49	271.68	274.94	281.12	287.97
Iraq	184.69	184.00	180.40	169.93	164.91	174.45	162.97	174.24	186.88	210.03	227.21	242.21	256.44
Jordan	19.41	19.56	21.26	20.93	22.88	24.39	24.87	26.28	25.94	26.40	26.14	27.44	27.42
Kuwait	137.40	145.12	152.09	160.17	167.53	179.36	179.12	178.88	183.93	191.20	190.61	195.57	202.47
Lebanon	18.03	19.27	19.19	19.60	20.04	19.34	17.96	16.72	20.80	24.72	23.94	24.40	24.30
Libya	102.69	106.60	111.00	113.69	117.58	123.41	125.83	124.83	131.95	137.96	141.91	119.80	130.60
Mauritania	9.38	9.62	9.59	9.74	10.18	10.28	9.73	10.07	9.58	10.44	10.88	10.93	11.16
Morocco	42.52	45.37	46.93	47.02	51.16	54.70	65.91	67.66	70.31	70.02	73.16	77.06	72.51
Oman	63.11	65.37	66.28	66.52	65.58	66.13	75.49	80.41	90.05	95.87	99.96	108.11	109.32
Qatar	27.33	29.23	33.49	35.18	38.81	48.25	52.48	58.43	63.23	68.35	73.01	75.92	85.25
Saudi Arabia	279.70	286.60	303.98	317.38	335.48	352.08	370.09	388.87	418.33	437.74	478.26	498.30	526.97
Sudan	191.50	135.86	153.70	146.55	155.01	159.59	160.65	167.38	171.67	184.62	171.25	181.35	177.35
Syrian Arab Republic	74.92	73.97	76.22	76.17	79.66	89.49	93.02	96.84	97.34	91.43	90.78	88.19	72.50

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Tunisia	27.76	28.60	28.46	28.79	29.94	30.90	31.38	31.74	32.46	33.02	34.77	33.39	30.70
United Arab Emirates	114.66	115.99	127.38	134.76	140.97	145.09	153.87	165.91	188.66	191.87	196.59	202.88	216.04
Yemen	20.43	21.97	22.12	24.94	26.15	27.19	27.43	30.24	31.14	33.17	35.40	31.10	29.84
Arab Countries	1626.82	1610.43	1692.12	1724.62	1794.28	1902.04	1965.22	2057.98	2180.07	2279.58	2352.68	2408.08	2486.36
World	36679.72	37366.04	38123.23	39449.47	40841.06	42000.97	42779.41	43915.81	44372.42	44002.56	45747.71	46905.72	47598.55

Sources: CAIT Climate Data Explorer. 2015. Washington, DC: World Resources Institute. Available from http://cait.wri.org.

Boden, T.A., G. Marland, and R.J. Andres. 2015. Global, Regional, and National Fossil-Fuel CO2 Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi 10.3334/CDIAC/00001_V2015 Available from http://cdiac.ornl.gov/trends/emis/overview_2011.html.

Food and Agriculture Organization of the United Nations (FAO). 2014. FAOSTAT Emissions Database. Rome, Italy: FAO. Available from http://faostat3.fao.org/download/G1/*/E.

International Energy Agency (IEA). 2014. CO2 Emissions from Fuel Combustion (2014 edition). Paris, France: OECD/IEA. Available from http://www.oecd-ilibrary.org/docserver/download/6114281e.pdf?expires=1503384692&id=id&accname=ocid195767&checksum=9E6222573429384C9EB447B496DF976D.

World Bank. 2014. World Development Indicators 2014. Washington, DC. Available from http://data.worldbank.org/ (accessed 18 May 2015).

U.S. Energy Information Administration (EIA). 2014. International Energy Statistics Washington, DC: U.S. Department of Energy. Available from http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8.

U.S. Environmental Protection Agency (EPA). 2012. "Global Non-CO2 GHG Emissions: 1990-2030." Washington, DC: EPA. Available from http://www.epa.gov/climatechange/EPAactivities/economics/nonco2projections.html.

Table AIII.3 Total carbon dioxide emissions excluding land-use change and forestry

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Algeria	80.94	77.15	82.86	86.29	86.97	91.62	96.29	103.68	107.94	116.51	116.83	120.91	131.63
Bahrain	17.85	18.40	19.21	19.89	19.91	22.69	24.59	24.94	26.97	27.32	28.41	28.46	28.81
Comoros	0.08	0.09	0.09	0.10	0.10	0.11	0.12	0.12	0.12	0.12	0.13	0.16	0.16
Djibouti	0.36	0.33	0.41	0.43	0.41	0.42	0.42	0.46	0.50	0.46	0.52	0.47	1.80
Egypt	116.07	126.92	133.68	136.62	148.90	167.88	177.87	191.94	199.38	207.14	208.92	213.45	219.58
Iraq	75.01	77.77	82.13	77.48	76.72	90.41	74.13	80.60	88.12	105.32	117.83	129.18	140.22
Jordan	15.68	15.81	16.86	16.65	18.71	20.04	20.40	21.35	20.75	21.25	20.73	21.79	21.70
Kuwait	50.62	54.45	57.41	61.77	65.27	72.97	72.31	71.67	76.07	82.85	81.69	86.25	92.77
Lebanon	15.52	16.75	16.68	17.07	17.46	16.77	15.32	13.98	17.95	21.78	20.93	21.23	21.03
Libya	42.91	44.57	46.35	46.95	48.35	51.66	52.17	48.84	54.13	58.12	60.23	39.10	51.16
Mauritania	1.17	1.28	1.35	1.39	1.54	1.59	1.61	1.84	1.93	2.13	2.14	2.31	2.41
Morocco	33.46	36.98	38.21	38.14	41.83	44.93	45.54	47.88	50.28	50.04	53.28	56.20	51.84
Oman	22.35	25.37	27.06	28.07	27.90	29.01	38.33	43.19	52.63	58.26	62.28	69.55	69.94
Qatar	24.57	26.36	30.44	31.96	35.09	44.68	48.74	54.02	59.07	63.70	67.86	70.14	79.13
Saudi Arabia	246.32	251.96	268.95	280.17	296.98	312.65	329.84	347.71	377.36	396.80	435.93	453.86	480.23
Sudan	5.87	6.43	7.87	8.13	8.89	10.40	12.81	13.87	14.97	15.45	16.53	17.17	14.46

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Syrian Arab Republic	42.77	42.74	45.03	44.78	48.25	57.73	60.80	64.40	65.77	60.30	60.76	56.74	40.61
Tunisia	21.55	22.26	22.27	22.43	23.52	24.24	24.83	25.11	25.74	25.97	27.79	26.32	23.35
United Arab Emirates	90.98	90.24	100.58	106.94	112.42	115.65	123.53	134.69	156.77	158.78	163.01	168.72	181.30
Yemen	13.91	15.12	15.21	17.44	18.44	19.42	19.43	21.80	22.52	24.38	26.37	21.93	20.54
Arab Countries	918.02	950.98	1012.67	1042.71	1097.67	1194.88	1239.06	1312.07	1418.99	1496.66	1572.16	1603.94	1672.64
World	24758.12	24999.06	25439.46	26612.47	27879.38	28893.35	29848.50	30912.63	31146.37	30718.49	32339.94	33370.97	33843.05

Sources: CAIT Climate Data Explorer. 2015. Washington, DC: World Resources Institute. Available from http://cait.wri.org.

Boden, T.A., G. Marland, and R.J. Andres. 2015. Global, Regional, and National Fossil-Fuel CO2 Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi 10.3334/CDIAC/00001_V2015 Available from http://cdiac.ornl.gov/trends/emis/overview_2011.html.

Food and Agriculture Organization of the United Nations (FAO). 2014. FAOSTAT Emissions Database. Rome, Italy: FAO. Available from http://faostat3.fao.org/download/G1/*/E.

International Energy Agency (IEA). 2014. CO2 Emissions from Fuel Combustion (2014 edition). Paris, France: OECD/IEA. Available from http://www.oecd-ilibrary.org/docserver/download/6114281e.pdf?expires=1503384692&id=id&accname=ocid195767&checksum=9E6222573429384C9EB447B496DF976D.

World Bank. 2014. World Development Indicators 2014. Washington, DC. Available from http://data.worldbank.org/ (accessed 18 May 2015).

U.S. Energy Information Administration (EIA). 2014. International Energy Statistics Washington, DC: U.S. Department of Energy. Available from http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8.

U.S. Environmental Protection Agency (EPA). 2012. "Global Non-CO2 GHG Emissions: 1990-2030." Washington, DC: EPA. Available from http://www.epa.gov/climatechange/EPAactivities/economics/nonco2projections.html.

Table AIII.4 Total carbon dioxide emissions including land-use change and forestry

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Algeria	82.41	78.62	84.32	87.76	88.44	93.09	97.76	105.14	109.41	117.97	118.29	122.38	133.10
Bahrain	17.85	18.40	19.21	19.89	19.91	22.67	24.59	24.93	26.97	27.31	28.40	28.46	28.81
Comoros	0.27	0.41	0.42	0.42	0.42	0.43	0.42	0.40	0.39	0.38	0.37	0.38	0.36
Djibouti	0.36	0.33	0.41	0.43	0.41	0.42	0.42	0.46	0.50	0.46	0.52	0.47	1.80
Egypt	115.53	126.34	133.09	136.04	148.32	167.30	177.65	191.72	199.16	206.92	208.71	213.23	219.36
Iraq	74.37	77.09	81.46	76.80	76.04	89.72	73.46	79.94	87.45	104.65	117.17	128.51	139.55
Jordan	15.68	15.81	16.86	16.65	18.71	20.04	20.40	21.35	20.75	21.25	20.73	21.79	21.70
Kuwait	50.59	54.43	57.40	61.74	65.26	72.94	72.29	71.65	76.04	82.83	81.67	86.22	92.74
Lebanon	15.52	16.70	16.63	17.02	17.41	16.72	15.27	13.93	17.90	21.73	20.88	21.18	20.98
Libya	42.91	44.57	46.35	46.95	48.35	51.66	52.17	48.84	54.13	58.12	60.23	39.10	51.16
Mauritania	2.27	2.38	2.45	2.49	2.64	2.69	2.12	2.35	2.45	2.64	2.65	2.83	2.93
Morocco	25.41	28.11	29.30	29.20	32.85	35.92	46.54	48.89	51.31	51.07	54.32	57.26	52.91
Oman	22.35	25.37	27.06	28.07	27.90	29.01	38.32	43.19	52.63	58.26	62.28	69.55	69.93
Qatar	24.57	26.36	30.44	31.96	35.09	44.68	48.74	54.02	59.07	63.70	67.86	70.14	79.13
Saudi Arabia	246.32	251.96	268.95	280.17	296.98	312.65	329.84	347.71	377.36	396.80	435.93	453.86	480.23
Sudan	64.45	22.72	29.22	22.04	26.64	25.96	31.82	30.86	34.97	42.94	36.63	41.24	38.23

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Syrian Arab Republic	41.71	41.68	43.96	43.71	47.17	56.65	59.58	63.16	64.53	59.04	59.50	55.47	39.33
Tunisia	20.93	21.74	21.75	21.92	23.00	23.73	24.05	24.32	24.93	25.15	26.97	25.49	22.51
United Arab Emirates	89.79	90.19	100.53	106.89	112.37	115.60	123.31	134.49	156.55	158.57	162.79	168.51	181.08
Yemen	13.91	15.12	15.21	17.44	18.44	19.42	19.43	21.80	22.52	24.38	26.37	21.93	20.54
Arab Countries	967.20	958.33	1025.03	1047.59	1106.35	1201.29	1258.18	1329.17	1439.03	1524.19	1592.27	1628.01	1696.38
World	27381.58	28000.80	28524.22	29700.50	30924.59	31927.57	32542.38	33493.94	33798.84	33319.27	34901.46	35924.18	36421.81

Sources: CAIT Climate Data Explorer. 2015. Washington, DC: World Resources Institute. Available from http://cait.wri.org.

Boden, T.A., G. Marland, and R.J. Andres. 2015. Global, Regional, and National Fossil-Fuel CO2 Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi 10.3334/CDIAC/00001_V2015 Available from http://cdiac.ornl.gov/trends/emis/overview_2011.html.

Food and Agriculture Organization of the United Nations (FAO). 2014. FAOSTAT Emissions Database. Rome, Italy: FAO. Available from http://faostat3.fao.org/download/G1/*/E.

International Energy Agency (IEA). 2014. CO2 Emissions from Fuel Combustion (2014 edition). Paris, France: OECD/IEA. Available from http://www.oecd-ilibrary.org/docserver/download/6114281e.pdf?expires=1503384692&id=id&accname=ocid195767&checksum=9E6222573429384C9EB447B496DF976D.

World Bank. 2014. World Development Indicators 2014. Washington, DC. Available from http://data.worldbank.org/ (accessed 18 May 2015).

U.S. Energy Information Administration (EIA). 2014. International Energy Statistics Washington, DC: U.S. Department of Energy. Available from http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8.

U.S. Environmental Protection Agency (EPA). 2012. "Global Non-CO2 GHG Emissions: 1990-2030." Washington, DC: EPA. Available from http://www.epa.gov/climatechange/EPAactivities/economics/nonco2projections.html.

Table AIII.5 Carbon dioxide emissions (Kg per PPP of GDP), carbon dioxide emissions total (kt) and carbon dioxide emissions per capita (metric tons per capita)

	2000			2005			2007			2008			2009			2010			2011	
	Kg/ PPP $	Kt	Mt/ cap	Kg/ PPP	Kt	Mt/ cap	Kg/ PPP	Kt	Mt/ cap	Kg/ PPP	Kt	Mt/ cap	Kg/PPP	Kt	Mt/ cap	Kg/ PPP	Kt	Mt/ cap	Kg/PPP	Kt	Mt/ cap
Algeria	0.35	87,931	2.82	0.29	107,128	3.22	0.27	109,295	3.19	0.26	111,576	3.21	0.28	121,374	3.43	0.26	119,277	3.31	0.25	121,755	3.32
Bahrain	0.78	18,643	27.96	0.56	19,208	22.15	0.52	22,013	21.44	0.53	24,012	21.52	0.46	21,705	18.14	0.47	23,252	18.44	0.45	23,439	17.95
Comoros	0.14	84	0.15	0.14	110	0.18	0.14	117	0.18	0.14	121	0.18	0.14	121	0.18	0.14	132	0.19	0.16	158	0.22
Djibouti	0.3	363	0.5	0.27	422	0.54	0.25	462	0.58	0.25	499	0.62	0.22	462	0.56	0.24	517	0.62	0.2	473	0.56
Egypt	0.35	141,326	2.07	0.31	167,208	2.23	0.29	193,343	2.49	0.27	196,797	2.49	0.26	198,069	2.46	0.25	204,677	2.49	0.26	220,790	2.64
Iraq	0.32	72,445	3.07	0.43	113,523	4.2	0.2	62,156	2.19	0.27	93,149	3.19	0.29	104,297	3.48	0.29	111,447	3.61	0.32	133,655	4.19
Jordan	0.53	15,508	3.25	0.47	21,060	3.95	0.4	22,035	3.83	0.35	21,349	3.55	0.34	21,892	3.49	0.32	21,181	3.25	0.32	22,259	3.29
Kuwait	0.47	53,560	27.76	0.38	71,547	31.61	0.33	75,236	29.64	0.35	82,731	30.58	0.38	85,635	29.72	0.41	90,846	29.69	0.37	91,030	28.1
Lebanon	0.48	15,284	4.72	0.37	16,245	4.07	0.26	13,520	3.31	0.3	17,268	4.2	0.33	20,913	5	0.29	20,091	4.63	0.28	20,488	4.46
Libya	0.51	47,114	8.83	0.39	52,108	8.98	0.33	53,230	8.85	0.33	55,944	9.14	0.37	62,317	10.04	0.37	66,057	10.54	0.56	39,021	6.2
Mauritania	0.2	1,173	0.43	0.19	1,588	0.5	0.17	1,845	0.55	0.17	1,936	0.57	0.19	2,131	0.61	0.18	2,138	0.6	0.18	2,310	0.63
Morocco	0.33	33,905	1.17	0.31	45,771	1.51	0.29	50,267	1.62	0.28	52,900	1.69	0.27	52,482	1.65	0.27	55,958	1.74	0.25	56,538	1.74
Oman	0.28	21,896	9.78	0.32	29,893	11.92	0.41	44,591	17.19	0.32	38,404	14.48	0.3	38,467	13.93	0.42	56,292	19.12	0.48	64,855	20.2
Qatar	0.67	34,730	58.52	0.61	51,881	61.99	0.48	65,240	55.34	0.42	67,506	48.6	0.39	71,341	44.84	0.34	75,280	42.64	0.33	83,875	44.02
Saudi Arabia	0.5	296,935	13.88	0.47	397,642	16.07	0.39	393,535	15.09	0.37	418,240	15.64	0.42	484,880	17.69	0.44	533,094	18.98	0.38	520,278	18.07
Somalia	..	517	0.07	..	594	0.07	..	609	0.07	..	601	0.07	..	598	0.06	..	612	0.06	..	576	0.06
Sudan	0.09	5,534	0.16	0.11	10,708	0.27	0.11	13,113	0.31	0.1	13,931	0.32	0.11	15,427	0.34	0.11	15,779	0.34	0.11	16,579	0.35
Syrian Arab Republic	..	51,048	3.12	..	50,634	2.79	..	66,468	3.42	..	67,542	3.36	..	61,954	3.01	..	61,576	2.97	..	57,671	2.81
Tunisia	0.34	19,923	2.09	0.28	22,662	2.26	0.26	24,111	2.36	0.25	24,826	2.4	0.24	24,785	2.37	0.24	26,743	2.54	0.24	25,643	2.4
United Arab Emirates	0.43	112,562	36.9	0.31	116,149	25.91	0.31	139,405	23.2	0.33	158,935	23.03	0.36	162,602	21.1	0.36	167,597	20.12	0.35	178,484	20.43
Palestine	0.08	792	0.27	0.21	2,743	0.83	0.18	2,325	0.67	0.17	2,054	0.57	0.14	2,090	0.56	0.13	2,035	0.53	0.13	2,248	0.57
Yemen	0.26	14,639	0.82	0.26	20,044	0.98	0.25	21,298	0.98	0.24	22,097	0.99	0.24	23,557	1.03	0.25	25,717	1.09	0.25	22,295	0.92
Arab Region	0.41	1,045,913	3.72	0.37	1,318,866	4.21	0.32	1,374,212	4.18	0.32	1,472,418	4.37	0.33	1,577,100	4.57	0.34	1,680,300	4.76	0.32	1,704,418	4.72
World	0.51	24,799,921	4.06	0.45	29,614,692	4.55	0.4	31,286,844	4.69	0.39	32,049,580	4.74	0.38	31,902,900	4.66	0.38	33,516,380	4.84	0.37	34,649,483	4.95

Source: World Development Indicators database.

Endnotes

1 See http://unstats.un.org/unsd/statcom/47th-session/documents/2016-1-Provisional-agenda-and-annotations-E.pdf.

2 It might be necessary, for example, to adjust some indicators to reflect any changes proposed by the Task Force of the Economic Commission for Europe in 2017, if approved by the United Nations Statistical Commission.

3 http://unfccc.int/paris_agreement/items/9444.php.

4 http://unfccc.int/national_reports/non-annex_i_natcom/items/10124.php.

5 http://unfccc.int/national_reports/non-annex_i_natcom/reporting_on_climate_change/items/8722.php.

6 http://www.ipcc-nggip.iges.or.jp/support/Primer_2006GLs.pdf.

7 http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx.

8 http://unstats.un.org/unsd/statcom/47th-session/documents/2016-1-Provisional-agenda-and-annotations-E.pdf.

9 http://www.unescwa.org/publications/arab-sustainable-development-report-2015.

10 http://www.unescwa.org/sites/www.unescwa.org/files/events/files/8th_cc_negotiation_workshop_info_note_31march17.pdf.

11 https://library.wmo.int/opac/doc_num.php?explnum_id=3414.

12 http://eltahir.mit.edu/wp-content/uploads/2015/08/Paper.pdf.

13 http://www.uncclearn.org/sites/default/files/inventory/l1500436.pdf.

14 https://documents-dds-ny.un.org/doc/UNDOC/GEN/N15/441/54/PDF/N1544154.pdf?

15 http://www.unece.org/statistics/statstos/task-force-on-climate-change-related-statistics.html.

16 http://www.unece.org/index.php?id=37166.

17 http://www.unece.org/fileadmin/DAM/stats/publications/2014/CES_CC_Recommendations.pdf.

18 http://www.nasa.gov/mission_pages/noaa-n/climate/climate_weather.html.

19 http://www.unece.org/fileadmin/DAM/stats/documents/sustainable_development/Recommendation_ratings_pilot.xlsx.

20 http://www.unece.org/statistics/statstos/task-force-on-a-set-of-key-climate-change-related-statistics-using-seea.html.

21 The Task Force on a set of key climate change-related statistics using SEEA is due to publish its final report in 2017.

22 www.unece.org/index.php?id=41299#/.

23 https://unstats.un.org/unsd/ENVIRONMENT/FDES/EGES4/19Session%203_UNSD_Climate%20change%20statistics.pdf.

24 http://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf.

25 http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf.

26 https://unstats.un.org/unsd/envaccounting/seeaRev/CF_trans/SEEA_CF_Final_ar.pdf.

27 http://www.unescwa.org/sites/www.unescwa.org/files/publications/files/sd-09-3_0.pdf.

28 While it is difficult to attribute any single weather event to climate change, the science needed to do so is improving rapidly.

29 http://www.preventionweb.net/files/45466_indicatorspaperaugust2015final.pdf.

30 http://www.desinventar.net/index_www.html.

31 http://www.unescwa.org/climate-change-water-resources-arab-region-riccar.

32 It is worth noting that the United Nations *Fundamental Principles of Official Statistics* defines official statistics to include "data about the economic, demographic, social and environmental situation" of countries. See http://www.unece.org/?id=3207.

33 See http://www.cbs.nl/en-gb/news/2015/08/slight-rise-in-co2-emissions.

34 See http://www.statcan.gc.ca/eng/cder/index.

35 See http://www.gov.uk/government/statistics/agricultural-statistics-and-climate-change.

36 See http://data.worldbank.org/topic/climate-change.

37 https://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=27&Lg=1.

38 https://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=27&Lg=1.

39 https://elibrary.worldbank.org/doi/abs/10.1596/978-0-8213-9459-5.

40 See http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=83A34A7A-1.

41 Activity data are data describing the economic processes that contribute to climate change. For example, activity data include data on energy use and industrial production.

42 See http://www.statcan.gc.ca/daily-quotidien/160907/dq160907c-eng.htm.

43 See http://www.statcan.gc.ca/daily-quotidien/151117/dq151117d-eng.htm.

44 See http://www.statcan.gc.ca/daily-quotidien/160511/dq160511d-eng.htm.

45 See http://www.statcan.gc.ca/pub/16-201-x/16-201-x2013000-eng.htm.

46 See http://www.statcan.gc.ca/pub/57-003-x/57-003-x2016002-eng.htm.

47 See http://www.statcan.gc.ca/pub/21-023-x/21-023-x2013001-eng.htm.

48 See http://www.statcan.gc.ca/daily-quotidien/150429/dq150429d-eng.htm.

49 See http://www.statcan.gc.ca/daily-quotidien/150313/dq150313c-eng.htm.

50 *Envirostats* published a series of five special studies between 2011 and 2012. See, for, example, http://www.statcan.gc.ca/pub/16-002-x/2011001/part-partie2-eng.htm.

51 See www.stat.gov.kz/faces/homePage/ecolog?_afrLoop=7238720001017770#%40%3F_afrLoop%3D7238720001017770%26_adf.ctrl-state%3D355t0h1t5_4.

52 Kazakhstan does not have an online database through which environmental statistics can be accessed. Those data are available as downloadable Excel spreadsheets from the website of the Committee on Statistics.

53 See http://www.kazhydromet.kz/en/monitor_kz.

54 See http://www.arso.gov.si/en/Climate%20change/.

55 See www.stat.si/StatWeb/en/field-overview?idp=96&headerbar=8#tabNovice.

56 See http://www.stat.si/StatWeb/en/field-overview?idp=13&headerbar=8.

57 See http://www.oecd.org/greengrowth/greengrowthindicators.htm for more information on the OECD's green growth indicators.

58 See http://www.oecd.org/greengrowth/Green%20growth%20indicators%20in%20Slovenia%202014.pdf.

59 It might be necessary, for example, to adjust some indicators to reflect any changes proposed by the Task Force of the Economic Commission for Europe in 2017, if approved by the United Nations Statistical Commission.

Climate change and its impacts represent a major challenge to sustainable development in Arab countries. Reliable statistics are crucial for measuring and monitoring the economic and social impacts of climate change at the national and regional levels. In this special issue of the publication entitled "Compendium of Environment Statistics in the Arab Region", ESCWA presents the potential role of national statistical offices in leading and coordinating climate change statistics.

With a view to improving climate change-related statistics collected by national statistical offices in the Arab region, the present report proposes a set of climate change-related indicators for Arab countries. The set of indicators is relevant to the region, uncumbersome to compile, feasible given existing data and methods, and consistent with international recommendations in this area.

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