Framework for Environmental Economic Accounting in the ESCWA Region

ESCWA

United Nations Economic and Social Commission for Western Asia

ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA (ESCWA)

FRAMEWORK FOR ENVIRONMENTAL ECONOMIC ACCOUNTING IN THE ESCWA REGION

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Preface

The United Nations Statistics Division (UNSD) developed the System of Integrated Environmental and Economic Accounting (SEEA) in 1993, as a satellite to the 1993 System of National Accounts (SNA), in recognition of the increasing importance of integrating environmental issues into development and the need to account for the manifold interactions between all sectors of the economy and the environment in order to ensure sustainable development. SEEA measures the contribution of the environment to the economy and the impact of the economy on the environment, and provides an information system for strategic planning and policy analysis aimed at identifying more sustainable paths of development.

The Statistics Division at the Economic and Social Commission for Western Asia (ESCWA) assists member countries to enhance their national capacities in environment statistics indicators and accounts in order to integrate environmental concerns into economic development, thereby supporting progress towards achieving environmental sustainability and related internationally agreed development goals. This assistance by ESCWA, which encompasses training workshops, technical assistance missions, publication of studies and development of information systems, is coordinated with regional and international agencies, particularly UNSD, the Economic Commission for Latin America and the Caribbean (ECLAC), the regional statistical cooperation programme between the European Union and Mediterranean partner countries (MEDSTAT) and the United Nations Environment Programme (UNEP).

Within that context, the "Framework for environmental economic accounting in the ESCWA region", which is published by ESCWA Statistics Division, explains the SEEA approach and proposes that system to ESCWA member countries, albeit with some adaptation aimed at taking into account the priorities and specificities of the region. Such a system addresses, in the context of environmental accounting, scarce water resources, land degradation, and exploitation of oil and gas resources, which are considered main constraints in achieving sustainable development.

This publication is composed of five chapters as follows: (a) chapter I provides a background on environmental and economic accounting; (b) chapter II explains specific resource accounts of priority to the region, in particular water, energy, soil and land, and ecosystem accounts; (c) chapter III explains the environmental protection expenditure component of SEEA; (d) chapter IV overviews the cost of environmental degradation; and (e) chapter V concludes with a regional agenda and recommendations.

The publication is intended to be a useful guide to statisticians, environment experts and policymakers in their efforts to develop a system for collecting environment statistics. In their commitment to achieving sustainable development, ESCWA member countries will benefit from the implementation of SEEA by compiling and disseminating timely, reliable, relevant and comparable environmental data that can be integrated in the economic data for use by government officials, concerned stakeholders and the public.

The Sectoral Statistics Team at ESCWA, which executed the task of preparing the material, extends its gratitude to Mr. Jad Chaaban, at the American University of Beirut, for his contributions in preparing a first draft. In addition, it wishes to thank the following for their cooperation on joint activities related to water accounts and for sharing information and providing advise: Ms. Alessandra Alfieri and Mr. Michael Vardon, at UNSD; Ms. Cécile Rodier Quéfelec, at MEDSTAT; and Mr. Adel Abdel Kader, at UNEP. Moreover, this publication has benefited from various papers, discussions and recommendations by participants during three meetings on environmental accounting, which were organized by ESCWA.

ESCWA strives to improve the quality of its publications. Consequently, any suggestions or comments regarding the content of this publication is welcome and can be addressed to Ms. Wafa Aboul Hosn, Team Leader, Sectoral Statistics, at: aboulhosn@un.org; or to Mr. Juraj Riecan, Chief of Statistics Division at: riecan@un.org.

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ABBREVIATIONS AND EXPLANATORY NOTES

BOD	Biochemical oxygen demand
CEA	Country Environmental Analysis
CEC	Cation exchange capacity
CEPA	Classification of environmental protection activities
CM	Choice modelling
CVM	Contingent valuation method
DESA	Department of Economics and Social Affairs
EDP	Environmentally adjusted domestic product
EDS	Ecosystem distress syndrome
EPE	Environmental protection expenditure
ECLAC	Economic Commission for Latin America and the Caribbean
FAO	Food and Agricultural Organization
GDP	Gross domestic product
GHG	Greenhouse gas
GIS	Geographical information system
HPM	Hedonic pricing method
IADGs	Internationally agreed development goals
IEA	International Energy Agency
IEEA	Integrated environmental and economic accounting
IESS	Integrated environmental statistical system
IMF	International Monetary Fund
IRES	International Recommendations for Energy Statistics
IRWS	International Recommendations for Water Statistics
ISIC	International Standard for Industrial Classification
IWRM	Integrated Water Resources Management
LPG	Liquified petroleum gases
MD	Marginal damage (costs)
MPC	Marginal private costs
MSC	Marginal social costs
NDP	Net domestic product
NEAP	National environmental action plan
NGO	Non-governmental organization
NGL	Natural gas liquids
NSO	National statistical office
OECD	Organisation for Economic Co-operation and Development
PEER	Public Environmental Expenditure Review
ROWA	Regional Office for West Asia (UNEP)
SEEA	System of Integrated Environmental and Economic Accounting
SEEA-E	System of Environmental-Economic Accounting for Energy
SEEAW	System of Environmental-Economic Accounting for Water
SNA	System of National Accounts
SOC	Soil organic carbon
TCM	Travel cost method
UNCEEA	United Nations Committee of Experts on Environmental-Economic Accounting
UNCSD	United Nations Commission on Sustainable Development
UNEP	United Nations Environment Programme
UNSD	United Nations Statistics Division
VOSL	Value of statistical life
WCED	United Nations World Commission on Environment and Development
WTP	Willingness to pay

References to dollars ($) are to United States dollars, unless otherwise stated.

Executive summary

The goal of sustainable development, which was first raised in the Brundtland Report of 1987, has become the driving force of changing government practices and societal attitudes towards the economy-environment link.[1] Environmental implications can no longer be assumed to be local, reversible and not likely to hamper the economy. It is now evident that human activities can profoundly affect, and are profoundly affected by, basic environmental systems and functions, with significant implications for national economies and humanity as a whole. Within the ESCWA region, rapid population and economic growth, pressure on already scarce water resources, deterioration of air and water quality, depletion of energy and mineral resources, and land and soil degradation, including loss of biodiversity from various activities, are all issues that require the attention, effort and resolve of regional policymakers.

However, the underlying foundations of any policy or programme aimed at tackling the issues of environment and environment-economic linkages need to be adequate, reliable and easily accessible, and consistent and regularly updated. Moreover, such accounts must eventually be able to show the baseline and subsequent annual changes in these vital environmental categories.

For that reason and in order to assess the environmental sustainability of economic performance in a more comprehensive manner, the United Nations in collaboration with other organizations developed SEEA as a satellite account for the 1993 System of National Accounts (SNA). SEEA brings together economic and environmental information in a common framework to measure the contribution of the environment to the economy and the impact of the economy on the environment.

Given the above-mentioned environmental stresses in the ESCWA region, member countries need to establish environment statistics programmes as part of their statistical system in order to compile and disseminate timely, reliable, relevant and exchangeable information on natural resources and the environment, including detailed data, indicators and accounts. The outcome of an integrated environmental and economic accounting system, such as SEEA, could assist government officials, concerned stakeholders and the public in their respective duties through a systematic and organized national environmental statistical system readily available to monitor progress towards the achievement of sustainable development.

This report begins by outlining the environment-economic paradigm and the importance of an integrated approach whereby the environment is not seen as a separate entity from the economy. In particular, the strong bond between environment and economy is leading to the dramatic drainage of the natural resources found in the region. The various tables in chapter I illustrate the extent of decreasing regional resources throughout the years. This empirical evidence provides substance to the current environmental and socio-economic situation in the ESCWA region, and underscores the need for a properly managed and reliable accounting system as provided by SEEA. In addition to delving into the theoretical background of SEEA, chapter I presents the results of the Global Assessment of Environment Statistics and Environmental-Economic Accounting, which shows the current status of national implementation of environment statistics and environmental-economic accounting programmes; and assesses the compliance by countries in terms of implementing environmental-economic accounting within the framework of the *Handbook of national accounting: Integrated environmental and economic accounting 2003*, with a focus on the ESCWA region where possible.[2]

Chapter II reviews specific resource accounts as follows: (a) water accounts (System for Integrated Environmental-Economic Accounting for Water); (b) energy accounts; (c) soil accounts; and (d) land and

[1] United Nations World Commission on Environment and Development (WCED), "Our Common Future: Report of the World Commission on Environment and Development", which is equally referred to as the Brundtland Report (March 1987).

[2] Department of Economic and Social Affairs (DESA), European Commission, International Monetary Fund (IMF), Organisation for Economic Co-operation and Development (OECD) and the World Bank, *Handbook of national accounting: Integrated environmental and economic accounting* (2003).

ecosystem accounts. These are presented through a brief theoretical background with specific examples from countries that have implemented these accounting systems, including, for example Bahrain and Jordan for water accounts, and New Zealand for energy and emissions accounts. Additionally, this chapter reviews the results of the Global Assessment for Energy Statistics and Balances and reports on the status of institutional and legal entities and requirements for the proper establishment of energy accounts, including information on programme status, coordination efforts, future prospects and barriers to the collection, compilation and dissemination of these accounts.

Chapter III gives an overview of environmental protection expenditure accounts by focusing on the Public Environmental Expenditure Reviews (PEERs) of the World Bank and using the Country Environmental Analysis (CEA) tool. Within that context, Egypt and Jordan have completed CEAs, while other member countries include information on public expenditure on the environment through national environmental agencies or ministerial budgets.

Chapter IV reviews the methodology related to the cost of environmental degradation and highlights the importance of quantifying environmental damages as a percentage of gross domestic product (GDP). Several techniques for quantifying environmental externalities or amenities are identified and briefly described in annex V. Currently, only four ESCWA member countries have undertaken studies to investigate the cost of environmental degradation study. Moreover, even these studies are not part of an ongoing effort aimed at updating consistently the estimates on a yearly basis.

The current situation of the ESCWA region with regard to statistical capacity is identified in chapter V, which outlines the important findings of earlier studies and recommendations, including, chiefly: (a) the recommendations and conclusions of UNSD and ESCWA, as presented in the relevant final reports, of four meetings on environment statistics that were held in 2004, 2006 and 2007; and (b) the national work plan for countries and recommendations by the Department of Economic and Social Affairs (DESA) aimed at achieving a reliable, consistent and easily accessible environmental and integrated environment-economic accounts system.[3] This final chapter also categorizes countries according to the status quo of their environment statistics and suggests, consequently, a specific agenda for each group in order to enhance their environmental account systems and water accounting in particular.

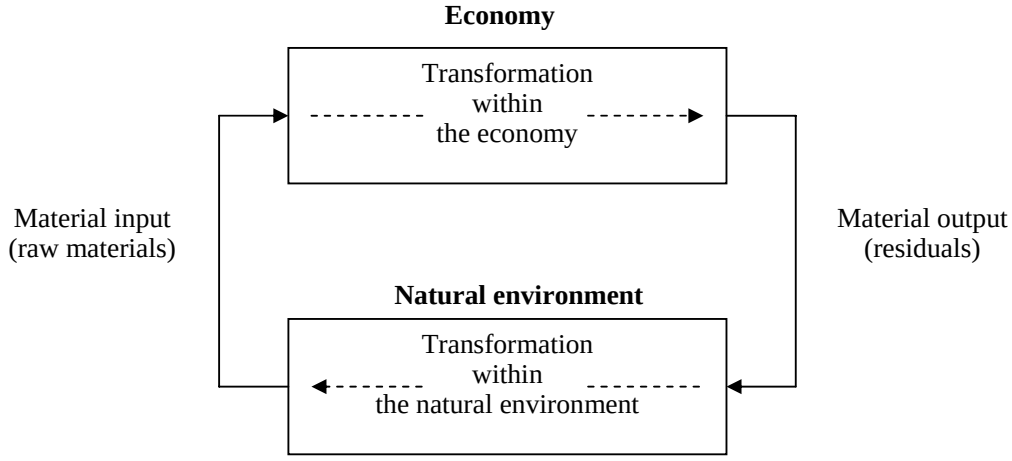
[3] DESA, "An assessment of the situation of environment statistics in the ESCWA region" (Statistics Division, 2005).

I. BACKGROUND ON ENVIRONMENTAL AND ECONOMIC ACCOUNTING

A. INTRODUCTION

Until recently, the majority of countries omitted the environment from their national accounts because the implications on the environment were thought to be local, reversible and unlikely to hamper the economy. Furthermore, the environment's contribution was thought to be very difficult to measure "requiring the resolution of intractable methodological problems and the costly generation of a large amount of data".[4] However, this line of thinking is changing dramatically. It is now clear that "human activities can profoundly affect, and are profoundly affected by, basic environmental systems and functions, with significant implications for national economies and humanity as a whole".[5] Figure I illustrates the interrelationship between the economy and the natural environment whereby natural resources are used as raw material inputs and, moreover, residual outputs are diffused back into the environment.

Figure I. Interrelationships between the economy and the natural environment



Source: ESCWA.

As figure I shows, given that the environment is used from both ends in any economy, it should therefore be included in national accounting. The environment includes "the provision of natural resources to production and consumption activities, waste absorption by environmental media and environmental services of life support and other human amenities".[6] Furthermore, "new scarcities of natural resources now threaten the sustained productivity of the economy, and economic production and consumption activities may impair environmental quality by overloading natural sinks with wastes and pollutants. By not accounting for the private and social costs of the use of natural resources and the degradation of the environment, conventional accounts may send wrong signals".[7]

[4] Department of Economic and Social Affairs (DESA) and United Nations Environment Programme (UNEP), *Integrated environmental and economic accounting: an operational manual*, No. 78 (2000), p. 3.

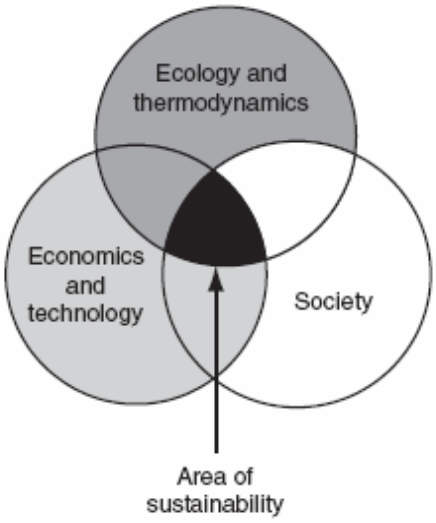
[5] Ibid.

[6] Ibid., p. 2.

[7] Ibid.

This link between the environment and economy was brought to light by the Brundtland Report.[8] Sustainable development was defined as a concept aimed at balancing the three pillars of economic and social development with environmental protection (see figure II), which involves a "strong element of intergenerational ethics".[9] Moreover, as highlighted in chapter 8 of Agenda 21 of the 1992 Earth Summit, integrating environment and development in decision-making is at the basis of achieving sustainable development.[10]

Figure II. Sustainability assessment Venn diagram



Source: G.P. Hammond and A.B. Winnett, "Interdisciplinary perspectives on environmental appraisal and valuation techniques", vol. 159, No. 3 (August 2006).

Figure II shows the interconnections between engineering constraints and the economics and social domain forming a sustainability assessment Venn diagram, where sustainability is simply the end goal or final objective of sustainable development.[11] According to this view, there must be no single focus (or object) of sustainability, but instead the economic, social and environmental systems must be simultaneously sustainable in and of themselves.

Satisfying any one of these three sustainability pillars without also satisfying the others is deemed insufficient for the following reasons: (a) each of the three pillars is independently crucial; (b) the three pillars are interconnected; and (c) each of the three pillars is urgent and need to be addressed simultaneously.

The System of National Accounts (SNA) attempts to measure a country's wealth via the flows of goods, services and capital stocks in an economy using the GDP or the net domestic product (NDP) concepts, and recognizing certain natural resources, such as forests, land, and subsoil minerals, as assets in national balance sheets, the "stock" accounts. However, the United Nations in collaboration with several

[8] United Nations World Commission on Environment and Development (WCED), "Our Common Future: Report of the World Commission on Environment and Development", which is equally referred to as the Brundtland Report (March 1987).

[9] G.P. Hammond and A.B. Winnett, "Interdisciplinary perspectives on environmental appraisal and valuation techniques", vol. 159, No. 3 (August 2006), p. 118.

[10] DESA, *Agenda 21: Earth Summit –The United Nations Programme of Action from Rio* (Division for Sustainable Development, 1993).

[11] G.P. Hammond and A.B. Winnett, "Interdisciplinary perspectives on environmental appraisal and valuation techniques", vol. 159, No. 3 (August 2006).

other organizations developed the System of Integrated Environmental and Economic Accounting (SEEA) as a product of SNA in order to assess the environmental sustainability of economic performance in a more comprehensive system. This resulted in the dissemination of SEEA in a handbook of national accounting to account systematically for the stocks and flows of environmental resources consistent with SNA.

In 2003, the United Nations, the European Commission, the International Monetary Fund (IMF), the Organisation for Economic Co-operation and Development (OECD) and the World Bank developed the *Handbook of national accounting: Integrated environmental and economic accounting*, which is commonly referred to as SEEA-2003. It describes the interaction between the economy and the environment and covers the whole spectrum of natural resources and the environment.[12]

SEEA brings together economic and environmental information in a common framework in order to measure the contribution of the environment to the economy and the impact of the economy on the environment. The system enables governments to set priorities, monitor economic policies more precisely, enact more effective environmental regulations and resource management strategies, and design more efficient market instruments for environmental policies.

Within that context, SEEA extends SNA flow accounts into the following: (a) flows of products (goods and services produced within the economic sphere); (b) flows of natural resources (mineral and energy resources, water and biological resources); (c) flows of ecosystem inputs (water and other natural inputs required by plants and animals for growth, and the oxygen necessary for combustion); and (d) flows of residuals (incidental and undesired outputs from the economy with no economic value, which may be recycled, stored within the economy or discharged into the environment).

Since 1993, environmental accounting has progressed steadily, and many developing countries have compiled environmental accounts. To that end, such organizations as the United Nations and the World Bank have "set out to examine the feasibility of physical and monetary accounting in the areas of natural resources and the environment where a consensus emerged to further develop the links between environmental-economic accounting and SNA".[13] In addition, a major global initiative was launched by the Earth Institute in collaboration with the World Bank and UNSD aimed at supporting the implementation of environmental accounting in developing countries.[14]

SEEA is now used by governments to give answers to some interesting research questions and to demonstrate the analytical benefits SEEA can offer to potential users. Environmental economic accounting is also used to compare the interaction of the economy with the environment between different countries given that environmental problems have a global dimension.[15]

At its thirty-seventh session in March 2006, the United Nations Statistical Commission requested the Committee of Experts on Environmental-Economic Accounting to focus on the development and promotion of environmental accounting and refine its working relationship with the various groups responsible for the development of environmental, energy and related statistics. The output is expected to result in a revised

[12] DESA, European Commission, International Monetary Fund (IMF), Organisation for Economic Co-operation and Development (OECD) and the World Bank, *Handbook of national accounting: Integrated environmental and economic accounting* (2003).

[13] United Nations Statistical Division (UNSD), "Environmental-Economic Accounting", which is available at: http://unstats.un.org/unsd/envaccounting/EnvAcc_Brochure_FINAL1.pdf.

[14] J. Sachs et al., "*Global Initiative for Environmental Accounting*: Concept Note" which was presented to the Preliminary Meeting of the United Nations Committee on Environmental-Economic Accounting (New York, 29-31 August 2005).

[15] J.S. Choi, K. Schoer and S. Schweinert, "Comparison of environmental economic performance in South Korea and Germany" (German Federal Statistical Office and Korean National Statistical Office, May 2003).

edition of the *Handbook of National Accounting: Integrated Environmental-Economic Accounting 2003* and to become an international standard in 2012.

In that light, ESCWA, as a regional commission of the United Nations, has taken the responsibility to develop a regional agenda for environmental accounting in its member countries and to build their capacities in the implementation of environmental accounting according to regional priorities and specificities.

B. The need for environmental-economic accounting in the ESCWA region

Given that ESCWA member countries depend strongly on their natural and non-renewable resources to support their economic growth, they face numerous constraints in their efforts to achieve sustainable development. The main constraints include fast growing populations, scarce water resources, land degradation, and exploitation of oil and gas resources.

In 1998, the population in the ESCWA region was estimated at 160 million and has grown at an average annual rate of 2.8 per cent, compared to the world average of 1.7 per cent, to reach 192.7 million in 2006.[16] The average population growth rates in ESCWA member countries was an estimated 2.2 per cent between 2006 and 2007, and GDP at 2000 constant price increased by 5.1 per cent over the same period (see table 1). GDP growth increased significantly in most ESCWA member countries, with the exception of Palestine.

Table 1. Population and GDP growth rates in ESCWA member countries, 2006-2007

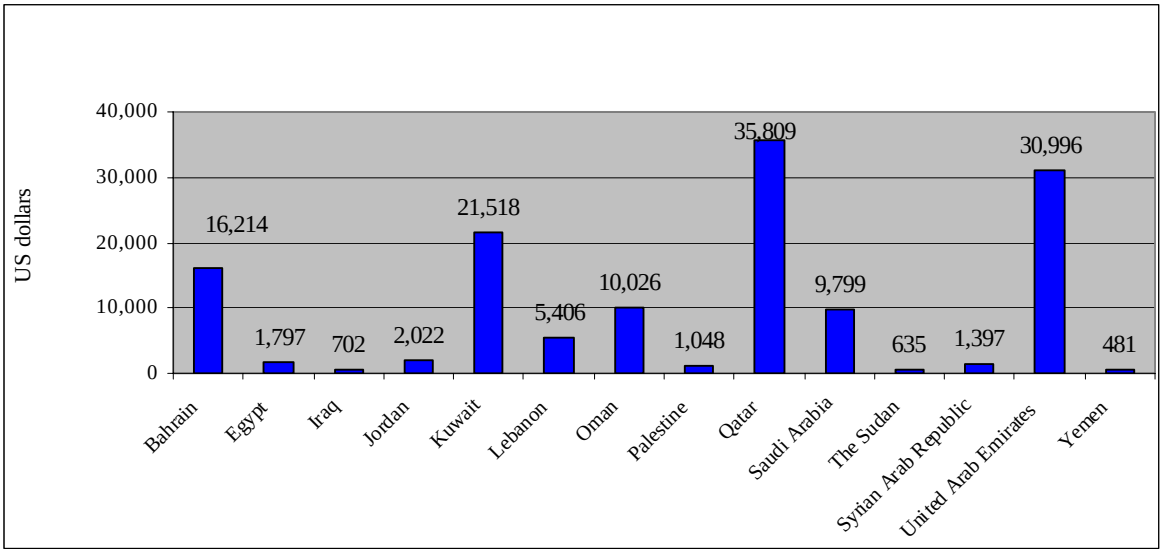
	Population (*thousands*)			GDP (*millions of dollars in 2000 constant prices*)		
Country or territory	2006	2007	Growth 2006-2007 (*percentage*)	2006	2007	Growth 2006-2007 (*percentage*)
Bahrain	739	753	1.9	11 480	12 203	6.30
Egypt	74 166	75 498	1.8	126 688	135 683	7.10
Iraq	28 506	28 993	1.7	19 172	20 341	6.10
Jordan	5 729	5 924	3.3	11 239	11 977	6.56
Kuwait	2 779	2 851	2.5	58 794	61 350	4.35
Lebanon	4 055	4 099	1.1	20 614	22 161	7.50
Oman	2 546	2 595	1.9	24 150	26 019	7.74
Palestine	3 889	4 017	3.2	4 183	4 210	0.64
Qatar	821	841	2.4	29 270	30 102	2.85
Saudi Arabia	24 175	24 735	2.3	234 423	242 370	3.39
The Sudan	37 707	38 560	2.2	22 164	24 495	10.52
Syrian Arab Republic	19 408	19 929	2.6	26 191	27 849	6.33
United Arab Emirates	4 248	4 380	3.0	129 026	135 774	5.23
Yemen	21 732	22 389	2.9	10 381	10 765	3.70
Total	230 500	235 564	2.1	727 774	765 299	5.11

Source: ESCWA, *Statistical Abstract of the ESCWA Region*, Issue No. 28 (2009).

Figure III shows GDP per capita in ESCWA member countries in 2007, which ranged between $36,000 in Qatar to $481 in Yemen.

[16] See ESCWA, *Compendium of Environment Statistics in the ESCWA Region* (E/ESCWA/SCU/2007/2). Following the Sudan's accession to ESCWA, the regional population was an estimated 230 million inhabitants in 2006.

Figure III. GDP per capita in selected ESCWA member countries
(*United States dollars in constant 2000 prices*)



Source: ESCWA, *Statistical Abstract of the ESCWA Region*, Issue No. 28 (2009).

The region is endowed with vast oil and natural gas reserves, which have fuelled economic growth and which, along with population growth, are placing excessive burdens on such natural resources as water and biodiversity (see table 2).

TABLE 2. OIL AND NATURAL GAS RESERVES IN SELECTED ESCWA MEMBER COUNTRIES, 2007

Country or territory	Oil reserves (*millions of barrels*)	Natural gas reserves (*billions of cubic metres*)
Bahrain	125	90
Egypt	4 100	2 060
Iraq	115 000	3 170
Jordan	1	6
Kuwait	101 500	1 780
Oman	5 600	690
Qatar	27 400	25 600
Saudi Arabia	264 200	7 170
The Sudan	6 600	84
Syrian Arab Republic	2 500	290
United Arab Emirates	97 800	6 090
Yemen	2 800	490
ESCWA	627 626	47 520
World	1 237 900	177 360
Share of ESCWA out of world	51%	27%

Source: ESCWA, Statistical Abstract of the ESCWA Region, Issue No. 28 (2009).

Table 2 indicates that oil and natural gas in the ESCWA region accounted for 51 per cent of world oil resources and 27 per cent of world natural gas resources in 2007.

With respect to total surface area, the ESCWA region amounts to approximately 7.3 million km^2, or about 5.5 per cent of the total world surface area, with approximately 6 per cent of the land on average

pertained to agricultural services (see table 3). However, more than 70 per cent of the region is categorized as arid with surface inland water covering 1.8 per cent of the total land area in the ESCWA region.

TABLE 3. TOTAL SURFACE AREA AND PROPORTION OF AGRICULTURAL LAND IN ESCWA MEMBER COUNTRIES

Country or territory	Total surface area (km^2)	Proportion of agricultural area to land area (*percentage*)
Bahrain	694	8.5
Egypt	1 001 450	3.0
Iraq	438 317	23.1
Jordan	89 324	4.6
Kuwait	17 818	1.9
Lebanon	10 452	32.2
Oman	309 500	3.5
Palestine	6 020	63.3
Qatar	11 493	4.2
Saudi Arabia	2 149 690	8.8
The Sudan	2 505 813	7.7
Syrian Arab Republic	185 180	29.6
United Arab Emirates	83 600	3.4
Yemen	527 970	3.6
ESCWA	7 337 321	5.6
World	134 279 330	-

Source: ESCWA, *Compendium of Environment Statistics in the ESCWA Region* (E/ESCWA/SCU/2007/2).

Note: Agricultural area is the sum of arable land and permanent crops area and permanent pastures area except for countries where not all pasture land is cultivable.

TABLE 4. PER CAPITA WATER RESOURCES INDICATORS IN ESCWA MEMBER COUNTRIES, 2000-2004

	Per capita conventional water resources (*cubic metres/year*)			Per capita conventional and non-conventional water resources (*cubic metres/year*)			Change in per capita conventional and non-conventional water resources (*percentages*)
Country or territory	2000	2003	2004	2000	2003	2004	2000-2003
Bahrain	189	180	..	344	368	..	7.0
Egypt	868	818	..	977	923	..	-5.5
Iraq	2 926	2 762	..	2 999	2 882	..	-3.9
Jordan	180	163	234	196	296	249	51.0
Kuwait	9	8	..	274	259	..	-5.5
Lebanon	912	647	..	919	770	..	-16.2
Oman	532	392	..	564	550	..	-2.5
Palestine	244	213	..	244	213	..	-12.7
Qatar	99	72	..	300	320	..	6.7
Saudi Arabia	283	343	354	335	394	417	17.6
The Sudan	1 074	..	..	1 074	..	..	..
Syrian Arab Republic	755	980	1056.7	945	1 157	1 247	22.4
United Arab Emirates	97	37	78.7	255	377	385	47.8
Yemen	203	208	..	206	210	..	1.9
ESCWA	949	913	..	1 038	1 029	..	-0.9

Source: ESCWA, *Compendium of Environment Statistics in the ESCWA Region* (E/ESCWA/SCU/2007/2).

Note: Two dots (..) indicate that data are not available or are not separately reported.

Table 4 indicates a reduction in available water resources per capita from conventional resources in 10 out of the 14 ESCWA member countries from 2000 to 2003. Specifically, the average per capita renewable water resources decreased from 949 to 913 cubic metres per year for the region compared to 7,000 for the world.[17] The quantity of less than a 1,000 cubic metres per year is considered within the chronic water scarcity limit. Table 5 expresses the status of freshwater in the various countries of the region and indicates that, with the exception of Iraq, all the countries of the region face water scarcity concerns.[18]

TABLE 5. FRESHWATER STATUS OF ESCWA MEMBER COUNTRIES, 2007
(*Cubic metres per capita per year*)

Country or territory	Freshwater
Kuwait, United Arab Emirates, Qatar, Jordan, Bahrain, Yemen, Palestine, Saudi Arabia, Oman	Acute scarcity: less than 500
Egypt	Scarcity: 500-1000
Lebanon, the Sudan	Stress: 1000-1700
Iraq, Syrian Arab Republic	Abundance: more than 1700

Source: ESCWA calculations.

Other socio-economic, environmental and interlinked problems in the ESCWA region are as follows:[19] (a) high population density, which increases the pressure on already limited resources; (b) deterioration of air and water quality; (c) depletion of energy and mineral resources; (d) excessive exploitation of natural resources, thereby causing premature depletion of freshwater resources and deterioration of freshwater quality; (e) land degradation associated with agricultural intensification, inappropriate farming practices, desertification, salinization and other land uses; and (f) biodiversity losses.

C. SYSTEM OF INTEGRATED ENVIRONMENTAL AND ECONOMIC ACCOUNTING FOR THE ESCWA REGION

Given the above-mentioned environmental stresses in the region, ESCWA member countries need to establish environment statistics programmes as part of their statistical system in order to compile and disseminate timely, reliable, relevant and exchangeable information on natural resources and the environment, including detailed data, indicators and accounts.[20]

In that context, ESCWA submitted a development account project proposal to DESA in 2007 aimed at enhancing the national capacities of ESCWA member countries in environment statistics, indicators and accounts; and at integrating environmental concerns into economic development by taking advantage of an integrated environmental statistical system approach (IESS) in support of progress towards achieving national and internationally agreed development goals (IADGs). The project was allocated a budget of $602,000 and it is being implemented in collaboration with ECLAC and UNSD.

This project emphasizes the importance of integrated environmental and economic accounting, such as SEEA, in terms of assisting government officials, concerned stakeholders and the public in their respective duties through a systematic and organized national environmental statistical system that can monitor progress towards the achievement of sustainable development.[21]

[17] Ibid.

[18] Ibid.

[19] More details on these issues are set forth in annex I.

[20] ESCWA, "Overview of the production of statistics on natural resources and environment in the ESCWA region – ESCWA" (E/ESCWA/SCU/2007/WG.2/3).

[21] Ibid.

Moreover, the implementation of SEEA allows Governments in the ESCWA region to assess the impact of their activities on the environment and helps them to minimize the effect of these activities on the environment. Additionally, it can impact the launching of future activities that are harmful to the environment and can shift some of these into more environmentally friendly activities, all the while remaining economically beneficial.

As illustrated in Figure IV, where the shaded blocks represent the environmental extensions of the conventional accounts, SEEA supplements SNA by separately identifying expenditures related to environmental issues and by incorporating environmental assets and changes therein in the supply, use and asset accounts of SNA.[22]

Specifically, SEEA incorporates environmental concerns over and beyond conventional accounts by undertaking the following: (a) segregating and elaborating all environment-related flows and stocks that are already included in the conventional accounts in order to show separately environmental protection expenditures; (b) expanding the asset accounts beyond economic assets to include environmental assets and changes therein; and (c) introducing impacts on natural assets (economic and environmental), which are caused by production and consumption activities of industries, households and government, as environmental costs incurred by these activities.

Figure IV. SEEA: flow and stock accounts with environmental assets

			Assets	
	OPENING STOCKS		Economic assets	Environmental assets
	Industries	Household/ government	+	Rest of the world
SUPPLY OF PRODUCTS	Domestic production			Imports of products
	thereof: for environmental protection			thereof: for environmental protection
	Economic cost (intermediate consumption, consumption of fixed capital)	Final consumption	Gross capital formation, consumption of fixed capital	Exports
USE OF PRODUCTS	thereof: for environmental protection			thereof: for environmental protection
USE OF NATURAL CAPITAL	Environmental cost of industries (imputed)	Environmental cost of households (imputed)	Natural capital consumption	
			+	
	OTHER CHANGES OF ASSETS		Other changes of economic assets	Other changes of environmental assets
			=	
	CLOSING CAPITAL		Economic assets	Environmental assets

Source: Department of Economic and Social Affairs (DESA) and United Nations Environment Programme (UNEP), *Integrated environmental and economic accounting: an operational manual*, No. 78 (2000).

[22] DESA and UNEP, *Integrated environmental and economic accounting: an operational manual*, No. 78 (2000).

SEEA illuminates the distinction between economic and additional environmental natural assets, where the former supply the economy with natural resources or raw materials for use in production and consumption processes, while the latter provide such environmental services as waste absorption, habitat, flood and climate control and nutrient flows.[23]

Consequently, SEEA complements and expands SNA with regard to costing by incorporating the following: (a) the use of natural resources in production and final consumption; and (b) the impacts of environmental quality (emissions) resulting from pollution by production and consumption activities.[24] Furthermore, SEEA extends the concept of capital to cover not only human-made capital but also non-produced natural capital, including renewable resources, for example marine resources or tropical forests; and non-renewable resources, for example land and soil. Indicators compiled under SEEA include therefore capital accumulation, environmentally adjusted net value added and domestic product.[25]

Moreover, SEEA is a beneficial tool in terms of supporting such environmental themes as sustainable development and climate change, as well as such programmes as integrated water resources management. Consequently, SEEA can serve as a partial framework for measuring sustainable development.

Most of the environment-related sustainable development indicators developed by the Commission on Sustainable Development can be derived from SEEA, which, additionally includes indictors of energy use and emissions of greenhouse gases (GHGs) aimed at monitoring climate change (see table 6).

TABLE 6. SEEA AND THE UNITED NATIONS SUSTAINABLE DEVELOPMENT INDICATORS

Sustainable development indicator		Source of data in SEEA
Atmosphere		
Climate change	Emissions of GHGs	SEEA flow accounts for emissions of GHGs
Ozone layer depletion	Consumption of ozone depleting substances	SEEA flow accounts for use of ozone depleting substances
Land		
Agriculture	Arable and permanent crop land area	Reported in land asset accounts
	Use of fertilizers	Could be reported in the physical flow accounts
	Use of agricultural pesticides	Could be reported in the physical flow accounts
Forests	Forest area as percentage of land area	Reported in land and forest asset accounts
	Wood harvesting intensity	Reported as harvesting in the forest asset accounts
Desertification	Land affected by desertification	Could be reported in land asset accounts
Urbanization	Area of urban formal and informal settlements	Could be reported in land asset accounts
Oceans, seas and coasts		
Fisheries	Annual catch by major species	Reported in fisheries asset accounts
Freshwater		
Water quantity	Annual withdrawal of ground and surface water as percentage of total available water	Calculated from SEEA water flow accounts

[23] Ibid.

[24] Ibid.

[25] Ibid.

TABLE 6 (*continued*)

Sustainable development indicator		Source of data in SEEA
Water quality	- Biochemical oxygen demand (BOD) in water bodies - Concentration of faecal coliform in freshwater	Could be calculated from SEEA water quality accounts
Biodiversity		
Ecosystem	Area of selected key ecosystems	Reported in ecosystem asset accounts
	Protected area as percentage of total area	Reported in land asset accounts and in ecosystem asset accounts
	Abundance of selected key species	Reported in wildlife asset accounts
Consumption and production patterns		
Material consumption	Intensity of material use	SEEA flow accounts report total material inputs; indicator can be derived by dividing GDP by total material inputs
Energy use	Annual energy consumption per capita	SEEA flow accounts report total energy use; indicator derived by dividing total energy by total population
	Share of consumption of renewable energy resources	Calculated from composition of energy flow accounts
	Intensity of energy use	SEEA flow accounts report total energy inputs; indicator can be derived by dividing GDP by total energy inputs
Waste generation and management	Generation of industrial and municipal solid waste	SEEA flow accounts for solid waste
	Generation of hazardous waste	SEEA flow accounts for specific types of waste
	Generation of radioactive waste	SEEA flow accounts for specific types of waste
	Waste recycling and reuse	SEEA flow accounts for waste, recycling and reuse

Source: Compiled by ESCWA.

D. GLOBAL ASSESSMENT OF ENVIRONMENT STATISTICS AND ENVIRONMENTAL-ECONOMIC ACCOUNTING

In 2005, a report by UNSD and ESCWA showed that the situation of environment statistics varied considerably between ESCWA member countries.[26] For example, Oman, Qatar and the United Arab Emirates have not yet started environment statistics programmes, while Iraq, Saudi Arabia and Yemen have only recently started such programmes. Moreover, Bahrain, Egypt, Kuwait, Lebanon and Syrian Arab Republic cover certain programme components of environment statistics, while Jordan and Palestine have a long experience in environment statistics.

In 2007, UNSD prepared the Global Assessment of Environment Statistics and Environmental-Economic Accounting under the auspices of the United Nations Committee of Experts on Environment-Economic Accounting (UNCEEA) and in collaboration with the Inter-Secretariat Working Group on Environment Statistics in order to "assess the current status of national implementation of environment statistics and environmental-economic accounting programmes, to identify priorities and future plans, and to assess the compliance of countries' implementation of environmental-economic accounting with the *Handbook on National Accounts: Integrated Environmental and Economic Accounting-2003* (SEEA-2003)".[27]

[26] ESCWA, "Review of statistical work carried out since the fifth session of the Statistical Committee: The outcome of the self-evaluation of the Project on Strengthening Statistical Capacity in the ESCWA Region" (E/ESCWA/SCU/2004/IG.1/4(Part III)).

[27] UNSD, "Global Assessment of Environment Statistics and Environmental-Economic Accounting", which was presented to the Statistical Commission at its thirty-eighth session (27 February – 2 March 2007).

The first phase of the Global Assessment involved obtaining general information on environment statistics and environmental-economic accounting programmes, in particular institutional infrastructure, subject areas, constraints encountered in setting up statistical programmes and future plans. The second phase focused on specific subject areas that were identified in phase I.[28]

Phase I of the Global Assessment achieved a response rate of 52 per cent out of the 192 States Members of the United Nations.[29] However, out of the 14 ESCWA member countries, only five countries responded as of 12 February 2007. Moreover, a total of 91 per cent of responding countries indicated having an environmental statistics programme, while approximately 50 per cent stated they had environmental-economic programmes.

The existence of environment statistics and environmental-economic accounting programmes in different groupings and regions, including countries in Western Asia, are indicated in table 7. In the ESCWA region, only 30 per cent of countries indicated having a programme on environmental accounting. Specifically, while a full programme of environment statistics is established in the Department of Statistics in Jordan, this falls under the remit of the economic statistics or social statistics departments in other member countries.

Regarding institutional infrastructure, 84 per cent of total respondents affirmed the existence of a legal framework for environment statistics in their respective countries.[30]

TABLE 7. GLOBAL ASSESSMENT: INSTITUTIONAL INFRASTRUCTURE RESPONSES, 2007

		Environment statistics			Environmental-economic accounting		
	Number of countries	Number of countries responding to Part A	Number of countries with a programme	Percentage of responding countries with programme	Number of countries responding to Part B	Number of countries with a programme	Percentage of responding countries with programme
United Nations Member States	192	97	88	91	99	49	49
Developed economies	37	32	31	97	32	27	84
Transition economies	19	11	11	100	11	3	27
Developing economies	136	54	46	85	56	19	34
Western Asia	17	9	7	78	10	3	30

Source: United Nations Statistical Division (UNSD), "Global Assessment of Environment Statistics and Environmental-Economic Accounting", which was presented to the Statistical Commission at its thirty-eighth session (27 February – 2 March 2007).

1. *Scope of the programmes*

The areas mostly covered in the environment statistics programmes and environmental-economic accounting in developing countries included water statistics, followed by air, land, forest, biodiversity and energy in the environment statistics category; while in the environmental-economic accounting category, water accounts is followed by energy and emission accounts, mineral accounts and forest accounts (see table 8).

[28] Ibid.

[29] Ibid.

[30] Ibid.

In the ESCWA region, Iraq, Jordan and Lebanon indicated that they were developing environmental-economic accounting; and Bahrain, Egypt and Oman, while not listed, have taken concrete measures during 2008 aimed at developing water accounts, and pilot tables, and related diagrams have been prepared and are set to be officially disseminated.

TABLE 8. AREAS COVERED BY ENVIRONMENT STATISTICS AND ENVIRONMENTAL-ECONOMIC ACCOUNTING IN DEVELOPING REGIONS

Developing region	Number of countries	Percentage of countries	Developing region	Number of countries	Percentage of countries
Environment statistics			Environmental-economic accounting		
Total countries	43		Total countries	15	
Water[a/]	41	95	Water accounts	13	87
Air[a/]	36	84	Energy and emission accounts	11	73
Land[b/]	36	84	Mineral asset accounts	9	60
Forest[b/]	34	79	Forest accounts	9	60
Biodiversity[b/]	34	79	Land and ecosystem accounts	6	40
Energy[b/]	29	67	Material flow and waste accounts	6	40
Agriculture[b/]	28	65	EPE accounts	6	40
Mineral	27	63	Fisheries accounts	5	33
Transport[b/]	23	53	Physical supply and use tables	2	13
Waste	17	40	Other	3	20
Environmental protection expenditure (EPE)	5	12			
Other	20	47			

Source: United Nations Statistical Division (UNSD), "Global Assessment of Environment Statistics and Environmental-Economic Accounting", which was presented to the Statistical Commission at its thirty-eighth session (27 February – 2 March 2007).

Notes: a/ From a regional perspective, examples are taken from Iraq, Jordan and Lebanon.
b/ From a regional perspective, examples are taken from Jordan and Lebanon.

Furthermore, the responding institutions compiling environment statistics and environmental-economic accounting indicated that they were planning to continue the existing compilation programme and to expand these programmes both in terms of coverage and new areas. The most common use of these data records is the derivation of indicators for modelling and economic analysis and responds to the need to report to international-regional organizations.[31]

2. *Impeding factors*

Several impeding factors for the development and compilation of environment statistics and environmental-accounting programmes were identified in phase I and are outlined in table 9. The availability of data and the quality of data were the primary impeding factors in the compilation of environment statistics and environmental-economic accounts.[32]

In the ESCWA region, a number of main factors were identified that need to be addressed in order to develop comprehensive environmental-economic accounting. These include the lack of an institutional

[31] Ibid.

[32] Ibid.

framework, insufficient human and financial resources, lack of coordination among different data producers and quality of data, and lack of access to training material (see table 9).

TABLE 9. IMPEDING FACTORS IN THE DEVELOPMENT OF ENVIRONMENT STATISTICS AND ENVIRONMENTAL-ECONOMIC ACCOUNTING PROGRAMMES

Environment statistics			Environmental-economic accounting		
	Number of countries	Percentage of countries		Number of countries	Percentage of countries
Total countries	79		Total countries	62	
Lack of human resources[a/]	57	72	Lack of human resources[a/]	43	69
Lack of financial resources[a/]	47	60	Lack of financial resources[a/]	42	68
Lack of institutional set-up and coordination[a/]	40	51	Availability of data[a/]	38	61
Lack of access to training material[b/]	25	32	Quality of data[a/]	32	52
Lack of users interest[a/]	12	15	Lack of institutional set-up and coordination[a/]	24	39
Other[b/]	14	18	Lack of users interest[a/]	21	34
			Lack of access to training material[a/]	19	31
			Other	11	18

Source: United Nations Statistical Division (UNSD), "Global Assessment of Environment Statistics and Environmental-Economic Accounting", which was presented to the Statistical Commission at its thirty-eighth session (27 February – 2 March 2007).

Notes: a/ From a regional perspective, examples are taken from Iraq and Lebanon.
b/ From a regional perspective, examples are taken from Iraq.

II. SPECIFIC RESOURCE ACCOUNTS

It is vital to deliver environmental and integrated environmental and economic accounts for several reasons, most notably in order to enhance economic and environmental policies. Economic policies are improved through integrated environmental and economic accounting (IEEA) given that it encompasses environmental assets (natural capital) as independent and important underlying resources in their own right.

The conventional GDP indicator can be further disaggregated into NDP, which is simply GDP net of consumption of fixed capital and environmentally adjusted domestic product (EDP), which deducts the monetary values of natural asset depletion and degradation from NDP.[33] Furthermore, environmental accounts data can be used to factor the economic costs of natural asset depletion and degradation into economic policies, where comparisons between EDP and NDP over time can "demonstrate the effectiveness of reformed economic policies in preserving the value of natural assets".[34]

Moreover, environmental accounts provide information that can be applied to environmental policies in the following ways: (a) identifying environmental priorities; (b) tracing pressure points; (c) designing environmental policies; (d) evaluating policy effects; and (e) facilitating international environmental management.[35]

In SEAA, natural resources are classified as mineral and energy resources, soil resources, water resources and biological resources, in addition to land and surface water and ecosystems assets (see table 10).

TABLE 10. CLASSIFICATION OF ASSETS IN SEEA

EA.1	Natural resources				
	EA.11	Mineral and energy resources			
		EA.111	Fossil fuels (*cubic metres, tonnes, tonnes of oil equivalent, joules*)		
		EA.112	Metallic minerals (*tonnes*)		
		EA.113	Non-metallic minerals (*tonnes*)		
	EA.12	Soil resources (*cubic metres, tonnes*)			
		EA.121	Agricultural		
		EA.122	Non-agricultural		
	EA.13	Water resources (*cubic metres*)			
		EA.131	Surface water		
			EA.1311	Artificial reservoirs	
			EA.1312	Lakes	
			EA. 1313	Rivers and streams	
		EA.132	Groundwater		
	EA.14	Biological resources			
		EA.141	Timber resources (*cubic metres*)		
			EA.1411	Cultivated	
			EA.1412	Non-cultivated	
		EA.142	Crop and plant resources, other than timber (*cubic metres, tonnes, number*)		
			EA.1421	Cultivated	
				EA.14211	Yielding repeat products (vineyards, orchards, etc.)
				EA.14212	Yielding one-time harvests (crops, etc.)

[33] DESA and UNEP, op. cit.

[34] Ibid., p. 151.

[35] Ibid.

TABLE 10 (*continued*)

EA.1	Natural resources			
		EA.143	EA.1422	Non-cultivated
			Aquatic resources (*tonnes*, *number*)	
			EA.1431	Cultivated
			EA.1432	Non-cultivated
		EA.144	Animal resources	
			EA.1441	Cultivated
			EA.1442	Non-cultivated
EA.2	Land and surface water			
EA.3	Ecosystems			

Source: Department of Economic and Social Affairs (DESA), European Commission, International Monetary Fund (IMF), Organisation for Economic Co-operation and Development (OECD) and the World Bank, *Handbook of national accounting: Integrated environmental and economic accounting* (2003).

Water, energy and soil resources, in addition to land and ecosystems sub-accounts are discussed below, particularly in the light of the role played by those natural resources and assets in sustainable development and within the context of the energy-rich albeit water-scarce characteristics of the ESCWA region.[36]

Given the unavailability of data related to building a comprehensive SEEA in the region, priorities identified by ESCWA member countries pertained to physical flow accounts, assets accounts (physical stocks) and environmental protection expenditures (see table 11). Monetary flows could be developed in countries where advanced systems for National Accounts exist, including, for example, Oman. Moreover, emissions accounts are difficult to compile given the insufficient environmental monitoring systems and lack of environmental reporting in most ESCWA member countries.

TABLE 11. NATURAL RESOURCES BY TYPE OF ACCOUNTS OF PRIORITY IN THE ESCWA REGION

	Water	Soil	Mineral and energy	Ecosystems
Flow and pollution accounts				
Physical flows	X	X	X	
Hybrid accounts				
Monetary flows				
Pollution (waste, emissions)				
Asset accounts				
Physical stocks	X		X	
Monetary stocks				
Economic information on the environment				
Expenditures	X		X	
Revenues/taxes				

Source: ESCWA.

A. WATER ACCOUNTS

As indicated in tables 4 and 5, the ESCWA region "is characterized by scarcity and uneven availability of freshwater resources, increasing gap between freshwater supply and demand, deteriorating water quality and dominating water use in agriculture".[37] Furthermore, existing wastewater treatment facilities in the region face difficulties in handling increasing volumes of wastewater generated by increased

[36] Other accounts can also be developed, namely: fisheries, which represent an important resource in coastal member countries; and forests, which cover a significant part of the land in such member countries as Lebanon, the Sudan and the Syrian Arab Republic. However, this report did not analyse such sub-accounts given that they were not identified as priorities for development by member countries.

[37] ESCWA, *Compendium of Environment Statistics in the ESCWA Region* (E/ESCWA/SCU/2007/2), p. 2.

water consumption and urbanization where the regional wastewater treatment capacity in the ESCWA region was sufficient to handle only 40 per cent of the domestic wastewater generated in 2000.[38]

To that end, water accounts are vital and critical for the ESCWA region, which was further supported by a recommendation that emanated from the Statistical Committee in ESCWA.[39]

Additionally, the System of Environmental-Economic Accounting for Water (SEEAW) was set up to provide a conceptual framework for organizing the hydrological and economic information in a coherent and consistent manner.[40] The SEEAW framework represents an elaboration of SEEA-2003, and both SEEAW and SEEA use SNA as the basic framework.

The conceptual framework of SEEAW is complemented with a set of standard tables that focus on the following hydrological and economic information:[41] (a) stocks and flows of water resources within the environment; (b) pressures of the economy on the environment in terms of water abstraction and emissions added to wastewater and released to the environment or removed from wastewater; (c) water supply and use as input in the production process and by households; (d) water reuse within the economy; (e) collection, purification, distribution and treatment costs of water, as well as the service charges paid by users; (f) financing these costs, that is who is paying for the water supply and sanitation services; (g) payments of permits for access in order to abstract water or to use it as sink for discharge of wastewater; (h) existing hydraulic stock as well as investments in hydraulic infrastructure during the accounting period; and (i) quality accounts, which describe water resources in terms of their quality.

Additionally, SEEAW can be used to support the Integrated Water Resources Management (IWRM) given that it provides information to decision makers on the following:[42]

(a) Allocating water resources efficiently by using the quantity of water used by the different sectors, the quantity of wastewater and emissions generated as the result of the production process, and the value added generated by the industries. The information allows for the derivation of indicators on water efficiency and productivity indicators;

(b) Improving water efficiency by targeting both the demand side through the application of economic instruments and the supply side through the promotion of efficient water supply or irrigation systems and the reuse of water. SEEAW also provides information on the fees paid for water supply and sewerage service, payments for permits to access water resources, either for abstracting water or for using water resources as a sink;

(c) Understanding the impacts of water management on all users and evaluating trade-offs of different policy options on all users;

(d) Getting the most value for money from investment in infrastructure based on the evaluation of long-term costs and benefits. The water accounts provide information of current costs to maintain existing infrastructure, the service charges paid by the users, as well as the cost structure of the water supply and sewerage industries;

(e) Linking water availability and use by providing information on the stocks of water resources as well as all changes in stocks due to natural causes and human activities;

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[38] Ibid.

[39] ESCWA, "Report of the Statistical Committee on its sixth session, Beirut, 6-8 October 2004" (E/ESCWA/SCU/2004/IG.1/6).

[40] UNSD, "System of Environmental-Economic Accounting for Water", which was presented to the Statistical Commission at its thirty-eighth session (27 February – 2 March 2007).

[41] Ibid.

[42] Ibid.

(f) Providing a standardized information system that harmonizes information from different sources, is accepted by the stakeholders and is used for the derivation of indicators, thereby allowing for the identification of inconsistencies in the data as well as data gaps;

(g) Getting stakeholders involved in decision-making, particularly given that SEEAW is a transparent information system that can be used by interest groups and communities to argue their position on the basis of sound information.

Countries were encouraged to compile water accounts using harmonized concepts, definitions and classifications.[43] Worldwide, 25 countries have so far implemented parts of the water accounts, 17 of which are developed countries and 8 are developing countries, namely: Botswana, Chile, Mexico, Namibia, Philippines, South Africa, Turkey and the Republic of Moldova.[44] Currently, 60 countries have requested the assistance of UNSD in implementing their SEEAW, including all ESCWA member countries.[45]

The Global Assessment of Water Statistics and Accounts was undertaken by UNSD under the auspices of UNCEEA with the following aims: (a) to obtain an in-depth understanding of country practices in the compilation of water statistics and accounts; (b) to assess compliance with SEEAW; (c) to contribute towards the development of the International Recommendations of Water Statistics; and (d) to assist with the development of targeted technical cooperation activities in these areas.[46]

Within that context, UNSD organized the Expert Group Meeting on the International Recommendations for Water Statistics (New York, 4-6 November 2008) aimed at discussing with organizations and member countries the concepts, definitions and classifications of the International Recommendations for Water Statistics (IRWS). The adopted IRWS was used as a guideline to compile water accounts in SEEAW.[47]

In order to assist member countries further in terms of understanding and applying the compilations process of water accounts, ESCWA provided methodological documents in Arabic, including the translation of the manual on SEEAW and the standard tables, and the publication of various general and specific surveys aimed at compiling data on water accounts in Arab countries. Moreover, ESCWA made use of information technology tools in order to publish a database, docubase and expert-base on environment information for ESCWA.[48]

In the same vein, ESCWA organized in collaboration with UNSD, UNEP and MEDSTAT, training workshops in Amman and Beirut in 2008; and technical assistance missions and study visits to Jordan, Oman, Lebanon and Syrian Arab Republic aimed at familiarizing and strengthening capacity of ESCWA member countries with respect to water accounting. The workshops provided training on the compilation and practical and operational use of SEEAW by drawing on experiences from across the world and by bringing together experts (water statisticians, water managers and/or accountants) from national statistical offices, ministries of environment and water authorities of member countries.[49]

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[43] Ibid.

[44] A. Alfieri, "Integrated Environmental and Economic Accounting for Water Resources – SEEAW", UNSD presentation (Voorburg, Netherlands, 22-24 May 2006).

[45] M. Vardon, "The System of Environmental-Economic Accounting for Water (SEEAW), Part 2", which was presented to the Training Session on the System of Environmental-Economic Accounting for Water (SEEAW) for the Arab Gulf Countries (Beirut, 25-28 August 2008).

[46] More information is available at: http://unstats.un.org/unsd/envaccounting/ceea/surveyWAS.asp.

[47] Part I of the draft is published on the UNSD website and is available at: http://unstats.un.org/unsd/envaccounting/irws/egm2008/AC170-4.PDF.

[48] The integrated website, ESIAP, is aimed at promoting knowledge sharing on environmental statistics, indicators and accounts in the Arab region and among interested groups and experts. It is available at: http://esiap.escwa.un.org/index.php.

[49] ESCWA, "Report of the Joint Sub-regional Workshop on the System of Integrated Environmental-Economic Accounting for Water Resources, Amman, 10-13 March 2008" (E/ESCWA/SCU/2008/1); and "Report of the Training Session on the System of Environmental-Economic Accounting for Water (SEEAW) for the Arab Gulf Countries, Beirut, 25-28 August 2008" (E/ESCWA/SD/2008/4).

Joint technical missions conducted to national statistical offices in member countries emphasized on presenting a work plan in order to assess existing information, identify gaps, bridge with corresponding data producers and users, set a national coordinating mechanism and present the advantages of water accounts and SEEAW to policymakers.

The outcomes of the trainings revealed the need for more cooperation among international organizations and institutions, and further technical assistance to member countries; and to make available in Arabic documentation on environment and water statistics, indicators and accounts.

Another important outcome centred on the adaptation of SEEAW standard tables in order to take into consideration the regional peculiarities of member countries, namely: (a) to classify underground water resources into renewable and non-renewable; (b) to divide the water supply and use into cooling water and mining water; (c) to divide the industry's aggregates of the standard tables in order to show mining, oil extraction manufacturing, oil refining, hotels and restaurants, and construction sectors; (d) to divide the water received from other economic units into reuse wastewater to sewerage, and distributed water; and (e) to include desalinated water. Currently, Bahrain, Jordan and Oman have undertaken practical steps to develop water accounts; and Egypt and Lebanon are planning pilot water accounts for 2009.

1. *Pilot water accounts in ESCWA member countries*

(a) *Jordan*

Jordan represents one of the world's poorest countries in terms of water availability. In the face of water scarcity and the few and expensive opportunities to increase supply, the Government is trying to solve part of the problem by redistributing the available water resources to different uses. The Government's planning and future projects take into consideration alternative sources for water supply, including building dams and the use of such non-traditional sources as the reuse of treated water and desalinization.

The Department of Statistics (DOS) in Jordan detains a programme of environment statistics and publishes regular statistical reports on environment. In 2008, the section of environment statistics in DOS undertook a pilot study on water statistics and accounts aimed at responding to the issue of water scarcity and its economic implications. This pilot study which is still under revision, was prepared in coordination among the different stakeholders in Jordan and with the technical assistance from UNSD, ESCWA and MEDSTAT.

The study included water sector challenges, data sources, and water supply and demand analysis; and presented standard tables of SEEAW on supply, use and emission accounts. Hybrid accounts were not compiled owing to a lack or dispersion of data. The main results are shown in tables 12-14 below.

TABLE 12. PHYSICAL WATER USE IN JORDAN, 2007

		Industries by ISIC categories					Households	Rest of the world	Total
		Total agriculture ISIC 1	Other industries ISIC 2-33, 38, 39, 41-43, 45-99	Water supply ISIC 36	Sewerage ISIC 37	Total			
	U1 - Total abstraction (= a.1+a.2 = b.1+b.2):	506	49	294	0.0	849	0.0		849
	a.1- Abstraction for own use	506	49	0.0	0.0	555	0.0		555
	a.2- Abstraction for distribution	0.0	0.0	294	0.0	294	0.0		294
	b.1- From water resources:	506	49	294	0.0	849	0.0		849
	Surface water	261	4	80	0.0	345	0.0		345
	Groundwater	245	45	214	0.0	504	0.0		504
	Soil water	0.0	0.0	0.0	0.0	0.0	0.0		0.0
	b.2- From other sources	0.0	0.0	0.0	0.0	0.0	0.0		0.0
	Collection of precipitation	0.0	0.0	0.0	0.0	0.0	0.0		0.0
From the environment	Abstraction from the sea	0.0	0.0	0.0	0.0	0.0	0.0		0.0

TABLE 12 (*continued*)

		Industries by ISIC categories					Households	Rest of the world	Total
		Total agriculture ISIC 1	Other industries ISIC 2-33, 38, 39, 41-43, 45-99	Water supply ISIC 36	Sewerage ISIC 37	Total			
	U2 - Use of water received from other economic units	91	0.0	0.0	113	204	147		351
	of which: Reused water	0.0	0.0	0.0	0.0	91	0.0		91
Within the economy	of which: Wastewater to sewerage	0.0	0.0	0.0	113	0.0	0.0		0.0
U=U1+U2	Total use of water	597	49	294	113	1 053	147	0.0	1 200

Source: Mahmoud Alkhwalde, "Experiences in Water Statistics and Accounts", 5th World Water Forum, Istanbul, Turkey, 16-22 March 2009 (Department of Statistics, Jordan).

TABLE 13. PHYSICAL WATER SUPPLY IN JORDAN, 2007

		Industries by ISIC categories					Households	Rest of the world	Total
		Total agriculture ISIC 1	Other industries ISIC 2-33, 38, 39, 41-43, 45-99	Water supply ISIC 36	Sewerage ISIC 37	Total			
	S1 - Supply of water to other economic units	0.0	23	147	91	261	90		351
	of which: Reused water					0.0	0.0		0.0
Within the economy	Wastewater to sewerage	0.0	23	0.0	0.0	23	90		113
	S2 - Total returns (= d.1+d.2)	60	5	140	6	211	0.0		211
	d.1- To water resources	60	5	140	6	211	0.0		211
	Surface water	5	5	10	6	26	0.0		26
	Groundwater	50	0.0	10	0.0	60	0.0		60
	Soil water	5	0.0	120	0.0	125	0.0		125
To the environment	d.2- To other sources (e.g. seawater)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
S - Total supply of water (= S1+S2)		60							562
Consumption (U - S)									638

Source: Mahmoud Alkhwalde, "Experiences in Water Statistics and Accounts", 5th World Water Forum, Istanbul, Turkey, 16-22 March 2009 (Department of Statistics, Jordan).

TABLE 14. MATRIX OF FLOWS IN THE ECONOMY IN JORDAN

To use from supply	ISIC 1	ISIC 36	ISIC 37	Others	Total	Household	Total supply
ISIC 1	0	0	0	0	0	0	0
ISIC 36	0	0	0	0	0	147	147
ISIC 37	91	0	0	0	91	0	91
Others	0	0	23	0	23	0	23
Total	91	0	23	0	114	147	261
Household	0	0	90	0	90	0	90
Total use	91	0	113	0	204	147	351

Source: Mahmoud Alkhwalde, "Experiences in Water Statistics and Accounts", 5th World Water Forum, Istanbul, Turkey, 16-22 March 2009 (Department of Statistics, Jordan).

In 2008, Bahrain launched a pilot study aimed at studying the water usage in the country for the year 2005. Tables 15 and 16 present standard tables of SEEAW on water use; and figure V indicates the water flows from its origin to the consumer, thereby representing the water accounts for Bahrain in 2005. The complete SEEAW tables for Bahrain and Jordan are set forth in annex II.

TABLE 15. AVERAGE ANNUAL WATER CONSUMPTION FOR ALL USES IN BAHRAIN
(*Millions of cubic metres*)

Year	Population (*thousands*)	Mean domestic use per capita	Groundwater				Desalinated water				Treated water	Grand total				Percentage use		
			Domestic	Agriculture	Industrial	Total	Domestic	Agriculture	Industrial	Total	Agriculture	domestic	Agriculture	Industrial	Total	Domestic	Agriculture	Industrial
1990	426	658	55	123	6	184	51.7	0.5	2.4	54	4	107	128	8	243	44	53	3
1991	436	631	51	121	5	178	53.5	0.6	2.5	56	6	105	128	8	241	44	53	3
1992	454	636	50	136	6	192	59.1	0.6	2.8	62	8	109	144	8	262	42	55	3
1993	472	648	60	139	6	205	55.7	0.6	2.6	58	8	116	148	9	273	43	54	3
1994	491	617	58	151	6	215	57.1	0.6	2.7	60	11	115	163	9	287	40	57	3
1995	511	574	62	159	7	227	50.1	0.5	2.4	53	12	112	171	9	292	38	59	3
1996	532	564	57	169	7	233	56.7	0.6	2.7	59	13	114	183	10	307	37	60	3
1997	554	552	61	178	7	247	55.2	0.6	2.6	58	13	116	192	10	318	37	60	3
1998	577	544	62	181	8	250	57.3	0.6	2.7	60	12	119	193	10	322	37	60	3
1999	600	532	62	170	6	239	58.5	0.6	2.8	61	14	121	185	9	315	38	59	3
2000	625	556	53	160	6	219	77.6	0.8	3.7	81	15	130	175	10	315	41	56	3
2001	651	570	52	137	5	195	86.0	0.9	4.1	90	15	138	154	9	301	46	51	3
2002	677	559	54	142	5	201	87.3	0.9	4.1	91	16	141	158	9	309	46	51	3
2003	705	567	54	136	5	195	94.1	1.0	4.4	99	19	149	156	9	314	47	50	3
2004	734	575	55	130	5	107	100.9	1.1	4.8	106	19	156	156	10	322	49	48	3
2005	764	572	57	128	5	111	104.6	1.1	4.9	110	21	161	158	10	329	49	48	3

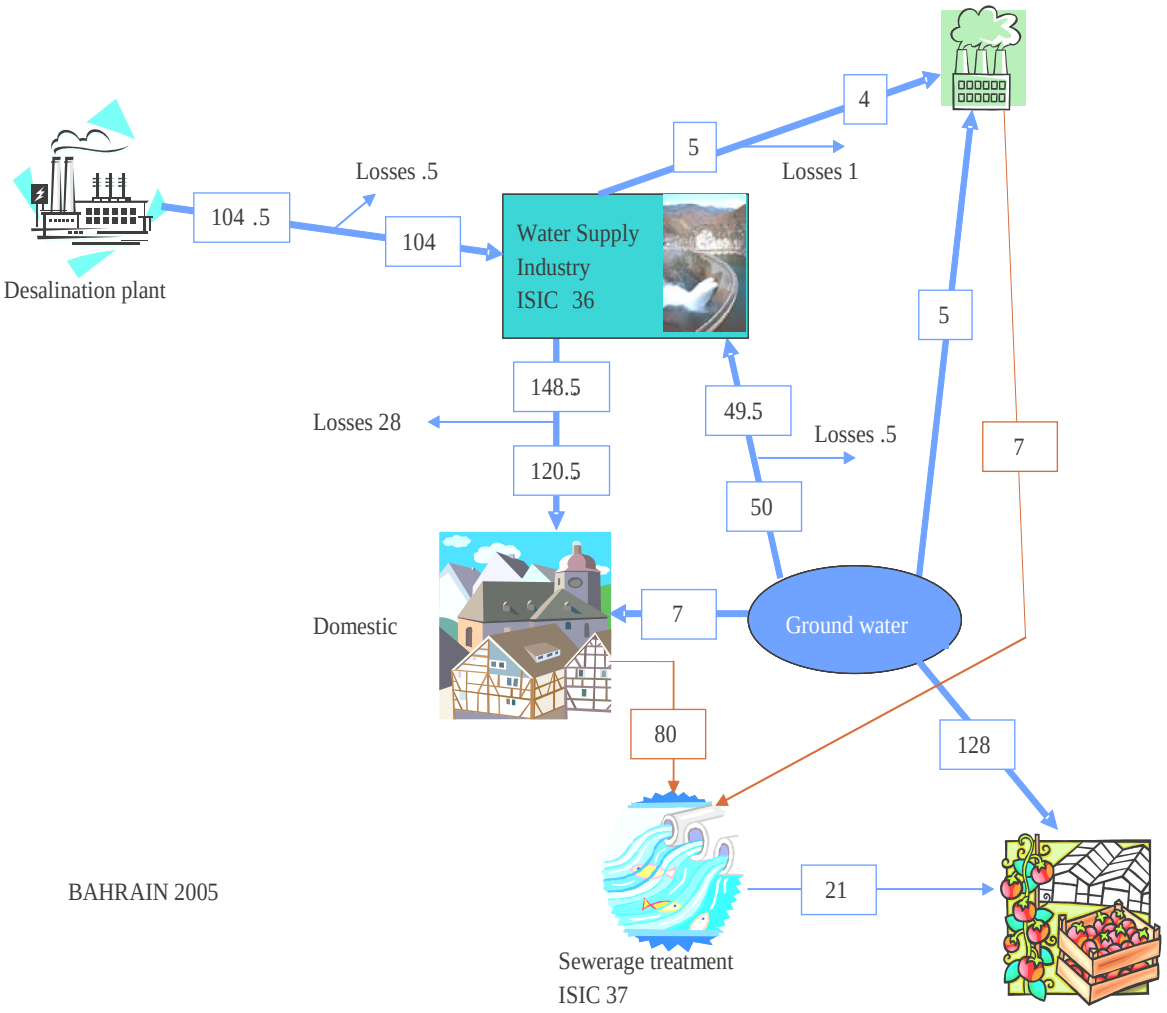
Source: Ministry of Electricity and Water, Bahrain, 2008.

TABLE 16. PILOT SEEAW PHYSICAL USE IN BAHRAIN, 2005

		Industries by ISIC categories								Households	Rest of the world	Total
		ISIC 1-3	ISIC 5-33, 41-43	ISIC 35	ISIC 36	ISIC 37	ISIC 55	ISIC 38, 39, 45-99	Total			
From the environment	1. Total abstraction (= 1.a+1.b = 1.i+1.ii)	128	5	0	160	0	0	0	293	7		300
	1.a. Abstraction for own use	128	5		1				134	7		141
	1.b. Abstraction for distribution	0			159				159			159
	1.i. From water resources:	128	5	0	50	0	0	0	183	7	0	190
	1.i.1. Surface water								0			0
	1.i.2. Groundwater	128	5		50	0			183	7		190
	1.i.3. Soil water								0			0
	1.ii. From other sources	0	0	0	110	0	0	0	110	0	0	110
	1.ii.1. Collection of precipitation								0			0
	1.ii.2. Abstraction from the sea				110				110			110
Within the economy	2. Use of water received from other economic units	21	4	0	0	0	0	0	25	126		151
	of which:	21							21			21
	2.a. Reused water											
	2.b. Wastewater to sewerage	0	4						4	126		130
3. Total use of water (=1+2)		149	9	0	160	0	0	0	318	133	0	451

Source: Ministry of Electricity and Water, Bahrain, 2008.

Figure V. Water accounts in Bahrain, 2005



Source: Ministry of Electricity and Water, Bahrain, 2008.

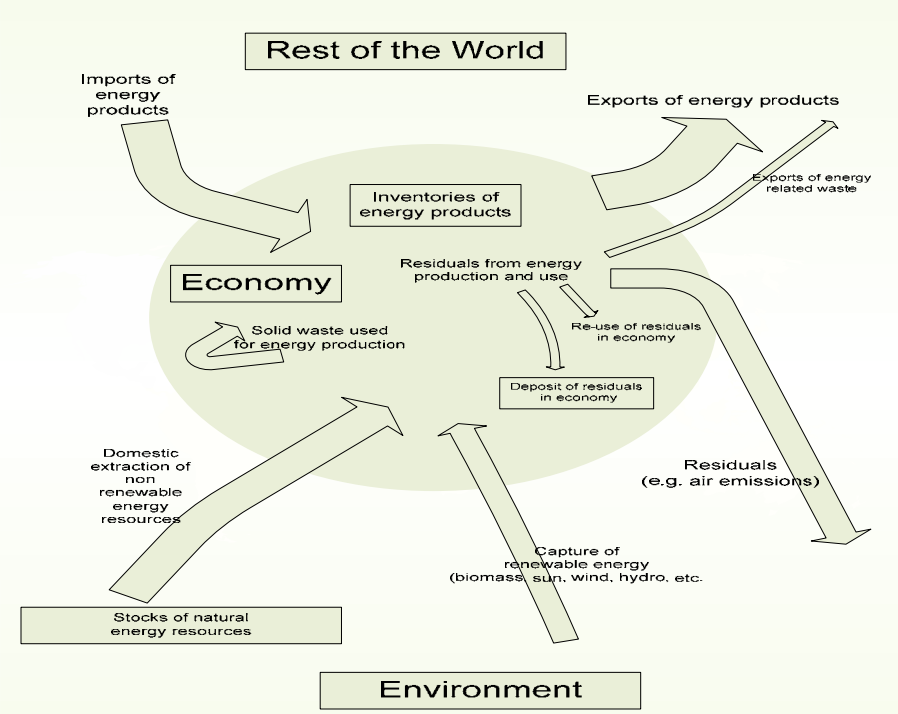
B. ENERGY STATISTICS AND ACCOUNTS

Energy represents a basic input to all sectoral and national development plans, particularly in ESCWA member countries where the energy sector plays a vital role in economic and social development. In addition, energy interacts with the national economy, the environment and the external economies as shown in figure VI.

While the development of national policies and programmes is highly dependent on the availability, accuracy and reliability of statistical energy production and sectoral consumption information, the quality of energy statistical information in most ESCWA member countries still needs capacity-building to meet the appropriate statistical requirements for formulating national development plans and international reporting.[50]

[50] ESCWA, "Report of the Workshop on Energy Statistics in ESCWA Member Countries and Seminar on Application of the UNFC for Energy Reserves/Resources in ESCWA/OPEC Member Countries (Beirut, 31 May – 2 June 2004).

Figure VI. Economy and energy



Source: United Nations Statistical Division (UNSD), "System of Environmental-Economic Accounting for Energy (SEEA-E): A project management framework for its drafting" (2007).

1. *The Global Assessment of Energy Statistics and Balances*

UNSD conducted the Global Assessment of Energy Statistics and Balances in 2007 with the following main objectives: (a) to identify the role of national statistical offices in the national statistical system in collecting, compiling and disseminating energy statistics and energy balances; (b) to assess the scope of energy statistics and balances in national statistical offices by identifying the energy sources covered, data collection practices, the use of international guidelines and classifications as well as the use of the statistics provided; and (c) to assess the impeding factors in the collection, compilation and dissemination of energy statistics and balances.[51]

The Global Assessment was sent to national statistical offices of 210 countries and territories in June 2007 and, by end November 2007, a total of 107 countries had responded, including eight ESCWA members, namely, Bahrain, Egypt, Jordan, Kuwait, Palestine, Qatar, United Arab Emirates and Yemen. The report of the Global Assessment provides an overview of the current status of energy statistics systems in the States Members of the United Nations, with their respective status from an institutional and/or legal perspective, programme status, coordination efforts, future prospects and barriers or impeding factors in the collection, compilation and dissemination of energy statistics.[52] These are briefly outlined below.

(a) *Legal framework for the collection of energy statistics*

Most of the responding countries, 86 per cent, indicated the existence of a legal framework for the collection of energy statistics (see table 17).

[51] UNSD, "Preliminary report on the Global Assessment of Energy Statistics and Balances", which was presented to the Statistical Commission at its thirty-ninth session (26-29 February 2008).

[52] Ibid.

TABLE 17. EXISTENCE OF A LEGAL FRAMEWORK FOR THE COLLECTION OF ENERGY STATISTICS

	Number of responding countries	Existence of a legal framework	
		Yes	No
Total	107	92 (86 %)	15 (14 %)
Developed economies	30	27(90 %)	3 (10 %)
Transition economies	14	14	0
Developing economies	63	51 (81 %)	12 (19 %)
Western Asia	13	13	0

Source: United Nations Statistical Division (UNSD), "Preliminary report on the Global Assessment of Energy Statistics and Balances", which was presented to the Statistical Commission at its thirty-ninth session (26-29 February 2008).

(b) *Existence of a programme on energy statistics*

A total of 93 per cent of countries and 85 per cent in Western Asia indicated the existence of energy statistics programmes (see table 18).[53]

TABLE 18. EXISTENCE OF ENERGY STATISTICS PROGRAMMES

	Number of responding countries	Countries with an energy statistics programme	Percentage of responding countries
Total	107	99	93
Developed economies	30	29	97
Transition economies	14	13	93
Developing economies	63	57	90
Western Asia	13	11	85

Source: United Nations Statistical Division (UNSD), "Preliminary report on the Global Assessment of Energy Statistics and Balances", which was presented to the Statistical Commission at its thirty-ninth session (26-29 February 2008).

(c) *Coordination mechanisms*

A coordination mechanism was defined as a formal or informal agreement between institutions/agencies for data sharing. Within that definition, 67 countries indicated the existence of coordination among institutions collecting energy statistics; 31 countries indicated the lack of a coordination mechanism; and nine countries failed to respond to the question. Moreover, in cases where the energy statistics programme is located in more than one institution, there is a coordination mechanism between institutions for data sharing in 85 per cent of such cases.

(d) *Plans for the future*

A total of 85 per cent of those institutions with an energy statistics programme explicitly indicated plans to continue current programmes and/or further expand them. The further expansion of the energy statistics programme consists most commonly in the increase of the scope (in 37 countries) and frequency (in 18 countries) of data collection and compilation.

[53] In this context, an energy statistics programme is defined as efforts aimed at collecting, compiling or disseminating energy data on a regular basis.

(e) *International classification, standards and guidelines*

Most respondents indicated that they used as reference the *Energy Statistics Manual*, which was published by OECD, the International Energy Agency (IEA) and the Statistical Office of the European Communities (Eurostat); followed by the *Joint Oil Data Initiative Manual* and various handbooks by UNSD on energy statistics, as indicated in table 19.

TABLE 19. USE OF INTERNATIONAL GUIDELINES, 2008

	Number of responding countries	Concepts and methods in energy statistics (UNSD)	Energy statistics: A manual for developing countries (UNSD)	Energy statistics: Definition units and measure and conversion factors (UNSD)	Energy Statistics Manual	Joint Oil Data Initiative Manual	Other
Total	84	28	12	30	57	35	15
Developed economies	26	8	1	7	22	17	3
Transition economies	12	2	2	3	12	3	0
Developing economies	46	18	9	20	23	15	12
Western Asia	12	3	2	6	8	4	0

Source: United Nations Statistical Division (UNSD), "Preliminary report on the Global Assessment of Energy Statistics and Balances", which was presented to the Statistical Commission at its thirty-ninth session (26-29 February 2008).

(f) *Impeding factors*

Countries encounter a number of impending factors in collecting, compiling and disseminating energy statistics, which, in order of importance are as follows: (a) lack of a coordination mechanism and/or data sharing; (b) poor data quality; (c) low response rate; (d) lack of confidentiality; and (e) classification and definition of new energy sources.

(g) *Reporting to international organizations*

Most of the responding institutions, 92 per cent, reported to international and/or regional organizations. Some constraints in reporting were attributed to the following reasons: (i) questionnaires were deemed too detailed and could not be completed; (ii) the classification of products did not match national classifications; and (iii) the classification of energy uses did not match national classifications.[54]

(h) *Dissemination and use*

A total of 90 per cent of respondents in Western Asia considered most of the energy statistics to be freely available to users, and that these uses were aimed at compiling and/or calculating the following: (i) overall energy balances; (ii) national accounts; (iii) environment statistics; (iv) GHG emissions; (v) indicators; (vi) commodity balances; and (vii) energy accounts.[55]

[54] UNSD, "Preliminary report on the Global Assessment of Energy Statistics and Balances", which was presented to the Statistical Commission at its thirty-ninth session (26-29 February 2008).

[55] Ibid.

2. *Energy accounts*

The use of energy is of critical importance for the economic process given that nearly every economic activity is connected either directly or indirectly with the consumption of energy.

Energy accounts provide detailed physical information on energy resources, production, conversion and consumption, and facilitate the development of a reliable set of air emission flow accounts that can be further used in conjunction with corresponding monetary data. More specifically, they provide information on the levels of direct energy consumption of industries regarding their production processes and of private households regarding their consumption. The accounts can also provide information on changes in the energy requirements of particular industries in relation to their output.

Consequently, UNCEEA identified energy accounts as an important domain of environmental-economic accounting and requested that energy accounts feature prominently in the revised SEEA. UNSD is preparing a manual on the System of Environmental-Economic Accounting for Energy (SEEA-E), which presents standard concepts, definitions, classifications and tables for energy accounts. In addition, UNSD is developing the International Recommendations for Energy Statistics (IRES) that will be complementary and fully coordinated with SEEA-E. The work is being coordinated with the Oslo Group on Energy Statistics whose main objective is to address issues related to energy statistics and to contribute to improved international standards and improved methods for official energy statistics by pooling expertise in the energy community.

The SEEA framework has proven its potential and added value in many areas of environmental-economic analysis and it is the most practical way forward. Given that the information contained in the accounts constitutes a prerequisite for reliable estimates of air emissions related to energy consumption, a stepwise approach and the development of simplified standard tables that many countries can implement is an essential part of the agenda on climate change.[56]

The scope of energy and air emission accounts includes physical flows, namely: natural resource extraction of coal, crude oil and natural gas, among others; ecosystem inputs, including oxygen for combustion; products, such as motive fuels and other fuel types; and residuals generated by the use of fossil fuels, including emissions to air and other residuals such as ash.[57]

The interest is mostly on specific energy supply and demand as well as on air emissions. Usually the energy supply and use accounts include both the monetary and the physical dimension in tonnes or in their calorific equivalents. Supply of products is defined as domestic production plus import of the various energy commodities, while total product use is defined by the intermediate use by industries (classified by ISIC), household consumption, inventory changes and exports. The number of energy commodities to be accounted for needs to be sufficiently large in order to reflect the various types and levels of emissions from different types of energy. Moreover, the use table must be able to show the use of natural resources, for example the use of coal, gas and oil extracted by the mining industries.

As part of its standard presentation, SEEA-E includes the following information: (a) asset accounts in physical and monetary units (stock accounts); (b) supply and use tables for energy products in physical and monetary units (flow accounts); (c) energy-related air emissions accounts; and (d) hybrid accounts juxtaposing physical and monetary accounts.[58]

[56] UNSD, "Report of the Conference on Climate Change and Official Statistics, Oslo, 14-16 April 2008" (2008).

[57] DESA, European Commission, IMF, OECD and the World Bank, *Handbook of national accounting: Integrated environmental and economic accounting* (2003).

[58] Data requirements for the compilation of the supply and use tables, such as data sources, conversion into calorific values and balancing the system are explained in detail in DESA, European Commission, IMF, OECD and the World Bank, *Handbook of national accounting: Integrated environmental and economic accounting* (2003).

International and regional organizations and institutions, including ESCWA, are cooperating in that regard in order to unify methodologies, terminologies and definitions with respect to energy statistics, balances and accounts.[59]

Energy accounts have not been developed yet in any ESCWA member country. The difficulties are at the level of basic energy statistics and energy balances. However, with further assistance and capacity-building in energy accounts to national statistical offices and concerned ministries, the development of pilot energy accounts could be achieved in one or two years in Egypt, Jordan and Oman. Within that context, Egypt and Jordan are preparing energy balances, and Oman has developed a comprehensive set of data on national accounts. For illustration purposes, tables 20-23 present the energy accounts produced in New Zealand.[60]

TABLE 20. ENERGY DEMAND IN NEW ZEALAND, (PJ) YEAR ENDING MARCH 2003

Industry	Coal[a/]	Lignite	Natural gas	LPG/ NGL	Petrol	Diesel	Fuel oil	Aviation fuels[b/]	Electricity	Total
Agriculture	0.35	-	0.84	-	2.74	13.17	0.03	0.13	4.55	21.81
Fishing	-	-	-	-	0.00	5.19	1.61	0.01	0.34	7.15
Forestry and logging	-	-	-	-	0.38	1.61	0.51	0.02	0.32	2.83
Mining	0.29	-	0.01	-	0.22	3.61	0.51	-	1.58	6.23
Petroleum chemicals, plastic and rubber[c/]	0.29	0.06	91.04	0.05	0.02	1.47	0.17	0.00	1.84	113.60
Electricity and water supply	-	-	-	-	-	-	-	-	1.62	1.62
Food and beverages	9.81	1.96	6.13	0.32	1.01	2.67	0.12	0.02	7.67	29.71
Textile, apparel and leather goods	0.47	0.09	0.78	0.01	0.02	0.49	0.10	0.00	0.71	2.68
Wood processing and wood products	0.54	0.11	1.23	0.26	0.00	0.06	0.08	-	7.65	9.93
Paper and paper products[d/]	-	-	6.39	0.02	0.00	0.02	0.41	0.02	6.58	13.44
Non-metallic mineral manufacturing	5.21	1.04	0.95	0.20	-	0.48	0.03	0.00	0.99	8.92
Basic metal industries	16.73	-	1.57	0.11	0.01	0.19	0.67	0.02	18.82	38.11
Fabricated metal products[e/]	0.12	0.02	0.97	0.15	0.07	3.03	0.10	0.00	1.02	5.48
Other manufacturing industries	-	-	0.02	0.00	0.02	0.02	0.00	-	0.81	0.87
Construction	-	-	0.00	0.11	1.04	3.71	0.01	0.08	1.05	6.00
Wholesale and retail trade	1.15	0.17	3.80	0.74	5.22	1.75	0.01	-	8.46	21.30
Motels, hotels and guest houses	0.02	0.00	2.31	0.18	0.15	0.15	0.07	-	3.49	6.37
Communication	-	-	0.01	0.01	0.22	0.65	-	-	1.03	1.91

[59] More details are available at: http://www.iea.org/interenerstat_v2/index.asp.

[60] Further examples from Denmark, Republic of South Korea, Norway and United Kingdom of Great Britain and Northern Ireland, among others, are available in the literature.

TABLE 20 (*continued*)

Industry	Coal[a/]	Lignite	Natural gas	LPG/ NGL	Petrol	Diesel	Fuel oil	Aviation fuels[b/]	Electricity	Total
Finance and business services	0.06	0.01	1.98	-	-	-	0.08	-	3.81	5.94
Central Government administration and defence	0.29	0.04	0.72	-	0.13	1.63	0.25	0.74	1.51	5.32
Local government administration	0.09	0.01	0.50	-	0.30	0.31	-	-	1.19	2.40
Education	1.09	0.17	1.31	-	-	0.46	0.01	-	2.06	5.10
Health and welfare services	1.72	0.26	2.23	-	0.17	-	-	-	2.02	6.40
Other community services	0.07	0.01	0.20	-	0.22	0.36	0.02	-	2.36	3.23
Transport and storage	0.08	-	0.20	2.47	6.83	44.87	16.43	43.53	1.91	116.32
Household	0.18	0.45	6.57	2.14	88.56	13.16	-	-	42.20	153.26
Total	38.57	4.41	129.76	6.79	107.34	99.03	21.24	44.57	125.60	595.95

Source: Official Statistics Agency in New Zealand, which is available at: http://www.stats.govt.nz/environment/environmental-accounts/energy-and-emissions.htm.

Notes: Energy demand incorporates final consumption of energy productions, including non-energy use but excluding energy used for electricity generation.

a/ 'Coal' includes bituminous and sub-bituminous coal.
b/ 'Aviation fuels' includes kerosene.
c/ 'Petroleum chemicals, plastic and rubber' includes 18.65PJ of refinery intermediates and residues.
d/ 'Paper and paper products' includes printing and publishing.
e/ 'Fabricated metal products' includes both machinery and equipment.

TABLE 21. CARBON DIOXIDE EMISSIONS IN NEW ZEALAND, (KT) YEAR ENDING MARCH 2003

Industry	Coal[a/]	Natural gas	LPG/NGL	Petrol	Diesel	Fuel oil	Aviation fuels[b/]	Total
Agriculture	31.9	44.5	-	181.5	915.3	2.3	8.6	1 184.0
Fishing	-	-	-	0.1	360.5	118.7	0.6	479.8
Forestry and logging	-	-	-	25.3	111.7	37.5	1.1	175.7
Mining	26.9	0.7	-	14.8	251.1	37.5	-	331.2
Petroleum chemicals, plastic and rubber[c/]	31.8	572.3	3.1	1.4	101.9	12.8	0.2	1 585.7
Electricity and water supply	1 750.7	4 961.5	-	-	-	-	-	6 712.3
Food and beverages	1 079.3	323.8	19.5	66.9	185.3	9.0	1.1	1 684.9
Textile, apparel and leather goods	52.0	41.1	0.6	1.3	34.4	7.1	0.2	136.8
Wood processing and wood products	59.3	65.1	15.8	0.1	4.4	5.9	-	150.6
Paper and paper products[d/]	-	337.3	1.3	0.1	1.3	29.8	1.4	371.2
Non-metallic mineral manufacturing	573.7	50.2	12.4	-	33.3	2.6	0.2	672.4
Basic metal industries	1 534.9	82.8	6.4	0.5	13.5	49.5	1.1	1 688.6
Fabricated metal products[e/]	13.5	51.2	9.1	4.5	210.4	7.1	0.2	296.1
Other manufacturing industries	-	1.0	0.1	1.1	1.1	0.1	-	3.5

TABLE 21 (*continued*)

Industry	Coal[a/]	Natural gas	LPG/NGL	Petrol	Diesel	Fuel oil	Aviation fuels[b/]	Total
Construction	-	0.1	6.9	69.1	257.8	0.8	5.2	339.8
Wholesale and retail trade	122.0	200.5	44.5	345.4	121.4	0.7	-	834.4
Motels, hotels and guest houses	2.0	121.8	10.8	10.0	10.5	5.0	-	160.2
Communication	-	0.5	0.5	14.2	44.9	-	-	60.2
Finance and business services	6.7	104.3	-	-	-	5.9	-	117.0
Central Government administration and defence	30.6	38.2	-	8.9	113.1	18.4	50.4	259.6
Local government administration	9.8	26.4	-	19.8	21.2	-	-	77.2
Education	115.1	69.4	-	-	31.7	1.1	-	217.3
Health and welfare services	181.6	117.9	-	25.8	24.8	-	-	350.1
Other community services	7.0	10.4	-	-	-	1.2	-	18.6
Transport and storage	7.3	10.5	149.5	452.0	3 118.6	1 207.9	2 964.6	7 910.4
Household	57.4	346.9	129.5	5 862.7	914.4	-	-	7 311.0
Total	5 693.6	7 578.4	410.0	7 105.7	6 882.6	1 561.0	3 035.0	33 128.3

Source: Official Statistics Agency in New Zealand, which is available at: http://www.stats.govt.nz/environment/environmental-accounts/energy-and-emissions.htm.

Notes: Emission from use of energy products excludes fugitive emissions.

a/ 'Coal' includes bituminous and sub-bituminous coal.
b/ 'Aviation fuels' includes kerosene.
c/ 'Petroleum chemicals, plastic and rubber' includes 18.65PJ of refinery intermediates and residues.
d/ 'Paper and paper products' includes printing and publishing.
e/ 'Fabricated metal products' includes both machinery and equipment.

TABLE 22. GREENHOUSE AND OZONE PRECURSOR GAS EMISSION SUMMARY IN NEW ZEALAND, YEAR ENDING MARCH 2003

	tCO_2-e			t		
Industry	CO_2	CH_4	N_2O	CO	NMVOCs	NOx
Agriculture	1 183 983	4 742	17 366	16 675	3 847	10 919
Fishing	479 843	1 642	6 909	1 857	611	6 486
Forestry and logging	175 660	627	6 538	2 423	585	1 919
Mining	331 160	1 172	8 892	2 360	706	3 349
Petroleum chemicals, plastic and rubber[a/]	1 585 686	43 425	3 474	347	11 216	4 157
Electricity and water supply	6 712 261	5 695	11 615	2 870	514	25 495
Food and beverages	1 684 883	422	6 239	262	271	6 069
Textile, apparel and leather goods	136 822	46	365	27	17	451
Wood processing and wood products	150 641	54	388	32	20	558
Paper and paper products[b/]	371 168	195	222	110	31	1 509
Non-metallic mineral manufacturing	672 371	167	2 696	496	127	3 425
Basic metal industries	1 688 578	323	8 029	183	330	6 536
Fabricated metal products[c/]	296 060	105	520	67	23	628
Other manufacturing industries	3 477	1	5	1	0	8
Construction	339 821	109	632	75	24	521
Wholesale and retail trade	834 404	2 844	7 427	24 775	5 068	4 198

TABLE 22 (*continued*)

Industry	tCO_2-e			t		
	CO_2	CH_4	N_2O	CO	NMVOCs	NOx
Motels, hotels and guest houses	160 162	161	1 768	765	165	296
Communication	60 224	259	845	1 183	256	566
Finance and business services	116 981	61	1 306	32	23	105
Central Government administration and defence	259 558	614	2 992	1 268	365	1 565
Local government administration	77 197	230	848	1 488	318	403
Education	217 283	405	1 886	388	291	668
Health and welfare services	350 052	692	2 831	2 291	767	980
Other community services	18 633	20	160	16	16	27
Transport and storage	7 910 383	22 753	90 350	56 272	27 718	51 211
Household	7 311 007	41 451	55 054	412 821	79 866	51 286
Total	33 128 296	128 215	239 356	529 083	133 513	183 334

Source: Official Statistics Agency in New Zealand, which is available at: http://www.stats.govt.nz/environment/environmental-accounts/energy-and-emissions.htm.

Notes: Emission from use of energy products excludes fugitive emissions.

a/ 'Petroleum chemicals, plastic and rubber' includes 18.65PJ of refinery intermediates and residues.
b/ 'Paper and paper products' includes printing and publishing.
c/ 'Fabricated metal products' includes both machinery and equipment.

TABLE 23. SUMMARY OF MONETARY ENERGY STOCKS IN NEW ZEALAND, YEAR ENDING MARCH 2003
(*Millions of New Zealand dollars*)

	Non-renewable			Renewable		
	Petroleum	Coal	Total	Electrical	Heat	Total energy
1997 Stock	3 074.6	486.3	3 560.9	3 373.1	..	6 934.0
Less resource rent	375.2	19.9	395.1	141.2	..	536.3
Plus other changes	292.3	31.4	323.7	297.7	..	621.4
1998 Stock	2 991.7	497.8	3 489.5	3 529.6	..	7 019.1
Less resource rent	331.5	12.9	344.4	108.7	..	453.1
Plus other changes	181.9	-162.1	19.8	-703.0	..	-683.2
1999 Stock	2 842.1	322.8	3 164.9	2 717.9	..	5 882.8
Less resource rent	411.1	15.9	427.0	169.6	..	596.6
Plus other changes	631.5	90.9	722.4	1 692.6	..	2 415.0
2000 Stock	3 062.5	397.8	3 460.3	4 240.9	..	7 701.2
Less resource rent	567.5	0.0	567.5	101.9	..	669.4
Plus other changes	1 617.6	464.0	2 081.7	-1 592.2	..	489.5
2001 Stock	4 112.7	861.8	4 974.5	2 546.8	..	7 521.3

Source: Official Statistics Agency in New Zealand, which is available at: http://www.stats.govt.nz/environment/environmental-accounts/energy-and-emissions.htm.

Note: Two dots (..) indicate that data are not available or are not separately reported.

C. SOIL ACCOUNTS

Land, combined with soil and water, is of specific importance for agriculture and food policymaking (United Nations, 2000). Moreover, according to the UNEP *World Atlas of Desertification*, every year, nearly 6 million hectares of previously productive land in arid, semiarid and dry sub-humid area loses its productive capacity to produce food, which costs the world some $42.3 billion each year in 1990 prices.[61]

Soil is considered an ecosystem, a natural capital containing vital economic value.[62] Stocks of soil "can be measured inclusively as a complex material described by soil typology. It can be measured as well for each main components: minerals, biomass, carbon, nitrogen, phosphorous, potassium, fauna, flora and water".[63]

Furthermore, the main functions and ecosystem services of soil and carbon storage and sequestration are as follows:[64] (a) production function, which produces crops; (b) carrier function, which bears traffic and buildings; (c) filter, buffer and reactor function, which allows transformations of solutes passing through; (d) resource function, which provides base material for industry; (e) habitat function, which provides a living environment for plants and animals; (f) cultural and historic function, which reflects past practices; (g) climate regulating function, which stores organic and inorganic carbon and sequesters soil organic carbon (SOC), and which regulates water storage and evapo-transpiration; and (h) other important soil attributes, which are linked to soil humidity and soil biodiversity where soil is one of the most species-rich habitats of terrestrial ecosystems.

The development of an information system on the current status and problems of land resources, such as SEEA, provides a macro-view of the current status of soil degradation in relation to the total economic situation of the country as well as detailed disaggregated information. The system allows for the users of land resources to be more aware of the dangers of inappropriate management of the soil.[65]

An important land and soil resource accounting process was undertaken in the Philippines in 2000 in line with the SEEA framework. The agricultural sector of the Philippines contributes some 20 per cent to GDP and accounts for approximately 43 per cent of total labour force, thereby indicating the importance of soil to the economy.[66] Land accounts were produced and designed in order to outline the various land uses in the country, including agriculture, forest, residential, commercial, industrial, and recreational and other land use types.

These accounts describe the area, cover and vegetation, changes in land use and qualitative changes resulting from the use of land over time. Land accounts in the Philippines are aimed at providing improved, timely and relevant information on the allocation and use of land resources; and the indicators derived from the accounts serve as an important input to land policies concerning management, proper allocation and use of land and soil resources.[67]

The framework of the asset accounts on land and soil resource was structured for three sets of accounts, namely: land resource, soil resource and the land use accounts (see table 24).

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[61] DESA and UNEP, *Integrated environmental and economic accounting: an operational manual*, No. 78 (2000), p. 123.

[62] Weber J.L., "Implementation of land and ecosystem accounts at the European Environment Agency", *Special Issue on Environmental Accounting*, vol. 61, No. 4 (2007), pp. 695-707.

[63] Ibid., p. 695.

[64] Ibid.

[65] DESA and UNEP, op. cit.

[66] E.V. Domingo and M.G.B. Buenaseda, "Compilation of Resource Accounts (Selected Case Studies): Land/Soil Resource Accounts", which was presented to the International Workshop on Environmental and Economic Accounting (Manila, 18-22 September 2000).

[67] Ibid.

TABLE 24. SEEA LAND AND SOIL RESOURCES ACCOUNTING FRAMEWORK

	Land and soil resource (hectares)
Opening stock	Area of land underlying buildings, land under cultivation, recreational land (i.e. quantity of land use category at the beginning of accounting period)
Economic use (sustainable use, depletion)	
Other accumulation	▪ Changes in land use ▪ Transfer of land from the environment to economic use ▪ Land reclamation (increase in asset)
Other volume changes	▪ Changes in land use and land area due to natural, political or other non-economic causes
Closing stock	▪ Transfer of land from economic use to the environment ▪ Area of land underlying buildings, land under cultivation, recreational land (i.e. quantity of land use category at the end of accounting period)
Changes in quality (Changes in land and soil quality affect land productivity and economic value)	▪ Soil erosion or nutrient loss (metric tons) ▪ Land and soil contamination including salinization and other changes in soil quality.

Source: E.V. Domingo and M.G.B. Buenaseda, "Compilation of Resource Accounts (Selected Case Studies): Land/Soil Resource Accounts", which was presented to the International Workshop on Environmental and Economic Accounting (Manila, 18-22 September 2000).

Additionally, the Land and Water Development Division of the Food and Agriculture Organization (FAO) frequently publishes data on soil accounts. Table 25 shows several important parameters with respect to soil for selected ESCWA member countries.

TABLE 25. SOIL DATA FOR SELECTED ESCWA MEMBER COUNTRIES, 2000

Country	Total area (*thousands of km²*)	Salinity (*thousands of km²*)	Salinity (*percentage*)	Erosion risk (*thousands of km²*)	Erosion risk (*percentage*)	Hydro morphy (*thousands of km²*)	Hydro morphy (*percentage*)	Low CEC* (*thousands of km²*)	Low CEC (*percentage*)
Egypt	998	87	9	78	8	14	1	0	0
Iraq	431	61	14	33	8	3	1	15	3
Jordan	90	3	3	13	15	0	0	2	2
Kuwait	17	2	10	1	8	0	1	4	17
Lebanon	10	0	0	5	46	0	0	0	0
Oman	312	20	6	29	9	3	1	13	5
Qatar	12	2	17	1	10	1	7	0	1
Saudi Arabia	1 954	93	5	140	7	6	0	191	8
The Sudan	2 498	24	1	235	10	181	8	212	9
Syrian Arab Republic	187	5	2	21	11	1	1	0	0
United Arab Emirates	79	10	13	4	5	4	6	6	9
Yemen	421	17	4	36	9	0	0	19	4

Source: Food and Agriculture Organization (FAO), "Land resource potential and constraints at country and regional levels" (Land and Water Development Division, FAO, 2000).

* Cation Exchange Capacity (CEC) is a calculated value that is an estimate of the soil's ability to attract, retain and exchange cation elements.

D. LAND AND ECOSYSTEM ACCOUNTS

Land is treated as a non-produced asset, which provides economic benefits to its owner within the framework of SNA. However, this picture can be completed when the investigation incorporates the indirect

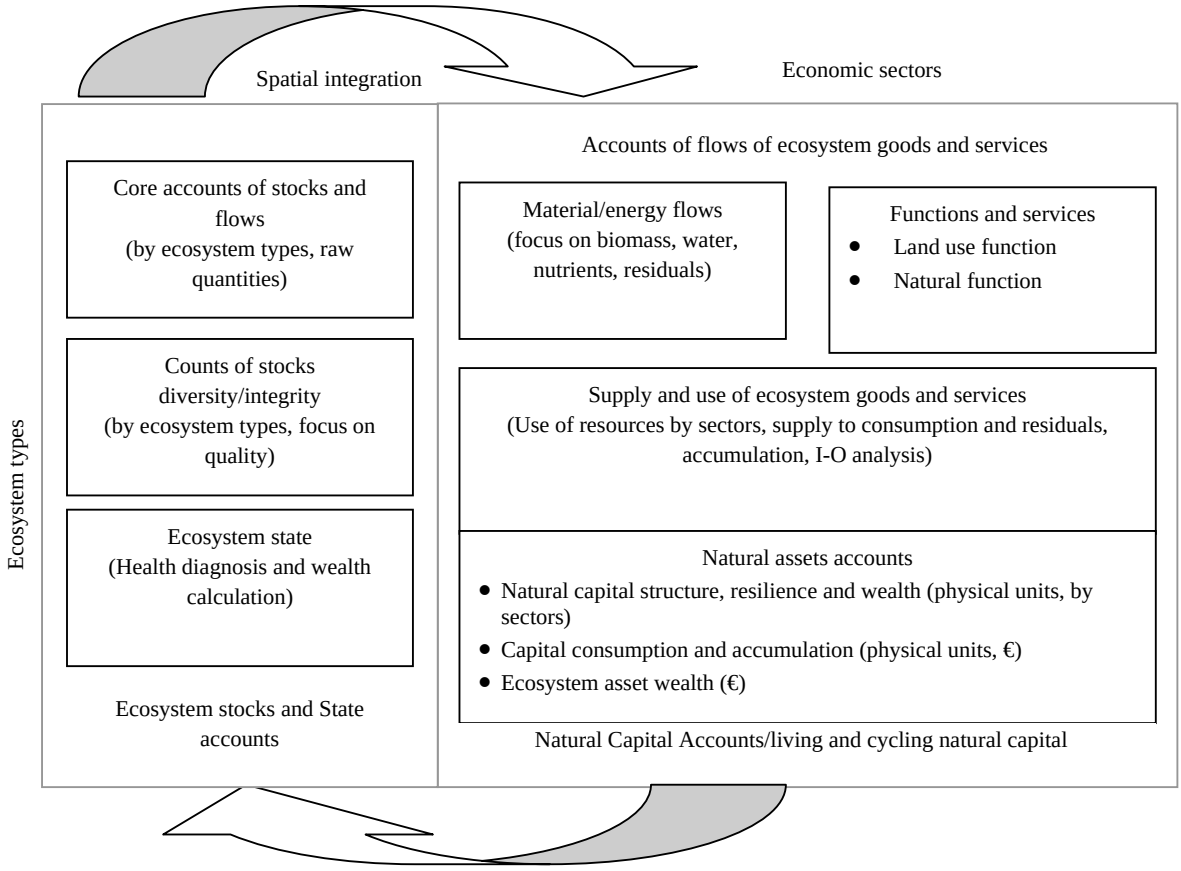
benefits that arise from the use of ecosystems, namely, the quality of habitats and ecosystems, and the characteristics of soil.[68]

The integration of land and ecosystem accounting links the economic and the environmental dimensions and permits aggregated indicators to be derived, thereby providing the background for such land-related policies as nature protection, agriculture and transport policy.

More specifically, such integration has the following benefits:[69] (a) provides a complete picture of land cover and land use for a country and allows the derivation of trends and indicators of change; (b) aids the integration of diverse data sources on land cover and land use as well as with other data, including, for example, on population, economic activity, water balances, species and fertilizer use; (c) promotes standardization and classifications of land cover, land use and causes of changes; (d) allows changes in land use, land cover, habitats and biodiversity to be linked to driving forces; and (e) facilitates its application at national, regional, watershed or landscape type levels.

The land and ecosystem accounting framework shows that land cover accounts are supplemented with accounts on land use and ecosystems as well as economic information on the processes driving land cover change, the impact of land cover change and the importance for policy issues and trade-offs (see figure VII).

Figure VII. Land and ecosystem accounting framework



Source: G.M. Lange and J.L. Weber, "Ecosystem accounting at the European Environment Agency: a summary of progress" (European Environment Agency, 2006).

[68] DESA, European Commission, IMF, OECD and the World Bank, *Handbook of national accounting: Integrated environmental and economic accounting* (2003).

[69] Ibid., p. 373.

In general, ecosystem accounts expand the land accounts in order to record the supply of ecosystem goods and services, thereby assessing ecosystem potentials and their integrity, health and viability. The accounts include geographical information and monitoring data on atmosphere and climate, the water systems, fauna and flora, and soils.[70]

Figure VII also shows a core stock account, which corresponds to the basic account of SEEA and two supplementary accounts.[71] Basic accounts establish the interface between the use of land and land cover from an environmental perspective.[72]

Tables 26 and 27 present the types and extent of land degradation associated with agricultural intensification, inappropriate farming practices, desertification and salinization.[73]

TABLE 26. TYPES AND CAUSES OF LAND DEGRADATION IN SELECTED ESCWA MEMBER COUNTRIES

	Water	Wind	Chemical degradation	Physical degradation	Deforestation	Overgrazing	Agricultural activity
Egypt	..	29	68	2	2	30	68
Iraq	6	37	45	11	2	36	61
Jordan	10	90	..	..	6	94	..
Kuwait	..	88	12	..	..	88	12
Lebanon	99	..	1	..	63	36	1
Syrian Arab Republic	17	46	37	..	9	46	45

Source: ESCWA, *Compendium of Environment Statistics in the ESCWA Region* (E/ESCWA/SCU/2007/2).
Note: Two dots (..) indicate that data are not available or are not separately reported.

TABLE 27. EXTENT OF LAND DEGRADATION IN ESCWA MEMBER COUNTRIES
(*Thousands of square kilometres and percentages*)

	Total area	Not degraded		Lightly degraded		Moderately degraded		Severely degraded		Very severely degraded		Cause	Type
Bahrain	0.7	..	..	..	..	..	..	..	..	..	..	..	..
Egypt	1 001	614	62	272	27	26	3	66	7	19	2	1	iii
Iraq	438	3	1	0	0	91	21	196	45	149	34	1, 2	i, ii, iii, iv
Jordan	96	3	4	0	0	62	65	14	14	16	17	2, 3	i, ii
Kuwait	24	0	0	0	0	24	98	0	0	1	2	2	ii
Lebanon	104	0	0	72	69	6	6	26	25	0	0	2, 3	i
Oman	271	42	16	76	28	46	17	107	39	0	0	2, 3	i, ii
Palestine	6	..	..	..	..	..	..	..	..	..	..	..	..
Qatar	11	0	0	7	65	4	35	0	0	0	0	2	ii
Saudi Arabia	2 396	514	21	732	31	348	15	660	28	142	6	2	ii

[70] G.M. Lange and J.L. Weber, "Ecosystem accounting at the European Environment Agency: a summary of progress" (European Environment Agency, 2006).

[71] Ibid.

[72] The detailed description of figure VII is attached in annex III.

[73] Data with respect to land degradation in the ESCWA region is presented in ESCWA, *Compendium of Environment Statistics in the ESCWA Region* (E/ESCWA/SCU/2007/2).

Table 27 (*continued*)

	Total area	Not degraded		Lightly degraded		Moderately degraded		Severely degraded		Very severely degraded		Cause	Type
The Sudan	2 498	1 163	46	326	13	263	11	366	15	0	15	2	i, ii
Syrian Arab Republic	185	0	0	9	5	64	35	78	42	33	18	1, 2	i, ii, iii
United Arab Emirates	75	14	19	0	0	58	77	3	4	0	0	1, 2	ii, iii
Yemen	480	18	4	85	18	161	33	217	45	0	0	2, 3	i, ii
ESCWA	7 586	2 371	31	1 579	21	1 153	15	1 733	23	360	5	..	..

Source: Food and Agriculture Organization (FAO), "Land resource potential and constraints at country and regional levels" (Land and Water Development Division, FAO, 2000).

Notes: Two dots (..) indicate that data are not available or are not separately reported.

Causes: 1 = agriculture; 2 = overgrazing; 3 = deforestation.
Types: i = water erosion; ii = wind erosion; iii = chemical deterioration; iv = physical deterioration.

III. ENVIRONMENTAL PROTECTION EXPENDITURE

While environment expenditures are commonly regarded as indicators of environmental commitment, they have to be seen within the context of the "particular environmental conditions in a country and its effectiveness in tackling these conditions".[74] SEEA proposes to segregate environmental protection activities and related expenditures in an activity classification, referred to as classification of environmental protection activities (CEPA).[75]

This is important for two main reasons as follows:[76] (a) to remain aware of the costs imposed by environmental protection expenditures in different sectors, with their implications for competitiveness and economic performance; and (b) to remain aware of the opportunities as well as the costs of environmental protection, wherein one sector's costs are another's revenue, and the environmental protection sector is widely forecast to be one of the fastest growing business sectors in the future.

An additional path towards identifying, defining, streamlining and possibly standardizing environmental protection expenditure information is performed through the PEERs of the World Bank and using the Country Environmental Analysis (CEA) tool.[77] In its design, CEA is an "upstream analytical tool aiming to integrate environmental considerations into country assistance strategies, poverty reduction strategy papers, development policy lending, and country level development assistance strategies and programmes, the objective of which is to help integrate environmental considerations into early stages of planning and to guide capacity-building and operational priorities in development assistance".[78]

Table 28 illustrates the three building blocks that constitute CEA, of which PEER represents one element within the "capacity/performance assessment" block that evaluates a national capacity for managing environmental priorities.

PEERs assist in terms of evaluating a government's environmental management capacity by asking three questions related to public expenditures and the effectiveness of the way funds are used in this respect, namely:[79]

(a) If the expenditures address policy priorities, does a particular expenditure address a policy priority in the most appropriate way? In turn, this involves asking the following: (i) whether there is a rationale for government involvement in the first place (e.g., a market failure); and (ii) whether the instrument chosen to address the problem is appropriate;

(b) Given that a particular expenditure is addressing a policy priority and is taking an appropriate approach to it, is the programme being carried out efficiently? In other words, are funds being managed correctly and producing the desired results.

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[74] DESA and UNEP, op. cit., p. 13.

[75] More information on the classification of environmental protection activities (CEPA) is available in annex IV.

[76] DESA and UNEP, op. cit.

[77] It is important to note that different organizations give slightly different definitions and classification systems for environmental expenditure.

[78] P. Pillai, *Strengthening Policy Dialogue on Environment: Learning from Five years of Country Environmental Analysis* (the World Bank Environment Department, February 2008), p. 1.

[79] A. Swanson and L. Lundethors, "Public Environmental Expenditure Reviews (PEERs): Experience and Emerging Practice" (the World Bank, May 2003).

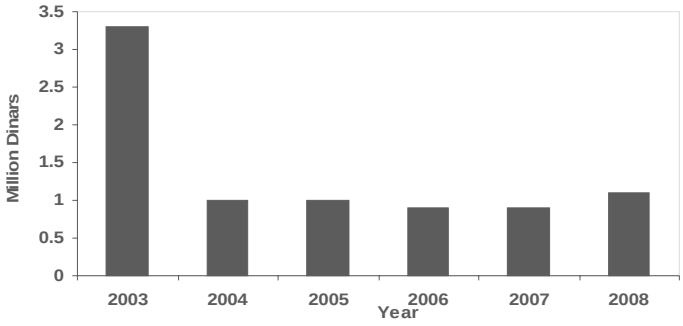
TABLE 28. KEY BUILDING BLOCKS OF CEA

State of environment and priorities for development	Policy analysis	Capacity/performance assessment
• Key environmental and sustainability indicators, with focus on priority issues identified by NEAPs, national strategies or other previous documents • Environmental trends in priority areas and sectors • Links of environmental issues with economic growth and poverty reduction (key environment and poverty indicators) • Data gaps	• Identification key macroeconomic or sector policies and reforms that could have significant environmental implications (e.g. energy and water pricing issues, privatization, trade liberalization) • Lessons from strategic environmental assessments • Suggested measures or areas for strategic environmental assessments	• Institutional and organizational capacity assessment • Methodology and processes for priority setting and cross-sectoral coordination • A capacity assessment • Environmental public expenditure review • Indicators for measuring public sector capacity • Data gaps • Areas for intervention
Business plan		
▪ Stocktaking of and lessons learned from past environmental assistance to client countries by the World Bank and development partners ▪ Review of planned lending and non-lending activities of the World Bank in key sectors and their links with environmental priorities ▪ Review of ongoing and planned environmental support activities of development partners ▪ Assessment of the comparative advantage of the World Bank vis-à-vis development partners ▪ Suggested World Bank assistance in the form of lending and non-lending assistance and partnerships		

Source: ESCWA, based on A. Swanson and L. Lundethors, "Public Environmental Expenditure Reviews (PEERs): Experience and Emerging Practice" (The World Bank, May 2003).

In the ESCWA region, only Egypt and Jordan have a completed and ongoing CEA, while Lebanon's CEA is in the planning stage.[80] Figure VIII illustrates the environment expenditure in Jordan between 2003 and 2008.

Figure VIII. Environment expenditure in Jordan, 2003-2008



Source: Ministry of Finance in Jordan, "General Government Finance Bulletin", vol. 10, No. 6 (Studies and Economic Policies Directorate, 2008), which is available at: http://eng.mof.gov.jo/english/PDFs/2007/PDF%20English%20(July2008).pdf.

Several ESCWA member countries explicitly mention Government environment expenditure within their yearly budget reports. For example, Bahrain includes in its yearly budget all revenues and expenditures, including environmental protection. In 2005 and 2006, the Public Commission for the Protection of Marine Resources, Environment and Wildlife spent approximately 4.85 and 1.46 million Bahraini dinars on their projects and services.

[80] P. Pillai, *Strengthening Policy Dialogue on Environment: Learning from Five years of Country Environmental Analysis* (the World Bank Environment Department, February 2008).

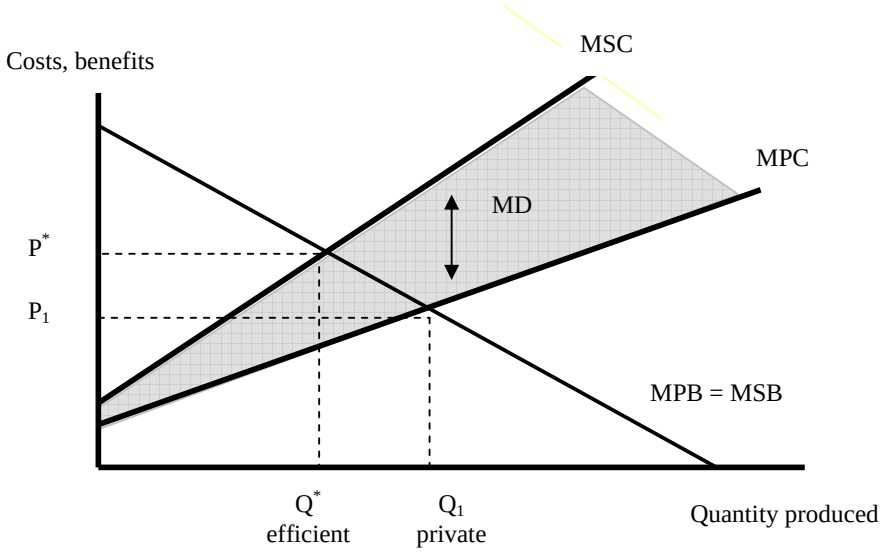
IV. COST OF ENVIRONMENTAL DEGRADATION

The cost of environmental degradation is a key factor to take into consideration at both the micro and macro level in order to ascertain the total economic costs and total economic benefits attributed to policies, programmes or projects.[81]

The cost of environmental degradation can be approached through the concept of externalities and/or public goods. An externality occurs "when a benefit or a cost incurred by a party is caused by somebody who does not take this effect into account in his or her decisions".[82] By contrast, public goods, such as clear air, are non-rivalry (everybody can use them without depleting their availability) and non-excludable (difficult to prevent people from using them), thereby leading often to the problem of free-riding.[83]

Figure IX underscores the problem of externalities: in this case, the cost of environmental degradation. In competitive market conditions, most private industries or firms produce output at Q_1P_1, where marginal private cost is equal to marginal private benefits.[84] However, when production leads to environmental externalities such as air or water pollution, there are unaccounted costs incurred by society, which is shown by the difference between the marginal social costs (MSC) and the marginal private costs (MPC).

Figure IX. Private versus social marginal costs of production



Source: The World Bank, "Estimating the Cost of Environmental Degradation: A training manual in English, French and Arabic" (September 2005).

Quantifying environmental externalities, which is represented by MD in figure IX, or the "value" of public goods is not a straightforward matter and often results in both measurement complications and ethical

[81] Within that context, the micro level refers to large projects with environmental impacts, while the macro level relates to economic or regulatory policies.

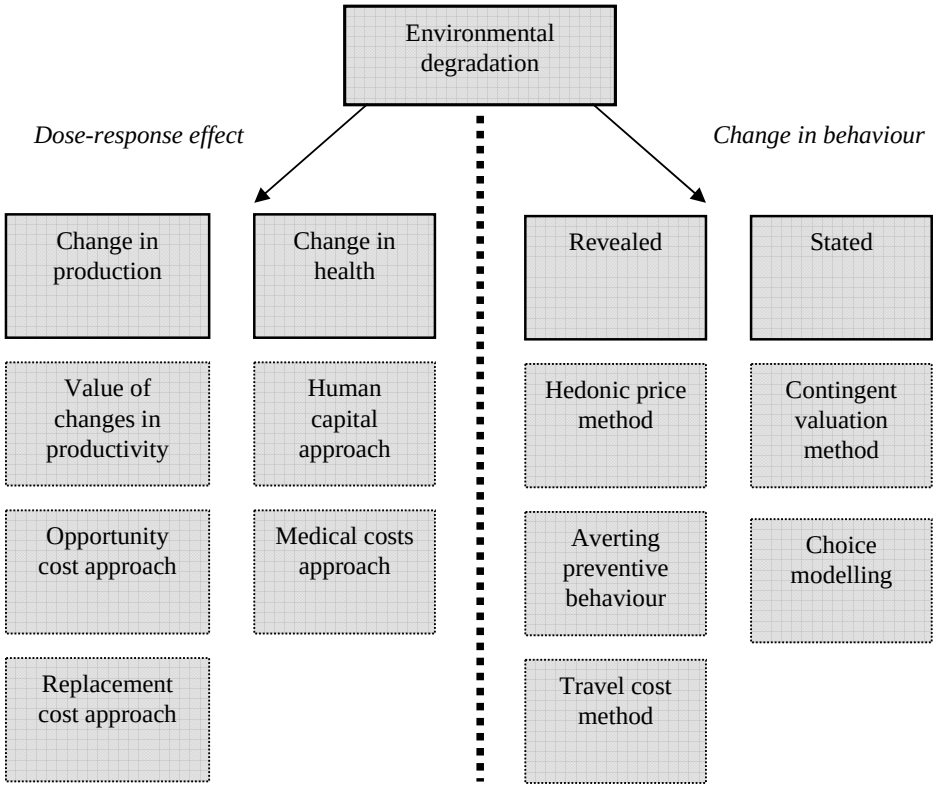
[82] The World Bank, "Estimating the Cost of Environmental Degradation: A training manual in English, French and Arabic" (September 2005), p. E-1.

[83] Ibid.

[84] For simplification purposes, marginal private benefits and marginal social benefits are considered equal and a linear model is assumed.

considerations, such as the value of a human life or of a rare species of flora or fauna. There are several environmental economics techniques used to quantify environmental externalities, as illustrated in figure X.[85]

Figure X. Environmental economics techniques: valuation method



Source: The World Bank, "Estimating the Cost of Environmental Degradation: A training manual in English, French and Arabic" (September 2005).

The World Bank analysed various case studies on the cost of environmental degradation in several countries in the Middle East and North Africa, thereby representing the yearly damage costs stemming from environmental degradation as a percentage of the respective GDP of those countries.

Six main categories are selected for costing, namely: (a) indoor and outdoor air pollution; (b) lack of access to water supply and sanitation services; (c) land degradation; (d) coastal zone degradation; (e) waste management; and (f) global environment.

Table 29 indicates the results for Egypt, Jordan, Lebanon and Syrian Arab Republic.

[85] These techniques are briefly explained in annex V. More information is available in the World Bank, "Estimating the Cost of Environmental Degradation: A training manual in English, French and Arabic" (September 2005).

TABLE 29. AVERAGE ANNUAL DAMAGE COSTS OF ENVIRONMENTAL DEGRADATION IN SELECTED ESCWA MEMBER COUNTRIES
(*Percentage of GDP*)

	Egypt	Lebanon	Syrian Arab Republic	Jordan
Air pollution	2.1	1.0	1.3	..
Lack of access to water supply and sanitation	1.0	1.1	0.9	..
Land degradation	1.2	0.6	1.0	..
Coastal zone degradation	0.3	0.7	0.1	..
Waste management	0.2	0.1	0.1	..
Subtotal	4.8	3.5	3.4	2.74
Global environment (CO_2 emissions)	0.6	0.5	1.3	..
Total	5.4	4.0	4.7	3.1

Source: Compiled by ESCWA.
Note: Two dots (..) indicate that data are not available or are not separately reported.

Nine other ESCWA member countries have yet to undergo studies related to the annual cost of environmental degradation. Furthermore, the cost of environmental degradation in Egypt, Jordan, Lebanon and Syrian Arab Republic was undertaken in a one-off report; and there are no plans to publish systematic annual or triennial reviews to update the figures.

The environment degradation in Lebanon was in the range of 2.8-4.0 per cent of GDP, with a 3.4 per cent mean value in an economic assessment of environmental degradation report, which was published by the World Bank in June 2004. However, as a result of the conflict in Lebanon in the summer of 2006, the environment degradation indicated that the cost amounted to $729 million or 3.6 per cent of GDP.[86]

[86] The World Bank, "Republic of Lebanon: Economic Assessment of Environmental Degradation Due to July 2006 Hostilities", Report No. 39787-LB (October 2007).

V. REGIONAL AGENDA AND RECOMMENDATIONS

A. REGIONAL AGENDA FOR ENVIRONMENTAL ACCOUNT SYSTEMS

This section investigates a proposed regional agenda aimed at developing environmental account systems particularly water accounting. The agenda, beginning January 2009 and ending in December 2009, comprises five phases and establishes a framework that can be repeated for the development of sub-accounts, including pilot energy accounts.

The phases vary according to the level of a given country in terms of environment statistics. Within that context, ESCWA member countries are divided into the following three groups, based on the status of environmental statistics that are available in each country:

(a) Group 1, which represents ESCWA member countries where environment statistics are available, consists of Bahrain, Egypt, Jordan, Lebanon, Oman and Palestine. These are capable of producing water accounts in one year according to the work plan below;

(b) Group 2 comprises ESCWA member countries where the establishment of environment statistics is a need and where financial and human resources are available, namely: Kuwait, Qatar, Saudi Arabia and United Arab Emirates. These are capable of compiling water accounts in two years according to the work plan below;

(c) Group 3 represents countries that, despite the need to establish environment statistics, lack the necessary human and financial resources. This category comprises Iraq, the Sudan, Syrian Arab Republic and Yemen, which are expected to be able to compile water accounts in three years.

PHASE I. SETTING THE GROUNDWORK: THREE MONTHS

Activities	Stakeholders	Month
1. Awareness raising on the importance of environmental accounting at the political and public levels	National authorities, non-governmental organizations (NGOs), United Nations organizations and the public	First (continuous)
2. Legal framework		
Update legal framework on environment statistics and accounts	National Governments	First to third
Reinforce the legislation (continuous)	National Governments and the public	Continuous

PHASE II. INSTITUTIONAL FRAMEWORK AND COORDINATION: FOUR MONTHS

Activities	Stakeholders	Month
1. Establishment of high-level steering committee - Clarification of roles and responsibilities for data production and compilation of accounts - Allocation or resources. Need one person, ideally full time, to be responsible for the compilation of the accounts	National authorities, Ministers and Director Generals	Third
2. Establishment of working group for environment accounts and nomination of focal points within government agencies Define the objectives Draft functioning rules and responsibilities Examine data exchange procedures Agree on a timetable for regular transmissions	National statistical office (NSO) and concerned ministries, private sector and NGOs Technical staff in concerned departments	Fourth
3. Data exchange: detailed data quality assessment of existing data sources and identification of data gaps	Technical staff in concerned departments	Fifth (regular)
4. Information system for environment statistics and accounts	IT experts in concerned departments	Sixth (continuous)

PHASE III. TECHNICAL SUPPORT: TWO MONTHS (REGULAR)

Activities	Stakeholders	Month
Identification of training needs	NSO with concerned departments and organizations	Seventh to eighth
1. Training on the background documents on environmental accounting		Seventh to eighth
2. Environment surveys		
Add environmental part of the industry questionnaire Add environmental survey of industries and services Add environmental survey of households	NSO with concerned departments	Periodic (depending on countries)

PHASE IV. PRODUCTION OF PILOT SUB-ACCOUNTS: THREE MONTHS

Activities	Stakeholders	Month
Sub-account 1: Water accounts		
1. Build physical supply and use tables Identify available data sources and accessibility Find estimating methods for missing data Populate a first pilot table (SEEAW standard table I, II)	NSO with water authorities and concerned departments	Ninth to eleventh
2. Build hybrid accounts Identify available data sources and accessibility Enterprises reports	NSO with central bank and data producers on national accounts	Ninth to eleventh
3. Build emissions tables Identify available data sources and accessibility	NSO with water authorities and concerned departments	Ninth to eleventh
4. Build asset accounts Identify available data sources and accessibility		
5. Expenditure accounts	NSO with concerned departments	Ninth to eleventh

PHASE V. DISSEMINATION: ONE MONTH

Activities	Stakeholders	Month
Publication of pilot study and planning for ongoing production of accounts Prepare a joint publication Revise tables and analysis for publication • Prepare publication for release • Publish on the website • Prepare promotional material and brief senior officials on water accounts • Prepare plan for ongoing production of accounts, including a cost-effective way to address data deficiencies and gaps	NSO with concerned departments	Twelfth
After publication Monitor use of accounts Review use and implement plan for ongoing production of water accounts	NSO with concerned departments, continuous	Feedback review and restart the cycle

B. RECOMMENDATIONS FOR IMPROVING ENVIRONMENT STATISTICS

ESCWA reports of four meetings on environment statistics, which were held in 2004, 2006 and 2007, an assessment report by DESA in 2005 and several technical assistance missions to member countries have all contributed towards providing a comprehensive list of recommendations aimed at improving environment statistics in the ESCWA region. These are reiterated below.

The recommendations target, among others, institutional and legal provisions, information accessibility, cooperation between the relevant environment-economic data agencies, human resources and training requirements, and information dissemination.

(a) *Institutionalizing official water statistics and accounts*

The national statistical offices (NSOs) are the authorities that collect, compile and disseminate official statistics in most ESCWA member countries, including environment statistics. Countries need to update their legal provisions on statistics and reinforce environment statistics and accounts acts. Moreover, they need to determine appropriate organizational structures with clear delineations of responsibilities and cooperation links between governmental bodies concerned with the compilation of environmental data.

(b) *Coordinating with other leading institutions producing water data*

Across the region, various ministries, including of the environment, water, agriculture/irrigation and municipalities, play an important role in collecting data on environment. In some countries, cooperation links between those governmental bodies and the NSO have been established in order to develop environment statistics at the national level. This is the case of Bahrain, Jordan, Lebanon, Palestine and Syrian Arab Republic. In other countries, however, internal regulations do not allow all relevant data to be made available to the statistical office. In some cases, duplication in data collection usually leads to incompatibility among data sets.

Cooperation saves time and reduces the cost of duplication in data production and allows agreement on applied methods, standards, classifications, concepts and definitions in order to ensure data comparability. NSOs are best positioned to assume a leading role in the cooperation system. Moreover, there is a need for the creation of a statistical coordination committee aimed at supporting mutual coordination and agreement in statistical programming, organizing data collection and disseminating data by all environment bodies involved in the process.

(c) *Strengthening human, technical and financial resources for water statistics*

In six ESCWA member countries, namely, Bahrain, Egypt, Jordan, Palestine, Syrian Arab Republic and Yemen, a separate unit dealing with environment statistics has been created within the respective NSOs. However, almost all of them consider the number of employees dedicated to environment statistics as being insufficient. In addition, their work situation is affected by frequent transfers of personnel and limited capacity of equipment and logistic means in terms of carrying out data collection. NSOs need professional staff and appropriate training covering such general statistical issues as sampling, non-response evaluation, as well as subject matter issues in order to analyse data and derive indicators on environment.

(d) *Installing monitoring stations and conducting environment and water surveys*

Given that primary water data can be obtained from the field, it is vital to install sufficient monitoring stations and other technical infrastructure, and to collect regular data at a representative geographic scale. Within that context, six ESCWA member countries regularly undertake environmental/water data collection through special statistical surveys, namely, Jordan, Iraq, Kuwait, Palestine, Saudi Arabia and Yemen.

Additionally, NSOs collect secondary data sources, which constitute an important part of data, from the ministries of environment, agriculture and water and special environmental protection agencies. A few countries add special questions on environmental issues to questionnaires of existing surveys, including, for example, the Economic Enterprise Survey or the Household Budget Survey.

Moreover, Egypt, Jordan, Lebanon, Palestine and the Syrian Arab Republic participated in the statistical cooperation project between the European Union and Mediterranean partner countries, referred to as MEDSTAT I, and are at present involved in the MEDSTAT Environment Project.

(e) *Adopting new classifications, methodologies, standards and coding systems*

In general, such statistical methodologies as sampling design, the specification of the survey population, methods of data collection, calculation and statistical modelling have not yet been applied to their full extent in the ESCWA region. Some members, namely, Jordan, Lebanon, Palestine, Saudi Arabia and Syrian Arab Republic, apply international classifications in specific fields. However, the most relevant classifications need to be applied across the region, particularly ISIC Rev.4 on economic activities and FAO land cover classifications.

(f) *Filling data gaps*

Data gaps in all ESCWA member countries often depend on the national priorities, which in turn depend on their respective needs, past experience and activities, as well as the availability of institutional and financial resources.

Substantial data gaps in all ESCWA member countries concern the following specific areas: (i) water quantity statistics in terms of supply, demand and distribution of water; (ii) water quality statistics: freshwater quality, drinking water quality, river water quality, lake and marine water quality, sewage and treated water quality; (iii) air quality and air emissions; (iv) municipal, industrial and hazardous waste, quantities generated by source, and methods of disposal and composition; (v) land use and land degradation; and (iv) biodiversity.

(g) *Disseminating statistics*

With the exception of Jordan and Palestine, most ESCWA member countries do not produce regular specific reports on environment/water statistics.[173] Usually countries include tables in their annual statistical reports or in specific reports, such as the health statistics report.

These procedures and output of basic water statistics need to be made freely available in a well-organized and computerized system, thereby allowing efficient data processing and promoting data exchange among institutions involved in environment statistics production.[174] However, the lack of available information in some countries stems from the highly sensitive nature of water data.

(h) *Tailoring the assistance of ESCWA and other United Nations and regional organizations in the field*

ESCWA can further assist countries in the region by raising awareness on the importance of environment statistics, indicators and accounts; by offering training on related data collections; by

[173] Some one-off reports include Central Organization for Statistics and Information Technology (COSIT) in Iraq, *Environmental Survey of Iraq for the year 2005* (June 2006); and Central Administration of Statistics in Lebanon, *A National Compendium of Environment Statistics in Lebanon* (in French), 2006.

[174] In line with the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters.

strengthening coordination between countries; and by collaborating with UNSD, UNEP, MEDSTAT and other organizations in this field.

ESCWA technical assistance needs to comprise expert missions aimed at helping in the initial phase of the work and providing on-the-job-training; and consultancy missions aimed at providing countries with training on the production of statistical tables and on methods of estimating and filling data gaps.

Specifically, ESCWA could support the creation of a regional environmental statistical system, including by developing or adapting appropriate manuals, classifications and guidelines for standardization and methodologies; and by presenting case studies from the ESCWA region in order to support countries in terms of responding to international data requests.

The *Compendium of Environmental Statistics* is a pilot publication by ESCWA that could serve as an example for ESCWA member countries to emulate. The availability and use of international classifications for the main themes used in environment statistics as well as international and suggested national standards are indispensable for the comparability of environmental data at the international level.[175]

The main issues that need to be covered in the Compendium or national environment statistics programmes in the ESCWA region are as follows: (i) water statistics, including, for example, rainfall, river inflow/outflow, quality, groundwater abstraction and desalination; (ii) solid and liquid waste statistics, including, among others, waste generation, collection, recycling rate, reuse, wastewater treatment and cost of treatment; (iii) atmospheric statistics, including GHG emissions and local air quality; (iv) land statistics, including, among others, land use, changes in land use and land degradation; (v) biodiversity, environmental and sustainable development indicators; and (vi) natural resource statistics.

Disseminated outputs and reports on environment accounts are effective policymaking tools at the national and international levels. Moreover, UNSD could support ESCWA member countries by leading, in close collaboration with UNEP, the international harmonization of definitions, concepts and methods in water statistics. Equally, other concerned international bodies could help by providing guidelines in Arabic for the development of national environment statistics, and by providing data collection manuals and training material for water statistics and accounts.

C. CONCLUSIONS

The above offers a comprehensive overview of the current situation of environment and environment statistics in the ESCWA region. The proposed agenda, along with integrated strategic planning, resource allocation, sound management and monitoring and evaluation, provides ESCWA member countries with a background to produce pilot water accounts that can be used by policymakers for sound decisions on environment protection and economic development.

Furthermore, the comprehensive recommendations cover most of the issues needed in order to develop and disseminate reliable, consistent and readily available statistics on the environment and on integrated environment-economic accounts in the ESCWA region.

[175] Within that context, the main themes encompass, among others, drinking water quality, treated sewage water quality, toxic residuals in food and air quality.

Annex I

RELEVANT INDICATORS FOR ESCWA MEMBER COUNTRIES

Annex table 1 illustrates the high population density, which is increasing the pressure on already limited resources.

ANNEX TABLE 1. POPULATION DENSITY

	Population density per km^2	
	2003	2005
Bahrain	1 017	1 047
Egypt	71	74
Iraq	62	66
Jordan	61	64
Kuwait	142	151
Lebanon	337	344
Oman	8	8
Palestine	577	615
Qatar	67	74
Saudi Arabia	11	11
The Sudan	14	15
Syrian Arab Republic	98	103
United Arab Emirates	48	54
Yemen	37	40
ESCWA	38	40

Source: ESCWA, *Compendium of Environment Statistics in the ESCWA Region* (E/ESCWA/SCU/2007/2).

A. DETERIORATION OF AIR AND WATER QUALITY

While many pollutants impact air and water quality, only the sample of carbon dioxide emissions for air quality is indicated below in annex table 2.

ANNEX TABLE 2. CARBON DIOXIDE EMISSIONS: TOTAL AND PER CAPITA IN ESCWA MEMBER COUNTRIES, 1990 AND 2004

	Total (Mt CO_2)		Per capita tCO_2	
	1990	2004	1990	2004
Bahrain	11.7	16.9	24.2	23.9
Egypt	75.4	158.1	1.5	2.3
Iraq	-	-	-	-
Jordan	10.2	16.5	3.1	2.9
Kuwait	43.4	99.3	20.3	37.1
Lebanon	9.1	16.3	3.3	4.2
Oman	10.3	30.9	6.3	13.6
Palestine	-	0.6	-	0.2
Qatar	12.2	52.9	24.9	79.3
Saudi Arabia	254.8	308.2	15.9	13.6
The Sudan	5.4	10.4	0.2	0.3
Syrian Arab Republic	35.9	68.4	3.0	3.8
United Arab Emirates	54.7	149.1	27.2	34.1
Yemen	10.1	21.1	0.9	1.0

Source: United Nations Development Programme (UNDP), *Human Development Report 2007-2008*.

B. WATER QUALITY

Many water quality parameters exist, including marine environment, surface freshwater resources and groundwater. Annex table 3 provides an example of groundwater quality for one ESCWA member country, namely, Bahrain.

ANNEX TABLE 3. GROUNDWATER QUALITY IN BAHRAIN, 2000-2005

	2000	2001	2002	2003	2004	2005
Annual average flow (000 m^3/s)	30 988	30 484	29 267	26 299	29 188	21 699
BOD (mg O2/l)	<30	<30	<30	<30	<30	<30
COD (mg O2/l)	<50	<50	<50	<50	<50	<50
DO (mg O2/l	0.1	0.1	0.1	0.1	0.1	0.1
TDS (mg/l)	1 260	1 300	1 290	1 296	1 260	1 260
Conductivity level of ground water (µmhos/cm)	1 960	1 970	1 980	1 966	1 960	1 960
Total Phosphorus (mg P/l)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Nitrogen of groundwater in site (mg N/l)	<20	<20	<20	<20	<20	<20
Number of deaths from water-borne diseases per 1000	-	-	6	9	5	4

Source: Central Informatics Organization. Reply to ESCWA Questionnaire on Environment, 2006.

Annex table 4 illustrates the improved access to drinking water access and sanitation in the ESCWA region.

ANNEX TABLE 4. IMPROVED DRINKING WATER ACCESS AND SANITATION, 2006

	Access to improved drinking water sources (*total percentage*)	Access to improved sanitation (*total percentage*)
	2006	2006
Bahrain*	100	73
Egypt	98	66
Iraq	77	76
Jordan	98	85
Kuwait*	100	100
Lebanon	100	98
Oman*	79	89
Palestine	89	80
Qatar	100	100
Saudi Arabia*	95	89
The Sudan	70	35
Syrian Arab Republic	89	92
United Arab Emirates*	100	97
Yemen	66	46

Source: Millennium Development Goals (MDGs) Database, 2009.

* Values are for 2004.

C. BIODIVERSITY LOSSES

Annex table 5 indicates the biodiversity threats and losses in selected ESCWA member countries.

ANNEX TABLE 5. BIODIVERSITY SPECIES KNOWN AND THREATENED IN SELECTED ESCWA MEMBER COUNTRIES FOR THE YEAR 2006

Country	Mammal species		Bird species		Reptiles species	
	Number known	Number under threat	Number known	Number under threat	Number known	Number under threat
Egypt	98	14	123	18	108	11
Iraq	81	12	140	18	99	2
Jordan	71	12	117	15	81	5
Kuwait	21	5	35	12	21	2
Lebanon	57	9	116	10	44	7
Oman	56	13	109	14	64	4
Saudi Arabia	77	12	125	18	99	2
Syrian Arab Republic	63	10	145	14	81	7
United Arab Emirates	25	7	34	12	36	2
Yemen	66	9	93	14	101	2
ESCWA*	615	103	1 037	145	734	44

Country	Fish species		Amphibian species		Plant species	
	Number known	Number under threat	Number known	Number under threat	Number known	Number under threat
Egypt	284	17	11	0	2 076	2
Iraq	170	5	11	2		
Jordan	73	12	1	0	2 100	0
Kuwait	44	9	0	0	234	0
Lebanon	77	10	3	0	3 000	0
Oman	328	21	3	0	1 204	6
Saudi Arabia	167	13	6	0	2 028	3
Syrian Arab Republic	73	22	5	0	3 000	0
United Arab Emirates	41	8	2	0		
Yemen	130	13	7	1	1 650	159
ESCWA*	1 387	130	49	3	15 292	170

Source: International Union for Conservation of Nature and Natural Resources (IUCN), the IUCN Red List of Threatened Species, 2006.

* Excluding Bahrain, Qatar and Palestine and, with regard to plant species, also excluding Iraq and the United Arab Emirates.

Annex II

SEEAW STANDARD TABLES IN ENGLISH AND ARABIC

SEEAW STANDARD TABLE I. PHYSICAL SUPPLY TABLE جداول الحسابات المائية الموحدة SEEAW 1- جدول الطلب المادي

Physical units		Total المجموع	Rest of the world العالم الخارجي	Households المساكن	Industries (by ISIC categories) الصناعات (بموجب أبواب الأيزيك)									وحدات مادي	
					Total المجموع	99-58 53-45 39 38	56 55	37	36	35	43-41 33-10	9-5	3-1		
From the environment	1. Total abstraction (=1.a+1.b = 1.i+1.ii)													1. مجموع الاستخراج (=1.أ+1.ب=1.ح+1.ح ح)	من البيئة
	1.a. Abstraction for own use													1.أ. الاستخراج للاستعمال الذاتي	
	1.b. Abstraction for distribution													1.ب. الاستخراج للتوزيع	
	1.i. From water resources:													1.ح. من موارد المياه:	
	1.i.1. Surface water													1.ح.1. المياه السطحية	
	1.i.2. Groundwater													1.ح.2. المياه الجوفية	
	Renewable													*المتجددة*	
	Non-renewable													*غير المتجددة*	
	Saline													*المالحة*	
	1.i.3. Soil water													1.ح.3. مياه التربة	
	1.ii. From other sources													1.ح ح. من المصادر الأخرى	
	1.ii.1. Collection of precipitation													1.ح ح.1. تجميع الأمطار الهاطلة	
	1.ii.2. Abstraction from the sea													1.ح ح.2. الاستخراج من البحر	
Within the economy	2. Use of water received from other economic units													2. استعمال المياه المتلقاة من الوحدات الاقتصادية الأخرى	في الاقتصاد
	2.a. Reused water													2.أ. المياه المعاد استخدامها	
	2.b. Wastewater to sewerage													2.ب. المياه العادمة إلى الصرف الصحي	
	2.c. Distributed													2.ج. المياه الموزعة	
3. Total use of water (=1+2)														3. مجموع استعمال المياه (=1+2)	

Note: grey cells indicate zero entries by definition.

ملاحظة: تشير الخلايا المظللة إلى مدخلات تساوي أصلاً صفر.

SEEAW STANDARD TABLE II. PHYSICAL SUPPLY TABLE **جداول الحسابات المائية الموحدة SEEAW 2- جدول العرض المادي**

		Total المجموع	Rest of the world العالم الخارجي	Households المساكن	Industries (by ISIC categories) الصناعات (بموجب أبواب الأيزيك)										
					Total المجموع	99-58 53-45 39 38	56 55	37	36	35	43-41 33-10	9-5	3-1		
Within the economy	4. Supply of water to other economic units of which: 4.a. Reused water 4.b. Wastewater to sewerage 4.c. Distributed													4. تزويد الوحدات الاقتصادية الأخرى بالمياه من بينها : 4.أ. المياه المعاد استعمالها 4.ب. المياه العادمة إلى الصرف الصحي 4.ج. المياه الموزعة	في الاقتصاد
To the environment	5. Total returns (= 5.a+5.b) 5.a. To water resources 5.a.1. Surface water 5.a.2. Groundwater *Renewable* *Non-renewable* *Saline* 5.a.3. Soil water 5.b To other sources (e.g. sea water)													5. مجموع العائدات (=5.أ+5.ب) 5.أ. إلى موارد المياه 5.أ.1.ا لمياه السطحية 5.أ.2. المياه الجوفية *المتجددة* *غير المتجددة* *المالحة* 5.أ.3. مياه التربة 5.ب. إلى المصادر الأخرى (مثل مياه البحر)	إلى البيئة
6. Total supply of water (= 4+5)														6. مجموع عرض المياه (=4+5)	
7. Consumption (=3-6)														7. الاستهلاك (=3-6)	

Note: grey cells indicate zero entries by definition.

ملاحظة: تشير الخلايا المظللة إلى مدخلات تساوي أصلاً صفر.

SEEAW STANDARD TABLE III. GROSS AND NET EMISSIONS جدول حسابات الانبعاثات -3 SEEAW جداول الحسابات المائية الموحدة
الإجمالية والصافية

Physical units وحدات مادية

Pollutant	Total المجموع	Rest of the world العالم الخارجي	Households المساكن	Industries (by ISIC categories) الصناعات (بموجب أبواب الأيزيك)							الملوث
				Total المجموع	38، 39، 45-99	37	36	35	33-5، 33-41	1-3	
1. Gross emissions (= a + b)											1. الانبعاثات الاجمالية (=1.أ+1.ب)
1.a. Direct emissions to water (= 1.a.1 + 1.a.2 = 1.a.i + 1.a.ii)											1.أ. الانبعاثات الإجمالية في المياه (=1.أ.1+1.أ.2=1.أ.ح+1.أ.ح ح)
1.a.1. Without treatment											1.أ.1. من دون معالجة
1.a.2. After on-site treatment											1.أ.2. بعد المعالجة في الموقع
1.a.i. To water resources											1.أ.ح. إلى مصادر المياه
1.a.ii. To the sea											1.أ.ح ح. إلى البحر
1.b. To Sewerage (ISIC 37)											1.ب. إلى الصرف الصحي (الأيزيك 37)
2. Reallocation of emission by ISIC 37											2. إعادة توزيع الانبعاث بموجب الأيزيك 37
3. Net emissions (= 1.a + 2)											3. الانبعاثات الصافية (=1.أ+2)

SEEAW STANDARD TABLE IV. EMISSIONS TO WATER BY ISIC 37 جدول حسابات الانبعاثات -4 SEEAW جداول الحسابات المائية الموحدة
بموجب الأيزيك 37

Physical units وحدات مادية

Pollutant	ISIC الأيزيك 37	الملوث
4. Emissions to water (=4.a+4.b)		4. الانبعاثات إلى المياه (=4.أ+4.ب)
4.a. After treatment		4.أ. بعد المعالجة
To water resources		إلى موارد المياه
To the sea		إلى البحر
4.b. Without treatment		4.ب من دون معالجة
To water resources		إلى موارد المياه
To the sea		إلى البحر

Annex III

LAND AND ECOSYSTEM ACCOUNTING FRAMEWORK*

(a) *Stocks of ecosystems and the related flows include the following*

- Terrestrial ecosystems: land cover (km², number of land units), rivers (standard-river-km, number of reaches), small features (number of units);
- Marine ecosystem (km²) – to be developed;
- Inland water and biomass:

  (i) Biomass (dry matter, energy) of soil, vegetation (non soil) and fauna;
  (ii) Water quantity (cubic metres);
  (iii) Nitrogen (t), flows only;
  (iv) Phosphorus (t), flows only;

- Fauna and flora (number of units, of groups, volumes, tonnes);
- Counts of indicators of integrity and/or diversity of the ecosystems is based on the ecosystem distress syndrome (EDS) model. Symptoms of distress can be grouped in a limited number of classes: nutrient cycling disruption, change in species composition, destabilization of substrates and, for managed ecosystems, self-sustaining capacity and capacity to sustain healthy human communities.

(b) *Diagnosis of the state and final assessment of ecosystem assets*

This component quantifies in physical terms the amount of ecosystems (surface, volume, number, etc.) and their health. Together, these determine the sustainability of an ecosystem and its potential to deliver goods and services. The basic account will show the distribution of ecosystems among health/morbidity classes such as:

(i) Steady state (homeostasis, no noticeable alteration foreseen);

(ii) Resilience state (ecosystems are still able to absorb or compensate disturbance, keeping the same functions, identity and feedbacks);

(iii) Reversible process without compensation (degradation);

(iv) Irreversible change (equivalent to death for living organisms).

(c) *Economic accounts linked to ecosystem accounts include the following*

- Material and energy flows (including biomass, water, nutrients, residuals, etc.);
- The goods and services assessed on the basis of the land use and natural functions of the ecosystems, as well as the potential stress resulting from land use;
- A supply and use table for those elements (materials or services related to materials);
- Accounts for natural capital (structure and resilience, physical and monetary values, produced and non-produced).

* Annex III is adapted from G.M. Lange and J.L. Weber, "Ecosystem accounting at the European Environment Agency: a summary of progress" (European Environment Agency, 2006).

(d) *Natural functions, land use functions and ecosystem services*

Ecosystem services need to be defined in a way that allows consideration of trade-offs between economic and non-economic use. Land use functions reflect both economic and non-economic social values. They can be connected via supply and use tables to the agents which benefit them. In the case of non-marketed ecosystem services, land use functions (in given places and for the communities involved) represent the starting point of comprehensive accounting.

(e) *Land use functions and ecosystem stress*

Land use can create stress on natural systems. EDS identifies the following four main types of anthropogenic stress:

(i) Physical restructuring, which fragments or destroys critical habitats, causes substrate instability and disrupts nutrient cycling;

(ii) Introduction of exotic species, intentionally or accidentally;

(iii) Discharge of residuals and toxic substances, which contribute to eutrophication and the build-up of toxic substances in food webs;

(iv) Over-harvesting.

The land use accounts identify stressors in relation to the previous health diagnosis of the account of ecosystem state, thereby taking into account carrying capacities and threshold values as well as possible synergies with natural disturbances. In the full system of land and ecosystem accounts, the observed stress can then be linked to the economic accounts (supply and use table) as well as to a range of statistics on agriculture, forestry, population, transport and others.

Annex IV

CLASSIFICATION OF ENVIRONMENTAL PROTECTION ACTIVITIES (CEPA)[*]

(a) *Protection of ambient air and climate*

- Prevention of air pollution through in-process modifications for the protection of ambient air and of the climate and ozone layer
- Treatment of exhaust gases and ventilation air for the protection of ambient air and of the climate and ozone layer
- Measurement, control, laboratories
- Other activities

(b) *Wastewater management*

- Prevention of pollution through in-process modifications
- Sewerage networks
- Wastewater treatment
- Treatment of cooling water
- Measurement, control, laboratories
- Other activities

(c) *Waste management*

- Prevention of pollution through in-process modifications
- Collection and transport
- Treatment and disposal of hazardous waste: thermal treatment, landfill, and other treatment and disposal
- Treatment and disposal of non-hazardous waste: incineration, landfill, and other treatment and disposal
- Measurement, control, laboratories
- Other activities

(d) *Protection of soil and groundwater*

- Prevention of pollutant infiltration
- Decontamination of soils
- Protection against soil erosion
- Measurement, control, laboratories
- Other activities

(e) *Noise and vibration abatement (excluding workplace protection)*

- Noise from road and rail traffic: preventive in-process modifications at the source, construction of anti-noise/anti-vibration facilities

[*] Annex IV is adapted from C. Ardi and F. Falcitelli, "The Classification of Resource Use and Management Activities and Expenditure – CRUMA" (Instituto Nazionale di Statistica, August 2007), table 2.

- Air traffic noise: preventive in-process modifications at the source, construction of anti-noise/anti-vibration facilities
- Industrial process noise and vibration
- Measurement, control, laboratories
- Other activities

(f) *Protection of biodiversity and landscape*

- Protection of species
- Protection of landscapes and habitats
- Protection of forests
- Rehabilitation of species populations and landscapes
- Restoration of cleaning of water bodies
- Measurement, control, laboratories
- Other activities

(g) *Protection against radiation (excluding nuclear power stations and military installations)*

- Protection of ambient media
- Measurement, control, laboratories
- Other activities

(h) *Research and development*

- Protection of ambient air and climate
- Protection of ambient air
- Protection of atmosphere and climate
- Protection of ambient water
- Waste
- Protection of soil and groundwater
- Abatement of noise and vibration
- Protection of species and habitats
- Protection against radiation
- Other research on the environment

(i) *Other environmental protection activities*

- General administration of the environment
- Education, training and information
- Activities leading to indivisible expenditure
- Activities not elsewhere specified

Annex V

ENVIRONMENTAL ECONOMICS TECHNIQUES: VALUATION METHOD

Figure X indicates several environmental economics techniques used to calculate or derive the monetary value (or cost) of environmental amenities (or pollution) when no direct market exists which indicates the cost (or price) and consumer value.[a/]

1. *Changes in production*

Dose-response methods require the existence of data linking human, plant or animal physiological response to pollution stress. As an example, if a given level of low-level ozone is associated with crop yield losses, then it is usually the case that the output lost can be valued at market or shadow prices.

Along the dose-response lines the value of changes in productivity, the opportunity cost approach and the replacement cost approach are used to quantify environmental impacts as follows:

(a) *Productivity loss*: When there is a change in an environmental input, this can lead to a change in the quantity produced resulting in an economic loss that can be measured;

(b) *Opportunity cost approach:* This refers to the case when the benefits of the activity causing environmental degradation are estimated in order to give a benchmark for what the environmental benefits have to be for the development not to be worthwhile (for example, drainage of a wetland in order to allow intensive agriculture);

(c) *Replacement costs method:* This regards the cost of replacing or restoring a damaged asset and uses this cost as a measure of the benefit of restoration (for example, the cost of restoring monuments affected by acid rain – usually added to other costs of acid rain affects).

2. *Changes in health*

In terms of quantify environmental impacts on health, the two main categories are as follows:

(a) Human capital approach, which attempts to quantify mortality via the net discounted present value of an individual's lifetime earning;

(b) Medical cost approach, which simply estimates the cost of medical treatment for a patient resulting from an environmental impact.

Willingness to pay (WTP) studies for a reduction in the risk of death or risk of experiencing illness is used more often, however, in order to calculate the value of a statistical life (VOSL). This usually results in higher values than the human capital approach or the medical cost approach given that it attempts to measure such intangible issues as pain. These methods are subject to much debate and are beyond the scope of this report.

3. *Changes in behaviour*

Revealed preference methods involve estimating value from observations of behaviour in the markets of related goods. There are various main approaches associated with this as set forth below.

[a/] These techniques are discussed in more detail in the World Bank, "Estimating the Cost of Environmental Degradation: A training manual in English, French and Arabic" (September 2005).

(a) *Hedonic pricing method (HPM)*

The Hedonic pricing method (HPM) attempts to "evaluate environmental services, the presence of which directly effects market prices".[b/] It is based on the theory of consumer behaviour that suggests that a good is valued by people due to its characteristics rather than the good itself.[c/] The most common application of HPM is the housing market, owing to the fact that house prices are affected by a number of factors, including the physical qualities (number of rooms, size of garden), neighbourhood qualities (crime rate, proximity to workplace or central district), and environmental qualities (existence of nearby park or river, air quality, noise pollution, proximity to quarry or landfill site).

A hedonic price function relates the price of the property or house to its attributes, including those that have an impact on individual welfare. Mathematically, this function can take the following form (World Bank, 2005):

Price of Property = f (Physical attributes, Neighbourhood quality, Environmental quality)

Given that different locations have different environmental attributes, such variations will result in different property values. Using statistical techniques, the hedonic approach attempts to identify how much a property differential owes to a particular environmental difference between properties and infer how much people are WTP for an improvement in the environmental quality that they face (Pearce et al., 1994).

(b) *Averting preventive behaviour*

Averting preventive behaviour is noticed when households, for example, purchase insulation to defend their homes from noise pollution (as a substitute for a reduction in noise at source) or buying bottled water in place of drinking from polluted tap water. These costs that households make can be added up and estimated.

(c) *Travel cost method (TCM)*

This method mainly values environmental resources associated with recreational activity. The basic premise to the model is that "travel cost to a site can be regarded as the price of access to the site" (Kahn, 1997). An on-site questionnaire is used at the recreation site's gate to record how often visitors come to the site, their travel costs to the site and their income among others. A relationship is then examined through a demand curve showing the overall trend between travel costs and visit rates for all the visitors interviewed. Using this information, an estimate for the average visitor's total recreational value for the site can be approximated and multiplied by the total number of visitors per annum, thereby obtaining the total annual recreational value of the site (Turner et al., 1994).

(d) *Contingent valuation method (CVM) and Choice modelling (CM)*

Stated preference techniques directly solicit value measures by asking people hypothetical questions. There are two main types of stated preference techniques, namely, the contingent valuation method (CVM) and choice modelling (CM) method.

CM approaches rely on the notion that a good may be described by its attributes. For example, a forest can be illustrated by its flora and fauna diversity, age structure and recreational facilities (Bateman et

[b/] Turner, R.K, D. Pearce and I. Bateman, *Environmental Economics: An Elementary Introduction* (Harvester Wheatsheaf, 1994).

[c/] Kahn, J.R., *The economic approach to environmental and natural resources*, Second edition (Dryden Press, Orlando, 1997).

al., 2002). In a policy context, CM can tell us the following four things about non-market goods (Bateman et al., 2002):

(a) Which attributes are significant determinants of the values people place on non-market goods;
(b) The implied ranking of these attributes among the relevant population(s);
(c) The value of changing more than one of the attributes at once;
(d) The total economic value of a resource or good.

CVM involves asking a "randomly chosen sample of people what they are willing-to-pay for a clearly defined change in the provision of a good or service (or to prevent a change) or to illicit what people are willing-to-accept to forgo or tolerate a change".[d/]

[d/] The World Bank, "Estimating the Cost of Environmental Degradation: A training manual in English, French and Arabic" (September 2005).

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This study provides a review of the System of Integrated Environmental and Economic Accounting (SEEA), developed by the United Nations Statistics Division to integrate economic and environmental information into a common framework, measuring both the contribution of the environment to the economy and the impact of the economy on the environment in order to achieve sustainable development. Against a regional background of scarce water resources, deterioration of air and water quality, depletion of energy and mineral resources, land and soil degradation, and loss of biodiversity, the study outlines a proposed adaptation of the SEEA to the particular needs of ESCWA member countries, emphasizing accounts for specific resources, including water accounts, energy accounts, soil accounts, and land and ecosystem accounts. Specific examples of pilot accounts in selected member countries are highlighted; the results pertaining to the region from the Global Assessment of Energy Statistics and Balances are presented; and environmental protection expenditure and the cost of environmental degradation are discussed. The study concludes with a proposed work plan for the implementation of an integrated Environment-Economic accounts system in the countries of the ESCWA region.

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