



West Asia Regional Study on the Experience in the Development of Environmental Data and Information Systems



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List of Acronyms and Abbreviations

AEF	Arab Environment Fund
AEIN	African Environment Information Network
AGEDI	Abu Dhabi Global Environmental Data Initiative
AGU	Arabian Gulf University
ALECSO	Arab League Educational, Cultural and Scientific Organization
ASCAD	The Arab Center for the Studies of Arid Zones and Dry Lands
ASDL	Asymmetric Digital Subscriber Line
BCSR	Bahrain Center for Studies and Research
CEDARE	Center for Environment and Development in the Arab Region and Europe (Egypt)
CIDA	Canadian International Development Agency
CIESIN	Center for International Earth Science Information Network
DAP	Arab Data bank for Arid Plants
DPSIR	Driving Force State Impact Response
DSS	Decision Support Systems
EAD	Environment Agency Abu Dhabi, formerly “Environment Research and Wildlife Development Agency”
EDMRAS	Environmental Data Management, Reporting and Assessment System
EEAA	Egyptian Environmental Affairs Agency (Egypt)
EEIS	Egyptian Environmental Information System
EIS	Environmental Information System
EPA	Environment Public Agency (Kuwait)
EQA	Environment Quality Authority (Occupied Palestinian Territories)
ERWDA	Environment Research and Wildlife Development Agency (UAE)
ESCWA	Economic and Social Commission for Western Asia (Lebanon)
ESIS	ESCWA Statistics Information System
FAO	Food and Agriculture Organization
GEO	Global Environment Outlook
GTZ	German Agency for Technical Cooperation
GCC	Gulf Cooperation Council Countries
GCEA	General Commission for Environmental Affairs (Syria)
GCPMEW	General Commission for the Protection of Marine Resources, Environment and Wildlife (Bahrain)
GIS	Geographic Information System
ICARDA	International Center for Agricultural Research in the Dry Areas
ICT	Information and Communications Technology
IEA	Integrated Environmental Assessment

IOC	Intergovernmental Oceanographic Commission
ISDN	Integrated Services Digital Network
KISR	Kuwait Institute for Scientific Research (Kuwait)
LAS	The League of Arab States
LEDO	Lebanese Environment and Development Observatory (Lebanon)
MAREGIS	Marine Environmental Geographic Information System
MED-ERMIS	Mediterranean Environmental Reporting and Monitoring Information System
MEDPOL	Programme for the Assessment and Control of Pollution in the Mediterranean Region
MPA	Marine Protected Area
MED-ERMIS	Mediterranean Environmental Reporting and Monitoring Information System
MRMEWR	Ministry of Regional Municipalities Environment and Water Resources (Oman)
NCWCD	National Commission for Wildlife Conservation and Development
NIS	National Information System
NISTIC	National Scientific and Technology Information Center (Kuwait)
PCBS	Palestinian Central Bureau of Statistics
PAAF	Public Authority for Agriculture and Fisheries (Kuwait)
PERSGA	Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden
PME	Presidency of Meteorology and Environment
QA	Quality Assurance
QC	Quality Control
RITSEC	The Regional Information Technology and Software Engineering Centre
ROPME	Regional Organization for the Protection of the Marine Environment (Kuwait, Oman, UAE, Saudi Arabia, Qatar, Bahrain, Iran and Iraq)
ROWA	Regional Office of Western Asia (UNEP)
RSCN	Royal Society for the Conservation of Nature (Jordan)
RSGA	Red Sea and Gulf of Aden Environment
SDNP	Sustainable Development Networking Program
SOER	State of the Environment Report
TEDO	Tripoli Environment & Development Observatory (Lebanon)
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNSD	United Nation Statistical Division

EXECUTIVE SUMMARY

The Abu Dhabi Global Environmental Data Initiative (AGEDI) aims to improve the quality of environmental data and increase access to data at the national, regional and global levels. The initiative originated as a proposal from the Emirate of Abu Dhabi and the United Arab Emirates as a contribution to sustainable development through improved data management. AGEDI has three geographic components, national, regional and global. The Environment Agency Abu Dhabi (EAD) and UNEP entered in a strategic partnership to implement those components, with initial focus at the Emirate of Abu Dhabi level, and some elements at the regional level. EAD is leading AGEDI implementation at the United Arab Emirates level and UNEP is implementing the regional component.

In an effort to assess the current situation, and learn about the experiences and best practices in the region, AGEDI commissioned UNEP to undertake a regional study. In pursuing this study, UNEP solicited technical papers on environmental data and information systems from 12 countries (Bahrain, Jordan, Kuwait, Lebanon, Oman, Occupied Palestinian Territories, Qatar, Saudi Arabia, Syria, UAE, Yemen and Egypt) and four regional organizations (PERSGA, CEDARE, ACSAD and AGU). These papers were prepared by 16 experts in the fields of environmental information and/or information system and were submitted to UNEP in 2005. This Integrated Regional Report synthesizes the reports prepared by the national experts and regional organizations, presenting key findings, best practices and lessons learned in West Asia.

Occupied Palestinian Territories Environmental information systems in West Asia have achieved very different levels of sophistication and coverage. All the countries in West Asia have started to build environmental information systems but no country is quite there yet. There is substantial amount of environmental data and information collected for specific projects or programmes. Nevertheless, there are no coherent, consistent, systematic and comprehensive environmental databases and systems on national and regional level. There are dozens of environmental databases covering a wide range of themes from biodiversity and environmental legislation to land use and war-related environmental issues. Examples include the Marine Environmental Geographic Information System in Bahrain (MAREGIS), the biodiversity and hunting databases in Jordan (Royal Society for the Conservation of Nature), the Database for War Related Environmental Damage in Kuwait (EDMRAS), the Atlas of biological data and land use in Gaza Strip in Occupied Palestinian Territories, and the database on environmental legislation in Lebanon (SELDAS). Many databases rely on environmental and/or performance indicators but such indicators appear truncated and localized.

We can also conclude that environmental data and information systems in the region do not meet the current and future needs to support decision making and policy formulation. It is not necessary that data collected are the right data needed for environment policy and decision making. A more coherent and integrated regional to national approach needs to be put in place to make progress on this front.

Despite a remarkable growth in the availability of environmental data, most countries in West Asia have yet to produce their State of the Environment Report (SOER) in a systematic manner. To date, countries have not produced an SOER based on integrated environmental assessment using UNEP guidelines for environmental reporting. Several countries however including Kuwait and Oman have produced sectoral reports such as the “state of the marine environment”. To encourage and promote environmental reporting, UNEP is providing regional and national training on integrated environmental assessment and state of environment reporting.

Public access to information in West Asia is improving but remains inadequately appreciated and integrated in national policies. The confidentiality, political sensitivity, ownership, cultural and technical issues hinder public access to environmental information. Some countries regard public access as an awareness issue (you need awareness to generate demand for environmental data); other countries

regard it as the sharing of environmental information between potential users (usually scientists); very few countries recognize public access insofar as the general public has the right to access, view, and retrieve environmental data for his/her information and personal good and satisfaction. A lot of information is reportedly available “upon request” but requests may require time-consuming authorizations. In spite still limited in scope, there is a growing trend of making accessible environmental information on the web. Although increased public access to environmental data could buttress the work of local pressure groups and civil society, a lot of the political hype surrounding public access to environmental information remains unfounded.

Information policy and legislation in West Asia countries is also limited. Most countries have no clear national policy, mechanisms or protocols for sharing and disseminating environmental information and data. Research organizations and government agencies however may have in-house data management protocols and quality management systems (such as ISO9001:2000) but there is little overall integration of these protocols and systems. Most countries have begun to delineate responsibilities related to the collection and dissemination of environmental information.

There is a great disparity in ICT infrastructure West Asia, with very low levels in Iraq and Yemen compared to state-of-the-art infrastructure in Bahrain and UAE. Disparities in service delivery also exist within countries insofar as city dwellers have better access to PCs and the Internet compared to rural dwellers. Despite a 30 percent growth in Internet users in West Asia in 2004, Internet penetration in Mashreq countries has increased to less than seven percent (of the total population) which remains significantly lower than the penetration in the Gulf Cooperation Council countries (17.6 percent) and to the world average (18 percent). Most countries have increased their total Internet bandwidth with the UAE registering the highest level so far (2,680Mbps). Despite improved ICT infrastructure in West Asia countries, the digital divide with developed countries remains significant.

Environmental information networking also remains an aspiration than a reality. In spite many efforts to establish national and regional networks, there is no concrete network in place in the region. UNEP has just launched a regional effort to catalyze environmental information networking in the region, with the intention to pilot this initiative in selected countries and work on regional network with partner institutions to cover not only West Asia but the Arab region.

In summary, the strengths and weaknesses of environmental information in West Asia include:

Strengths:

1. Diversification of data-acquisition methods
2. Dissemination of electronic culture (in rural areas also through government programs)
3. Cost reasonableness for computer and Internet access (in some countries)
4. Integration of environmental information in other information portals (e.g., statistics)
5. Proliferation of geographic data and GIS applications
6. Private-sector participation in data generation
7. National environmental indicators (in some countries)

Weaknesses:

1. Poor consolidation and duplication of efforts
2. Little continuous data monitoring
3. Cacophony of environmental indicator programs that are disconnected
4. No dissemination of environmental data *real-time*
5. Lack of data classification for purposes of disclosure
6. Lack of qualified staff to run technical programs and complex information systems

7. Concentration of environmental data in the capital; no direct sharing with regional departments
8. Keeping pace with technological advances
9. No public pressure on government agencies to release environmental data

All countries recognize the need for environmental data to support sustainable development. Although several environmental data needs may be common to a group of countries (e.g., air pollution, hazardous waste, loss of biodiversity), several countries have also expressed very specific data needs. For example, low-lying countries like Bahrain are very much concerned with climate change and its impact on sea level rise; Gulf countries including Qatar and Kuwait are assessing the environmental fallouts of the Iraq war; countries with appreciable freshwater reserves such as Lebanon are concerned with surface and/or groundwater pollution; etc. Environmental data needs therefore reflect priority issues.

This report presents a number of recommendations for improving data quality, availability and accessibility in West Asia, covering policy, institutional, technical and financial issues. It sets the stage for the formulation of a regional strategy for environmental information.

1. INTRODUCTION

The Abu Dhabi Global Environmental Data Initiative (AGEDI) aims to improve the quality of environmental data and increase access to data at the national, regional and global levels. The initiative originated as a proposal from the Emirate of Abu Dhabi and the United Arab Emirates as a contribution to sustainable development through improved data management. AGEDI was launched by Emirates jointly with UNEP as a partnership initiative at the World Summit on Sustainable Development in August 2002. AGEDI has three geographic components, national, regional and global. The Environment Agency Abu Dhabi (EAD) and UNEP entered in a Strategic partnership to implement those components, with initial focus at the Emirate of Abu Dhabi level, and some elements at the regional level. EAD is leading AGEDI implementation at the United Arab Emirates level and UNEP is implementing the regional component.

1.1. Background

UNEP and AGEDI are working together to assess the current state of environmental information systems, learn about experiences and best practices in West Asia countries and to formulate a regional strategy for environmental information. One of the activities so far has been the preparation and submission of technical papers describing the status of environmental information systems and databases, experiences, best practices in twelve countries and four organizations:¹

Countries:

From West Asia: Bahrain, Jordan, Kuwait, Lebanon, Oman, Occupied Palestinian Territories, Qatar, Saudi Arabia, Syria, UAE, and Yemen. Iraq did not nominate an expert to participate in the study.

From North Africa, Egypt was selected to participate in the study to share the experience and lessons learned related to the Egyptian Environmental Information System -- the most elaborate environmental information system developed so far in the Arab Region.

Regional Organizations:

The organizations, which participated in the study are: Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA), Center for Environment and Development in the Arab Region and Europe (CEDARE), Arabian Gulf University (AGU), The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD)

These papers were prepared by experts in the field of environment and/or information. Appendix A lists the authors of the technical papers, by country and organization. This report summarizes key findings and recommendations from all 16 reports into one, stand-alone integrated report.

1.2. Purpose

The report summarizes key findings, recommendations and lessons learned presented in twelve national and four regional reports on environmental information systems and databases. The report is intended to serve as baseline to support the formulation of a regional strategy for environmental information in West Asia, and to be used in conjunction with a similar global report prepared by UNEP, to guide the design and implementation of AGEDI, using lessons learned including best practices.

¹ Iraq is part of West Asia but did not participate in AGEDI and therefore is not included in this report (except for section related to ICT).

1.3. Methodology

This integrated report was prepared based on a thorough review of 16 reports (twelve countries and four organizations).² At UNEP's request, national environment authorities nominated independent experts to prepare national reports; four regional organizations nominated experts to prepare their regional reports. During report preparation, UNEP and AGEDI organized in January 2005 a "Regional Meeting on Experiences and Best Practices in Environmental Information Development and Management in West Asia" under the patronage of HE Sheikh Hamdan Bin Zayed Al Nahyan.³ At that meeting, each expert presented the preliminary findings related to environmental information and databases in his/her country or organization.

The terms of reference included three tasks, the first was a questionnaire focused on harvesting the information needed for the report, the second focused on collecting more detailed information on initiatives, programmes, projects, systems, or networks on environmental data and information. The third task was preparation of the report, etc (Appendix D).

It is important to note that while these reports followed the same outline, there were substantive discrepancies in the depth of the responses as well as in the way the preset questions were interpreted and addressed. To the extent possible, this review focuses on success stories, lessons learned, clear-cut recommendations and anecdotal evidence on environmental information systems and databases. Additional information was retrieved from miscellaneous websites or obtained during consultations with the ICT department at the United Nations Economic and Social Commission for Western Asia (ESCWA) in Beirut.

1.4. Report Organization

This report follows by large the same outline as the one used to prepare the national reports. For clarity however, the regional report has aggregated several headings as follows:

<i>Section</i>	<i>National Report Outline</i>	<i>Section</i>	<i>Regional Report Outline</i>
1	Executive Summary	1	Executive Summary
2	Introduction and background	2	Introduction (inc. background and methodology)
3	Methodological approach	3	Environmental data and information in West Asia
4	Status of environmental data	4	Effectiveness and efficiency of current information systems
5	Financing of environmental data	5	Constraints and barriers to improve environmental data and information
6	Effectiveness & efficiency of current information systems	6	Environmental data needs to support sustainable development
7	Constraints and barriers to manage and...	7	Regional and international cooperation
8	Assessment of general requirements	8	Lessons learned & opportunities for the future
9	Regional & international cooperation	9	Recommended priority actions
10	Opportunities for the future		

² Approximately 600 pages in total

³ Abu Dhabi, January 9-10, 2005

11	Lessons learned and experiences		
12	Recommendations of priority actions		

The report contains four appendices as follows:

- Appendix A Authors of National and Regional Report
- Appendix B Tasks included in the terms of reference.
- Appendix C Cited References, Websites and Consultations
- Appendix D Glossary of Internet Services

2. ENVIRONMENTAL DATA AND INFORMATION IN WEST ASIA

2.1. Analysis of current situation regarding environmental data

Environmental information systems (EIS) in Bahrain, Jordan, Kuwait, Lebanon, Oman, Occupied Palestinian Territories, Qatar, Saudi Arabia, Syria, UAE, Yemen, as well as Egypt have achieved very different levels of sophistication and coverage. All the countries have started to build environmental information systems but no country has yet achieved a system that is truly national and comprehensive. See Box 1 for a cursory review of EIS in selected countries.

Box 1. Environmental Information Systems in Jordan, Kuwait, and Yemen (West Asia) as well as Egypt

- Jordan launched its Environment Information System (EIS), pursuant to the environmental information strategy set in 1999. Along with another 16 information clusters covering various demographic, scientific, economic and social sectors, the EIS forms the National Environmental System, that is hosted by the National Information Center.
- Although Kuwait has no national environmental system per se, the Kuwait Institute for Scientific Research (KISR) started developing the Kuwait Environmental Information System (KEIS) in 1996, in cooperation with the Regional Information Technology and Software Engineering Centre in Egypt (RITSEC). The system is being built in five phases, of which the first two have already been completed: Phase I (marine and coastal data), Phase II (terrestrial and atmosphere data). Contributors include the Municipality of Kuwait, the Public Authority for Agriculture and Fisheries (PAAF) and ROPME.
- Yemen Environmental Information Management System is hosted in the Department of Environmental Planning and Data at the Ministry of Water and Environment. Currently, the system offers a library and has contributed to the publication of the SOER in Yemen. It lacks adequate equipment and human resources with appropriate technical skills, as well as environmental monitoring networks and indicators.
- Egypt developed a very elaborate Egyptian Environmental Information System (EEIS), with grant funding from CIDA (CA\$11.2 million). The EEIS, built between February 1997 and September 2004, was installed at the Egyptian Environmental Affairs Agency (EEAA) in Cairo; EEAA regional branches do not have direct access to the system in Cairo, yet.

There are many programmes, projects and initiatives related to environmental databases in countries of West Asia, completed, on-going or prospective. They involve very diverse institutions from government agencies, to private research institutions and organizations. The following paragraphs describe a small selection of these programs – the full list of programs is given in Table 1.

Bahrain: In collaboration with the Bahrain Center for Scientific Research (BCSR), the General Commission for the Protection of Marine Resources, Environment and Wildlife (GCPMEW) developed the Marine and Environmental Geographic System (MAREGIS). Currently used by many government development projects, MAREGIS is a computer-based decision making system for the management of Bahrain coastal and marine resources mainly for environmental management, fisheries management, and oil spill contingency planning and response. In its final form, it will consist of the following data and information layers: base map, satellite images, color aerial ortho-rectified photos, bathymetric digital terrain model, habitat distribution map, environmental sensitivity index map, depth contour map, field data, video and still photograph coverage.

Kuwait: In an effort to assess war damages related to the Iraqi invasion, the country set up an Integrated Environmental Data Management, Reporting and Assessment System (EDMRAS) to examine and predict impacts on human health, terrestrial, marine and groundwater environments.

Jordan: The country is implementing a national surface water quality monitoring program coined “real time monitoring system.” The system monitors 11 parameters from 13 different locations in Jordan. Test results are centralized and reportedly public. Jordan also implemented a National Information

System (NIS) to link domestic information centers in public and private sectors (each information sector has a dedicated sub-network, managed by a focal point).

Lebanon: The Country has implemented a number of mostly donor-funded projects on environmental information including “Strengthening the Environmental Legislation Development and Application System” (SELDAS) to review and document all legal texts that have implications on the environment; the new forest map of Lebanon; the National Land Use Master Plan which compiled and produced the largest amounts of geographic data to help articulate a national land use master plan; etc.

Oman: The Ministry of Regional Municipalities Environment and Water Resources (MRMEWR) manages a database on environmental permits and planning that stores data and information about industrial companies. In addition to containing basic industry-specific information (industry code, name, geographic and administrative details), the database keeps track of monitoring programs and records, penalties and permits – it is used to plan site visits, manage permits and penalty expiry. The biodiversity databases in Oman are managed by the Department of Biodiversity at MRMEWR with contributions from several national organizations and research institutes. Available in MS Word and Excel, the databases are regularly updated and include fauna and flora details covering terrestrial and coastal habitats of the Gulf of Oman, the Arabian Sea and offshore islands.

Occupied Palestinian Territories: The Palestinian Integrated Rural Environmental Protection project designed and developed a rural information system to support interventions in rural areas. Data needs were assessed with extensive stakeholder consultation was first conducted, and a series of GIS themes were developed covering: socio-economic, land use, natural reserve areas, agricultural and rangelands, water and wastewater and energy sectors in rural areas. The collected data is stored in the system using ACCESS, by district. Database contents are available for public access on the Palestinian Environmental Authority website.

Qatar: The online environmental information portal, developed by the National Center for Environmental Information, gives a broad overview of the events in the centre but does not really cater for the environmental data needs of the country. The Technical Affairs division within the Supreme Council for the Environment and Natural Reserves runs a coastal and marine environment monitoring program. The program has been recently overhauled with reselection of stations to cover the entire coast and the territorial water of Qatar.

Saudi Arabia: The Presidency of Meteorology and Environment (PME) has a network of “Real-time Ambient Air Quality Monitoring Stations”. They are connected to a workstation through data-loggers and modems. The data is automatically generated and stored in a database after statistical analysis and validation. The results are mostly used internally, however regular updates of ambient air quality are available for public information on PME website.

Syria: A database on banned and/or expired pesticides lists such substances accumulated in stores. To meet MEDPOL requirements, Syria conducted intermittent monitoring of the sea water quality for various pollutants.

UAE: The Coastal Sensitivity Index aids the oil spills response team to locate vulnerable coastal locations. It contains three types of information delineated by rankings: shoreline rankings, biological resources, and human-use resources. Data was generated using satellite imagery for the definition of the geo-biological zones, which were then digitized into features. Vulnerability and resource index values were assigned to each of the identified feature based on: a) the degree of likely exposure to oil; b) the degree of penetration of oil into the substratum; c) degree of oil persistence; d) extent of biological productivity. The atlas helps identify the natural resources along the coast, providing the team responsible for combating oil spills with information on the resource to be protected in case of accidents.

Yemen: The National Statistics Yearbook of Yemen contains a chapter on environment. The indicators however remain basic and limited to waste generation and management.

Although significant progress has been made in the region in the development of environmental data and information systems, not all of the programmes and initiatives achieved their intended goals. In fact, too many of them grind to a halt when funding ends, typically after a couple of years. Clearly, the most significant challenge is how to sustain these programs by integrating them in a host agency. Examples of “white-elephant” information programs include the Sustainable Development Networking Program (Lebanon, Jordan), the Lebanese Environment and Development Observatory (LEDO), and undoubtedly many other programs in every country in the region of West Asia (and beyond).

We can also conclude that environmental data and information systems in the region do not meet the current and future needs to support decision making and policy formulation. A more coherent and integrated regional to national approach needs to be put in place to make progress on this front.

2.2. Data and Information Availability

Environmental data and information cover a wide range of sectors and subjects. Many subjects are common to many countries (e.g., biodiversity, air pollution) but several sectors are country-specific (energy production in GCC countries, impact of sea level on low lying countries like Bahrain), etc.

There is substantial amount of environmental data and information collected for specific projects or programmes. Nevertheless, there are no coherent, consistent, systematic and comprehensive environmental databases on national and regional level databases. Further more it is not necessary that data being collect are the right data needed for environment policy and decision making.

Common data themes may be aggregated into the following three categories:

1. Development sectoral data
 - a. Agriculture
 - b. Fisheries
 - c. Industry (including petroleum)
 - d. Tourism
 - e. Transport (land, maritime, air)
 - f. Energy (production, transmission, distribution)
 - g. Urbanization

2. Natural resources data
 - a. Water resources (quantity and quality; surface, and groundwater)
 - b. Land (including soil, land cover, land use, desertification)
 - c. Coastal and marine environment.
 - d. Biodiversity
 - e. Air quality (including ambient air quality, indoor quality, emission)

3. Policy response data Monitoring programs
 - a. Permitting requirements
 - b. Solid waste management (domestic, industrial, hazardous)
 - c. Air quality management
 - d. Wastewater management (domestic, industrial)
 - e. Water resources management (springs, aquifers, catchments, desalination, etc.)

Status of Environmental Reporting

Most countries have yet to produce their State of the Environment Report (SOER) in a systematic manner. State of environment reports produced in the region were rather sporadic, non coherent, and descriptive. Some countries including Kuwait and Oman have produced sectoral reports such as the “state of the marine environment”. To date, no country in West Asia except Lebanon has produced a SOER following the Driving_Force_State_Impact_Response (DPSIR) framework, or consistent with

UNEP integrated environmental assessment methodology. Egypt (the only country from North Africa included in this study) has also produced a SOE report according to UNEP IEA methodology. In an effort to encourage environmental reporting in West Asia, UNEP is implementing a regional training programme on SOE reporting; the programme has so far delivered formal training modules in Bahrain, Jordan, Qatar, Syria, United Arab Emirates, and Yemen.

Table 1
Indicative List of Environmental Databases in West Asia Countries⁴

<i>Country</i>	<i>Databases Listed in National Reports</i>	<i>Public Access</i>	<i>Online</i>	<i>Links</i>
Bahrain	<ul style="list-style-type: none"> - Marine Environmental Geographic Information System (MAREGIS) - Air quality data, coastal and marine data, EIA reports, municipal and medical waste data, groundwater data, domestic water quality, soil data 	<ul style="list-style-type: none"> × ✓ 	<ul style="list-style-type: none"> × × 	
Jordan	<ul style="list-style-type: none"> - The Environment and Natural Resources chapter under the National Information System - Biodiversity databases (Royal Society for the Conservation of Nature) - Hunting Database (Royal Society for the Conservation of Nature) 	<ul style="list-style-type: none"> ✓ Partially available online 	<ul style="list-style-type: none"> ✓ ✓ 	<ul style="list-style-type: none"> http://www.dos.gov.jo/env/env_e/index.htm http://www.rscn.org.jo/reservesFaunaAndFlora.asp
Kuwait	<ul style="list-style-type: none"> - TERA BASE: data management system capturing all environmental data from the monitoring programs of the Environment Public Agency - Environmental Information System(EIS) developed by KISR containing information on marine, coastal, terrestrial and atmosphere systems - Database for War Related Environmental Damage in Kuwait (EDMRAS) - The Soil Information System (SIS): considerable amount of soil characteristics and features developed and updated by the public authority for agriculture and fisheries 	<ul style="list-style-type: none"> Limited to authorized scientists ✓ 	<ul style="list-style-type: none"> ✓ × × × 	<ul style="list-style-type: none"> http://www.kisr.edu.kw/isd/
Lebanon	<ul style="list-style-type: none"> - Lebanon State of the Environment Report (SOER) - Land use planning information in Lebanon (on CD) - Land use cover maps (on CD) - Mediterranean Environmental Reporting and Monitoring Information System (MED-ERMIS) - Strengthening the Environmental Legislation, Development and Application System in Lebanon (SELDAS) 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ 	<ul style="list-style-type: none"> ✓ × ✓ Book 	<ul style="list-style-type: none"> www.moe.gov.lb www.cdr.gov.lb http://www.toubibonline.com/medermis/
Oman	<ul style="list-style-type: none"> - Biodiversity; groundwater pollution; hazardous waste management; solid waste; air, noise & marine pollution; coastal zone management, wastewater treatment plants, chemical plants, environmental planning and permits, aquatic realm, and transboundary management of waste data databases managed by MRMEWR - Database on fisheries, aquacultures, fish quality control managed by the Ministry of Agriculture and Fisheries 	<ul style="list-style-type: none"> × ✓ 	<ul style="list-style-type: none"> × ✓ 	<ul style="list-style-type: none"> www.agrcensus.gov.om

⁴ As Reported in national and regional reports

<i>Country</i>	<i>Databases Listed in National Reports</i>	<i>Public Access</i>	<i>Online</i>	<i>Links</i>
Oman (cont'd)	<ul style="list-style-type: none"> - Biological collections available for public consultation at Ministry of Agriculture and Fisheries, Sultan Qaboos University and the Museum of Natural History - Database on marine sciences at Sultan Qaboos University 	✓	×	www.squ.edu.om
Occupied Palestina n Territories	<ul style="list-style-type: none"> - Seawater and groundwater monitoring databases under the “Strengthening the Palestinian Environmental Action Plan” project - Rural information system within the “Palestinian Integrated Rural Environment Protection Plan - Atlas of biological data and human use of the coastal line in Gaza Strip - Data on parameters affecting sustainable land use on an ecological rather than national basis 	×	×	www.environment.gov.ps/rural
		To concerned organizations and experts	×	www.cmc.sandia.gov/LITER
		✓	✓	
Qatar	<ul style="list-style-type: none"> - The environmental information web portal - Environmental site assessment and management system 	✓	✓	www.qatarenv.org
		×	×	
Saudi Arabia	<ul style="list-style-type: none"> - National Environmental Information Centre (under development by Scientific Information and Documentation Center) - Ambient air quality data - Groundwater database under supervision of Ministry of Agriculture - Environment City files cover major sources of pollution in Saudi Arabia cities 	×	×	http://www.pme.gov.sa/EnMonitoring.asp
		✓	✓	
			×	
			×	
Syria	<ul style="list-style-type: none"> - Biodiversity Atlas of Fauna and Flora of Syria - Inventory of PCBs - Inventory of forbidden and expired pesticides - Inventory of persistent organic pollutants 		×	
			×	
			×	
			×	
UAE	<ul style="list-style-type: none"> - Internal environmental database to EAD - Landsat images covering the entire country - Soil types (coastal area) - Water resources (Eastern region) - Fish stock assessment of UAE territorial waters - Terrestrial environmental baseline survey data - AGEDI metadata portal 	✓	✓	http://www.agedi.info/en/index.jsp
				http://www.agedi.info/gosportal/gos

<i>Country</i>	<i>Databases Listed in National Reports</i>	<i>Public Access</i>	<i>Online</i>	<i>Links</i>
UAE (cont'd)	<ul style="list-style-type: none"> - The Abu-Dhabi wide environment database covering five thematic areas: biodiversity, water resources, air quality, marine resources, terrestrial and marine pollution - Annual water resources statistics bulletin (EAD) - Coastal sensitivity index for oil spills (EAD) - Environmental sensitivity index to monitor national development towards environmental sustainability (EAD) 	<p>Concerned organizations</p> <p>Limited use by concerned organizations</p> <p>✓</p>	<p>×</p> <p>×</p>	
Yemen	<ul style="list-style-type: none"> - Environment Chapter under National Statistics yearbook - Environmental Information Management System at the Directorate General of Environment Planning and Data 	<p>✓</p> <p>×</p>	<p>×</p> <p>×</p>	

Noteworthy *regional* environmental reports include:

- ROPME, State of the Marine Environment for the ROPME Sea Area, 1999 & 2001 and 2003.
- UNEP, Africa Environment Outlook 1, and 2

Environmental Indicators

Like most other countries, West Asia countries are also developing indicators and indices to monitor the environment including environmental quality, information technology, sustainable development, etc. Most of these initiatives however appear truncated, very localized, and short-lived. For example:

- **Kuwait** has no national program on environmental indicators but KISR is currently developing one related to the marine environment (no other information provided). Meanwhile, the Kuwaiti EPA runs a monitoring program covering seven targets: offshore water, coastal water, oil pollution of coastal areas, bottom sediments, bacterial contamination of coastal areas, air quality at four residential areas, and air quality in selected industrial sites.
- **Lebanon** launched the Lebanese Environment & Development Observatory (LEDO) in 1999, with grant funding from the EC Life Third Countries Program. Hosted at the Ministry of Environment, LEDO formed a multi-disciplinary steering committee, identified 90 environment and development indicators grouped into four categories and 14 themes, and collected baseline data to compute the indicators. Unfortunately, LEDO was terminated at the end of the 2-year project because a proposal to reorganize the ministry into seven departments had not yet materialized. The new organizational structure would enable the ministry to fully integrate the observatory into its mandate.⁵
- **Occupied Palestinian Territories** has no national program on environmental indicators but the Environment Quality Authority (EQA) with the support of the Palestinian Central Bureau of Statistics (PCBS) has formulated a number of environmental performance indicators covering economic sectors (agriculture, energy, industry, tourism, etc). The indicators examine air quality, water quality, biodiversity, etc.
- **Oman** has developed national environment and sustainable development indicators by ministerial decision No. 121 (2003). An inter-governmental committee was established to design, update and monitor these indicators; it is chaired by the Ministry of Regional Municipalities, Environment and Water Resources. The indicators are grouped into themes (water, energy, environment, biodiversity, agriculture, eco-tourism, etc.); each theme has recognized data sources.

At the regional level however, there has been serious efforts to select and harmonize environmental indicators. The League of Arab States (LAS) in collaboration with UNEP, ESCWA and other regional and international organizations have worked together to harmonize a list of sustainable development indicators. UNEP organized a regional workshop in October 2003 to select a core set of environmental indicators for the Arab Region. Based on the outcomes of this workshop, UNEP developed guidelines for the development and use of priority environmental indicators for the Arab region. These indicators cover water resources, energy, agriculture/land resources, health and environment, biodiversity, and coastal and marine environment. In November 2005, the League of Arab States organized a meeting to coordinate the work of regional and international organizations in the Arab region, adopted and disseminated the guidelines to member countries for their feedback and to support national efforts towards the development of national environmental indicators. An expert meeting, to be held at the end of 2006, is planned by LAS in collaboration with UNEP and ESCWA to discuss the testing of a set of sustainable development indicators, based on the environmental core indicators in the guidelines developed by UNEP, and the socio-economic set of indicators prepared by ESCWA. Many countries

⁵ The new organizational structure was approved by parliament in July 2005 - i.e., 3 years after the official closure of the LEDO.

have embarked on several indicator programmes that are not mutually consistent or complementary. The regional coordination initiated by the League of Arab States and UNEP and the core indicators developed by UNEP provide an opportunity to improve the situation.

It also worth noting that the United Nation Statistical Division (UNSD), in collaboration with UNEP, developed global environmental statistics questionnaires addressing key environmental themes and issues, such as water, land, air pollution and waste management. These questionnaires were to be filled by all countries in the world. In April 2004, UNSD, ESCWA and UNEP conducted a capacity building workshop in Beirut, Lebanon, on how to complete the questionnaires. However, country responses to the questionnaires have been low.

2.3. Public Access

Public access to information is understood in many different ways. Some countries regard public access as an awareness issue (you need awareness to generate demand for environmental data); other countries regard it as the sharing of environmental information between potential users (usually members of the scientific community); few country reports recognized the meaning of public access in as far as the general public has the right to access, view, and retrieve environmental data for his/her information and personal good. Some countries such as Qatar make information available “upon request”. Such availability remains vague and can be hampered by bureaucratic complications. Public access as a form of transparency and a tool for spontaneous monitoring (i.e., local communities/residents/pressure groups may serve as dogwatch groups by flagging environmental problems as they arise) is by and large absent or poorly assessed in West Asia countries. The confidentiality, political sensitivity, ownership, cultural and technical issues hinder public access to environmental information. In spite still limited in scope, there is a growing trend of having environmental information posted and accessible on the Internet.

Some examples of public access are described next:

- **Kuwait:** the Environment Public Agency (EPA) and the Public Authority for Agriculture and Fisheries produce bi-monthly reports containing data from national monitoring programs. Data on the industrial sector however (petroleum) is not public.
- **Lebanon:** The Ministry of Environment has posted on the Internet the full and unabridged version of the “Lebanon 2001 State of the Environment Report.” The report subsequently became one of the most commonly cited references in environmental reports in Lebanon. The largest single user group is university students and mid-level researchers.
- **Oman:** The Ministry of Regional Municipalities, Environment and Water Resources regularly publishes a technical magazine “Man and the Environment” for the wider public.
- **UAE:** The Federal Environment Agency is chairing a working group that is working with the Center for International Earth Science Information Network (CIESIN) to produce an Environmental Sensitivity Index 2005 for UAE. Indices and final reports will reportedly be made public on the Internet.

2.4. Information Policy and Legislation

There is inadequate information policy and legislation in West Asia countries. In a few countries, there are agencies with clear mandate to collect and manage environmental data. Most countries have no clear national policy, mechanisms or protocols for sharing and disseminating environmental information and data. The region also lacks a regional convention, similar to the Aarhus Convention that comprises three key pillars: i) securing effective access to environmental information; (ii) improving public participation in decisions relating to the environment and (iii) ensuring that there is a review procedure for any decisions, acts or omissions under the convention or in relation to other national environmental law. Further more, there is no regional initiatives, such as the Partnership for Principle 10 (PP10) is a new initiative developed as a 'Type II' outcome of the World Summit on Sustainable Development. Principle 10 of the Rio

Declaration 1992 articulated public access to information, participation in decision-making, and access to justice as key principles of environmental governance.⁶ Research organizations and government agencies however may have in-house data management protocols and quality management systems (such as ISO9001:2000) but there is little overall integration of these protocols and systems. Some countries have begun to mandate the collection and dissemination of environmental information to well defined environmental institutions. Table 2 attempts to summarize these institutions according to two groups:

- (1) **Host Institutions:** any institution which appears to be assuming a lead role in the collection and consolidation of environmental information from multiple (national) sources. Examples include the GCPMEW in Bahrain, the EEAA in Egypt, NISTIC in Kuwait, EQA in Occupied Palestinian Territories, etc.
- (2) **Data Generators:** any institution, organization or agency that generates environmental information and manages environmental databases. Examples include the RSCN in Jordan, the NCSR in Lebanon, BCSR in Bahrain, NCWCD in Saudi Arabia, the Central Bureau of Statistics in Syria, etc.

2.5. Institutional Capacity for Managing Environmental Data and Information

Many institutions in West Asia countries generate and manage environmental data and information (see Table 2). Several country reports pointed to the lack of coordination between those institutions and a noticeable duplication of effort. The majority of these organizations face shortages in human resources and technology hampering the swift compilation and analysis of environmental information. Most countries have their environmental information centers or departments either within the national environmental authorities or embedded in National Statistics Centers (e.g., Jordan); a few countries have no designated environmental information center to date (e.g., Lebanon). Most national environmental or information authorities have a dedicated IT department (unit) that caters for data needs and requests. These IT departments (units), however, appear to be marginalized, receive little technical and financial support and are understaffed (“one-person-shows”). The following examples describe in more details the institutional capacity of three countries for managing environmental data and information.

- **Syria:** When the Ministry of Local Affairs and the Ministry of State for Environmental Affairs were merged, the GCEA lost a vital department for the collection of baseline environmental information. This crippled the GCEA but plans are currently underway to establish a department for environmental statistics and indicators at GCEA.
- **UAE:** Environment Agency Abu Dhabi developed its data management, data dictionary, and procedures for the collection and storage of data. All data-generating projects go through the IT department at EAD, enabling the organization to keep track of the information that it generates.
- **Qatar** offers a credible example of a centralized environmental information database common to several different organizations, located at the National Center for Environmental Information. Most of the information feeding into the Environmental Site Assessment and Management Database do not belong to the host Center, but come from different government agencies through a high-speed fiber optic network.

Overall, national environmental authorities in West Asia countries are generally juvenile as most of them were established during the 1990s. Some of them are being restructured such as in Bahrain (General Commission for the Protection of Marine Resources, Environment and Wildlife), Lebanon (MOE), Occupied Palestinian Territories (EQA), Syria (GCEA), United Arab Emirates (Ministry of Environment and Water), and Yemen (Ministry of Water and Environment). Institutional development in several countries including Iraq, Occupied Palestinian Territories and Yemen is hampered by geopolitical pressures, and depend almost exclusively on donor funding.

⁶ Field Foundation for International Environmental Law and Development; Principle 10 / Aarhus Convention <http://www.field.org.uk/aarhus.php>

2.6. Financing of environmental data and information

Financing for environmental data and information may come from two sources: (i) national and (ii) international. Cash-stripped Mashreq countries are more likely to access international sources of funding including the Global Environment Facility, European Community (EC-Life Third Countries Program), GTZ, CIDA, etc. International funding alone however cannot sustain environmental information systems. There are many examples of information systems that were setup with international funding but were not adequately maintained and eventually came to a halt after donor funding ended.

The countries of the Gulf Cooperation Council (GCC), on the other hand, are more likely to mobilize national resources to finance environmental data. But even GCC countries allocate very modest resources (from national budgets) for environmental information. Although environmental agencies usually recognize the value of information, they typically prioritize other environmental sectors. The Abu Dhabi Global Environmental Data Initiative (AGEDI) is an inspiring example of government financing to support environmental information.

Table 2 Central Institutions Handling Environmental Information in West Asia

<i>Country</i>	<i>Host Institutions</i>	<i>Mandate in relation to Environmental Information</i>	<i>Data Generators Listed in National Reports (Indicative List)</i>
Bahrain	General Commission for the Protection of Marine Resources, Environment and Wildlife (GCPMEW)	Establishment of systems that enable environmental data/information collection and analysis and their exchange, and the cooperation with research centers, organizations and associations in and outside Bahrain	<ul style="list-style-type: none"> - Bahrain Center for Studies and Research (BCSR) – GEOMATIC team - Ministry of Interior - Central Statistics Organization - Ministry of Municipalities and Agriculture - Ministry of Health - Ministry of Electricity and Water - Regional Arabian Gulf University
Jordan	National Environmental Information Coordination Committee within the Department of Statistics (since 1997) www.dos.gov.jo	Assess the different kinds of information within involved environmental organizations, enhance environmental exchange, and keep on updating the information of each focal point.	<ul style="list-style-type: none"> - Jordanian Ministry of Environment - Royal Society for the Conservation of Nature - Friends of Environment - Industrial Development Bank
Kuwait	The National Scientific and Technology Information Center (NISTIC) at the Kuwait Institute for Environmental Research (KISR) http://www.kisr.edu.kw/isd/ http://www.kisr.edu.kw/nstic_intro.asp	Depository center for all environmental databases and socio-economic databases and other related information	<ul style="list-style-type: none"> - Kuwait Environmental Public Agency - Public Authority for Agriculture and Fisheries (PAAF) - Kuwait Institute for Environmental Research (KISR) - Regional Organization for the Protection of the Marine Environment (ROPME)
Lebanon	The Lebanese Ministry of Environment www.moe.gov.lb	Supervises the development of a national EIS, pursuant to Law 444 (2002)	<ul style="list-style-type: none"> - Central Administration of Statistics (CAS) - National Council for Scientific Research (NCRS) - Litani River Authority - Ministry of Agriculture - Ministry of Public Health - Council for Development and Reconstruction - Tripoli Environment and Development Observatory (TEDO) - Universities: American University of Beirut, Université Saint-Joseph, University of Balamand, Lebanese American University
Oman	Ministry of Regional Municipalities, Environment and Water Resources (MRMEWR) www.mrmewr.gov.om	No legal mandate on environmental information in Oman, however the MRMEWR made most of the effort towards organizing environmental data in the country	<ul style="list-style-type: none"> - Ministry of Agriculture - National Museum of Natural History - Sultan Qaboos University - Ministry of Commerce and Industry

Country	Host Institutions	Mandate in relation to Environmental Information	Data Generators Listed in National Reports (Indicative List)
Occupied Palestinian Territories	Palestinian Environmental Quality Authority www.environment.gov.ps	No written mandate for Palestinian ministries, but the EQA has signed agreements with various concerned ministries (health, agriculture, industry, and water authority) to centralize environmental issues with EQA.	<ul style="list-style-type: none"> - Palestinian National Bureau of Statistics - Ministry of Planning
Qatar	National Center for Environmental Information within the Supreme Council for the Environment and Natural Reserves http://www.qatarenv.org/English/Home.htm	Establish a national environmental database and establish a reference laboratory for the environment (Law 11/2000)	Information not provided
Saudi Arabia	Scientific Information and Documentation Center under the Presidency of Meteorology and Environment http://www.pme.gov.sa/EnMonitoring.asp	Collects, collates, archives the meteorological, climatological and environmental data and disseminates this data in the required format within and outside the PME	<ul style="list-style-type: none"> - Ministry of Agriculture - Ministry of Petroleum and Mineral Resources - Ministry of Municipal and Rural Affairs - Ministry of Health - Ministry of Industry and Trade - National Commission for Wildlife Conservation and Development (NCWCD) - Universities: King Saud, Riyadh, King Fahd, King Faisal, Dammam, Jeddah, King Abdulaziz City of Science and Technology
Syria	General Commission for Environmental Affairs (GCEA) at the Ministry of Local Administration and Environment http://www.mlac-sy.org/nobcms/index.php	Collects and disseminates related information and produce yearly statistics abstracts (Law 50/2002)	<ul style="list-style-type: none"> - Central Bureau of Statistics - General establishment of surveying - General organization for remote sensing
UAE	Federal Environmental Agency http://feaapp.fea.gov.ae Environment Agency Abu Dhabi (EAD) http://www.ead.ae/ – AGEDI http://www.agedi.info/en/index.jsp and AGEDI e-Community http://www.agedi.org/default.aspx	FEA manages and protects the environment of the whole of the United Arab Emirates. EAD manages and protects the environment of the Abu Dhabi Emirate, and manages Abu Dhabi Global Environmental Data Initiative (AGEDI).	<ul style="list-style-type: none"> - Town Planning Authorities - Federal Environmental Authority - Dubai Municipality
Yemen	General Directorate of Environmental Planning and Data at the Ministry of Water and Environment & the Environment Protection Authority	Setting up and operating an environmental management system	<ul style="list-style-type: none"> - Meteorology Authority - Ministry of Agriculture - National Water Resources Authority

3. EFFECTIVENESS AND EFFICIENCY OF CURRENT INFORMATION SYSTEMS

The effectiveness and efficiency of current information systems in West Asia countries is very diverse. This chapter describes key strengths and weaknesses as reported in the national and regional reports prepared for this study.

3.1. Strengths

Generally, environmental data and information are improving, increasingly complex and cover a growing number of environmental disciplines/themes. Data acquisition methods are increasing and diversifying: from printed materials to the world-wide-web to electronic messaging and electronic conferencing. Some of the strengths mentioned in country reports strengths include:

- **Jordan:** the EIS is based on voluntary responses from data generating institutions. This proactive approach promotes ownership and local buy-in and usage of the information system.
- **Kuwait:** EPA produces high-quality environmental data. A lot of these data are geographically-sensitive and digitized. EPA staff have received valuable training and developed several IT applications from those databases.
- **Lebanon:** High level of electronic culture. Many research institutions have developed valuable GIS applications and acquired remote sensing capabilities. Universities offer a range of environmental studies and degrees.
- **Oman:** Information Systems are facilitating the inspection and monitoring of coastal developments. Many environmental databases now exist in the country and are being updated fairly regularly.
- **Syria:** Computer hardware is affordable in the country thanks to local manufacturing and assembly plants (this is also true in Egypt and Lebanon).
- **United Arab Emirates:** Efficient information technology infrastructure.
- **Yemen:** Environmental information has been integrated in other information portals. For example, the National Statistical Year Book recently started to include a chapter on the environment.

3.2. Weaknesses

Reported weaknesses are equally diverse. These weaknesses however are not necessary unique to the countries mentioned here, but it is the weaknesses highlighted in the national reports. Examples of what was mentioned in those reports are:

- **Jordan:** There is a need for more qualified staff, professional interest, and national cooperation, as well political and financial support to run environmental information systems. The country needs a set of national environmental indicators, and limited duplication of efforts between line agencies. Some of the environmental data is internally inconsistent (different data for the same parameters depending on the source) and is irregularly updated.
- **Kuwait:** Industrial data are very limited (especially related to the petroleum sector). Little epidemiological data for risk assessment. Much of the data is considered confidential and there are too few monitoring sites in industrial areas. No public pressure on authorities to publicize the data and no political pressure on data-generating institutions to make their data available to the public and the scientific community.
- **Lebanon:** Insufficient capacity and resources to conduct continuous monitoring. Bulk of environmental data is limited to spot checks. Environmental databases are scattered and have yet to contribute to the development of an “information system” per se.

- **Syria:** Information systems are expensive and scattered among several agencies. A lot of the information is centralized in Damascus and therefore not easily accessible to regional government departments and agencies.
- **United Arab Emirates:** Lack of coordination between major data generators which has resulted in the production of data using different formats, standards and scale.

In general, key strengths include (stars indicate the occurrence of each strength across West Asia countries: one “*” indicates low occurrence and three “***” indicates high importance):

1. Diversification of data-acquisition methods **
2. Dissemination of electronic culture (in rural areas also through government programmes) **
3. Cost reasonableness for computer and Internet access (in some countries) *
4. Integration of environmental information in other information portals (e.g., statistics) *
5. Proliferation of geographic data and GIS applications ***
6. Private-sector participation in data generation **
7. National environmental indicators (in some countries) *

And key weaknesses include (stars indicate the occurrence of each weakness across West Asia countries: one “*” indicates low occurrence and three “***” indicates high occurrence):

1. Poor consolidation and duplication of efforts ***
2. Little continuous data monitoring *
3. Cacophony of environmental indicator programs that are disconnected**
4. No dissemination of environmental data *real-time* *
5. Lack of data classification for purposes of disclosure ***
6. Lack of qualified staff to run technical programs and complex information systems **
7. Concentration of environmental data in the capital; no direct sharing with regional departments *
8. Keeping pace with technological advances **
9. No public pressure on government agencies to release environmental data (and hence no political pressure on data-generating institutions to publicize the data) **

4. CONSTRAINTS AND BARRIERS TO IMPROVE ENVIRONMENTAL DATA AND INFORMATION

Constraints to the availability and accessibility of environmental data in West Asia countries are classical in nature:

- Disclosure/confidentiality
- IT infrastructure & Internet connectivity
- Data consolidation/storage
- Funding
- Bureaucracy

4.1. Disclosure/Confidentiality

Disclosure of information in West Asia countries is limited. Most of the data is considered “classified” or proprietary data for limited or internal use within agencies and therefore only accessible to a handful of individuals or institutions. For example, in the UAE, despite having an enviable IT infrastructure and solid environmental databases across many topics, information sharing among organizations is very limited which consequently reduces the overall efficiency in data management. AGEDI is trying to remove barriers to information exchange in the UAE. In Jordan also, organizations are reportedly very reluctant to disclose proprietary information. In Kuwait, information regarding the petroleum industry, including emissions from refineries, is confidential; it is consequently difficult to conduct epidemiological studies to assess exposure and related health risks.

The root causes for the lack of public disclosure and excessive confidentiality of the data may include:

- Plagiarism: it limits information sharing because data generators are not duly credited. Competition among researchers is (understandably) significant and so many organizations that generate environmental data prefer not to share them.
- Fear of implications on data generator: researchers and research organizations may be unwilling to share some of the data they have for fear that it may reflect negatively on their performance or solicit a negative reaction from a higher authority.
- Fear of repercussions on select economic sectors: data generators may be unwilling to share environmental data that may reflect negatively on a particular sector. For example, releasing data regarding trace metals in marine waters would affect fisheries; data regarding fecal contamination or oil spills in coastal waters would jeopardize the tourism sector; data regarding contamination of public water supply system would cause serious alarm amongst the public, etc.
- Some data are withheld on the basis that the data are sensitive with potential implication on national security. In some cases this is could be true; in other cases, data withheld for security reasons are available from international/commercial sources (e.g., high resolution satellite data).
- Lack of data classification: perhaps the most compelling root cause for non-disclosure is the lack of sound and meaningful data classification system i.e., the data are not formally classified therefore all the data are restricted as a precautionary measure. If West Asia countries would recognize the need to classify and declassify environmental data, then at least some of the data would be made public without further deliberation.

4.2. ICT Infrastructure & Internet Connectivity⁷

There is a great disparity in ICT infrastructure between the West Asia countries, with very low levels in Iraq and Yemen compared to advanced infrastructure in Bahrain and UAE. Disparity also exists in the penetration of PCs and Internet between city and rural dwellers.

All West Asia countries, except Syria and Yemen, have developed and ratified ICT policies and strategies. Six of them have clear implementation plans, with one only (Bahrain) appearing to have rapid implementation, compared to a generally adequate implementation among the rest.

Internet services are now duopolistic or competitive in nine countries out of thirteen, however it is still lower than the rate of competition for mobile phone services (in ten countries). Despite a 30 percent growth in Internet users in West Asia in 2004, Internet penetration in Mashreq countries has increased to less than seven percent which remains significantly lower than the penetration rate in the Gulf Cooperation Council countries (17.6 percent) and to the world average (18 percent). Most West Asia countries have increased their total Internet bandwidth with the UAE registering the highest level so far (2,680Mbps). Overall however Internet bandwidth is still very limited in most West Asia countries -- a drawback for the exchange and transfer of high-volume data including satellite data, videos, digital map and high resolution photos. So, despite improved ICT infrastructure in West Asia countries, the digital divide with developed countries remains significant. Table 3 categorizes West Asia countries into four ICT infrastructure maturity levels: Level 1 is the lowest maturity and Level 4 is the highest maturity. The majority of West Asia countries are Level 2 and only four GCC countries have achieved Levels 3 and 4.

Table 3
Ranking of West Asia Countries with Respect to Maturity Levels of ICT Infrastructure

	Level 1		Level 2		Level 3		Level 4	
	2003	2005	2003	2005	2003	2005	2003	2005
Bahrain					✓			✓
Iraq*	✓	✓						
Jordan			✓	✓				
Kuwait			✓					
Lebanon			✓	✓				
Oman			✓	✓				
Occupied Palestinian Territories	✓			✓				
Qatar					✓	✓		
Saudi Arabia			✓			✓		
Syria			✓	✓				
UAE							✓	✓
Yemen	✓	✓						

* Did not submit national reports on environmental information and databases

Definitions:

Maturity level 1: ICT infrastructure shows (1) low telephony density rates and unattractive telecom market conditions to encourage usage by users in the individual and business segments; (2) scarce international links for telephony and to the Internet backbone; (3) poor Internet dissemination, inadequate national backbone, and limited number of Internet players in the market.

Maturity level 2: ICT infrastructure shows (1) average telephony density rates and increasingly attractive telecom market conditions for users in the individual and business segments; (2) developing international

⁷ This Section was prepared based on the source: ESCWA, Regional Profile of the Information Society in Western Asia. United Nations, 2005 (DRAFT).

links for telephony and to the Internet backbone; (3) improving Internet dissemination, improving national backbone, and active internet players market.

Maturity level 3: ICT infrastructure shows (1) above average telephony density rates and attractive telecom market conditions for users in the individual and business segments; (2) solid international links for telephony and to the Internet backbone; (3) somewhat strong Internet dissemination, adequate national backbone, and active internet players market.

Maturity level 4: ICT infrastructure shows (1) world class telephony density rates and very attractive telecom market conditions for users in the individual and business segments; (2) highly developed international links for telephony and to the Internet backbone; (3) strong Internet dissemination, world class national backbone, and a recognized internet players market.

Most West Asia countries have initiated several program or projects to automate their public offices and administrations. The rates of accomplishment remain however weak, with nearly all government documents remaining in their old conventional formats. Implementation plans for e-government remain slow in most countries, with Bahrain registering the highest e-government readiness score, compared to Yemen scoring the lowest. Arabic Web pages still constitute just 0.10 percent (40 million) of total Web pages, despite the fact that Arabic speakers constitute five percent of the world's inhabitants.

4.3. Data Consolidation/Storage

Most West Asia countries have argued that the lack of data consolidation and coordination among data generators hampers the availability of and accessibility to environmental data. Notwithstanding potential restrictions on data disclosure, if the data are scattered, not electronic or stored in a manner that makes them easily retrievable, then the data are considered unavailable. Recognizing the need to consolidate data from multiple sources is easy; each country must however develop its own mechanisms and protocols to achieve this.

Another problem related to data dissemination is volume. A wealth of data is not always useful because it can be very difficult, if not possible, to interpret and transmit. It is therefore important to define the user groups and tailor information to them. In Occupied Palestinian Territories for example, environmental indicators are used as a communication tool, not only a data management tool. The indicators simplify the data making it more meaningful to the general public.

4.4. Funding

Data management is expensive. It requires West Asia countries to develop effective monitoring systems, storage systems, reporting systems and Quality Assurance systems to verify data accuracy and reliability. Several countries, mostly Mashreq countries and Egypt, have received significant international funding to implement biodiversity, air and water quality, and data management systems. The challenge is always to institutionalize the projects and programmes before funds run out. The countries of the GCC naturally have access to significantly larger resources but do not necessarily enjoy higher levels of funding. This will require increased recognition by their governments that environmental data and information can positively influence decision-making and promote sustainable development.

4.5. Bureaucracy

Environmental data, like any other data, are often difficult to obtain especially if they are managed by in large public organizations or government agencies. Data requests are typically channeled vertically, from one department to another, and require approval from a senior representative of the organization. The hierarchical flow of data (and decision) is time-consuming and can reflect negatively on the organization itself. If there are no restrictions on the data, then the data should be disseminated without prior consent. Vertical communication could also be mitigated if there was public pressure on the authorities to publicize the data. Clearly, reducing bureaucracy and improving disclosure will require a cultural change in the way people perceive data sharing and exchange. Policies favoring data sharing could also help.

5. ENVIRONMENTAL DATA NEEDS TO SUPPORT SUSTAINABLE DEVELOPMENT

5.1. Environmental priority issues

All countries recognize the need for environmental data to support sustainable development. Although several environmental data needs may be common to a group of countries (e.g., air pollution, hazardous waste, loss of biodiversity), several countries have also expressed very specific data needs. For example, low-lying countries like Bahrain are very much concerned with climate change and its impact on sea level change; GCC countries including Qatar and Kuwait are still trying to assess the environmental fallouts of the Iraq war; countries with positive freshwater budgets such as Lebanon are concerned with surface and/or groundwater pollution; etc. In general therefore, it is safe to say that environmental data needs reflect priority issues, as summarized in Table 5.

Table 4
Environmental priority issues by country

	<i>Bahrain</i>	<i>Jordan</i>	<i>Kuwait</i>	<i>Lebanon</i>	<i>Oman</i>	<i>Palestina n Territorie</i>	<i>Qatar</i>	<i>Saudi Arabia*</i>	<i>Syria</i>	<i>UAE</i>	<i>Yemen</i>
Coastal/marine pollution	✓		✓	✓		✓				✓	✓
Land degradation				✓	✓	✓				✓	
Fresh water pollution		✓	✓	✓		✓			✓	✓	✓
Air pollution		✓		✓	✓	✓				✓	✓
Ozone Depleting Substance											✓
Noise pollution						✓					
Sea level rise	✓										
Wastewater management		✓		✓							✓
Solid waste management		✓	✓	✓						✓	✓
Hazardous substances mgt.		✓	✓		✓					✓	✓
Groundwater depletion			✓	✓	✓						
Sea water intrusion				✓	✓						
Soil salinity					✓						
Fish stock management	✓				✓					✓	
Oil stock management											
Freshwater shortage	✓				✓						
Agricultural runoff		✓								✓	
Loss of biodiversity	✓			✓	✓	✓	✓			✓	
Wildlife poaching					✓						
Invasion of alien species					✓						
Poor urban planning				✓		✓			✓		
Health and Safety		✓	✓								
Population pressures				✓							

* Information not provided

Note: These priority issues reflect the information provided in the national reports. Individual countries may have other priority issues or share some of the issues expressed by other countries. This table could be refined by asking each country to indicate priority issues from a list of preset issues.

5.2. Environmental information needs to support decision-making

It is difficult to categorize environmental information needs by stakeholder groups. Information needs differ by country as well as by stakeholder group and may change with time. For all practical purposes, stakeholder groups could be defined as follows:

- (i) Group 1: Governmental
- (ii) Group 2: The public including civil society
- (iii) Group 3: Private sector including industrialists and agriculture, and

- (iv) Group 4: Research institutions including universities, environmental observatories, etc.

The first level needs environmental information that has been synthesized, that is succinct and factual; the second needs to access information that will support compliance monitoring and auditing; the third needs access to information that will support site selection, investment decisions; and the fourth level will typically interpret primary data, assess trends, exposure and risks.

5.3. Technological needs

Clearly, West Asia countries need to do more in terms of IT infrastructure and Internet connectivity. Despite extensive government intervention to disseminate computer and Internet services across their territory (notable achievements in Egypt, Jordan and Syria), significant infrastructure investments are still required to extend and deliver IT services, at affordable prices, to remote areas. Table 6 provides a quick overview of Internet services and connectivity in West Asia countries, showing marked disparities - *see Appendix C for explanation of internet terminology*. On a different level, data-generating institutions also need to acquire, maintain and upgrade their hardware and software systems.

There is a need to use a common set of internationally recognized data standards, open source tools and resources and interoperability standards to allow data sharing and exchange.

Table 5
Type of Internet Services in West Asia

<i>Country</i>	<i>Local Internet Access</i>
Bahrain	Broadband, ISDN, Dial-up
Jordan	Dial-up, ISDN, ADSL
Kuwait	Dial-up, leased line, ISDN, DSL
Lebanon	Analog and digital Dial-up, WiFi, broadband
Oman	ISDN, ADSL, roaming dial-up, Dial-up, pre-paid cards
Occupied Palestinian Territories	ADSL, ISDN, leased line, broadband, Frame relay connection, Dial-up, Satellite
Qatar	ADSL, Dial-up
Saudi Arabia	Information not provided
Syria	Dial-up, ISDN, leased line, ADSL, Satellite
UAE	DSL, ADSL, Dial-up
Yemen	Analog dial-up, leased line, ISDN, pre-paid cards

Source: Information collected by ECODIT from several local ISPs websites.

Figure 1
Number of Internet Users in West Asia Countries

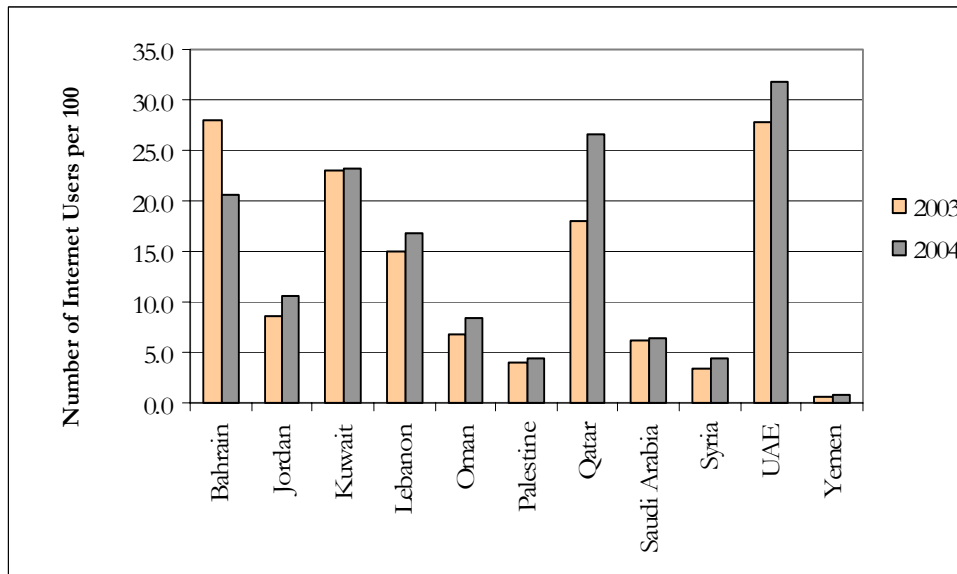
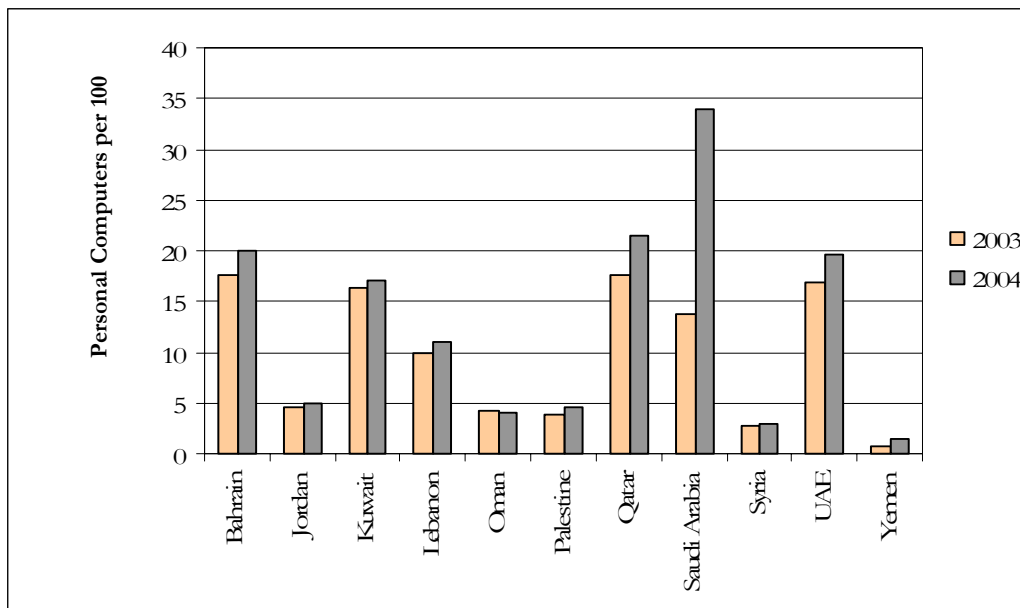


Figure 2
Number of Personal Computers in West Asia Countries



Source (Figures 1 and 2): ESCWA Statistics Information System, 2005

5.4. Institutional needs

Generally, all West Asia countries need to streamline data generation and management, with an eye for efficiency and transparency. Institutional needs can be summarized according to three levels:

- (1) At the government level, there needs to have a coherent framework for generating data and organizing data flow within an agency and across line agencies;
- (2) At the level of data-generating institutions, there should be more human and financial resources to manage increasingly larger and more complex databases; these institutions also will need protocols for managing, processing and disseminating environmental data; and

- (3) At the level of decision-makers, there should be mechanisms for retrieving environmental data that have already been interpreted to show trends, issues and options.

5.5. Using Environmental Data to support decision making in West Asia

All countries realize that data management should lead to improved decision-making yet few countries have yet been able to develop and employ information systems that support decision-making. Some promising examples follow – in the absence of more specific information; it is too early to call them success stories.

- **Occupied Palestinian Territories:** The Palestinian Integrated Rural Environmental Protection Plan developed a rural information system aiming to support the actions and interventions in rural areas. The framework was a joint effort between the Palestinian EQA and the International Center for Rural Environment Protection where the data is stored. The system provides up-to-date information on various rural parameters such as socio-economic situation, land use, nature reserves, agriculture and rangelands, water and wastewater in rural areas.
- **Oman:** The Environmental Planning and Permits database is designed to store data and information regarding industrial establishments. The database is considered a success story at MRMEWR and helps the ministry plan site visits and manage environmental permits and penalties for industries.
- **Bahrain:** The intended purpose of the MAREGIS database in Bahrain is to support decision making. In due course, it is hoped that the database will provide answers to such questions as: Where is the best place for an industrial development site with the least impact on the local ecology? Which areas should be protected to ensure protection of endangered species? The database is expected to support applications in environmental management, fisheries management and oil spill planning and response.
- **UAE:** The coastal sensitivity atlas for oil spills developed by EAD aims to assist oil spill response teams locate vulnerable sites and make rapid decisions that will minimize damages. The atlas is a remarkable aid tool to oil and chemical response teams, especially foreign teams who may be unfamiliar with the local area and environment.
- **Qatar:** The environmental site assessment and management system is a GIS-based Decision Support System to help managers evaluate the environmental viability of a development site. It contains fifteen different constraining themes such as hydrogeology, urban development, fragile landforms for the environmental evaluation of a site. It can generate automatic reports indicating the suitability of the candidate site (suitable, moderately suitable or unsuitable).
- **Lake Maryout DSS:** System was developed by CEDARE and aims to analyze the main policy failures behind improper urban management systems leading to deteriorating livelihood conditions. It is used by urban planners and environmental specialists to measure using a set of criteria the effects of multiple stresses induced by human activities in Lake Maryout and to weigh various response scenarios.

6. REGIONAL AND INTERNATIONAL COOPERATION

Various networks of cooperation exist in the West Asia region; this chapter presents a targeted selection based on information provided in the regional reports. UNEP has already initiated several forms of cooperation with regional organizations in the region including AGEDI, ASCAD, CEDARE PERSGA, and , ROPMEand. These organizations have also started to cooperate directly, thus leveraging resources and skills in key environmental areas and regions. PERSGA is a good example of sub-regional cooperation (See Box 2).

UNEP as part of the UN family recognizes the need for improved cooperation and synergy among UN bodies, MEAs and regional environmental fora, scientific and academic institutions and networking among national and regional institutions. The Executive Director of UNEP also felt it was necessary to put in place a more systematic approach to international cooperation in this field, and he suggested that Governments individually and through the Council/Forum might wish to play a more active role in this respect. He also proposed to the twenty third session of the Council/Forum in February 2005 the development of an Environment Watch framework to enhance the scientific base of UNEP⁸. The Council/Forum requested the Executive Director to further develop the proposal in consultation with governments and other stakeholders⁹. An updated proposal and a questionnaire was prepared and reviewed by Governments and partners through written submissions and consultations. The resulting iteration of the proposal¹⁰ which presented the architecture of an Environment Watch system was considered by the UNEP Governing Council at its ninth special session in February 2006.

In the ensuing discussion, several representatives endorsed the need for further consultations in order to clarify how the Environment Watch system might meet the needs of Governments and relate to existing national, regional and global structures such as the European Environmental Information and Observation Network, the African Environment Information Network and the Global Earth Observation System of Systems. Some concern was expressed at the current complexity of the system and the need for further development to ensure that it was user-friendly and met the need to reduce national reporting burdens and avoid duplication. Several representatives supported incremental development of the system, perhaps starting with a few pilot schemes.

UNEP believes that cooperation in the field of knowledge is a key vehicle for enhanced coherence, as shared knowledge promotes concerted action. Within this context UNEP is conducting regional consultations with the objective to consult with existing networks, regional bodies and international institutions which may serve as regional, functional and thematic focal partners in piloting the Environment Watch and to prepare a first draft of the guidelines for piloting the information network, building on experience from existing networks. A meeting was held in West Asia in June 2006 to Consult with relevant partners in the West Asia region so as to:

1. Assess the situation in West Asia with respect to
 - (a) regional, national and thematic environmental information networks.
 - (b) assessment and reporting frameworks.
 - (c) data and information sharing (in context of ecoMundus).
2. Propose an approach towards achieving better coherency for regional and national network structures.
3. Engage information and data providers in the ecoMundus initiative (as a tool for networking institutions to share and exchange environmental information and data).
4. Identify capacity building needs with respect to objectives 1-3.

It is to be noted that the regional AGEDI study noted that regional environmental information systems face the following difficulties:

1. Poor information flow;
2. Limited harmonization of data and indicators;
3. Hardware and software compatibility;
4. Lack of funds;
5. Intermittent commitment of countries for cooperation; and
6. Inadequate disclosure of information and data sharing.

⁸ See document [UNEP/GC.23/3](#) and annex 2 of document [UNEP/GC.23/INF/18](#).

⁹ Decision UNEP/GC.23/1.

¹⁰ UNEP/GCSS.IX/3/Add.2.

Many regional organizations can facilitate and promote the management of regional environmental information including:

- Council of Arab Ministers Responsible for Environmental Affairs.
- Regional Organization for the Protection of Marine Environment (GCC countries).
- Gulf Cooperation Council (GCC).
- Africa Environmental Information Network (AEIN)
- United Nations Economic and Social Commission for Western Asia (ESCWA).
- Center for Environment and Development in the Arab Region and Europe (CEDARE).
- Regional Organization for the Conservation of the Environment of the Red Sea and the Gulf of Aden (PERSGA).
- The Arab Center for the Studies of Arid Zones and Dry Lands (ASCAD).
- Arabian Gulf University (AGU).
- International Center for Agricultural Research in Dry Areas (ICARDA).
- International Development and Research Center (IDRC) – Cairo office.
- The Arab Network for Environment and Development (RAED): network of Arab NGOs.
- WHO Regional Centre for Environmental Health Activities (CEHA).

Several regional conventions or agreements can stimulate regional collaboration for environmental information management, including:

- Regional convention for the Conservation of the Red Sea and Gulf of Aden Environment (RSGA), Jeddah Convention in 1982, provides an important basis for environmental cooperation in the Region. It was the result of a Regional Intergovernmental Conference, supported by the United Nations Environment Programme. Djibouti, Egypt, Jordan, Occupied Palestinian Territories, Saudi Arabia, Somalia, Sudan and Yemen are Parties to the Jeddah Convention.
- Memorandum of Understanding between PERSGA and UNEP in 1989 leading to the joint review of the geology of Coral Reefs in the Red Sea, and developing the State of Marine Environment in RSGA.
- Memorandum of Understanding between PERSGA and UNESCO-IOC in 1991.
- Cooperation between PERSGA and ROPME convening a conference on the sustainable use of the marine environment. The conference presented cross-sectoral views and experiences within the context of each country's progress towards sustainable development.
- Cooperation between PERSGA and CEDARE on developing the GIS network for the Strategic Action Plan for RSGA.
- Collaboration between CEDARE, and ASCAD under the umbrella of UNEP to set water indicators for WA countries. A set of indicators on water quality, water and health, water and social activities as well as other water issues has been adopted in 2004.
- Collaboration between ASCAD and ICARDA within the Sub-regional action program to combat desertification.
- Collaboration between ASCAD and UNESCO on the development of a water resources map for the Arab region.
- Collaboration between UNEP and its collaborating centres in West Asia including ASCAD, Arabian Gulf University.
- Collaboration between CEDARE and UNEP to develop the African Environmental Information System.

Illustrative regional environmental information databases and systems, as highlighted in the national and regional organizations reports for AGEDI study, include:

- NETWORK: Managed by ACSAD, this integrated information system between Syria, Jordan and Lebanon aimed to monitor the evolution of different components of the ecological system in the three countries.

- ASCAD is in the process of developing an early warning system for desertification to which remote sensing centers in the Arab region will be associated in the form of a network, in cooperation with GTZ and the Trier University in Germany.
- A project is underway at ASCAD to compile information on water resources, use and socio-economic activities in the Arab region in one database.
- The work of the Mediterranean Action Plan (UNEP/MAP) for the standardization of sustainability indicators between Mediterranean countries. 130 indicators have been selected on population and society, lands and areas, economic activity and sustainability.
- ASCAD developed the Arab Data bank for Arid Plants (DAP) using unified data collection forms for all countries covering nomenclature data, general information about the plant, country information, site data, main climatic data and topography and soil data. The economic values of the species in grazing, medical, industrial, ornamental and aromatic practices were considered. The system used to build the bank is considered rather out of data and should be rebuilt and upgraded.
- ACSAD and ICARDA joined effort to develop a regional database on sustainable water management in West Asia, aiming to provide all users with a dynamic source of information for member countries on water resources management activities. An internal website was established for data entry by the focal points. The database is hosted on the International Plant Genetic Resources Institute (IPGRI) server.
- ASCAD also developed the “Wadi Hydrology Network” in collaboration with the UNESCO Cairo office and ALESCO. Both networks aim to generate and disseminate information on management of wadi systems in arid and semi arid zones in the Arab region.
- Priority environmental indicators in West Asia, and Arab Africa Regions developed UNEP, covering the areas of water, energy, health, agriculture, biodiversity, coastal and marine environment.
- Atlas of desert habitats in the GCC countries developed by AGU to provide information on natural resources, biodiversity, climate and population.
- African Environmental Information Network aiming to harness and improve access to information on Africa’s environmental resources.
- The Nubian Aquifer Regional Information System (NARIS): developed by CEDARE to assist in the management of the Nubian Sandstone aquifer providing information about the quantity and quality of the available wells in four neighboring countries: Egypt, Chad, Sudan and Libya.
- CEDARE Geographic Information System contains data on water resources, land degradation, and urbanization. The digital maps comprise several levels of details: the regional, the inter-country, and the national levels, as well as the hot spots. The system has been developed over two phases, the first – pilot- phase providing lessons learned to expand the system in the second phase.
- CEDARE Strategic Environment Information Systems assists environment authorities in six Arab countries manage their environmental related information at both the national and regional levels. It consists of from the following databases: 1) Sustainable development indicators information system; 2) environmental experts and human resources database; 3) environmental institutions profile database; 4) environmental institutions activities database; and 5) bibliographic database.
- North Africa Environmental Web Portal developed by CEDARE in cooperation with UNEP. It provides an easy navigation website for environmental organizations in the North Africa Countries.

Noteworthy international environmental information systems include:

- GEO data portal (UNEP) feeding into the Global Environmental Outlook assessments.
- FAOSTAT database initiated and managed by the FAO.
- The Millennium Ecosystem Assessment developed for the UN by collaborative institutions and agencies including UNEP and the World Resources Institute.
- Earth Trends online portal developed and hosted by the World Resources Institute.

Box 2. Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA) – Overview of Regional Activities

The Strategic Action Plan (SAP) for the Red Sea and Gulf of Aden (RSGA), which originated from the Regional Convention for the Conservation of the RSGA Environment, provides an information base for environmental cooperation in eight countries in the region: Djibouti, Egypt, Jordan, Occupied Palestinian Territories, Saudi Arabia, Somalia, Sudan, and Yemen. Implemented by PERSGA, SAP aims to facilitate the management of common marine resources in the region. PERSGA's work on SAP included several interventions:

- Reduction of navigation risks and marine pollution: PERSGA integrated the Raster Admiralty charts provided by the UK Hydrographical office to cover RSGA. The charts cover harbors, anchorage and navigational hazards; and are fully updated and include all safety-critical navigational information
- Sustainable use and management of living marine resources: PERSGA developed a modeling software that would assist in data analysis for the region's fishery. It aims to assist in the development of the sustainable management strategy for transboundary fish stocks and invertebrates. The strategy would fill many gaps including: 1) lack of information on transboundary stock; 2) unregulated exploitation of high profile species; and 3) lack of cooperation on the management of shared stocks. PERSGA assessed fish catch and effort as well as stock levels, hence combining biological and socio-economic information to develop the model and therefore the strategy.
- Habitat and biodiversity conservation database covering breeding seabirds, regional coral reef and sea turtles
- Regional network of marine protected areas (MPAs)
- Support for Integrated Coastal Zone Management integrating environmental and natural resources issues into the planning and management of the coastal zone

Key outcomes:

- Effective regional cooperation
- Data collection at both the national and regional levels using the same survey forms in all countries
- A regional GIS system covering coastal and environmental and other themes, as well as sustainability indicators, and institutional profiles and activities
- Remote sensing data covering the Red Sea
- Habitat and marine biodiversity system that can assist in proposing protected areas
- Living marine resources information system
- PERSGA regional sustainable development information system
- Status of Living marine resources in the RSGA

Key lessons learned:

- Data sharing mechanism should be developed prior to project implementation
- Independent audits of the environmental programs enable the identification and correction of deficiencies
- Standardizing data documentation, quality and network connectivity are essential for both national and regional information compilation
- Needs assessments are essential to ensure that the target users actually need the information developed within the program
- Pre-identification of data availability at the country and regional level enables cost effectiveness in the implementation of programs
- Regional and interdepartmental cooperation is essential for ensure the success of the regional programs
- Modeling systems are useless without data availability
- Involving local government and individuals is achievable in regional programs, and facilitates data acquisition and continuity in program performance
- Technical and scientific discrepancies are noticeable when working at the regional level: exchange of staff enabled capacity development
- Establishing relationships with other networks outside the region under study widen information and experience exchange

7. LESSONS LEARNED & OPPORTUNITIES FOR THE FUTURE

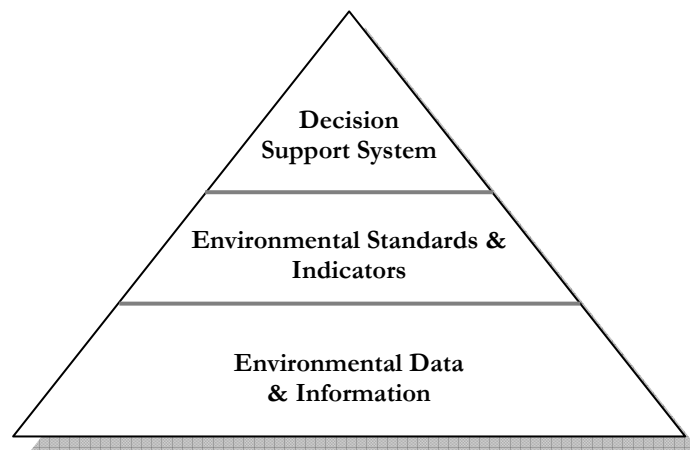
There are many lessons learned related to environmental data and information in West Asia but they all converge into one: ***the need to design and build environmental information systems that support decision-making and policy development.*** Currently, only a fraction of the available systems are used to support decision-making. The reasons for this “disconnect” between data generation and decision-making are numerous: e.g., decision-makers are not aware of the data, are not able to interpret it, the data is too theoretical to support decision-making, data accessibility is inadequate, information systems are not designed on the basis of decision making needs and do not provide the flexibility and the products needed and suitable for policy and decision makers. Good examples of environmental information system that support decision-making are emerging in several countries and must be explored further, as well as expanded and replicated in other countries (see Section 5.5). Some lessons learned follow.

- Information systems can only succeed if they meet user needs.
- Donor-financed information systems cannot generate sustainable results if the national government or counterpart organization is not committed to follow-up and maintain the system after the “formal” project ends.
- Recognition of data ownership and enforcement of copyright laws and regulations are essential ingredients for promoting data sharing and exchange.
- Information systems are expensive tools if not put to use in a cost benefit fashion.
- Host organizations (and national governments) must commit sufficient human and financial resources to sustain the systems.
- Environmental information systems should provide temporal and spatial coverage to increase effectiveness and reliability; GIS applications are a powerful data analysis and display tool.
- Regional environmental reporting requires intimate partnerships and technical coordination; data systems should be compatible and discrepancies must be addressed.
- Better results produced when there is good working relationship between data producers and data users
- Using environmental information systems to support decision-making is not easy. This requires sound judgment, science, coordination and authority.
- Environmental information systems are never perfect. All systems, old and new, can be improved through proper support and networking. Evaluation, monitoring (including independent audits) can help identify and remedy data errors and/or deficiencies.
- Continuous capacity building is essential for the sustainability for environmental information systems and its use for decision support.
- Strong leadership and high level political support is necessary for successful information systems. Information system strong in technology and poor in data are of limited value. There should be a balance systems population with data and the technology used to manage and share these data.
- It is critical to involve/consult with decision and lawmakers in the process of establishing any information system, as they are the source of actions and financing. In general, involving end users in the design phase is essential to the success of any system.
- Collaboration with the private sector is important as they hold significant portion of environmental data.

Thinking forward, it is opportune to recognize the elements of the information hierarchy from environmental data and information, to standards and indicators, to decision-support system, as illustrated clearly in

Figure 3, with the rapid growth of environmental data, it is very difficult to jump from data to decision support system without first due consideration for standards and indicators.

Figure 3
Echelons of the Information Hierarchy



8. RECOMMENDED PRIORITY ACTIONS

A lot could be done to improve and enhance environmental information and data in West Asia countries. The following recommendations covering policy, institutional, technical and financial issues were expressed by West Asia countries as part of the national reports submitted to AGEDI and UNEP, and the regional consultation on the study. These priority actions can support the formulation of a regional strategy for environmental information. Ideally, priority actions should seek to accomplish specific objectives at the local, sub-national, national and/or regional levels.

8.1. Policy

Regional Level:

- Develop a regional environmental information convention on information sharing and accessing that enhance the regional partnership in sharing environmental information, and also help increasing public access of environmental information at the national and regional levels. The convention should be realistic to the reality of the region starting with doable steps to be taken by the countries and regional entities. It would then evolve incrementally to more advanced levels of data and information sharing.
- Catalyze countries of the region to have clear mandate and role for their institutions in information development and dissemination.
- UNEP-AGEDI to provide countries with advice and guidelines related to environmental information policies.

National Level:

West Asia countries should individually and/or collectively develop policies that:

- Regulate data sharing & dissemination (including restrictions, copyright, source referencing, etc.)
- Assign lead responsibility for data collection and reporting by designating an existing institution or agency to serve as the lead host for environmental information (national observatory, etc.)
- Reduce process time for data requests (setting maximum allowable duration for data requests)
- Organize the flow of environmental information and databases.
- Enhance public access to unrestricted data.
- Formalize the establishment of national EIS or support existing systems (alternatively, some countries need to take active steps to implement existing legislation that call for EIS).
- Define data categories for purposes of disclosure with or without prior consent.

8.2. Institutional

Regional Level:

- Develop regional knowledge and information exchange mechanism among regional and international organizations in West Asia region. Regional working groups should be established for data and information technology. UNEP model for environmental information networking, highlighted in the Environment Watch Proposal should be considered as a model to be adopted at the regional and national levels. Regional and sub-regional networks should be considered (e.g, a network for GCC countries, and a network for Mashreq Countries). It would be most practical to consider a regional network for the Arab Region including linking Arab countries in Africa and West Asia, in addition to regional and international agencies and organizations working in the region. The network to be established under the Umbrella of the League of Arab States, lead by UNEP in partnership with key agencies in the field of environmental information in the region.

- UNEP-AGEDI to provide assistance to the countries to strengthen or establish national environmental information networks, including guidelines on how to establish those networks.

National Level:

West Asia countries need to:

- Establish national environmental information networks, including a core focal point, steering committees, and thematic focal points.
- Recognize the value of information in planning and decision-making; this will provide increased incentive and justification for setting up IT units and securing the funds to run them
- Take active steps to pool existing air and water quality monitoring services and capabilities to ensure continuous monitoring
- Encourage and support environmental monitoring and reporting at the municipal level
- Integrate existing “observatories” in public institutions to secure government funding
- Establish IT departments/units in relevant data generating institutions including ministries
- Develop and exercise Quality Assurance / Quality Control protocols of environmental data
- Provide technical training to key staff in data generating institutions (data collection, QA/QC reporting, data processing, etc.)
- Demand and exercise increased cooperation with international bodies to promote the transfer of technology and know-how (north-south as well as south-south exchange)
- Promote stakeholder involvement and public participation in data collection and management
- Institutionalize public awareness programs to boost demand for environmental information
- Build and support public libraries
- Consider the establishment of regional information and/or watchdog networks (for example, the “Long Term Ecological Network in West Asia”)
- Extend national information systems to sub-national directorates and governorates to ensure adequate geographic coverage of the data generated (and equality in data access)

8.3. Technical

There are many technical recommendations to improve environmental information and enhance the flow of information nationally and regionally. Key recommendations include:

Regional Level:

- Strengthen regional and national capacities for environmental information development, management and networking, with full consideration of Bali Strategic Plan for Technology Transfer and Capacity Building.¹¹
- To establish or enhance national and regional environmental data collection programmes.
- Catalyze use of standards for inter-operability standards, data and of cooperation between the bodies, access mechanisms.
- Provide guidelines and tools for development and use of environmental information and indicators.

¹¹ The Bali Strategic Plan (BSP) provides a coherent implementation platform for UNEP-wide implementation as well as approaches to strengthening national and regional institutions responsible for environmental management, promotes the integration of environmental initiatives and programmes agreed at the regional and sub-regional levels, provides a strategy for strengthening technology support and promotes efficiency and effectiveness in using financial and human resources through better coordination and cooperation with other UN agencies, MEAs and sustainable development programmes. The plan was adopted by the High-level Open-ended Intergovernmental Working Group on an Intergovernmental Strategic Plan for Technology Support and Capacity-building at its third session, in Bali, Indonesia, on 4 December 2004.

- Encourage regional initiatives, projects or studies that build upon and integrate existing national pilot or prototype activities.

National Level:

- IT infrastructure: many countries in Western Asia (Level 1 and Level 2 on ESCWA's IT infrastructure maturity scale) still have a long way to go. Computer users and internet connectivity need to increase markedly to partake in the information age more efficiently. Bandwidth must increase several folds (and keep up with ever new breakthroughs) to reduce the digital divide with the west (improvement will also require increased political will).
- Environmental indicators: nearly every country in Western Asia has developed indicators to monitor environmental performance. Unfortunately none of them are immediately compatible with the indicators (coined "variables") used in the GEO Data Portal. Some of these national indicators should therefore be realigned to be more consistent with GEO.
- Data format and structure: many countries acknowledge the need to develop data protocols that will reduce discrepancies between similar data groups located in different institutions and agencies. Data protocols could also specify the frequency of updating.
- Data gaps: despite the abundance of environmental data in West Asia countries, each country continues to face crippling data gaps (not many) that should be addressed. It is therefore important to assist or encourage countries to determine priority data gaps (not needs) in key environmental areas (for example, pressures and receptors).
- QA and QC protocols: nearly every country voiced the need to establish mechanisms to verify the quality and reliability of the environmental information and data. QA and QC protocols could be developed *within* data-generating institutions and *between* institutions (cross-validation, checking for consistency, etc.).
- Setting up IT departments: most research institutions and agencies recognize the need to set up IT departments/units or strengthen existing IT units. This may require a combination of resources including human, technical and financial.
- Storage media: although environmental information is usually generated in digital form, old records and some new records continue to be stored using the conventional log book method (this is especially true for municipalities). Many data-generating institutions need to accelerate computerization programs and transfer all environmental data in digital format.
- Keeping IT infrastructure up to speed: IT infrastructure is steadily improving in West Asia but at a slower pace than in other regions. Many institutions have invested heavily in revamping hardware and software installations but such investments usually take too long to materialize (and new installations may become outdated by the time they have been installed).
- User-friendly databases: probably every country in Western Asia has developed on-line databases (see indicative list in Table 1) but many websites contain only a fraction of the data that is currently available. It is important to display the full range of data categories to potential visitors and eventually limit access by requiring login username and password. The website should clearly distinguish classified (confidential) from non-classified (public) data.

8.4. Financial

Financing information systems is clearly a problem in all countries. Pertinent recommendations include:

Regional Level:

- Establishing regional environmental information trust fund that can support the implementation of regional environmental information projects. The aim of the projects should enhance data and information collection programmes and enhance access to environmental information.
- Create regional project portfolio for environmental information projects at the national and regional level and solicit to regional and international donors.
- Seek partnership and support of the private sector in the region to support environmental information projects and networks.

National Level:

- Governments need to reconsider the allocation of annual budgets to run IT departments and environmental information systems
- Make best use of local and international funding (by making them mutually dependent)
- Identify new sources of funding to finance information systems, public libraries, awareness programs and projects
- Sell information services to the private sector to help cover financial costs (of the service)
- Make better use of international conventions to access financial resources

APPENDIX A

Authors of National and Regional Reports

1. National Reports:

<i>Country</i>	<i>National Expert/Author</i>	<i>Institution</i>
Bahrain	Waleed K. Al-Zubari	Arabian Gulf University
Egypt	Moheed Abd El-Sattar Ebrahim	Egyptian Environmental Affairs Agency
Jordan	Ahmad Thalji Qatarnah	Ministry of Environment
Kuwait	Abdul Nabi Al-Ghadban	Kuwait Institute for Scientific Research
Lebanon	Karim El-Jisr	ECODIT Liban
Oman	Mohammed bin Saif Al-Kalbani	Ministry of Regional Municipalities, Environment and Water Resource
Occupied Palestinian Territories	Naim Mahmoud Al-Khatib	Environmental Quality Laboratory
Qatar	Sayed Jamal Bukhari Mubarak Khalifa Al-Dosari	Supreme Council for the Environment and Natural Reserves
Saudi Arabia	Ahsanullah Khan	Presidency of Meteorology and Environment
Syria	Yahia Awaidah	Consultants for Sustainable Development
UAE	Anil Kumar	Environment Agency Abu Dhabi
Yemen	Ahmed Salem Muskat Jamalat Hassan Abdo Ali Al-Aghbari	Planning and Data Environment Protection Agency Ministry of Water & Environment Protection Authority

2. Regional Reports:

<i>Institution</i>	<i>Author</i>
Program for the environment of the Red Sea and the Gulf of Aden (PERSGA)	Ahmed Abdel Rehim
Center for Environment and Development in the Arab Region and Europe (CEDARE)	Hossam Allam
Arabian Gulf University (AGU)	Mohammed Ait Belaid
The Arab Center for the Studies of Arid Zones and Dry Lands (ASCAD)	Abdallah Droubi

APPENDIX B

Tasks Included in the Terms of Reference

Task 1

Please answer the following questions:

- What are the focus areas for environmental data and information in your institution/ country, or region (as applicable to your case)?
- What is the environmental information needs common across stakeholder groups in your country (region)?
- Is there a national (regional) environmental information system, initiative, programme, project, etc., that address those needs? When it started and when it will be completed?, who is overseeing it?
- What are the strengths and weaknesses of current public information systems and services provided in your country (region)?
- What are the preferred information acquisition methods? Internet, CDs, printed materials, etc.
- What are the constrains and barriers to access environmental information in your country (region)?
- Is there a national (regional) programme or project on environmental indicators? Please provide titles, starting and ending dates, thematic areas covered, indicate whether it has been successful and why?
- Are there any monitoring programmes (national or regional) aiming at collecting data and filling in data gaps, what are the thematic areas covered?
- Does your country (region) produce state of environment (environment outlook) reports? Please give dates produced; what is the information sources being used in producing this report?
- Please give recommendation to improve public access to environmental data at the local, national and regional levels (address the following aspects: policy, institutional, technical, financial, sustainability).

TASK 2

Please identify and provide information on initiatives, programmes, projects, systems, or networks on environmental data and information. You need to give the experience of your own organization too.

For each one, please provide the following:

1. Name:
2. Lead agency:
3. Purpose, aims, objectives:
4. Users:
5. Methods - a description of the work done.
6. Appropriateness of the approach.
7. Institutional capacity.
8. Outcomes and benefits expected or achieved.
9. Results (impact).
10. Effectiveness and efficiency:
11. Discussion on the results in relation to the intensions.
12. Lessons learned and experiences

Task 3

Please synthesize all the information you collected and prepare a 12-15 page report according to the following outline:

- 1- Title.
- 2- Executive summary (no longer than one page, shorter is preferable)
- 3- Introduction and background
- 4- Methodological approach.
- 5- Status of environmental data and information.
 - a. Analysis of existing initiatives, programmes, projects, systems, and networks.
 - b. Data and information availability (collectively, sectoral and thematic)
 - c. Public Access.
 - d. Information policy and legislations.
 - e. Institutional capacity for managing environmental data and information.
 - f. Financing of environmental data and information.
- 6- Effectiveness and efficiency of current information systems (include strengths and weaknesses).
- 7- Constraints and barriers to manage and improve availability and accessibility of environmental data and information.
- 8- Assessment of general requirements:
 - a. Environmental priority issues.
 - b. Priority environmental information needs of various groups (stakeholders) to support decision-making.
 - c. Technological needs
 - d. Institutional needs (including training and finance)
- 9- Regional and international cooperation (including UNEP and other UN agencies).
- 10- Opportunities for the future.
- 11- Lessons learned and experiences.
- 12- Recommendations of priorities for action. Please consider the following:
 - a. Policy.
 - b. Institutional.
 - c. Technical.
 - d. Financial.
 - e. Sustainability.
13. References

Appendix 1

List of agencies and person interviewed (if any).

Appendix 2

List of conventions used.

APPENDIX C

Cited References, Websites and Consultations

AGEDI Regional Studies:

1. Bahrain. Prepared by Waleed K. Al Zubari from the *Arabian Gulf University*.
2. Egypt: Prepared by Moheed Abd El-Sattar Ebrahim from *CEDARE*.
3. Jordan. Prepared by Ahmad Qatarneh from the *Ministry of Environment*.
4. Kuwait. Prepared by Abdul Nabi Al-Ghadban from the *Kuwait Institute for Scientific Research*.
5. Lebanon. Prepared by Karim El-Jisr from *ECODIT Liban*.
6. Oman. Prepared by Mohamed Saif Al-Kalbani from the *Ministry of Regional Municipalities, Environment and Water Resource*.
7. Occupied Palestinian Territories. Prepared by Naim Al Khatib from the *Environmental Quality Laboratory*.
8. Saudi Arabia. Prepared by Ahsanullah Khan from the *Presidency of Meteorology and Environment*.
9. Syria. Prepared by Yahia Awaidah from *Consultants for Sustainable Development*.
10. United Arab Emirates. Prepared by *Environmental Research and Wildlife Development Agency*.
11. Yemen. Prepared by Ahmad Salem Mulkat from the *Planning and Data Environment Protection Agency*.

Other reports:

12. E/ESCWA/ICTD/2005/6 (Draft), 29 August 2005: Regional Profile of the Information Society in Western Asia (English)
13. Convention on access to information, public participation in decision-making, and access to justice in environmental matters. Aarhus, Denmark – June 25, 1998

List of Websites Visited

<http://www.agedi.info/en/index.jsp>
<http://www.unepgrid>
www.webopedia.com
www.esis.escwa.org.lb
www.unece.org/env/pp (Aarhus Convention)

People Consulted

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APPENDIX D

Glossary of Internet Services¹²

Dial-up connection: Refers to connecting a device to a network via a modem and a public telephone network. In the past, the maximum data rate with dial-up access was 56,000 bits per second, but new technologies such as ISDN are providing faster rates.

Broadband connection: a high-speed Internet connection using DSL, cable, wireless, fiber optic or satellite means of transmitting data. The terms broadband usually refers to a high-speed network connection with data speeds in excess of 128 kilobits per second.

Integrated Services Digital Network (ISDN): An international communications standard for sending voice, video, and data over digital telephone lines or normal telephone wires. ISDN supports data transfer rates of 64 Kbps (64 kilobits per second).

Asymmetric Digital Subscriber Line (ADSL): A new technology that allows more data to be sent over existing copper telephone lines (POTS). ADSL supports data rates of from 1.5 to 9 Mbps when receiving data (known as the downstream rate) and from 16 to 640 Kbps when sending data (known as the upstream rate).

DSL is similar to ISDN inasmuch as both operate over existing copper telephone lines (POTS) and both require the short runs to a central telephone office (usually less than 20,000 feet). However, DSL offers much higher speeds - up to 32 Mbps for upstream traffic, and from 32 Kbps to over 1 Mbps for downstream traffic.

Leased-line connection: Unlike normal dial-up connections, a leased line is always active and affords a faster data transfer rate and is cost-effective if the Internet is used heavily. It is typically used by businesses to connect geographically distant offices.

Wi-Fi: Wireless Fidelity is meant to be used generically when referring of any type of 802.11 based wireless Local Area Network (LAN) products. The term is promulgated by the Wi-Fi Alliance. It provides up to 54 Mbps in the 5GHz band.

Frame relay connection: A packet-switching protocol for connecting devices on a Wide Area Network (WAN)

¹² From www.webopedia.com