



INCO-CT-2004-509158

NOSTRUM-DSS

NETWORK ON GOVERNANCE, SCIENCE AND TECHNOLOGY

FOR SUSTAINABLE WATER RESOURCE MANAGEMENT IN THE MEDITERRANEAN.

THE ROLE OF DSS TOOLS

INSTRUMENT: Co-ordination Action

**THEMATIC PRIORITY: INCO-MPC, Specific measures in support of international
co-operation - Mediterranean Partner Countries (MPC)**

Deliverable D4-4

Metadata analysis

DUE DATE OF THE DELIVERABLE: 31 DECEMBER 2006	ACTUAL SUBMISSION DATE: 15 FEBRUARY 2007
START DATE OF PROJECT: 1st August 2004	DURATION: 36 Months
ORGANISATION NAME OF LEAD CONTRACTOR FOR THIS DELIVERABLE: National Center for Remote Sensing	
REVISION:	
PROJECT CO-FUNDED BY THE EUROPEAN COMMISSION WITHIN THE SIXTH FRAMEWORK PROGRAMME (2002-2006)	

DISSEMINATION LEVEL

PU PUBLIC	X
PP RESTRICTED TO OTHER PROGRAMME PARTICIPANTS (INCLUDING THE COMMISSION SERVICES)	
RE RESTRICTED TO A GROUP SPECIFIED BY THE CONSORTIUM (INCLUDING THE COMMISSION SERVICES)	
CO CONFIDENTIAL, ONLY FOR MEMBERS OF THE CONSORTIUM (INCLUDING THE COMMISSION SERVICES)	

Table of contents

1- WP04 objectives and tasks

1.1 Team in Lebanon

1.2 Project meetings

1.3 WP04 Objective and Tasks (D4-4 Metadata)

2-Metadata analysis

2.1 Meta data repository

2.2 Internet based Meta database search tool

2.3 A list of organizations and projects found in the National reports and the WWW

2.4 Web sites

2.5 Problems and corrections

3- DSS in the National reports

I- WP04 objectives and tasks

1.1- Team in Lebanon

In order to complete the work required in WP4 a team is organized to complete each task and their related subtasks. This team consisted of different personnel with different skills. The majority of the team is related to information technology, their work ranges between collecting information (national reports and World Wide Web WWW, and surveillance) and building Database Management system for metadata repository and search. The following are the Team members:

- Mohamad Khawlie, professor of environment geology, he is the manager of this project in Lebanon and the planning of WP4 different phases.
- Mohamad Awad GIS and RS expert his main work is on the collection of Geo metadata in the Mediterranean basin and organizing these data and the dissemination of the data by using up-to-date information technology.
- Tarek Khaled is computer scientist whose main job is to help in the creation of the tools.
- Theodora Haddad – environment and urban planner with socio economic analysis.
- Roula Giya-executive secretary helping in administrative aspects
- Three assistants for field and office logistics.

In general, all team members have experience in different fields of information technology,

1.2 Project meetings

There have been many administrative meetings during a period of two years; however, two workshops took place in the last six months. They cover three different topics. The first technical workshop took place in Tunisia, Feb. 2006, where two topics covered concern the WP2 on Sectoral issues for DSS use in water resource management, and WP3 on Methodological issues for DSS use in water resource management. However, at the end of the workshop there were discussion about WP04-06 and we presented an assessment of data availability with reference to the National report and our overview of an acceptable DSS system. Another presentation was about data limitations, accuracy and uncertainty within WP04.

The second workshop took place in Aswan, April 2006. The main topic of this workshop is decision makers need and their expectations. In the workshop CEDARE discussed the Decision support system EIADSS and the impact components of socio-economic, political, economic, biological resources, and natural resources, then there were a brief introduction by Medias to the climate data sources, and a presentation made by our team covered the sources of the geographic data and the obstacles and problems faced in the collection process.

1.3 Work Package 4 objectives (D4-4 Metadata)

The WP4 is divided into four main tasks:

- *Task a) Statistical data issues:* to investigate the needed data for meaningful research and informed policy making, as well as existing database and efforts in the socio-economic sector;
- *Task b) Territorial analysis & implementation of GIS systems:* to set up a knowledge base about the availability of geographical data (remote sensed information, geophysical databases, monitoring networks, etc.);
- *Task c) Water and climate change in the Mediterranean:* inventory of data and studies on climate change, and climate change modelling and scenario building, in the Mediterranean area;
- *Task d) Metadata analysis: information on data and needs assessment for supporting DSSs use for IWRM.*

Figure 1 depicts the position of WP4 in comparison to other WPs in the project. Tasks b and d are the responsibility of NCRS.

In WP4 the work concentrates on Identification of data availability and constraints in relation to water management. NCRS will carry out a desk survey of relevant information centers and sources in the Mediterranean basin. The survey should include all information pertinent to availability of geographical data (remote sensed information, geophysical databases, monitoring networks, etc.). Data needs assessment for supporting DSS use for IWRM. The final aim is to compile an interactive meta-data analysis based on the data surveys performed on tasks a, b, and c.

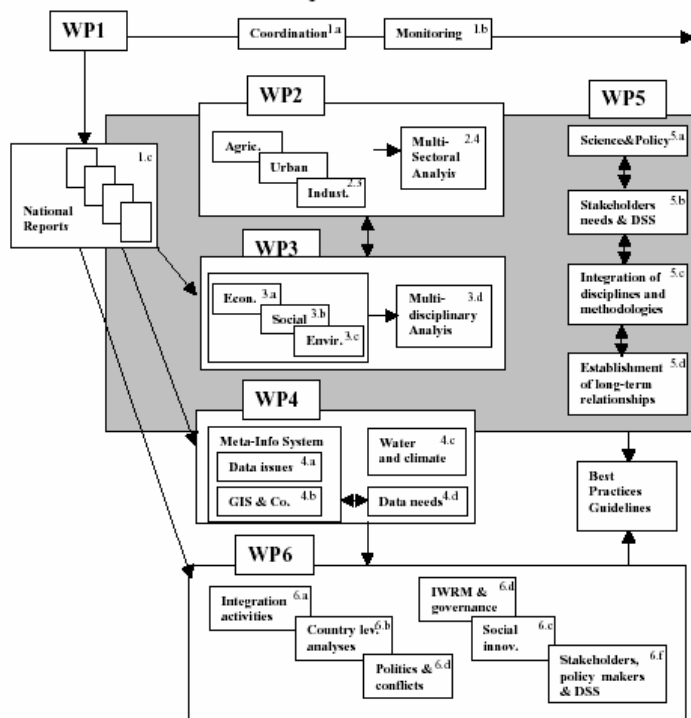


Figure 1. WP4 position with respect to the remaining WPs of the project

2.1 Meta data repository

Collecting information on the availability of remote sensed data and geographic information is a very tedious mission. Making them available for use in an efficient way is another important mission. This is obvious when decision makers need a reliable point and click tool which makes accessing information for use in water resources management more productive. For these reasons, and as part of our tasks, we have built a meta data repository, this repository consists of many entities which are related in different relationships (see Figure 2). The main menu of this repository allows to enter and browse information about remote sensing and GIS institutes and organizations, and to search for information about the availability of RS and GIS data in these organizations and institutes (Figures 3 and 4) show the main menu and the organizations and institutes menu.

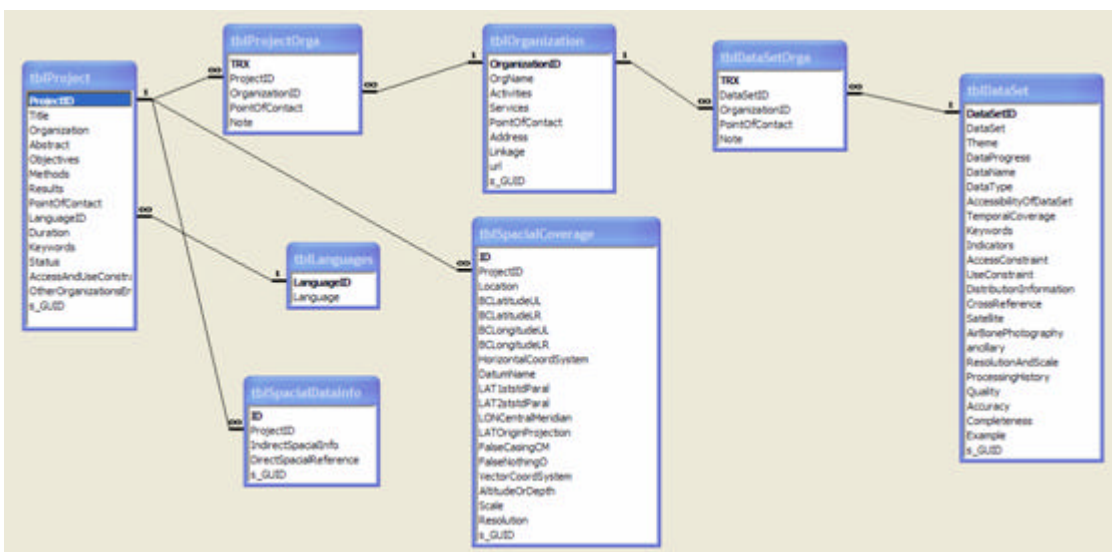


Figure 2. A relationship schema between different entities in the meta data repository

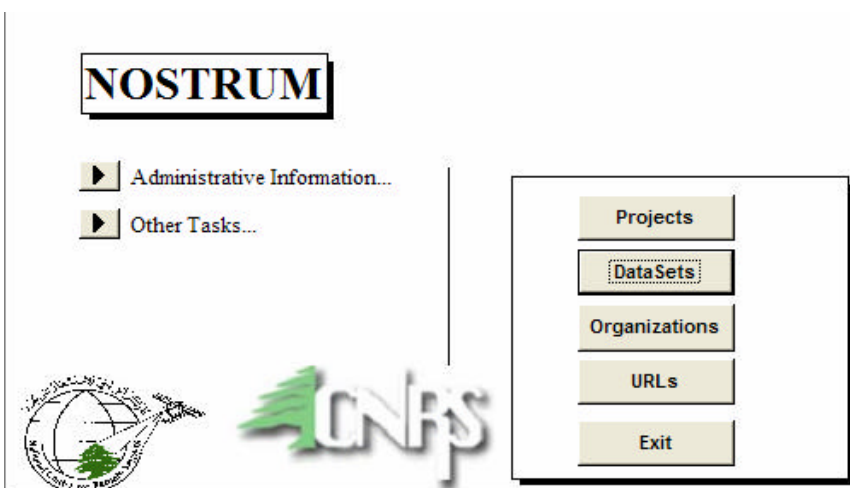


Figure 3. Main menu of Meta data repository

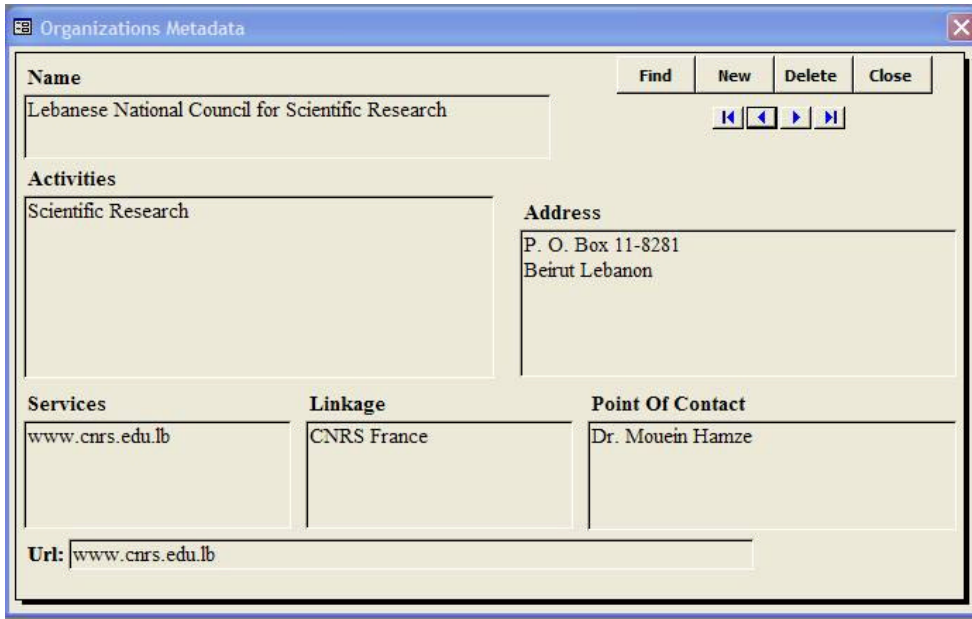


Figure 4. Organizations main menu in the meta data repository

To speed up the process of updating the meta data and to make it available publicly it is going to be placed on the World Wide Web. This will ease accessibility to information and will help in updating.

2.2 Internet based Meta database search tool

In order to improve our Meta database, and to speed up the process of updating we had to start a method to make this tool available for other partners to enter and update new records, this method is a Web tool, see figure 5. In addition, it will help researchers and academic institutes in their search for information about projects and organizations and datasets related to water resources management using GIS and/or Remote Sensing. The following shows some examples about the web page and the information which appears in the home page figure 6. One last note about this page is that it is not the final version.

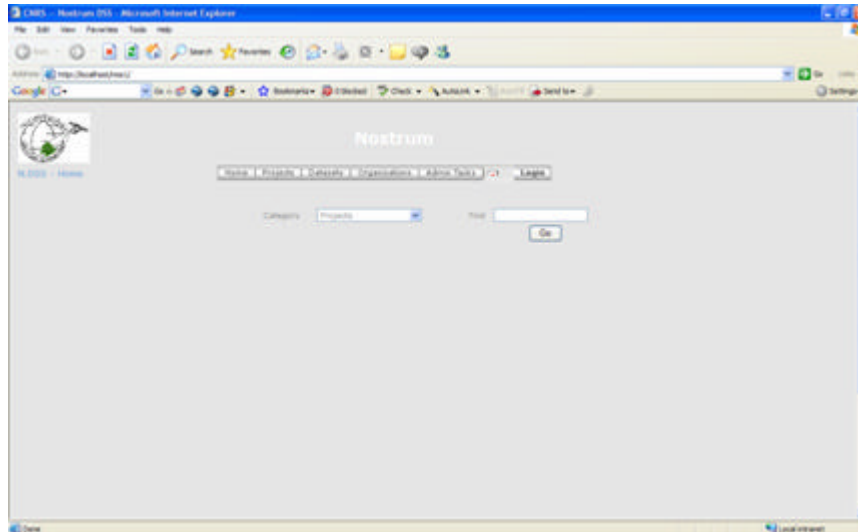


Figure 5. Web tool to improve Meta database efficiency and availability

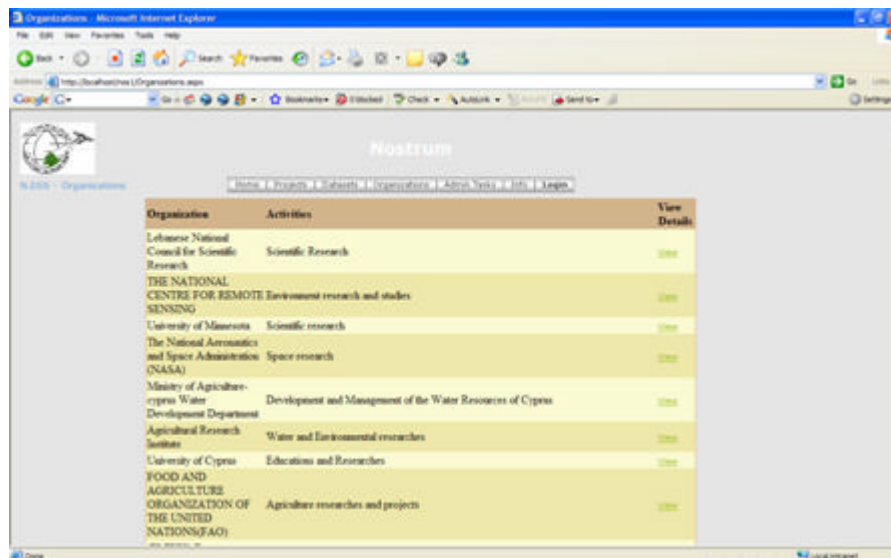


Figure 6. RS and GIS list of organizations

2.3 organizations, projects, and datasets found in the National reports, the WWW and surveyed institutes and organizations

The following are the list of organizations, projects, and datasets surveyed on International and national scales. Complete details can be found on the WWW address to be supplied later this week.

Organizations

Organizations Name
Lebanese National Council for Scientific Research
THE NATIONAL CENTRE FOR REMOTE SENSING
University of Minnesota
The National Aeronautics and Space Administration (NASA)
Ministry of Agriculture-Cyprus Water Development Department
Agricultural Research Institute
University of Cyprus
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS(FAO) (EMWIS) Euro-Mediterranean Information System on the know-how in the Water sector
(UNDP) United Nations Development Programme
World Resource Institute(WRI)
(WSSD) World Summit on Sustainable Development
World Health Organization(WHO)
Plan blue
World Water Council
(IUCN) The World Conservation Union
Ministry of Environment and Forestry(MEF)-Turkey
National Environmental Action Plan(NEAP)
General Directorate of rural Services - Turkey
Agences de l'Eau
International Journal of Water Resources Development
The Ramsar List of Wetlands of International Importance
University of Michigan
Ministere de l'agriculture(Tunisie)
International Commission on Irrigation and Drainage(ICID)
International Energy Agency(IEA)
National Institute for Agricultural Economics(INEA)
Birzeit University Community Health Unit, Ramalla
Hebrew University(Rehovoth , Israel)
Bar Ilan University
Stanford University Institute for Advanced Strategic and Political Studies(IASPS)
Aristotle University of Thessaloniki(AUTH) Greece
EYDAP SA (Athens Water Supply and Sewerage Company)
United Nations Convention to Combat Desertification
Ministry of Agriculture, Greece
National Technical University of Athens
Ministry of Environment, Greece
USAID-Lebanon
(ESCWA) The Executive Service Corps of Washington
International Institute for Applied System Analysis
FOA(SRDN) Environment and Natural Resources Service
Ecole Nationale D'ingenieurs de Tunis
Ben Gurion University- Geography and Environ.Devt DPT (Israel)
Centre National de Teledetection (Tunis)
PO River Basin Authority

ESA/ESRIN Remote Sensing Exploitation Dept
University of Genova , Institute of Hydraulics
European Space Agency
Turkish National Photogrametry and Remote Sensing
U.S. Geological Survey(USGS)
United Nations Environment Programme(UNEP)
International Network of Basin Organizations(I.N.B.O.)
Institut de Recherche Pour le Developpement (France)
The National Authority For Remote Sensing and Space Sciences(Egypt)
The InterDisciplinary Center of Technological Analysis and Forecasting(Israel)
Institute for Environment and Sustainability(Italy)
University of Valencia/Estudi General (Spain)
Applied Research Institute of Jerusalem ARIJ(Palestine)
General Organization of Remote Sensing(GORS)
Land Water Med
Royal Centre for Remote Sensing (CRTS)
Libyan Centre for Remote Sensing and Space Science(LCRSSS)
National Observatory of Athena, Institute for Space Applications and Remote Sensing
University of Trier/ Department of Remote Sensing
Map Server(University of Minnesota (UMN))
Convention of Independent Financial Advisors(CIFA)
Southwest Watershed Research Center
Environmental Software and Services GmbH(ESS)
Ministry of Environment of Turkey(MoE)
Integrated Resource Management(IRM) Co.Ltd.
Intergeo Hellas Environmental Technology
Agricultural University of Athens(Department of Natural Resources Management and Agricultural Engineering)
The Agricultural Research Organisation - The Volcani Centre (Institute of Soil, Water and Environmental Sciences)
Al-Azhar University - Gaza (Faculty of Agriculture)
MetOffice - UK meteorological office
IRI - The International Research Institute for Climate and Society
DDC / IPCC - Data Distribution Center of the Intergovernmental Panel on Climate Change (WMO/UNEP)
Hadley Centre for Climate prediction and Research
WDCC - World Data Center for Climate (Germany) Max-Planck-Institute for Meteorology/Model & Data
ECPC - Experimental Climate Prediction Center
MNP-RIVM Netherlands Environmental Assessment Agency
NCAR & UCAR Office of programs National Center for Atmospheric Research (NCAR)
PLAN BLEU/PNUE
SD /FAO- Sustainable Development Department/ Food and Agriculture Organization of the United Nations
FAO/Land & Water development division
USGS /EROS Land Cover Institute Earth Resources Observation and Science
GEM/JRC (Global Environment Monitoring Unit of the Joint Research Centre)
WWF - World Wildlife Fund
PSU Pennsylvania State University Libraries
CIESIN/SEDAC (Center for International Earth Science Information Network/ Socioeconomic Data and Applications Center)
VITO
SPOT IMAGE
CESBIO - Center for the Study of the Biosphere from Space

LMD - Laboratoire de Météorologie Dynamique
LOV - Laboratoire d'Océanographie de Villefranche
Médias - France
DMI - Danish Meteorological Institute
Météo-France
WMO - World Meteorological Organization
Federal Ministry of Education and Research GERMANY (GLOWA program)
TAU (Tel Aviv University)

Projects

Project Title
Air-borne Thermal Infrared Scan of Fresh-water Sources in the Marine Environment- Lebanon
Application of Remote Sensing in Delineating the Hydrogeology of Occidental Lebanon (Ph.D. Dissertation)
Environmental master plan for Nahr el-Kabir river
The WebGIS of AdbPo's
MapServer GIS search engine
Southern Conveyor Project
Efficient Mangement of irrigation Water in Cyprus
Household Demand and Welfare Implications For Water Pricing in Cyprus
Water Resource - Water Policy
RE-Assessment of the Water Resources and Demand of the Islandof Cyprus
Changments Climatiques et Ressources en Eau en Algerie
Water Resources and uses in the Mediterranean Countries: figures and facts
Turkey Country Report
Integrated Management of River Basins in the Mediterreanean Region: Sustainable Water for Nature and Food
Typology and Reference conditions for surface water bodies in franc- the hydro - ecoregion approach
Strategie du secteur de l'eau en Tunisie a long terme 2030
Water Resources and Water Policies in Italy
An Overview of the Water Resources in Palestine, Arij, Bethlehem
The Use of Sewage and WateWater for Irrigation
The Water Economy of Israel
Water Use in the Southern Arava Valley of Israel and Jordan: A Staudy of Local Perceptions
Water Resources Development and Management in israel
Water policy in Israel
Metropolitan Areas and Sustainable Use of Water
Planning and Management of the Greek Water Resources
Population, Households and Domestic Water Use In Countries of the Mediterranean Middle East
Climate Map
Forest Maps
Land Cover Maps
Land Cover Maps
TIGER
Cyprus Water Resources Databases Development
Regional Water Data Banks - Rainfall Intensity
Regional Water Data Banks - Temporal Trends for Water Resources Data
Summary of Palestinian Hydrologic Data 2000
Regional Water Data Banks - Overview of Middle East Water Resources
Regional Water Data Banks - Hydrogeologic Databases
Public Awareness and Water Conservation Project- WaterCare
Public Awareness and Water Conservation Project
Optimisation for Sustainable Water Resources Management(OPTIMA)
Sustainable Water Use in Mediterranean (Horticulture)
WATER use Efficiency in natural vegetation and agricultural areas by Remote sensing in the Mediterranean basin (WaterMed)
The present status of knowledge on global Climatic Change; impacts in the Mediterranean Region, A scientific and

strategic report to Blue Plan
LandWaterMED - Geo-Information for Sustainable Management of Land and Water Resources in the Mediterranean Region
Une approche intégrée pour la gestion durable des ressources en eau dans le bassin méditerranéen
GICC - Med Water Impacts du changement climatique sur le cycle hydrologique du bassin méditerranéen
DYFAMED (Programm) Dynamique des Flux Atmosphériques en Méditerranée
RICAMARE - Research In global ChAnge in the Mediterranean : A REgional network
PRUDENCE - Prediction of Regional scenarios and Uncertainties for Defining European Climate change risks and Effects
IMFREQ (Impact des changements anthropiques sur la FRéquence des phénomènes EXtrêmes de vent, de température et de précipitations)
ALADIN (Aire Limitée Adaptation dynamique Développement InterNational)
MEDEX (Mediterranean Experiment on Cyclones that produce High Impact Weather in the Mediterranean)
MED - CLIVAR Mediterranean CLImate VARIability and predictability
GLOWA - Vulnerability of Water Resources in Eastern Mediterranean Ecosystems due to Climate Change
Tropic and Mediterranean Climate Variability - Recent climate trends in East Mediterranean and future projections. (Pinhas Alpert)
ENSEMBLE - based Predictions of Climate Changes and their Impacts

Datasets

DataSet	Type
A collection of maps	Raster
Parameters on Water Cycle: surface water volume, infiltration capacity zones, ground water flow mechanism, ground water potentials and water budget	Statistics
A net assessment of information from a variety of climate prediction tools, including dynamical models of the atmosphere, statistical models of climate variability related to sea surface temperature variability, and knowledge of the current state of the climate system. IRI (International Research Institute for Climate and Society) -Columbia University-USA	Global seasonal forecast probability maps
Outlooks for the most likely category of temperature and rainfall up to six months ahead for all regions of the globe. Updated monthly.(Metoffice UK)	Global seasonal forecast categories maps (forecast from 2-4 months, 3-5 months and 4-6 months)
PRECIS is a regional modelling system that can be run over any area of the globe on a relatively inexpensive, fast PC to provide regional climate information for impacts studies.(Metoffice UK)	PRECIS will only work on 32-bit Intel (x86) compatible Linux based systems, and not under Microsoft Windos, nor another Unix systems.
EURO-SIP system (European multi-model system) is a collaboration between ECMWF, Meteo-France and the Met Office (Glosea system) to produce operational real-time multi-model global seasonal forecasts. The EURO-SIP products displayed on the website have been calibrated by the Met Office from the common database of retrospective and real-time forecasts.(Metoffice UK)	Global seasonal forecast probability maps (forecast from 2-4 months, 3-5 months and 4-6 months)
Maps of differences between the current climate, conventionally defined as 1960-1990, and the climate of the end of the 21st century, taken to be 2070-2100.(Hadley Centre -Metoffice UK)	Global climate prediction maps annual and for the 4 seasons Decemb-Januar-february (DJF), March- April- May (MAM), June-July -August (JJA) Septemb-Octob-Novemb (SON).
Forecasts of ensemble mean fields up to 6 months ahead.(Metoffice UK)	Global seasonal forecast mean anomalies maps (forecast from 2-4 months, 3-5 months and 4-6 months)
Data for climate research are collected, stored and disseminated in order to serve the scientific community.The mission of the WDCC (World Data Center for Climate) corresponds with the basis tasks of M&D (Modelling & Data) or MPI (Max-Planck Institute).	climate model related to maps, metadata, statistics files ... (datasets)
Global seasonal predictions for the 1st, 2nd or 3th month coming or for the season (3 months ahead)	Global seasonal forecast probability maps
The DDC is jointly managed by the Climatic Research Unit (CRU) in the United Kingdom, the Deutches Klimarechenzentrum (DKRZ/MPI) in	climate model related to maps, metadata, statistics files ... (datasets)

Germany, and the Center for International Earth Science Information Network (CIESIN) at Columbia University, New York, USA. The DDC is designed primarily for climate change researchers, but materials contained on the site may also be of interest to educators, governmental and non-governmental organisations, and the general public.	
<p>The Integrated Model to Assess the Global Environment (IMAGE-2) is an ecological-environmental framework that simulates the environmental consequences of human activities worldwide. It represents interactions between society, the biosphere and the climate system to assess issues like climate change, biodiversity and human well-being. The objective of IMAGE-2 is to explore the long-term dynamics of global change as the result of interacting demographic, technological, economic, social, cultural and political factors. At the end of October 2006, MNP will publish a new IMAGE book: Integrated modelling of global environmental change; An overview of IMAGE 2.4.</p> <p>MAGICC carries through calculations at the global-mean level using the same upwelling-diffusion climate model that has been and is employed by the IPCC. SCENGEN uses these results, together with results from a set of coupled Atmosphere/Ocean General Circulation Models (AOGCMs) and a detailed baseline climatology, to produce spatially-detailed information regarding future changes in temperature and precipitation, changes in their variability, and a range of other statistics.</p>	<p>climate model related to maps, metadata, statistics files, graphs ... (datasets)</p> <p>maps, metadata, statistics files, graphs ... (datasets) related to defined climatic scenarios</p>
The georeferenced database was created by the FAO's Environment and Natural Resources Service (SRDN) from meteorological data ranging 1961 to 1990.	digital maps
In 1998 the International Union of Soil Sciences adopted the World Reference Base for Soil Resources (WRB) as the standard for soil correlation and nomenclature. In the light of these new developments it was decided to prepare an updated version of the generalized Map of the World Soil Resources at 1:25.000.000.	digital maps
The present survey, known as the Global Forest Resources Assessment (FRA 2000), provides crucial information describing the state and conditions of forest resources for the year 2000, and their changes over the last 20 years.	digital maps
The Global Land Cover Characteristics (GLCC) database is a land cover dataset	global thematic digital maps
The Global Land (GLC 2000) database is a land cover dataset. The project was carried out to provide accurate baseline landcover information to the International Conventions on Climate Change, the Convention to Combat Desertification, the Ramsar Convention and the Kyoto Protocol.	global thematic digital maps
The global lakes and wetlands database GLWD has been developed in partnership with the WWF, Center for Environmental Systems Research and the University of Kassel, Germany. The Conservation Science Program (WWF) is developing its capacity to make available more of the data that WWF has created and/or improved	global thematic digital maps
GTOPO30 was developed to meet the needs of the geospatial data user community for regional and continental scale topographic data. Several areas have been updated and the entire global data set has been repackaged, so these data supersede the previously released continental data sets	global thematic digital maps
The Digital Chart of the World (DCW) is a global topography database in GIS format.	GIS format data (polygons, linear and points).
<p>The Socioeconomic data and applications center (SEDAC) of the Consortium for International Earth Science Information Network of the Columbia University (CIESIN) has developed a geo-referenced database on population.</p> <p>Gridded Population of the World (GPWv3) is the third edition of a large-scale data product that demonstrates the spatial distribution of human populations across the globe. The purpose of the GPWv3 project is to provide a spatially disaggregated population layer that is compatible with datasets from social, economic, and earth science fields. The output is unique in that the distribution of human population is converted from national or subnational spatial units (usually administrative units) of varying resolutions, to a series of</p>	global thematic digital maps

geo-referenced quadrilateral grids at a resolution of 2.5 arc minutes.	
VEGETATION instrument is a very wide angle earth observation instrument (2250 km wide swath) offering a 1 km spatial resolution and high radiometric resolution. It uses 4 spectral bands: Blue, Red, Near Infrared, Middle Infrared.	satellite images
SPOT high resolution optical instruments are dedicated to earth observation	Satellite images

2.4 WEB sites

www.cnrs.edu.lb
www.cnrs.edu.lb/research/remotesensing.html
www.umn.edu
www.nasa.gov
www.moa.gov.cy
www.ari.gov.cy
<http://www.ucy.ac.cy/>
www.fao.org
www.emwis-cy.org
www.undp.org
www.earthtrends.wri.org
www.uneptie.org
www.who.int
www.planblue.org
www.worldwatercouncil.org
www.iucn.org
www.cevreorman.gov.tr
www.unescap.org
www.khgm.gov.tr/gdrs.htm
www.eaufrance.tm.fr
www.transboundarywaters.orst.edu
www.wetlands.org
www.uofmichigan.edu
www.tunisie.com/APIA
www.icid.org
www.iea.org
www.inea.it
www.icph.birzeit.edu
www.hebrewcollege.edu
www.biu.ac.il
www.israeleconomy.org
www.delab.csd.auth.gr
www.eydap.gr
www.unccd.int
www.minagric.gr
www.survey.ntua.gr
www.minenv.gr
www.usaidlebanon.org.lb
www.escwa.org
www.iiasa.ac.at
www.fao.org/WAICENT/FAOINFO/SUSTDEV/Eidirect/CLIMATE/EIsp0001.htm
www.enit.rnu.tn
www.bgu.ac.il

www.cnt.nat.tn
www.grid.unep.ch
esapub.esrin.esa.it
www.idra.unige.it
www.esa.int
w3.gazi.edu.tr/web/gurer/publist.htm
www.international.usgs.gov
www.unep.org
www.riob.org
www.ird.fr
www.narss.sci.eg
www.ictaf.tau.ac.il
www.ies.jrc.eu.int
www.uv.es
www.arij.org
www.gors-sy.org
www.landwatermed.net
www.crts.gov.ma
www.lcrsss.org
www.space.noa.gr
www.feut.de
mapserver.gis.umn.edu/
www.cifafound.ch
www.ars.usda.gov
www.ess.co.at
www.managenergy.net
www.irmwater.com
www.intergeo-consulting.com
www.aua.gr
www.agri.gov.il
www.alazhar-gaza.edu
www.metoffice.com
iri.columbia.edu
ipcc-ddc.cru.uea.ac.uk/
www.metoffice.com/research/hadleycentre/
www.mad.zmaw.de/wdc-for-climate/
ecpc.ucsd.edu
www.rivm.nl/image/
www.ucar.edu/
www.planbleu.org/planBleu/activites.html
www.fao.org/WAICENT/FAOINFO/SUSTDEV/en3_en.htm
www.fao.org/landandwater/default.stm
eros.usgs.gov/
www-gvm.jrc.it/glc2000/
www.worldwildlife.org/action/
beta.sedac.ciesin.columbia.edu/
www.spotimage.fr/html/_167_171_.php
www.cesbio.ups-tlse.fr/index_us.htm
www.lmd.jussieu.fr/LMD_General.html
www.obs-vlfr.fr/LOV/

mediasfrance.org/
www.dmi.dk/eng/index/forecasts.htm
www.meteofrance.com/FR/
www.wmo.int/thorpex/
www.glowa.org/eng/impressum/impressum.htm
geophysics.tau.ac.il/department.asp

2.5 Problems and corrections

It is indeed strange to find out that data availability, acquisition and management in the Mediterranean countries is a very difficult task. There are huge differences in all aspects relating to the above. Data sources differ in their values and accuracies. Their documentation is varied; their structures vary, as well as their details and units. Even geographically based data within the same country using advanced techniques such as remote sensing and GIS show a wide variability.

Another type of typical problems related to spatial data is its accessibility and people's responsiveness (or not!). This is particularly true in the "Southern" Mediterranean countries, or the developing ones for that matter. The response to requesting data is not only difficult, but may not come at all, especially when it relates to filling up few of pages formats and structured databases. Thus, correcting any feedback is meaningless unless one gets a sizeable number of responses, which is not the case.

3- DSS in the National reports

From the preceding, obviously, there are many problems relating to data availability, defining data sources, uniformity, scale, classification ... etc. There are over 18 themes of data packets, both national and human, relating to IWRM that are further subdivided into many items, making it necessary to structure the data and present it to the decision maker as a helping tool to arrive at proper decisions. This is actually the purpose of the Decision Support System (DSS). It is an integrated information management approach to help decision makers utilize appropriate knowledge to take optimal decisions for solving problems. DSS can be simplified into a 3-stages system (Khawlie et al., 2004) as follows: 1st is planning that incorporates identifying the problem, defining its criteria and weighting those criteria. 2nd is the overlapping stage of monitoring that includes analyzing the inputs and suggesting alternative solutions. 3rd is testing or rating the alternatives on the criteria to arrive at the optimal decision.

Accordingly, the data in the NR as well as the sectoral analysis reports were screened to assess how far is DSS a functional tool in IWRM. Five basic sectors, where IWRM is significant, were focused on, namely: agriculture, industry, urban and tourism, social and environmental. Furthermore, the availability of data – on geographic basis – was assessed on these sectors with respect to concerns that affect IWRM, i.e. the problems, the driving forces, risk, and vulnerability, which help in the DSS process (the 3-stages above). These concerns can be observed as impacts of environmental deterioration, the need to reduce those impacts for improving the water domain plus living conditions, and with vulnerability indicators.

For the planning stage, data analysis showed that DSS is an appropriate tool only for the agricultural sector and only in terms of basic capacities and setting priorities. All the

other sectors give DSS a secondary importance, including setting strategies, policies and implementation means, and this applies to agriculture as well. Data requirements of DSS in further stages, i.e. the monitoring – analysis and the decision making, unfortunately, gets worse for all the five sectors. This covers environmental capacities, EIA, and environmental monitoring at the second stage, and includes optimization, integration, performance and sustainability at the decision stage. Of course, what the preceding implies for IWRM, is that there is still a large gap in securing the appropriate data, notably in the monitoring and the decision making stages. This means simply a lack in connectivity between the science and the management ends of IWRM. It is significant, therefore, that this gap must be closed by securing the data, and any lacking connectivity must be filled by strengthening the relationship between the scientific community and management. This process of securing data and strengthening relationships must take place at different levels, and both top-down and bottom-up.

References

- i <http://www.nasa.gov>
- ii [http:// www.webgis.com/index.html](http://www.webgis.com/index.html)
- iii [http:// www.esri.com/data/download/basemap](http://www.esri.com/data/download/basemap)
- iv [http:// imageatlas.globexplorer.com/ImageAtlas/view.do?group=ImageAtlas](http://imageatlas.globexplorer.com/ImageAtlas/view.do?group=ImageAtlas)
- v <http://webclient.alexandria.ucsb.edu/mw/index.jsp>
- vi <http://earth.google.com>