

**Improving Access to Information  
on the  
IW:LEARN Web Site  
Through the Use of  
Thesauri, Taxonomies, and Indexes**

**Final Report**

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## Section 1: Introduction

The United Nations Environment Programme (UNEP), Division of Early Warning and Assessment (DEWA), operates the International Water Learning Exchange and Resources Network (IW:LEARN) Web site (<http://www.iwlearn.net>)<sup>1</sup> in support of the International Waters (IW) component of the Global Environment Facility (GEF).

IW:LEARN's overall goal is "to strengthen International Waters Management (IWM) by facilitating structured learning and information sharing among stakeholders."

([http://www.iwlearn.net/abt\\_iwlearn](http://www.iwlearn.net/abt_iwlearn)). Five products and services are provided by IW:LEARN:

1. Information sharing to facilitate access to information and experiences about transboundary water resources management developed as part of the GEF IW projects.
2. Structured learning by GEF IW project personnel and their cooperating partners.
3. Dialogue between GEF project personnel at biennial International Waters Conferences.
4. Testing innovative approaches to strengthen implementation of the portfolio of GEF IW projects.
5. Fostering partnerships and outreach to members of the water resources community and the general public to sustain the benefits of IW:LEARN and associated technical support.

### Tasks

During 2007 informal discussions between the UNEP/IW:LEARN Project Manager and Beaver Wood Associates led to the development of a proposal to develop and recommend metadata, taxonomies, and controlled vocabularies that would assist IW:LEARN in cataloguing and indexing the information on its Web site and propose other approaches that should assist visitors to the site to discover and access documents, data sets and other information resources. UNEP and Beaver Wood Associates signed a contract (UNEP/2007/021) on 31 October 2007 that involved the following seven Tasks:

1. IW:Learn Taxonomy Development—Develop a taxonomy (subject classification) of approximately 125 terms (maximum 200) that will be suitable for classifying the present subject contents of the IW:LEARN Web site ([www.iwlearn.net](http://www.iwlearn.net)) including the UNEP Regional Seas publications

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<sup>1</sup>All Web sites referred to in this report were accessed for verification in March 2008.

2. IW:Learn Taxonomy Application—Assign terms from the taxonomy to a small sample of documents (3 to 4) from each document group on the IW:LEARN Web site (i.e., Strategic Action Plans, Transboundary Diagnostics Analyses, Lessons Learned, Experience Notes, etc.) for the purpose of providing models for the UNEP/ DEWA staff to follow in assigning terms to the rest of the document collection.
3. Review of the GEMET Thesaurus—Review the strengths and weaknesses of the GEMET (1999) thesaurus, comment on a proposal to develop a “new and maintained thesaurus,” and compare it with other thesauri in use by other agencies.
4. Taxonomy Development for the GEF Project Data Base—Propose a taxonomy (classification scheme) for document types stored in the GEF project database. The taxonomy should be based on the current contents of the IW:LEARN Web site.
5. Observations about the IW: Learn Web site—Prepare a brief list of observations and suggestions for improving the structure and organization of the IW:LEARN Web site with the intent of the accessibility of information to users.
6. Assign Metadata to Selected Content of IW:LEARN Web site—Assign metadata to all available UNEP Regional Seas publications (maximum 200) using the taxonomy developed in Task 1 so that information about them may be retrieved through [www.iwlearn.net](http://www.iwlearn.net)
7. Compilation of Potential Sources for Data and Information—Produce a matrix of projects in the Caribbean region outlining their objectives, deliverables, and issues to be addressed as well as contacts and project-related outputs and key findings.

Task 7 was completed on November 17, 2007 by a subcontractor. Her report was submitted to UNEP/ DEWA at that time. Task 7 will not be discussed in this report.

## Organization of the Report

This report contains seven sections:

1. Introduction – Provides the background of the project and tasks performed
2. Metadata and the Dublin Core -- Discusses the standard developed by the international Dublin Core Metadata Initiative and describes the Dublin Core elements.
3. Thesaurus Review and Recommendation – Discusses thesaurus sources in use by

international agencies and includes a brief discussion of thesaurus software (Task 3)

4. Taxonomy Development – Provides subject and document type taxonomies for the information resources currently on the IW:LEARN Web site (Tasks 1 and 4)
5. Workflow for Assigning Terms -- Provides instructions for IW:LEARN staff to use in assigning Metadata to documents on the Web site (Task 2)
6. Informal Observations about the IW:LEARN Web Site -- Reviews organization of the IW:LEARN Web site and makes suggestions for improving users' access to the information stored on or linked to the site (Task 5)
7. Results of Indexing the Regional Seas Reports and a Sample of the GEF project documents -- Provides a description of problems encountered during the assignment of Metadata and records the decisions made with respect to missing information (Tasks 2 and 6)
8. Summary and Recommendations

The appendixes contain sample documents referred to in the report.



## Section 2: Dublin Core and Metadata

### Dublin Core Metadata Initiative

The Dublin Core Metadata Initiative is an international, open organization engaged in the developing interoperable online Metadata standards that support a broad range of purposes and business models (<http://www.dublincore.org>). The Dublin Core is an international standard also known as ISO Standard 15836 and ANSI Standard Z39.85.

According to the Dublin Core Usage Guide ([http://www.dublincore.org/documents/usage\\_guide](http://www.dublincore.org/documents/usage_guide))

A Metadata record consists of a set of attributes, or elements, necessary to describe the resource in question. For example, a Metadata system common in libraries -- the library catalog -- contains a set of Metadata records with elements that describe a book or other library item: author, title, date of creation or publication, subject coverage, and the call number specifying location of the item on the shelf.

The linkage between a Metadata record and the resource it describes may take one of two forms:

1. elements may be contained in a record separate from the item, as in the case of the library's catalog record; or
2. the Metadata may be embedded in the resource itself.

Examples of embedded Metadata that is carried along with the resource itself include the Cataloging In Publication (CIP) data printed on the verso of a book's title page or the TEI header in an electronic text. Many metadata standards in use today, including the Dublin Core standard, do not prescribe either type of linkage, leaving the decision to each particular implementation.

Use of metadata not only speeds up database queries but also helps make information retrieval more productive. Most importantly, metadata provides a standardized way of describing information resources within and across organizations and information systems. However, to be successfully applied, different groups of resource producers in an organization must agree to cooperate in the use of compatible methods and standards.



## Dublin Core Metadata Standard

The Dublin Core User Guide defines the Dublin Core as follows:

The Dublin Core metadata is a simple yet effective element set for describing a wide range of networked resources. The Dublin Core standard includes two levels: Simple and Qualified. Simple Dublin Core comprises 15 elements; Qualified Dublin Core includes three additional elements ... and element refinements ... that refine the semantics of the elements in ways that may be useful in resource discovery

(<http://dublincore.org/documents/2005/11/07/userguide/>).

### Simple Dublin Core Elements

The Simple Dublin Core elements are defined below based on the information provided in the Dublin Core User Guide. Numbers are those assigned by Dublin Core.

1. Title — Title refers to the name given to the resource. The title of a report, document, image, map, dataset, or other resource should be given for this element.
2. Subject — In the Dublin Core, the subject element contains (1) subject classification (taxonomy) codes and names, such as the Library of Congress Classification (LCC) or the Dewey Decimal Classification (DDC), and (2) keywords or phrases selected from a controlled vocabulary that describe the content of the resource. Semicolons are used as separators. Categories may be thought of as major themes or subjects covered by a document. Keywords represent the most significant or important topics included in a document.
3. Description — The description field contains an account of the content of the resource. The description may be an abstract, executive summary, table of contents, or textual description of the resource.
4. Type — The resource type is the genre the resource, such as text, image, sound, or video. The type of resource should be selected from a controlled vocabulary. Multiple entries, separated by semicolons, may be made to characterize these aspects of the resource type. Note that there are different kinds of resources that can be specified within this element. For example:
  1. Functional types – text document, photograph, video image, audiofile, etc.
  2. Content types – proposal, project description, news release, technical report, terminal evaluation, event description, etc.
5. Source — Source refers to a larger resource from which the present resource was derived in whole or in part. An example would be reference to a paper contained in a conference proceedings, the chapter of a book, or a report in a series of reports.

6. Relation —This element defines the relationship of the resources being described to a related resource. It is considered best practice to use a string or number for formal identification (identifier in element 14) of objects. The relationship qualifiers include: IsPartOf, IsVersionOf, IsFormOf, HasFormat, IsReferencedBy, References, IsBasisFor, and IsBasedOn. Thus, if describing Paper001 in ConfProceeding2005, this element might read “IsPartOf ConfProceeding 2005. This element can be used to link datasets, GIS coverages, photo albums, slide presentations, and so on to the resources of which they are a part or where they are referenced.

7. Coverage —The coverage element describes the extent or scope of content of the resource and typically includes a spatial location. This element could contain city, state, country, region, subregion, river basin, and/or other geographic names. However, these names must be standardized and used consistently. For example, one might use the Getty Thesaurus of Geographic Names (<http://www.getty.edu/research/tools/vocabulary/tgn/>).

Spatial coverage can also be represented by geographic points or latitude/longitude boxes following Dublin Core encoding standards ( DCMIPoint and DCMIBox). Coverage can also be temporal as in a date range (DCMIPeriod). An additional item to include in this element might be a thumbnail regional outline map showing the location of the a project/program that created the information resource. (See Appendix 1 for an example.)

8. Creator — The creator is the entity (person, organization, or service) primarily responsible for making the content of the resource—in other words, the author(s). An author can be a person or a corporate author, such as a business, nongovernmental organization, or government agency. People might be followed by organizations, all separated by semicolons. Although personal authors’ names are usually inverted in European languages (surname followed by first name), it may be better in an international context to leave a name uninverted. Unfamiliar forms of personal names and the various ways of inverting them is a continuing challenge to book and periodical indexers.

9. Publisher —The entity (person, organization, or service) responsible for making the content available. Usually, this is the organization that published the report or document or made it available on the Internet.

10. Contributor —The entity (name of the person, organization, or service) responsible for contributing to the content. This could be the contractor(s) who prepared a report or conducted a project for UNEP. Their names are generally found in the preface of UNEP reports.

11. Rights — Rights held in and over the resource, such as the copyright and the entity (person, organization or service) that holds the right. Many of the formal report documents on the IW:LEARN Web site are copyrighted by UNEP. Rights can also refer to document or Web site access, e.g., access to certain types of data might be limited to paid subscribers or registered users of the site.

An example of a public access statement in the metadata of the European Environmental Agency’s Web site (Appendix 1) reads as follows:

EEA grants free access to all its data/applications/maps/graphs provided that the user agrees to display a link to the EEA Web site (<http://www.eea.europa.eu>) and to acknowledge the source as follows: Copyright EEA, Copenhagen, 2007.

12. Date — Date associated with the life cycle of the resource. Creation date, publication date, or release date (for a press release). For IW:LEARN documents, this element will contain the document's publication date (yyyy) or date that it was placed on the Web site (dd-mm-yyyy).

13. Format — Physical or digital manifestation of the resource. This should include the document size and media type including its computer file type extension. Some examples are

PDF 580KB - Adobe Portable File Document

JPG 958 KB - JPEG bitmap image file

WPD 40 KB - Corel WordPerfect Document

A comprehensive database of computer file extensions with corresponding format-type names and descriptions can be found at File.Extensions (<http://www.file-extensions.org/filetypes>). Their Common File Extensions list of 142 extensions with standardized names could serve as a controlled vocabulary for this element. Any file types identifications not on that particular list can be found through searching the entire database of more than 80,000 file extensions.

14. Identifier — The resource identifier is an unambiguous reference to a resource within a given context. This might be the URL, ISBN number, or publishers number. The identifier element might also have the qualifier such as BibliographicCitation (see Dublin Core guidelines for encoding bibliographic citations).

15. Language — The language of the document. For example, “en” for English; “fr” for French; and “es” for Spanish are the standard two- or three-letter language codes defined in RFC 3066 (<http://www.ietf.org/rfc/rfc3066.txt>) and ISO 639 (<http://www.oasis-open.org/cover/iso639a.html>).

#### Dublin Core Qualifiers

Qualifiers make the meaning of an element more specific.

A. Audience — Class or entity for whom resource is intended or who will ultimately benefit. For example, audiences for water resources information might include students, educators, managers, researchers (scientists), administrators, policymakers, and/or the public. No standards exist for this qualifier. However, within the context of a specific application a controlled vocabulary should be defined.

B. Provenance — Changes of ownership and custody of resource.

C. Rights Holder — Managers or holders of the rights to the resource. This can be a person, organization service, or entity.

## Metadata in Adobe Acrobat Professional

The Portable Document Format (PDF) developed by Adobe Systems, Inc. (<http://www.adobe.com>) has become the de facto standard for cross-platform portability of many types of information resources that may be downloaded from the Internet. UNEP, on its Regional Seas Web site (<http://www.unep.org/regionalseas/Publications/>), makes extensive use of PDF files for the Regional Seas Reports and Studies series. Similarly, most of the documents on the IW:LEARN Web site are PDF files although there are a few Microsoft Word and PowerPoint documents, as well as images, and some other file formats.

Adobe Acrobat Professional, and other Adobe software, has incorporated an open-source technology into their software to enable users to capture metadata about a resource during its creation. The Extensible Metadata Platform (XMP) provides a standard, World-Wide Web Consortium (W3C) compliant method of tagging files (<http://www.adobe.com/products/xmp/overview.html>) And embedding metadata within the PDF file. In Adobe Acrobat Professional 8.0, the metadata of a file may be accessed by using the Properties feature on the File menu. In the Properties box, the Custom tab brings up the Custom Properties box that allows entry of name-value pairs, such as the element name and element value of a Dublin Core metadata element. Further, in the Properties box, clicking on the Description tab and then the Additional Metadata button displays a Description box with a column on the left-hand side of the box. Clicking on the last entry in the column, Advanced, displays the Advanced box. At the bottom of the box, clicking on the Save button will write out all the metadata associated with the PDF file on a separate file with the same file name and an XMP extension. This file, written in XML, can be read and edited by a text editor such as TextPad.

Embedding metadata in PDF files has a number of advantages.

- The metadata moves with the file whenever it is moved or downloaded to another computer.
- If the user has a collection of PDF reports, Adobe Acrobat Professional permits the user to build a catalog of the metadata for use in searching the private collection of documents offline.
- The user can also build a catalog of all the words in the text and embed the index in the PDF document. This increases the speed of full text searches of collections of documents maintained by the user.
- The use of PDFs permits staff unfamiliar with Plone to easily attach metadata to the resource without having to know the details of the Plone System.
- Little training is required for entering metadata in PDF documents. However, the user would need (1) to understand what information is required for the various metadata

elements and (2) to know how to apply the particular standards (e.g. taxonomy, thesaurus) that must be used for each of the elements.

- Should another content management system be used in the future, no metadata would be lost because the original data are embedded in each PDF file.
- PDF metadata field contents of a document can be copied as an XML file with the same file name.

There are also disadvantages of using Adobe Acrobat's document Properties for metadata.

- Metadata are redundant with that stored in the content management system.
- Mapping the metadata from the PDF file to the content management system may require some specialized programming. This disadvantage might be overcome by merely reading the metadata from the Acrobat document properties screen and retyping (or even copying and pasting) it into a metadata record on the content management system.

### Using Dublin Core With Plone and the IW:LEARN Web Site

The Dublin Core offers a great deal of flexibility to meet the needs of those searching for information on IW:LEARN's Web site. Table 1 compares the names given to equivalent data in the Dublin Core, the Plone Content Management System, and Adobe Acrobat Professional 8.0.

The Definitive Guide to Plone (<http://www.plone.org>) suggests that the system already has equivalent data elements for most of the Dublin Core. Our review of the current contents of resources currently on the IW:LEARN Web site indicated that Dublin Core Elements 1-5, 7-15, and Qualifier A should be coded for most information resources on the site.

To apply these metadata elements to the documents on the IW:LEARN Web site, the following controlled vocabularies need to be defined:

- Subject classification (taxonomy) for the Subject element
- Designation or development of a thesaurus of valid index terms (descriptors)
- Adoption of a standard bibliographic citation format for the Source element
- List of document types (taxonomy) for the Type element
- Adoption of a standard file suffixes for identifying the format of the information resource

in the Format element.

- Approval of legal language for designating copyrighted material
- Standard list of geographic names in the Coverage element
- Assignment of a unique Identifier for each information resource on the Web site for the Identifier element
- Use of standard language codes for the Language element
- Standard list of resource audiences for qualifier A

**Table 1** Metadata elements in Dublin Core, Plone, and Adobe Acrobat compared

Dublin Core Elements	Plone	Adobe Acrobat
1. Title	Title	Title
2. Subject	Subject [Keywords]	Subject [Category or memo] Keywords <sup>1</sup>
3. Description [Abstract]	Description [Summary]	Description
4. Type	Portal type	Custom <sup>2</sup> (Type)
5. Source	—	Custom (Source)
6. Relation	—	—
7. Coverage (Spatial / Temporal)	Region / Subregion / Country	Custom (Geographic coverage)
8. Creator	Creator [of document or file]	Author
9. Publisher	—	Custom (Publisher)
10. Contributor	Contributor [outside Plone system]	Custom (Contributor)
11. Rights	Copyright	Copyright Status Copyright Notice <sup>1</sup>
12. Date	Creation Date Modification Date <sup>1</sup> Effective Date <sup>1</sup> Expires Date <sup>1</sup>	Custom (Created Date) (Modified Date)
13. Format	Content Type Registry	“PDF File”
14. Identifier	ID [getid]	Custom (Identifier)
15. Language	Language	Custom (Language)
A. Audience	—	Custom (Audience)
C. Rights Holder	[Copyright]	Copyright Information

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<sup>1</sup>Separate field

<sup>2</sup>Adobe Acrobat provides for the addition of field names and value pairs in the Custom tab in the File Properties. Parentheses indicate possible uses equivalent to Dublin Core and/or Plone metadata elements.

### **Section 3. Thesaurus Review and Recommendation**

The IW:LEARN Web site serves as a knowledge base of the activities of the International Waters component of the Global Environment Facility (GEF) program. There are currently approximately 187 GEF projects in the IW:LEARN database, each with a variety of administrative documents, technical reports, fact sheets, and other materials pertaining to the project. These documents may be classified in a variety of ways: (1) geographic regions, (2) document types, (3) lead agencies or partner organizations, (4) project status, or (5) environmental, technical, or socioeconomic issues addressed. Document subject content is the primary area where a thesaurus (controlled vocabulary) assists the selection of metadata for effective retrieval of information.

This section the report examines existing thesauri that might meet the needs of IW:LEARN. In addition we also looked into thesaurus development software in case IW:LEARN might wish to create its own thesaurus. This was done chiefly in response to a draft proposal to IW:LEARN from a European organization that originally included software development as part of a project to create a thesaurus. This aspect of thesaurus development was dropped in a later revision of the proposal.

#### **Vocabulary Control**

The following definitions are used in this report.

A controlled vocabulary is a carefully selected list of words and phrases that are used as metadata for effective retrieval of documents or information.

A taxonomy is a systematic classification for grouping documents into broad categories according to a set of principles or general rules. The Dewey Decimal Classification scheme, used in many libraries worldwide, is an example of a taxonomy.

A thesaurus is set of terms representing concepts and the relationships among them, including hierarchy, equivalence, and associative relationships. It usually contains not only the authorized or valid terms assigned as metadata but also invalid (“Use for”) synonyms for the term. The structure is usually hierarchical, in that an entry often will show not only the term itself but also both more inclusive (“Broader than”) concepts and more specific (“Narrower than”) concepts (Figure 1). In addition, the entry for a valid term often suggests associated concepts (“Related to” terms) outside the hierarchy that might also be relevant (see Figure 2). Valid terms are analogous to the subject headings on library catalog cards.



Subject terms (often called keywords) are of two kinds: identifiers and descriptors. Identifiers are the names of things, e.g., Indian Ocean, Boeing 747, Edwards Aquifer. Generally speaking, most of the terms in a thesaurus are descriptors. They refer to undifferentiated topics such as oceans, airplanes or ground water.

Figure 1. Thesaurus Hierarchical Structure Example

```
graph TD; Basins --> River_basins[River basins]; River_basins --> Watersheds; Watersheds --> Agricultural_watersheds[Agricultural watersheds]; Watersheds --> Demonstration_watersheds[Demonstration watersheds]; Watersheds --> Forest_watersheds[Forest watersheds]; Watersheds --> Mountain_watersheds[Mountain watersheds]; Watersheds --> Urban_watersheds[Urban watersheds]; Related_terms[Related terms outside the hierarchy:] --> Watershed_management[Watershed management]; Related_terms --> Watershed_models[Watershed models];
```

Basins

- River basins
- Watersheds
  - Agricultural watersheds
  - Demonstration watersheds
  - Forest watersheds
  - Mountain watersheds
  - Urban watersheds

Related terms outside the hierarchy:

- Watershed management
- Watershed models

Figure 2. Thesaurus Entry Example

Watersheds		
UF:	Catchment basins Drainage basins	[Use for; use instead of]
BT:	River basins	[Broader term]
NT:	Agricultural watersheds Demonstration watersheds Forest watersheds Mountain watersheds Urban watersheds	[Narrower terms]
RT:	Watershed management Watershed models	[Related terms]

By using a controlled vocabulary in a search for information, instead of having a computer search the full text of every document for particular words, the Web site user can dramatically increase the likelihood of retrieving desired information without also bringing up large numbers of irrelevant documents that happen to have the same words in unwanted contexts (called false drops or false positives). For example, if the user wants information about wooden barrels for shipping or storing things, having to sort through documents that mention having “barrels of fun,” leaping over barrels on motorcycles, racing around barrels in a rodeo event, or candy called “root beer barrels,” is a waste of time.

Selecting the search terms from a thesaurus, the user also reduces the chance that significant documents are not found because he used slightly different words than those in the metadata. For example, in formulating a search for some aspect of information about old people, the thesaurus might specify the term “elderly persons” instead of synonyms like elderly people, senior citizens, pensioners, geriatric patients, retirees, aged, etc. A full text search for “old people” or one of the other synonyms might well miss significant documents with “elderly persons” in the metadata.

A controlled vocabulary is useful even for a fairly small collection of documents. In person, one can visually scan a few shelves of books or a pile of reports and easily determine which, if any, are useful. There is no need for a catalog or database. The online searcher, however, generally has no idea how many documents are in the database, nor what information they contain. A small database may rely on full text searching or require the user to scroll through a list of titles. Should the database size significantly increase, however, then someone needs to go back and assign subject terms to all the previously unindexed documents. That can be avoided by assigning subject metadata from the beginning. If the small collection is later integrated into a larger one that uses a different thesaurus, metadata terminology can be translated using a search-and-replace function.

## Developing an IW:LEARN Thesaurus

### Thesaurus Software

The original draft proposal to IW:LEARN from Consiglio Nazionale delle Ricerche (CNR) recommended the development and refinement of a thesaurus management software program. This recommendation was dropped from a later version of the proposal. There are approximately 30 stand-alone thesaurus programs as well as several other programs that are modules of database systems already on the market. An excellent summary of available thesaurus software can be found on the Internet at <http://www.willpowerinfo.co.uk/thessoft.htm>

Of the existing thesaurus software, MultiTes ([www.multites.com](http://www.multites.com)) [an abbreviated name for Multilingual Thesaurus] is a strong candidate for use by IW:LEARN. The program is widely used by large organizations, such as the World Bank, to maintain their extensive enterprise thesauri. It is available in a desktop program version that can be used to access a terms in a thesaurus, print the thesaurus as a hard copy, and/or post a static version of the thesaurus on a Web site for use by others. There is also a version for online enterprise system use, which is particularly helpful if a number of people in different locations are involved in creating and updating the thesaurus. MultiTes software is well-maintained, designed for multilingual thesauri building, and moderately priced. A thesaurus created in MultiTes can be exported as a text file for importation into another software program should that be necessary in the future. Help from the company's support is prompt. An online users' group exists for exchanging information about the capabilities of the program. We recommend that IW:LEARN acquire the MultiTes program so that staff may conveniently access terms in a thesaurus when indexing IW:LEARN documents.

## Existing Thesauri

There are a number of excellent thesauri have been developed for the environmental sciences that can be used to index the contents of the IW:LEARN Web site. These are kept up-to-date, their administrators will accept suggestions for “candidate” terms from users, and some are multilingual. Some of them, however, are highly specific to a particular discipline such as agriculture and therefore do not have the terminology likely to be needed by IW:LEARN. Others have a good selection of environmental terminology but lack the in-depth coverage needed to index IW:LEARN documents. These documents require not only vocabulary for the environmental and earth sciences but also vocabulary for project management, economics, environmental policy, and life sciences. Four thesauri are reviewed here: EARTH Thesaurus, GEMET Thesaurus, UNESCO Thesaurus, and World Bank Thesaurus.

### EARTH-VOC Thesaurus (Proposed)

The draft proposal from CNR, recommends creating an IW:LEARN thesaurus based on the bilingual (Italian and English) EARTH-CNR Thesaurus ([http://uta.iiia.cnr.it/earth\\_eng.htm](http://uta.iiia.cnr.it/earth_eng.htm)). The proposed EARTH-VOC Thesaurus is based on a system of categories (general concepts or themes) that are organized in a framework composed of different levels and classification knots that comprise hierarchical relationships. A sophisticated classifying tree will analyze the meanings of the terms to provide categorical interpretation of the terms and thus lead users to the term(s) that reflect the semantics of a given keyword. EARTH implements an extended set of semantic relationships that enrich and clarify relationships by navigating the thesaurus on a conceptual basis. The thesaurus designers envision its use for a wide range of applications including artificial intelligence.

Terms in the EARTH-VOC thesaurus are to be derived from a variety of multilingual and monolingual sources of controlled vocabularies, including the GEMET Thesaurus (described below). The EARTH-CNR Thesaurus (April 2002) is published online as seven volumes (files). The thesaurus Web site ([http://uta.iiia.cnr.it/earth\\_eng.htm](http://uta.iiia.cnr.it/earth_eng.htm)) indicates that a preliminary version of the advanced EARTH Thesaurus with 7000 terms in English and Italian would be available in the future. The thesaurus is described as GEMET compatible. EARTH appears to be a work in progress by the Environmental Knowledge Organization Library (EKOLib) of CNR. This group applies advanced techniques of semantic analysis to classify terminology. As a research effort, the technology may not yet be ready for convenient application to an operational document storage and retrieval system.

## GEMET Thesaurus

The GEMET Thesaurus, which has terms in 23 languages, is produced by the European Environment Information and Observation Network (EIONET), was reviewed for efficacy in indexing IW:LEARN documents. The original GEMET (GEneral Multilingual Environmental Thesaurus) was revised in 2004 and is kept up to date. This version of the thesaurus may be found at <http://www.eionet.europa.eu/gemet/alphabetic?langcode=eng>. For a sample page, see Appendix 2.

According to the “About” page of the GEMET Thesaurus:

GEMET...has been developed as an indexing, retrieval and control tool for the European Topic Centre on Catalogue of Data Sources (ETC/CDS) the European Environment Agency (EEA), Copenhagen. The work has been carried out through a contract between the EEA and the ETC/CDS which is led by the ministry of the Environment of Lower Saxony, includes members of Germany, Austria, Italy, Sweden, and benefits of the collaboration of other member countries of the European Union (EU), as well as of UNEP Infoterra.

Consiglio Nazionale delle Ricerche (CNR) and Umelt-Bundesamt (UBA) were also involved in the creation of the thesaurus. The Environmental Information and Observation Network (EIONET) maintains the thesaurus on its Web site

([http://glossary.eea.europa.eu/EEAGlossary/G/General\\_Multilingual\\_Environmental\\_Thesaurus](http://glossary.eea.europa.eu/EEAGlossary/G/General_Multilingual_Environmental_Thesaurus))

GEMET has undergone numerous revisions since the first edition was published in 1996. The thesaurus had a major revision in 2004 and provided with a graphical user interface for online browsing in 22 languages (including both British and American English). This version of the thesaurus can be found at <http://www.eionet.europa.eu/gemet/alphabetic?:langcode=eng>.

The link to the About page on this URL provides a guide explaining how to use GEMET and includes sources of terminology, a list of the languages covered, a list that breaks down the thesaurus vocabulary into 3 supergroups, 30 term groups, and 40 themes. Major advantages of the GEMET Thesaurus are (1) the translation of all terms in 22 different languages and (2) a glossary definition of each term (see Appendix 2).

The GEMET Thesaurus has some drawbacks, however. The English version of the thesaurus has some unusual entries. Native speakers of English, for example, would be unlikely to search for terms like “warm-blooded animal” or “drilling for oil.” Also many, if not most of the terms, are in the singular form, whereas the National Information Standards Organization (NISO) standard ANSI/NISO Z39.19 - 2005 Guidelines for the Construction, Format, and Management of Monolingual Controlled Vocabularies states that in English it is customary “to use the plural form for terms denoting discrete objects (countables) and the singular form for mass terms and most abstract

concepts (noncountables).” Most serious researchers have learned to follow this usage for fruitful retrieval of references on a given topic.

The thesaurus has only valid terms. Users are not referred to the valid term from invalid synonyms, which would be virtually impossible in a thesaurus that has terms in so many languages. Some subjects likely to be used by IW:LEARN have a limited number of hierarchical and/or related terms. Moreover, this thesaurus does not have good coverage of project management or economic terms which are likely to be needed for IW:LEARN’s documents.

The most serious drawback to the 2004 version of the GEMET Thesaurus is that term relationships tend to be weak. Entries for valid terms rarely show invalid synonyms, and do not always show all the more specific terms, or broader terms that are in the thesaurus. For example, the listing for the valid term “warm-blooded animal” gives the broader term (BT) “animal” but no mention of mammals even though “mammal” is also a valid term with many narrower terms (NT) for various types of mammals.

A revised version of the online GEMET Thesaurus is now being maintained in Denmark by the European Environmental Agency (EEA), Environmental Terminology Discovery Service. This version of GEMET has 23 languages [Arabic has been added] and may be found on the Web at <http://glossary.eea.europa.eu/>.

#### EEA Glossary

The 2004 version of GEMET is the basis for the new (February 2008) EEA Multilingual Environmental Glossary maintained by the EEA’s Environmental Terminology Discovery Service. This thesaurus combines the functions of a multilingual thesaurus and glossary. At the moment, however, terms can be searched only in English and are case sensitive. A search for Marine pollution yielded zero results but suggested similar terms, one of which was marine pollution. A search for the Danish term havforurening also yielded zero results but with no alternative suggestions. This translation is given, however, in the list of language equivalents under “marine pollution.”

The 2008 version of GEMET stresses its function as a glossary. Terms are defined at length with links via Google to other definitions on the Internet. There are “see also” references to other relevant terms, but there is no attempt to define hierarchical or equivalent relationships among them. See Appendix 3 for an example.

### UNESCO Thesaurus

The UNESCO Thesaurus (<http://databases.unesco.org/thesaurus/>) produced by the United Nations Educational, Scientific and Cultural Organization (UNESCO) is used to index and retrieve information in field of interest to UNESCO: education, culture, natural sciences, social and human sciences, communication, and information. The UNESCO Thesaurus has approximately 7000 terms in English and approximately 8600 terms in French and Spanish. Although not mentioned on the Web site's home page, there are 7000 terms in Russian and some terms in Arabic as well. The translations are given with each valid term. This means that terms in three languages could easily be copied into the metadata during the indexing process. By doing that, searchers could search in Spanish, for example, and retrieve documents written in English, French, or other languages. Alternatively, if indexing is done in English only, searchers could simply consult the French, Spanish, or Russian terms to learn the correct English words to use when searching. UNESCO Thesaurus can be used online, ([http://publishing.unesco.org/details.aspx?Code\\_Livre=4518](http://publishing.unesco.org/details.aspx?Code_Livre=4518) Accessed 24 March 2008) or it could be purchased on a CD-ROM. (For a sample page, see Appendix 4)

The main drawback to the UNESCO Thesaurus is its limited vocabulary for the marine sciences. For example, UNEP Regional Seas Reports and Studies No. 5 is entitled "Survey of tar, oil, chlorinated hydrocarbon, and trace metal pollution in coastal waters of the Sultanate of Oman." The UNESCO thesaurus does not have valid terms (nor cross references to synonyms) for tar, trace metals, or chlorinated hydrocarbons. It does have the term "marine pollution," however. A search for "oil" leads one to "oil pollution," "crude petroleum," and "vegetable oils." In contrast, the World Bank Thesaurus [see below] contains the terms "marine pollution," "marine pollution control," and "oil spills" as well as "tar," "trace metals" and "chlorinated hydrocarbons."

### World Bank Thesaurus

The World Bank Thesaurus (<http://www2.multites.com/wb/>) is actually a series of 30 subject-specific thesauri (called Vocabularies or Facet Categories) that are linked together to form a thesaurus of more than 85,000 terms. The home page's "Browse Vocabularies" link shows the scope of subjects covered. This information is reproduced in Appendix 5

There are fifteen Environment Vocabularies . Of most interest to UNEP's Regions Seas Studies Reports , is the Vocabulary called Freshwater, Coastal & Marine Environment Vocabulary. For other IW:LEARN documents, the Environmental Assessment & Management Vocabulary, the Global Environment Facility Vocabulary, and the Water Supply & Sanitation Vocabulary are likely to be of use. Subject terms can appear in more than one Vocabulary. Many of the GEF terms, for instance, are also in the Montreal Protocol Vocabulary. As another example "marine ecosystems" appears in five different Vocabularies.

Within the thesaurus, entries for specific terms agree with US and international standards in presenting equivalence (“use for”), hierarchical (broader and narrower terms), and associative (related terms) information for each subject concept. A sample page appears in Appendix 6.

It is anticipated that the Regional Seas Report Series and IW:LEARN projects may mostly use the Environment Vocabularies. However Vocabularies pertaining to Agriculture, Water Supply & Sanitation, Law, Governance, etc. are readily available in case of need. Hierarchical, equivalence, and relational connections among subject terms are extensive and shown for each term.

Some of the World Bank Vocabularies have been translated into languages other than English. Language coverage varies, however. Translated terms are not shown on the Web site. According to Denise Bedford (Senior Information Officer at the World Bank):

We have been working diligently in the past year to create an English and a Spanish version of the WB Thesaurus. We have been working on selected areas/ vocabularies, and also doing some high level, cross-cutting translations. This year we will be moving forward with Arabic and Russian, as well as continuing the work on Spanish and French. (D. Bedford, Personal communication, February 1, 2008).

Thus, the Bank is giving high priority to developing a multilingual thesaurus. As of April 26, 2008, the targeted languages are English, Spanish, French, Portuguese, Russian, Arabic and Chinese. They are also working on a “collaborative development thesaurus business model” that would allow users outside of the World Bank to contribute terms. (D. Bedford, Personal communication, April 26, 2008). This model would allow UNEP staff to participate in the thesaurus development.

The World Bank thesaurus is well maintained and adheres to rigorous standards. The underlying software is MultiTes (<http://www.multites.com>). This software is specifically designed to incorporate multilingual thesauri rather than using language equivalents for each term of an English language thesaurus.

The thesaurus can be used easily online. Term retrieval is speedy even without high-speed Internet access. As the Global Environment Facility (GEF) is a World Bank partner, it is likely that a copy of the thesaurus or can be acquired for efficiency in indexing IW:LEARN documents offline.



## Thesaurus Recommendations

Given the relatively small size of the IW:LEARN document collection and its narrow project focus (environmental assessment and management), the most cost-effective approach to indexing project documents is to use an existing thesaurus.

The thesaurus that, in our opinion, would best meet IW:LEARN needs is the World Bank Thesaurus. Furthermore, using the World Bank Thesaurus could provide an excellent opportunity for collaboration between the World Bank and GEF/IW:LEARN.

## Section 4: Taxonomies

As mentioned in Section 3, a taxonomy is a systematic classification for grouping documents into broad categories according to set of principles or rules. Usually, the owner of a Web site develops a taxonomy to make it easier for the user to find information on the site. A good taxonomy can improve the performance of the Web site's search engine and provide an alternative site navigation tool. Generally, there are two classes of taxonomies that are useful to improve access to site information: a content taxonomy used to tag the information resources on the site for retrieval and a navigation taxonomy that helps the user cope with complex Web site structures.

Two content taxonomies were developed for IW:LEARN documents as part of this contract: (1) a Subject Taxonomy and (2) a Document Type Taxonomy. These were specified in Tasks 1 and 4 (see pages 3 and 4). In addition, a list of audience types and geographic terms were developed for the project.

### Subject Taxonomy

The Subject Taxonomy for IW:LEARN documents used the following sources to determine the topic categories most likely to be useful: (1) IW:LEARN areas of interest listed on the Web Site, (2) a sample of project documents taken from the IW:LEARN Web site; (3) Regional Seas Studies Reports (<http://www.unep.org/regionalseas/Publications> Accessed March 15, 2008) , and (4) key issues listed on the Regional Seas Web site (<http://www.unep.org/regionalseas/Issues/default.asp> Accessed March 18, 2008). The Subject Taxonomy attempts to be sufficiently broad to encompass the scope of the contents of the Web site while at the same time providing enough specificity to guide the user to a group of potentially relevant documents. Additional terms (or descriptors) in the query will narrow the query still further.

The Subject Taxonomy is shown on pages 26-28 of this report. The taxonomy contains 18 major groups of information and 162 subgroups. With use, the taxonomy might be further refined by examining the topics most frequently used for query box searches.

## GEF Subject Taxonomy

- A Environment & Natural Resources
  - A1 Geology
    - A21 Rocks & minerals
    - A22 Sedimentation
    - A23 Erosion & weathering
  - A2 Geography & geomorphology
  - A3 Natural hazards & extreme events
    - [Disaster preparedness & response is classified as V6]
    - A31 Earthquakes
    - A32 Tsunamis
    - A33 Volcanic eruptions
    - A34 Landslides (including mudslides)
    - A35 Floods
    - A36 Droughts
- B Climate
  - B1 Meteorology & weather
  - B2 Climate change
- C Water resources
  - C1 Hydrology
  - C2 Surface water
    - C21 Rivers & streams
    - C22 Basins & watersheds (catchments)
    - C23 Lakes
  - C3 Ground water
  - C4 Transboundary waters
  - C5 Water quality
    - [Polluted or contaminated freshwater is classified as M3]
    - [Ocean water quality is classified as Seawater quality: F7]
  - C6 Water resources management
  - C7 Hydraulic structures
- D Terrestrial Landforms & Landscapes
  - D1 Deserts
  - D2 Forests
  - D3 Mountains
    - D31 Volcanoes
  - D4 Wetlands
    - D41 Tidal marshes & salt marshes
  - D5 Coastal Landforms
    - D51 Beaches
    - D52 Deltas
    - D53 Lagoons
  - D6 Islands
- E Oceans & Seas
  - E1 Marine Protected Areas
  - E2 Territorial waters
  - E3 Nearshore environment
  - E4 Marine landforms
    - E41 Atolls
    - E42 Seamounts
    - E45 Trenches
  - [Coral reefs are classified under Marine ecosystems: F41]
- F Habitats & Ecosystems
  - F1 Terrestrial habitats & ecosystems
  - F2 Freshwater aquatic habitats & ecosystems
  - F3 Coastal habitats & ecosystems
  - F4 Marine habitats & ecosystems
    - F41 Coral reefs
    - F42 Fisheries
  - F5 Ecological dynamics
  - F6 Habitat modification
  - F7 Biodiversity
  - F8 Habitat & ecosystem management
  - F18 Endangered species conservation
- G Plants
  - G1 Trees
  - G2 Grasses (including seagrasses)
  - G3 Mangroves
- H Animals
  - H1 Microorganisms
  - H2 Macroinvertebrates
  - H3 Mollusks
  - H4 Crustaceans
  - H5 Reptiles
  - H6 Amphibians
  - H7 Fish
  - H8 Birds
  - H9 Mammals
    - H91 Marine mammals
- J Land Use
  - J1 Agriculture
    - J11 Soils
    - J12 Forestry
    - J13 Crops
    - J14 Animal production
    - J15 Aquaculture

## J Land Use (continued)

### J2 Urban & suburban environments

J21 Buildings

J22 Coastal development

J23 Rural development

### J4 Ports & Harbors

### J5 Airports

### J6 Land degradation

J61 Deforestation

J62 Desertification

### J7 Tourism & recreation

J71 Sport fishing

J72 Boating

[Cruise ships are classified as K14]

## K Industrial & Military Activities

### K1 Transportation

K12 Shipping

K13 Pipelines

K14 Cruise ships & passenger vessels

K16 Roads

K17 Rail transport

K18 Air transport

### K2 Petroleum Industry

K21 Oil drilling

K22 Drilling platforms

### K3 Mining

K31 Deep sea mining

### K4 Manufacturing

### K5 Military activities

## M Environmental Pollution

### M1 Water pollution

M31 Industrial pollution

M32 Nonpoint source pollution

M33 Ground water pollution

M34 Surface water pollution

### M2 Coastal pollution

### M3 Marine pollution

M31 Sewage discharges (from ships)

M32 Garbage scows

M33 Oil spills

M35 Land-based pollution

### M4 Air pollution

### M5 Pollutants

M51 Nutrients

M52 Metals & metallic compounds

M53 Hazardous & radioactive substances

M54 Solid wastes & litter

M55 Persistent organic pollutants

M56 Pharmaceuticals

M57 Pesticides & fertilizers

### M6 Pollutant transport

M61 Atmospheric deposition

### M7 Thermal pollution

### M8 Noise pollution

### M9 Light pollution

## N Waste Management

### N1 Water treatment

### N2 Solid waste management

### N3 Hazardous wastes

### N4 Wastewater treatment

## P Energy

## Q Data Collection & Analysis

### Q1 Data collection

Q11 Surveys & mapping

Q12 Remote sensing & aerial imagery

Q13 Laboratory analyses

Q14 Bathymetry

Q15 Animal studies

Q16 Human behavior & opinion studies

Q17 Environmental monitoring

Q18 Literature reviews

### Q2 Data analysis & interpretation

Q21 Mathematical & statistical analysis

Q22 Modeling

Q23 Economic analysis

Q24 Environmental impact assessment

### Q3 Program & project evaluation

### Q4 Information technology & management

Q41 Databases

### Q5 Geographic information systems (GIS)

### Q6 Information resources

### Q7 Environmental problems overviews

### Q8 Case studies

## R Law

R1 Intergovernmental agreements & conventions

R2 Law of the Sea

R3 Water law

R4 National, state & local legislation

R5 Regulations & regulatory compliance

- S Governance
  - S1 Planning & decision-making
  - S2 Policy
    - S21 Environmental policy
  - S3 Public participation
  - S4 International organizations & programmes
  
- T Economics
  - T1 Environmental economics
  - T2 Socioeconomic impacts
  - T3 Funding & finance
    - T31 Public-private partnerships (PPPs)
  
- V Human aspects of environmental management
  - V1 Environmental management & protection  
[Environmental policy is classified as S21 under Governance]
  - V11 Pollution prevention & control
  - V12 Site cleanup
  - V13 Land reclamation
  - V14 Natural resources conservation
  - V2 Health & Sanitation
  - V3 Population & population characteristics
  - V4 Sustainable development
  - V5 Human behavior & attitudes
  - V6 Disaster preparedness & response
  - V7 Education, training & capacity building  
[Socioeconomic impacts is classified as T2 under Economics]

## Document Type Taxonomy

The Document Type Taxonomy categories were developed primarily from the site map on the IW:LEARN Web site (<http://www.iwlearn.net/>) and further expanded manually (see Appendix 7). On the Web site we also looked at Advanced search for content ([http://www.iwlearn.net/search\\_form](http://www.iwlearn.net/search_form)) and subdivision of reports on the “Documents” page (<http://www.iwlearn.net/publications>).

To a certain extent, the Document Type Taxonomy reflects probable user groups for various types of documents. The Administrative and Organization categories are for those documents required for program management purposes. They are not likely to be of interest to the general public. Scientific, Technical & Reference documents are those of interest to scientists, engineers, students, and others working in the environmental sciences. The Outreach & Public Education Documents and the Events-Related Documents categories are for documents most likely to be of interest to the general public and the news media.

The Document Type Taxonomy is shown on page 30 of this report. It consists of 8 major document groups and 48 subgroups.

## Taxonomy Category Codes

The category codes in the Subject Taxonomy are alphanumeric in contrast to the numerical codes in the Document Type Taxonomy. In an online knowledge base, the main advantage to the distinction is to verify that the various taxonomy codes have been put into the correct metadata fields. In terms of Dublin Core elements, the Subject Taxonomy codes should be in the Subject element, and Document Taxonomy codes should be in the Type element.

In a library or office environment, physical documents can be coded by both Document Type and Subject Category for filing or shelving without the user having to recall which set of number codes (or set of alphanumeric codes) comes first and which comes second. For example, within a project file, the annual performance report for a Regional Seas Studies project dealing primarily with coral reefs, could be coded by Project Identification Number, Document Type, and Subject or vice versa, e.g., Project 1234–02.06: F41 (or Project 1234–F41: 02.06). This would aid in consistent file drawer or shelf locations for project documents and thereby make it easier to find a given report when wanted. The punctuation marks between taxonomic elements in the examples above are arbitrary for physical documents. Semicolons are commonly used to separate values in computer file metadata. Periods, however, should be used only within the document type classification codes.

## GEF Document Type Taxonomy

- |  |   |
|--|---|
| <p><b>01 Administrative Documents</b></p> <ul style="list-style-type: none"> <li>01.01 Overall Performance Studies (OPS)</li> <li>01.02 Monitoring &amp; Evaluation Documents (M &amp; E)</li> <li>01.03 Project Concept Papers, project plans, &amp; research recommendations</li> <li>01.04 Project preparation materials</li> <li>01.05 Action plans</li> <li>01.06 Strategic Action Programmes (SAP)</li> <li>01.07 Annual Performance Reports (APR)</li> <li>01.08 Terminal Evaluations</li> <li>01.09 Project Briefs</li> <li>01.10 Project Information Documents (PID) (including 'working' documents)</li> <li>01.11 Project Implementation Plans (PIPs)</li> <li>01.12 Final project summaries</li> <li>01.13 Program strategies &amp; plans</li> <li>01.14 Program descriptions &amp; information</li> </ul> <p><b>02 Legal Conventions</b></p> <p><b>03 Scientific, Technical &amp; Reference Documents</b></p> <ul style="list-style-type: none"> <li>03.01 Transboundary Diagnostic Analyses (TDA)</li> <li>03.02 Technical reports</li> <li>03.03 Lessons Learned &amp; Experience Notes</li> <li>03.04 Project Web sites (including Web links)</li> <li>03.05 Reference manuals (including 'how-to' instructions)</li> <li>03.06 Glossaries</li> <li>03.07 Bibliographies &amp; links to other Web sites</li> <li>03.08 Laws &amp; regulations</li> <li>03.09 Geographic Information System (GIS) datasets</li> <li>03.10 Statistical data, surveys &amp; datasets</li> <li>03.11 Charts &amp; diagrams</li> <li>03.12 Maps</li> <li>03.13 Photographs, Photo albums [galleries]</li> <li>03.14 Videos</li> <li>03.15 Graphics (not elsewhere classified)</li> <li>03.16 Sound recordings (e.g., MP3, audio CD, audiotape)</li> </ul> | <p><b>04 Outreach &amp; Public Education Documents</b></p> <ul style="list-style-type: none"> <li>04.01 Brochures</li> <li>04.02 E-Bulletins &amp; newsletters</li> <li>04.03 Press releases, news reports, event publicity photos and videos</li> <li>04.04 Project fact sheets</li> <li>04.05 FAQ files</li> <li>04.06 Newspaper &amp; magazine articles</li> </ul> <p><b>05 Event-Related Documents</b></p> <ul style="list-style-type: none"> <li>05.01 Calendars &amp; meeting announcements</li> <li>05.02 Conferences, workshops, seminars, &amp; other meeting summaries, proceedings</li> <li>05.03 Presentations (e.g., PowerPoint)</li> <li>05.04 Photos, videos, and sound recordings of the event [Publicity photos are grouped with press releases–04.03]</li> </ul> <p><b>06 Organization Documents</b></p> <ul style="list-style-type: none"> <li>06.01 Job announcements</li> <li>06.02 Organization charts &amp; related documents</li> <li>06.03 Office &amp; personnel directories</li> <li>06.04 Human resources documents</li> <li>06.05 Mailing lists</li> </ul> <p><b>07 Online Services</b></p> <ul style="list-style-type: none"> <li>07.01 Website Toolkit (PLONE)</li> <li>07.02 Forums &amp; blogs</li> </ul> <p><b>08 Miscellaneous Documents</b></p> <ul style="list-style-type: none"> <li>08.01 Log-Frame Analyses</li> <li>08.02 LOM Courses</li> </ul> |
|--|---|

## Navigation Taxonomies

Navigation taxonomies depend upon the vocabulary of the user to quickly find a list of resources. These terms are often “themes” that cross-cut the information resources on the site. On the IW:LEARN Web site, topics in the left-hand column under Navigation is such a taxonomy. The success of such a taxonomy depends upon how well users understand the terminology.

Whatever taxonomies are used on a Web site, the most important task in assuring the ongoing effectiveness of such a system is maintenance. The controlled vocabulary must be current and the rules that populate browsable topics must be kept updated to stay in tune with user interests, and to provide accurate rules for targeted search results.

## Audience Taxonomy

Documents are generally written with a specific audience in mind. This often influences the writing style, the jargon, and the presentation of information. A scientific report is not generally of interest to the public but may be to the administrators and managers of a project that might benefit from the scientific knowledge. The original taxonomy had eight categories, but after some experience with it, categories were combined to four. These are listed below.

### 01 Administrators

(project and program managers, some of who may be scientists or technical experts but are engaged in the managerial details of project monitoring, evaluation, and reporting)

### 02 Technical managers & Scientists

(individuals not interested in the administration details of projects and programs)

### 03 Policy makers

(decision makers at the local, national, regional, and global level who need to set socioeconomic goals and priorities for the allocation of fiscal resources and who develop legislation and regulations)

### 06 Public

(includes news media, educators, and the general public)



## Geographic Terminology

The Dublin Core provides for information about geographic location under the Coverage element. Country names are fairly straightforward but reference should be made to a standard. Similarly, GEF International Waters projects often focus on a single major river basin or water body.

In the case of the Regional Seas program, the reports and studies often deal with a particular Regional Sea. The following list of regions was used in indexing the regional seas reports

(<http://www.unep.org/regionalseas/>):

- Black Sea
- Eastern Africa
- East Asian Seas
- Mediterranean
- North-East Pacific
- North-West Pacific
- Red Sea & Gulf of Aden
- ROPME Sea Area
- South Asian Seas
- South Pacific
- Western Africa (West & Central Africa)
- Wider Caribbean

IW:LEARN should adopt a formal lexicon of geographic names, especially for river basins, lakes, and aquifers that are the subject of GEF projects.

## Section 5: Workflow for Assigning Terms

The task of assigning and/or reviewing of Metadata to information resources on the IW:LEARN Web site should be given to a single person or a small group who have this task as one of their principal duties. The Metadata should be reviewed and quality controlled for conformity to the Metadata policies of the Web site. These policies include the use of specific controlled vocabularies, thesauri, taxonomies, and coding standards. It should be emphasized that this is not a secretarial or clerical task.

The staff who undertake Metadata assignment and review will require some basic training. At a minimum they need the following qualifications:

- IW:LEARN Web site structure—thorough understanding of how information is arranged on the IW:LEARN Web site
- Terminology—familiarity with the terminology and jargon used to describe the information resources documents on the Web site
- Information types—familiarity with how information is categorized on the Web site and proper use of the document taxonomy
- Subject classification—familiar with the taxonomy of subject categories and how to apply them to the documents and other resources
- Index terms—understanding of how to identify the most important thoughts and concepts contained in a document and how to select appropriate terms from the thesaurus used to validate index terms. While it is impossible to know all the terms in a large thesaurus, over a period of time, users can learn the subset of the vocabulary that is most frequently used for the body of knowledge that is being indexed and can become quite efficient at assigning terms.
- Knowledge of water resources concepts—although it is not critical, a good understanding of the water and environmental sciences will help the indexer accurately assign terms and identify the most important concepts to index even though the term best describing the concept is not used in the document. For example, a document might discuss the irrigation water requirements of different crops but never mention “agricultural water use.”

The following steps assume that the indexer is working with the metadata on a PDF of the document in Adobe Acrobat Professional 8.0 although both Acrobat Professional versions 6.0 and 7.0 could be used. Note that the program menus for the earlier versions differ slightly from version 8.0.

We think that a similar sequence of steps could be followed in entering metadata into Plone.

## Metadata Entry

The following steps are to be followed when inserting metadata into a document:

1. Launch the PDF document in Adobe Acrobat and make sure that the file opens properly.
2. Test the PDF document to see that a searchable text layer is present by opening the search window (Edit > Search) and searching for a word in the title. A message will appear if the file is not searchable. If the file is not searchable, i.e., it is an image file, then the a text layer should be added to it. This is done by going to Document > OCR Text Recognition > Recognize Text Using OCR and choosing the appropriate language to be scanned from the popup menu. The new, searchable PDF must then be saved. Files can be run in batch mode. Note that as a general rule of thumb, documents must be scanned a setting of 300 ppi for black-and-white documents and 400 ppi for color documents in order to obtain images that can be processed by the Adobe OCR program. Acrobat can scan files with resolution as low as 144 ppi, but there will be accuracy and font recognition problems in the text file.
3. Select document properties (File > Properties) and note the file name, PDF producer, PDF version, and number of pages. If the PDF producer is Acrobat Distiller, or Microsoft Word (or another word processor or a web browser that has an Adobe PDF printer plug-in), the PDF image probably has a text overlay and the document is searchable.
4. “Copy” the name of the author, probably the name of the person who scanned the original document and created the PDF, click on the Additional Metadata button and paste the “author name” into the “Description Writer” field. This will preserve the information about who created the original PDF.
5. Enter the indexer’s name or initials into the Description Writer field as well. If you are reviewing the file, enter your name or initials. Doing so provides a list of people who are responsible for the file. Names are separated by semicolons. Click on OK button and return to the Document Properties page.
6. Fill in the title of the report as it appears on the title page of the document. If the resource does not have a “title,” assign one that characterizes its specific content.

7. Enter the document author's name into the Author field. This mostly likely will be "UNEP." All organization names should be spelled out and followed by their acronyms in parentheses. If the names of the authors who wrote the document are shown on the cover or title page of the report, they should be included here as well and entered as first name, initial, and last name. (Note: the usual practice is to invert names but with international authors it is often difficult to distinguish given name from family surname.)
8. Select 1-3 subject categories from the subject taxonomy and enter the codes (terms) into the Subject field separated by semicolons.
9. Select 7-10 terms or descriptors based on quick reading of the title, table of contents, abstract or executive summary, and document text. If the resource is a slide presentation, look at the title, and conclusions for terms. If the document has report number and is part of a series, enter the abbreviation of the series and the number of the report as a term. Also add a geographic location term. Include the name of a specific organization, program name, or convention (or its acronym, if appropriate). The rest of the index terms are taken from the thesaurus, Look up each term to be sure that it is a valid term (if unsure) and for suggestions of Broader than, Narrower than, and Related to terms. Enter the terms in the Keywords field separated by semicolons. The entire text string should be enclosed in quotes. In choosing keywords choose concepts that are likely to be used in searching for information and that represent a significant component or section of the document. Place all the text in the Keywords field between double quotes.
10. Click on the "Custom" tab at the top of the Documents Property page. Under custom properties, the rest of the Dublin Core metadata elements can be added. The label of the element is typed in the name field followed by its value. Proof read the entry and click on "Add" button. Then enter the next element and its value. When done, click on OK at the bottom of the page. The order of element entry is not important, but to make sure that none are forgotten, it is well to follow a routine. Below are the labels of the Dublin Core elements [dc:xxxx] to be entered into the Custom Properties window.
  - dc:type Select the type(s) from the type of document taxonomy and enter the terms separated by semicolons.
  - dc:source If the document is part of a numbered report series, insert the name of the series and the number of the report here. For example, the "Regional Seas Reports and Studies No. xx" or the "GEF Experience Notes yyyy-xx." A bibliographic citation might be placed here.
  - dc:coverage Spatial coverage is given by entering the region, subregion, country(ies), and river basin(s) that are the subject of the document or resource. These terms should be valid terms in the geographic controlled vocabulary list used in for the Web site.
  - dc:publisher Usually UNEP but could be a contracting organization.

- dc:contributor Other organizations who helped prepare the document or the names of consultants who assisted UNEP prepare the document that are not listed in the authors field.
- dc:date Date of publication or distribution (usually year -yyyy)
- dc:format For PDFs, the format is automatically recorded at the bottom of the Document Metadata page.
- dc:identifier Unique number that identifies the resource on the Web site. This identifier might also be used for the file name. If the file name of the resource is changed place the old file name here to preserve it.

11. The Dublin Core also provides for a qualifier dcterms:bibliographicCitation to be inserted here if a citation is used to identify the document.

- dc:language Insert the two- or three-letter standard code for the language of the resources, e.g., en = English; fr = French, and es = Spanish.
- dcterms:audience Audience for who the document was primarily prepared. Select an audience from the controlled vocabulary list of user categories.

12. Proof the custom property entries and click on OK

13. Save the file using “File>Save” as and rename the PDF with a unique identifier for the file that will be used in the Plone file name to link the file to the metadata.

## Post Processing

With text read by the OCR and the metadata now embedded in the PDF file, the file can be reduced in size by removing extraneous materials such as hidden reviewers’ corrections and commands used for commercial publication. A PDF file can also be “optimized” for rapid viewing by a Web browser.

To optimize the PDF in one step, open the file and select Advance > PDF Optimization. Use the Standard setting. We recommend that all files be kept compatible with Adobe Acrobat Reader 5.0, which will be compatible with all later versions as well.

If desired, the metadata can be saved at this time as an Adobe XMP (Extensible Metadata Platform) file in XML. The file, which has the same file name as the document but with a suffix of .XMP can be read by a simple text editor to reveal the XML coding.

A similar manual workflow should be developed for use with the Plone System. It should be possible to write a script to copy the metadata from a XMP file and insert it into the Plone metadata catalogue. This possibility needs to be researched.

## Section 6: Informal Observations about the IW:LEARN Web Site

The Internet has become a powerful tool for the storage and sharing of information and the building of communities among dispersed users. However, as the use of the Internet has grown, the task of discovering and retrieving information that is relevant to the one's interests has become increasingly difficult. IW:LEARN is in the business of making the information gathered by the GEF IW projects available to the GEF community, to the international water resources community and to the interested public. The problems of finding relevant information on a single Web site is much the same as finding information on the Internet. Where is the information of interest stored, and how is it structured? How can it be rapidly retrieved? How do I avoid spending time drilling down through a series of links, only to find pages that are empty of content? How can I avoid downloading documents that are not to be relevant to my search?

These questions have been addressed by librarians and information scientists for books and print media for many years. Unfortunately, the training of most computer systems engineers and Web site designers have not included the basic tools of library science: classification procedures, cataloging, indexing, thesaurus development, and the creation of controlled vocabularies. These concepts have often been given other nomenclature in the computer world. All too often Web site designers and information specialists talk at cross purposes because of the different terminology and approach to information retrieval that they use in their respective professions.

During this project, we visited the pages of the IW:LEARN Web site, downloaded documents, and analyzed their content. In the process of navigating the site, we encountered opportunities to improve access to information on the Web site. We also encountered obstacles to understanding the content and its context. We also noticed inconsistencies in the treatment of information. While this review of the Web site is neither systematic nor inclusive, we believe that documenting our user experience is worthwhile. Thus, the observations recorded below might be viewed as a reviewer's red ink on a manuscript: places where the reader stumbled or got confused. As such they may be helpful in directing the attention of the IW:LEARN staff to areas of the site that might be redesigned or revised.

The point of view taken in looking at the IW:LEARN site is that of a water resources professional seeking information dealing with all aspects of the management and development of transboundary river basins worldwide. We assume that the user has no knowledge of the Global Environment Facility (GEF) or its programs. Our thinking is strongly influenced by *Web Style Guide* by Patrick Lynch and Sarah Gorton, Yale University Press, 2nd Edition (2002). This book, available in both hard copy and online (<http://www.webstyleguide.com>), is an excellent introduction to Web design and has many of the characteristics that a style manual has for printed documents. As the authors note, concepts for structuring and accessing information in books and documents are well established.

Following a standard language-usage style manual for documents and Web site will greatly aid in Web page consistency. These guides provide standards not only for punctuation and grammar but also for figure, table, and bibliographic citation format. Consistently following a designated style manual

ensures the Web site will have the same spelling for words that have several variants e.g., Web site, Web site, website. The most widely used English-language style manuals for scholarly works are (1) The Chicago Manual of Style (15<sup>th</sup> edition) from the University of Chicago Press, which is available both in hard copy and online for a fee (<http://www.chicagomanualofstyle.org>) and (2) the Oxford Style Manual from Oxford University Press (<http://www.oup.com/uk/catalogue/?ci=9780198605645>).

We believe that most of the suggestions below can be implemented within the context of Plone Content Management System (<http://www.plone.org>).

## Audience

Who are the users of a Web site? An interesting and informative evaluation of the South China Sea Project Web site and efforts to develop a collaborative information base for the project (<http://www.unepscs.org.SCSSstartdown/1867.html>) identifies five types of Web site users. Their classification of users is based on their access rights to the Content Management System's functions. Access rights refers to a user's ability to post, edit, and manipulate files on the Web site—as opposed to the users of the site's information content.

Critical to the Web site design are the types of people who use the Web site's content, their familiarity with the information resources available on the site, and their understanding of the terminology used to describe these resources.

The audience for information resources is sufficiently important for it to be part of the metadata described in the Dublin Core (<http://www.dublincore.org/documents/2005/11/07/userguide/>). The Audience is "A class of entity for whom the resource is intended to be useful (Para. 4.16)." The Dublin Core recommends that a controlled vocabulary be used to describe the Audience. For the IW:LEARN Web site, the user categories might be defined as follows:

- 01 Administrators – Project and programme managers responsible for day-to-day operations of projects and programs. They often are technical people who run investigations and incorporate technical information into the plans and strategies of their activities.
- 02 Technical managers / scientists – Technical people from outside the projects and programmes in National and other international organizations who may use the information in their own work.
- 03 Policy makers – Environmental policy makers and decision makers who use the report / document information to formulate policy at the local, national, and international levels. Generally, they will be more interested in assessments of environmental conditions and information on strategies, priorities and recommendations than on technical detail.

06 Public – The “public” represents a very broad category of interest and knowledgeable people who are interested in the topics covered by the documents. They include educators, students, and news media.

Originally, a more elaborate classification was tested, but it is often hard to discern the principal audience for which a specific document was written. Many documents will appeal to Administrators, technical managers, and also policy makers.

## Jargon and Acronyms

A constant problem in all professions is the frequently changing terminology as issues come and go. Geographic data systems, climate change, and constructed wetlands were not common terms a decade ago. Similarly, terminology is often a barrier to productive communications between technical disciplines, such as economics, law, and natural resources. A glossary of terms and acronyms would be a useful aid to the searcher. Indeed, there is a glossary of water terms accessible via the IW:LEARN Web site stored as documents > others > datasets > Water Science Glossary of Terms• that we located by doing a full-text search query on glossary. This resource links to the U.S. Geological Survey’s (USGS) list of water terms for use in better understanding the USGS site. A better glossary, mentioned on the USGS site is Water Words Dictionary• which is available online at <http://www.water.nv.gov/WaterPlanning/dict-1/ww-index.cfm>. This extensive glossary, compiled by Gary A. Horton, a former employee of the Nevada Division of Water Resources, is no longer updated online but is still the best dictionary (glossary) of English-language water resources terminology available online.

A second glossary retrieved in our search of the IW:LEARN site was located at toolkit > toolkit documentation center > glossary definitions. Clicking on the link, however, displays a blank page.

On the home page of IW:LEARN, the definition of GEF IW:LEARN speaks of the Web site as a “Knowledge Base ...for the portfolio.”• A more user-friendly description would be “an information resource for GEF IW:LEARN that contains an extensive collection of materials about the GEF’s international waters projects.” “Knowledge base” is computer science jargon and “portfolio” in the sense used here is financial jargon.

The acronym GEF is not defined on the home page. One has to go to another page, Contacts for example, to find the actual name of the organization. All acronyms and abbreviations should be spelled out the first time they are used on a Web page or in a report. In addition, users should be provided with a list of acronyms used in the online documents as well as on the Web pages of the site. Nearly all reports in the UNEP Regional Seas Reports and Studies contain a table of acronyms to help the user wade through the alphabet soup of international organizations. These could be amalgamated and posted on the Web site.

Finally, there is the question: what is in a given document? As a novice user of the site, we expected to find “technical reports”• produced by each project that would contain natural resource inventories,



hydrologic balances, water use information, information about the aquatic biology of a river, water quality and stream discharge information, etc.—in other words, the nuts and bolts of water resources assessments and investigations. On the other hand, we also expected to find “administrative reports” that addressed project proposals, plans, and progress. These would provide the basis for program managers to track the progress of each project. Yet Strategic Action Programme documents, the agreements between countries and partner organizations as what will be done in the project, are considered by GEF to be “technical reports.”• This will not present a problem to those intimately familiar to GEF projects and GEF terminology, but to outsiders it presents an major obstacle to finding information.

## Guide for New Users

Another item for the home page would be a prominent menu link for the benefit of new and infrequent users of the Web site. Librarians often prepare a “reader’s guide” to a particular topic to help students find relevant information sources in their library. The Guide for New Users page would provide analogous service. It should answer the following questions.

1. How is information structured on the site?

This might be a description of the types of information found of the site, how the information is arranged or grouped, and brief definitions of document types unlikely to be familiar to most users, e.g., Transboundary Diagnostic Analyses.

A description of the GEF project approval process and the types of documents that are associated with the typical project also might be useful here. It should describe the process of project proposals and approval, preparation of the Transboundary Diagnostic Analyses (TDAs), the Strategic Action Programmes (SAPs), monitoring and evaluation (M&E) reports, progress reports, and final project reports over the life cycle of a project.

2. How do I navigate the site? Tips and shortcuts
3. How do I search the site?

Use of the navigation buttons, quick links, the search box, how to use the site index, and other search features that a new user might overlook.

4. What is the meaning of various technical terms and acronyms?

Include a glossary of terms and acronyms used on the site.

## Drilling Down

There are a number of frustrations that can lead users to quickly give up searching a Web site for information. The first one deals with consistency of site behavior and page layout. The IW:LEARN appears to do a good job of tracking where you are in the hierarchy of pages by using the tracking bar at the top of the page. From page to page the navigation aids are consistent.

To retrieve the Mediterranean Strategic Action Plan (1998), however, it takes five mouse clicks to get the document: (1) using the Documents navigation button to get to a list of documents, (2) SAP documents, (3) the Mediterranean SAP title, (4) the Mediterranean SAP page with abstract, and (5) [Click-here-to-get-the-file](#) download link. This could easily be reduced to three mouse clicks: (1) SAP link on the home page under the [Documents Center](#) label; (2) SAP list with abstract under each; (3) [Click here to get the file](#).

This flattening of the hierarchy would make life much easier for those with slow Internet connections although it might not be practical if the abstracts or file descriptions were lengthy. This approach was taken by the [Documents > Project Related Documents > Reports](#) section where each of the reports is listed with a description. All that is needed here is a download button and the PDF file size. Clicking on the fifth report in the list, "Capabilities and Limitations of Decision Support Systems" takes the user to yet another report page with the [Click here to get the file](#) link. Again this seems like a step that could easily be eliminated.

## Dates

The date of report publication is an extremely important piece of information. Is the report recent or is it ancient history? Most of the TDA, SAP, and M&E reports have a date (year) attached to the report title by a dash or in parentheses and the size of the PDF file. On the other hand, in the category named [Project-Related Documents](#), the Project Fact Sheets, Project Information Documents, Reports, and other resources have no dates.

Within the project database, it would be helpful for the user to know the beginning and ending dates of projects. Perhaps the beginning date and ending date could be shown as a range in parentheses after the project title, e.g. (1998-2003) or for a current project just the beginning date, e.g. (2003- ). The Dublin Core provides for such temporal coverage data under the Coverage element. At present only beginning dates are shown in the [Project Documents](#) section.

## How Many Documents?

It also would be helpful to know how many documents are in a particular category. This is especially true in the projects database where a template has been established for each project. Project documents are shown as residing in folders for (1) Outreach materials, (2) Evaluation Reports, (3) Maps/Graphics, (4) Datasets, (5) Workshops, (6) Project Documents, and (7) Technical Reports. Except for those projects where it explicitly states "There are no documents for this project," there is great uncertainty

for users as to which folder to open. For example, the "Implementation of the Strategic Action Programme for the Red Sea and Gulf of Aden"(GEF ID 340) has 18 newsletters (with dates) under Outreach Materials but no documents in any of the folders labeled Evaluation Reports, Maps/Graphics, Datasets, and Workshops. There are three documents under Project Documents and a SAP under Technical Reports. This took approximately 15 minutes to discover with a telephone dial-up modem connection to the Internet.

One solution would be to indicate next to each report category, number of documents in each folder and/or to not show any empty folders. In the case of the Red Sea project (GEF ID 340), one would have expected to find many more documents for a project that has been completed. Similarly, it would be helpful to know that there are 19 SAPs, 17 TDAs and 10 Specially Managed Project Reviews (SMPRs) on the documents page.

There are 187 project records in the IW:LEARN database based on a search for "All" in the query box. Presumably, these are all GEF IW projects. The GEF IW Project list (<http://www.gefonline.org/projectlist>) shows 134 project records. Why do the two lists not have the same number of projects on them?

## Downloads

The Click here to get the file link combined with the icon for the type of application file (mostly PDFs) and the file size worked well in most cases. An annoying aspect of some Web sites is that they link of a document title directly to the file address of the download with no indication of the type of file or its size. As a result, when you click on a title hoping to find more information about the report, it is an unhappy surprise to find that you are downloading a 30 Mb document that you may well have no use for. This may not be a problem for people with fast high-speed Internet connections, but for those connected only by telephone wires it can be extremely tedious, especially if the document is not particularly relevant. Knowing the document size is extremely valuable, however. People without high-speed Internet connections can then decide to postpone the downloading a document until they can travel to a place with broadband access or else plan on a time to stay connected for the hours needed to complete the download.

## Projects

The project is the central unifying theme of the IW:LEARN information content. The Web site contains mostly information about projects, project status, and documents produced by projects. Although we did not meticulously cross check documents in the project file folders against those listed on the Documents page, our examination gave the impression that some, and perhaps many, documents listed by type (TDAs, SPAs, etc.) are not contained in their appropriate project folders. This is an area that needs attention.

A useful display for accessing these documents would be the table that appears as a result of the project search (<http://www.iwlearn.net/iw-projects>). We suggest adding the GEF identification number as a first column and then adding a set of seven one or two character wide columns where space for the project Web site URL is allocated. An X in the appropriate columns would represent the presence of project reports of the seven types listed on the project page. A blank column entry would signify the absence of a report. Alternatively, the X might be replaced by the actual number of reports in the project file of that type. The X (or number) would be linked to the appropriate project folder, thus permitting rapid access to the appropriate project document.

### Project Files

The layout of the Project File is pleasing and informative. It would be helpful to add a thumbnail-size outline map to show the approximate location of the river basin and/or the countries engaged in the study. Such maps might be obtained from Aaron Wolfe's International Atlas Project (<http://www.transboundarywaters.orst.edu/>).

In the General Information and GEF Characteristic [should be Characteristics] for each project, there appears to be occasional discrepancies. GEF ID 342 (Danube River Pollution Reduction Programme) shows its Project Status as "Completed," the GEF Project Stage as "Completed," but there is no End date for the project. GEF ID 392 (Regional Oceans Training Program) Project Status is shown as "Closed," but there is no End date shown nor a GEF Project State. GEF ID 803 (Volta River Basin) shows the Project Status as "Under Implementation," but the project has an End Date. Moreover, the GEF Project State shows that the project is CEO Endorsed. Should the Volta project have a Project Status of "Completed?" These inconsistencies are confusing to someone not familiar with the GEF nomenclature for projects. It is not clear what the difference is between Project Status and Project Stage.

Each project shows a listing of report types: Outreach, Evaluation Reports, Maps/Graphics, Datasets, Workshops, Project Documents, and Technical Reports. These headings should be revised to distinguish between administrative reports and scientific reports. Clicking on Outreach documents for GEF ID 789 [Benguela Current Large Marine Ecosystem (BCLME) Programme] yields a good list of Newsletters with brief descriptions of their contents. The Evaluation Reports folder is empty, but the BCLME Web site (<http://www.bclme.org>) shows three GEF Mid-Term evaluation reports. Presumably, these should be in the Evaluation Reports folder. Similarly BCLME has eight thematic reports ("integrated overviews") that contain useful scientific information about the ecosystem. Three of these reports are attached to the BCLME TDA. Another thematic report on socioeconomics attached to the TDA has at title page and table of contents, but the report itself is missing. All eight thematic reports should be listed on the BCLME project page of the IW:LEARN Web site.

## Log Frame

The Log Frame is a category that contains more than 7000 items. Presumably, the category was created when information resources were moved from the previous IW:LEARN Web site to the present system. These resources should be examined and moved to their appropriate locations within the new IW:LEARN Web site or deleted if they are no longer relevant.

## Document Identification

The documents that we looked at on the UNEP Regional Seas Web site were part of a series entitled, Regional Seas Reports and Studies. Each report has a unique number in its series; thus the filenames could be the same as the number: rrs003, rrs004, etc. It would increase the effectiveness of IW:LEARN Web site management to assign a unique number to each document on the Web site. The accession number of the document could serve as this unique number and also as the name of the file. The file name should not be confused with the document title which is often used in a creatively abbreviated form as the document name. Conversely, each document could be identified by the GEF Project ID and a sequence number assigned in chronological order as the documents are produced and entered into the IW:LEARN project database. Unique identification would assist in the review and editing of document metadata as the need arises.

## Site Structure and Navigation

To assist us in finding our way around the IW:LEARN Web site we created our own site map (Appendix 7). The map, based on the IW:LEARN site map, shows up to five levels below the home page, for example:

Home > Documents > GEF IW Experience Notes > Process > Public/Private partnership in TWM [2].

The number in brackets indicates the number of documents listed on the Public/Private Partnership page. This page, which shows two Experience Notes, ideally could be directly accessed from the site map.

Another approach is site navigation is used by the Montague Institute to access the contents of their Web site (Appendix 8). In addition to a search box for a full-text search of documents on the site, the Index page (<http://www.montague.com/Public/indexes.htm>) has an A-Z index across the top of the page that determines what range of index terms are shown in the left hand column (frame). Each index term shows the number of documents to which the term has been assigned. Clicking on a term brings up a page with a list of document titles (Appendix 9). Alternatively, a subject index can be displayed or a list of organizations or people mentioned in the documents. Instructions for searching are contained in the right-hand frame. This, of course, requires organizations' and peoples' names to be included in the metadata.

A similar approach might be to list the theme folders, one for each major subject category, on the Site Map page or Home page and show the number of documents in each folder. The World Bank site map provides detailed access to many types of its holdings (Appendix 10)

Finally, we were impressed by the European Environmental Agency's (EEA) use of the Plone Content Management System to create multiple ways to access the content of their Web site. Some of these features are listed below:

- Environmental Themes—a topics folder page (<http://www.eea.europa.eu/themes>) (See Appendix 11)
- A-Z Index of Environmental Terms—a list of the terminology used on the EEA Web site (<http://glossary.eea.europa.eu/terminology>)
- Overview of EEA Products—a description of the contents of the major information products on their Web site (<http://www.eea.europa.eu/products>) (See Appendix 12)

There are a few other design features that might be adopted by the IW:LEARN Web site. In particular, in describing some of their datasets, EEA included the record's metadata. The Coverage element included a thumbnail outline map showing the country coverage of the dataset in addition to a list of countries. This simple maps help orient the user to the location of the dataset and its extent. Such regional outline maps might be made part of the GEF project files.

Also, we suspect that the cartoon-like icons, such as the cute detective next to the search box may detract from the seriousness of a Web site containing technical information for professional managers, scientists, engineers, etc. This clearly is a matter of individual preference, but we feel that these icons would be more at home on a Web site for use by laypersons and/or students. Inclusion of organizations' icons, of course, is definitely helpful.

## Conclusion

We believe that with appropriate metadata and utilizing the versatility of the Plone Content Management System, the information content of the IW:LEARN Web site can be more effectively displayed by using the approaches currently used on sites that make good use of the tools of library science. The Montague Institute, which specializes in training organizational IT personnel in their use, provides one such example. The EEA site demonstrates that the Plone system can attractively implement some of these tools.



## Section 7: Results of indexing Regional Seas Reports and Selected GEF documents

The discussion in this section reflects our experience with indexing and entering metadata for the documents obtained from the Regional Seas and IW:LEARN Web sites. As part of this project, we indexed and created a complete suite of metadata for 168 Regional Seas Reports and 44 GEF documents from the IW:LEARN Web site.

### Regional Seas Reports

The UNEP Regional Seas Programme lists four report series on their Web site:

1. Regional Seas Reports and Studies (RSRS)—184 reports of which 13 are missing from the list and 9 are listed but do not have links to downloadable files (See Appendix 13).
2. Directories and Bibliographies (RSDB)—RSDB 12 to RSDB 36 listed with many missing in the sequence. None have links to PDFs.
3. Reference Methods for Marine Pollution Studies (RSRM)—RSRM 0 to RSRM 61 listed with 9 reports missing from the sequence. None have links.
4. Technical Bulletins for Marine Pollution Studies (RSTB) —Only one report is listed and it has no link.

Missing reports. Some of the missing reports in the numbered sequence may never have been published. We received a list of documents prepared by Esther Maina entitled "Nairobi and Abidjan Convention Regional Seas and other Relevant Reports" (Personal communication from Sean Khan, April 28, 2008) that listed a number of Regional Seas reports. We had all those listed except RSRS 140. We did not have any of the unnumbered documents, the EAFPOL document, the MARPOL documents, and the GESAMP documents not published in the RSRS series (GESAMP 57, 58, 61, 62, 63, 64, and 65). These documents apparently have been scanned and uploaded to a Web site although no URL of their location was given.

We downloaded 168 reports in PDF format from the Regional Seas Programme Web site ([http://www.unep.org/regionalseas/Publications/Reports/Series\\_Reports/Reports\\_and\\_Studies/default.asp](http://www.unep.org/regionalseas/Publications/Reports/Series_Reports/Reports_and_Studies/default.asp)). Two additional meeting reports (<http://www.unep.org/regionalseas/Publications>) and one Reference Method for Marine Pollution Studies (RSRM No. 20) ([http://www.unep.org/regionalseas/Publications/Reports/Series\\_Reports/Reference\\_Methods/default.asp](http://www.unep.org/regionalseas/Publications/Reports/Series_Reports/Reference_Methods/default.asp)) were also downloaded as examples of publications on the site.



None of the other documents had links to PDF files. The Web sites note by way of explanation that "Many [reports] are out of print, but some are available from Earthprint or by special request from Regional Seas headquarters."

Quality of documents. The downloads proceeded quickly using a high-speed Internet connection. On examination of the PDF files, some were of poor quality (e.g., RSRS-12). This was most likely caused by the poor quality reproduction of the original report that was available of scanning. A few lacked images of the report covers and occasionally, pages were upside down. Some of these pages were extracted from the document, rotated 180 degrees, and reinserted in the proper position in the document. Reports from the 1980s were scanned as images only. Initially, the OCR program that we used rejected some of the reports because of their poor quality. Later, we were able to successfully add a searchable text layer to the file using the OCR program that is part of Adobe Acrobat Professional version 8.0. However, because of the poor quality of the image, there may be issues of accuracy of the text conversion.

Reduction of Document File Size. One document, RSRS-177 is shown on the Regional Seas Web site in seven parts ranging in size from 294 KB to 2806 KB. These files were concatenated into a single file of 9.3 MB that is less awkward to download and somewhat smaller than the original file. Other documents, especially the more recent ones with color illustrations contained information used by the publisher when printing the report. The Adobe Acrobat PDF Optimizer program (Advanced>PDF Optimizer in Adobe Acrobat Professional 8.0) was run as the last step in processing all documents. In some cases, this resulted in a 20 percent reduction in the physical size of the file.

## GEF Documents

In addition to the Regional Seas documents, we download 44 documents from the IW:LEARN Web site. We attempted to select 3-4 documents from each of 13 categories based on those reports listed in the "Document Center" ( <http://www.iwlearn.net/publications>). The categories included

- Strategic Action Programmes (SAP) Transboundary Diagnostic Analyses (TDA)
- Monitoring and Evaluation Documents (M & E)
- GEF Policies and Programmes Documents
- Lessons Learned
- GEF Experience Note
- Project Fact Sheets
- Project Briefs
- Project Documents
- Project Information Documents
- Reports
- Presentations
- Miscellaneous.

File conversion to PDF. Most of the documents downloaded were PDF files. Those that were Microsoft Word documents and PowerPoint presentations were converted to PDF files. We would recommend that all documents on the IW:LEARN site be stored as PDF files.

Incomplete documents. Originally, we had hoped to show a full range of document types from one GEF project. However, few projects seemed to have a complete range of documents, even those marked as completed. In other cases, document contents that had appendices, were incomplete in that they were missing parts. For example, the Benguela Current Large Marine Ecosystem (BCLME) Programme Transboundary Diagnostic Analysis (1999) indicates that there are six thematic reports that are part of the TDA. Only three thematic reports are contained in the PDF. In addition, of the appendices, the title page and report ("Notes on Angolan Oceanographic Cruise and Data") for Appendix V is missing (p. 279) as is another document (p. 284). All this information is available from the BCLME Web site (<http://www.bclme.org>)

Another example of missing material, is the Dnipro River SAP. Annex 1 of the Agreement of Cooperation refers to three other annexes containing information about the SAP, such as Annex 4 -- Institutional framework of the SAP implementation. These are missing. This suggests that some quality control procedures should be applied to scanned documents before uploading them to a Web site.

Metadata Entry. We encountered a number of instances where we needed to make decisions about what and how to enter metadata into the Properties box of the PDF files. These are noted below for the record and for possible decisions for the future entry of metadata.

Metadata format. The Adobe Extensible Metadata Platform (XMP) allows for the creation of XMP files for each record that contain the metadata embedded in the PDF file written out in XML (see Appendix 14 for an example of the RSRS-184). These XMP files can be read and edited with a text editor, such as BBEdit (Barebones Software) or TextPad. XML conventions call for text strings of metadata elements to be enclosed in quotes (usually double quotes). Following this convention, all the text in the Adobe property fields and the text data in the names of the Custom Properties should be enclosed in double quotes. When saving metadata using XMP, the Adobe program does not insert quotes.

As a process has not yet been defined for transferring the metadata prepared as part of this contract to the Plone Content Management System, we only placed quotes around the index terms entered in to the Adobe Document Properties "Keywords" field. These keywords are separated by semicolons. Examples of the use of embedded PDF metadata is inconsistent. All text strings in some examples are enclosed in quotes and others examples do not use quotes at all.

We decided to only use quotes with the index terms. If necessary, quotes can be removed or added to the field in the XMP files using the search-and-replace function of a text editor.

Locked Files. A minor problem was encountered when opening reports in the Lessons Learned category; e.g., LL2005. These PDF files had security locks on them, making it impossible to add

information to the property fields. Perhaps a policy is needed as to under what conditions passworded locks should be placed on files on the IW:LEARN Web site.

Programme vs Program vs Project. Another policy issue is the use of the British spelling of the word programme versus the American spelling, program. Both spellings are in use in the files. The World Bank thesaurus instructs the user to use program instead of programme. We followed this in assigning index terms. However, programme is part of the official name of a program such as the "Regional Seas Programme." Thus, we used the British spelling when referring to an official name, such as "Strategic Action Programme."

There is also the problem in distinguishing between programs and projects. Usually, we think of a program (the Regional Seas Programme) to be made up of a number of smaller projects. However, these smaller regional and even national projects may be called programs. Further, a GEF project for a specific river basin has a Strategic Action Programme, although one or two projects call it a "Strategic Action Plan." This nomenclature is sometimes confusing, but probably cannot be changed.

## Adobe XMP Metadata Fields

### Document Properties

Title. Copied from the report title page. On rare occasion, a title might have to be made up to characterize a resource, such as an image or a map.

Author. Usually the author is show on the title page of a report. In the Regional Seas reports, if the author was listed on the title page, the authors name was placed here. Otherwise, a corporate author was assigned, usually, United Nations Environment Programme (UNEP) often proceeded by a collaborating organization such as International Union for Conservation of Nature (IUCN). Usually, all the organizations whose logos appeared on the report cover were included. If consultants were mention in the last or next to last paragraph of the report preface, they were listed as contributors in the Custom properties (dc:contributor).

In the International Waters projects, names of authors were mentioned infrequently. Global Environment Facility (GEF) was an obvious corporate author but often the work was done later on by a regional organization. Then there is the question of the executing and implement agencies of the project. We were probably not consistent in the application of these corporate authors to the reports.

Subject. The subject field is used for the subject categories, the numeric code and name of the broad fields of document content. Usually, we assigned two or three categories to a report. The subject taxonomy is a "living" document" and can be added to an expanded as necessary. Its current form is based on the actual content of the Regional Seas document collection and expectations about the content of the GEF documents based on the sample that we indexed.

Keywords. The index terms or descriptors entered into the "keywords" field reflect the important topics and concepts covered in the report. They usually are selected by reviewing the title, table of contents, abstract or executive summary, and illustrations in the text. Some terms -- properly called "Identifiers" -- inserted in this field were geographic names of a regional seas region, a country, city, or body of water. We also placed here the regional seas report number ("RSRS-020") to provide an easy way of retrieving a specific report number or a specific geographic area. In the case of the GEF documents, if we knew the GEF Project identification number, we inserted it here as well. This may be unnecessary duplication of metadata found in the source, identity, and coverage Dublin Core elements depending upon how the Web site's search engine is set up.

As terms occurred to us, we would look them up on line in the World Bank Thesaurus (<http://www2.multites.com/wb>) to validate them. This process went surprisingly quickly, even with a low speed Internet connection. Ideally, 7-10 terms would be selected in this manner.

As indicated above, this text is enclosed in quotes.

Description writer. Here we placed the name or initials of the individual who scanned the document, if known from the original PDF and "Beaver Wood Associates" to indicate our role in creating the file. Similarly, the names of initials of staff who review of prepare information should be recorded to provide a source should questions arise later.

### Custom Properties

dc:type. The document type taxonomy also can be expanded as needed. The original taxonomy was based on the GEF documents. The Regional Seas documents, however, had "Action Plans" rather than "Strategic Action Programs." Many of the Regional Seas reports were problem overviews used to prepare regional and nation action plans. Thus, such reports were identified as "03.11 Problem overviews & assessments" and "01.04 Project preparation materials." They served both an administrative and a technical function. In another example, a workshop proceedings containing a number of authored papers was identified as both "05.02 Conferences and workshops and 03.02 Technical reports.

dc:source. The source is usually the work from which the resource is derived. In the case of the Regional Seas reports we used the phrase "UNEP Regional Seas Reports and Studies No. xx." In the case of GEF reports, we used Global Environment Facility (GEF). In other contexts, this element could contain the bibliographic citation to the source of the resource. IW:LEARN might wish to consider adopting a standardized bibliographic citation format for this field.

dc:coverage. We inserted here the Regional Seas region following the geographic nomenclature used on the Regional Seas Web site followed by the names of individual countries, if appropriate. On occasion, this included the name of a city or a lake. In the case of GEF reports, we used the name of the river basin, and in the case of the Danube River the name of the Black Sea that it impacts environmentally.

dc: publisher. We placed the name of the publisher here. Almost always it was the United Nations Environment Programme (UNEP) or the Global Environment Facility (GEF). For a few items it may be the organization that placed the resource on the Web site.

dc:contributor. Individuals or organizations are listed here who authored the documents but are not formally listed on the title page (see "Author" above).

dc.date. As noted in our comments on the IW:LEARN Web site, every document should have a date. Some, but not all, of the document titles on the IW:LEARN Web site have dates affixed to the end of the title. We followed this approach and added the publication date to the reports in parentheses at the end of the title. In some documents, there was no publication date. In these cases we used the document creation date. All dates are given as yyyy or mm-dd-yy. The format of dates other than the year needs to be standardized.

dc:format. This is already provided by Adobe Acrobat.

dc:identifier . We assigned the number of the regional seas report to this element, e.g., rsrc020. We used the actual file name for the GEF documents.

dc:language. We used the international standard two-letter codes for English, French, and Spanish.

dcterms:audience. Originally we had a taxonomy of eight document user types—groups of people for whom a document was written or who would benefit from it. This classification was later reduced to four categories as we found it very hard to distinguish between groups. In most cases, project and program administrators (technical managers and staff scientists) will benefit from many reports. More work may be needed on this element.

## Summary

In summary, the Regional Seas reports followed a distinct pattern that made their classification and indexing straightforward. The GEF documents were much more diverse and challenging. By first grouping them by GEF project identification number and then by type of document, indexing them should be less of a chore.

## Section 8: Summary and Recommendations

During this project a number of tasks were completed.

1. IW:LEARN Taxonomy Development—A subject classification schema for the subject contents of documents on IW:LEARN and the UNEP Regional Seas Web sites was completed. The taxonomy, coded alphanumerically, contains 19 major headings and 93 subgroups. The major subject headings and subgroups should be relatively static. Additional subdivisions of the subgroups may be necessary as the subject content of the report changes over time.
2. IW:LEARN Taxonomy Application—The taxonomy for subject content and document type was applied to samples of 44 IW:LEARN documents. A workflow for assigning metadata to the documents using the Dublin Core metadata elements was developed, assuming that the metadata would be embedded in the PDF files and stored in the Plone metadata registry.

Additional taxonomies and controlled vocabularies need to be adopted by IW:LEARN to be able to assign values to the full Dublin Core set of metadata elements.

3. Review of the GEMET Thesaurus —A number of existing thesauri were reviewed for possible use in assigning index terms (keywords) to the IW:LEARN Web site document, including the GEMET Thesaurus. We recommend that IW:LEARN use the World Bank Thesaurus because of its scope, multilingual content and high level of support. There is an excellent opportunity for collaboration between IW:LEARN and the World Bank in the support of this resource. The GEMET Thesaurus or EEA Glossary could be a source of translated terms for use by both UNEP and World Bank. Acquisition of the MultiTes software (used by the World Bank to maintain their thesaurus) for office use would allow the use of the World Bank Thesaurus offline.
4. Taxonomy Development for the GEF Project Data Base—A document type taxonomy was developed to include the many types of documents and information resources found on the IW:LEARN Web site. The taxonomy, coded numerically, has 8 major groups and 49 subgroups.
5. Observations about the IW:LEARN Web site—The current design of the IW:LEARN Web site was reviewed from the point of view of a technical water resources person seeking technical information. We have made suggestions to develop an A-Z site index for the site, topical theme pages, more detailed site map for direct linkage to specific information, information on report publication dates, incorporate the use of thumbnail outline maps for the location of projects in the project file and providing information about the number of resources contained in a particular category. The European Environmental Agency uses the Plone Content Management System and provides examples of the design elements that we think could improve access to information on the IW:LEARN Web site.

6. Assign Metadata to Selected Contents of IW:LEARN Web site—We assigned Metadata to 162 Regional Seas Reports out of the 184 which were listed. Thirteen reports are missing from the UNEP Regional Seas Web site, and another nine are listed but unavailable. These reports may never have been scanned. In the process of downloading the PDF report files, those reports missing a text layer were processed by an optical character recognition reader so that all these PDF files are searchable. In addition, the files were optimized using Adobe Acrobat Professional 8.0 to reduce their physical size. In some cases a 20 percent reduction in file size was obtained. The Metadata for the Dublin Core elements were embedded in each PDF file using the Properties field of each file and a work flow developed for embedding similar information in other PDF files on the IW:LEARN Web site. These records are submitted on a DVD as a separate addendum to this report.
7. Compilation of Potential Sources for Data and Information for Projects in the Caribbean Region—This task was completed on November 17, 2007. A separate report was submitted to UNEP/DEWA.

## **Appendixes**

- Appendix 1: Index Map Showing the Coverage of a Dataset
- Appendix 2: “Marine pollution” in the GEMET Thesaurus (EEA, EIONET)
- Appendix 3: “Marine pollution” in the European Environmental Agency Glossary
- Appendix 4: “Marine pollution” in the UNESCO Thesaurus
- Appendix 5: World Bank Thesaurus Facet Categories
- Appendix 6: “Marine pollution” in the World Bank Thesaurus
- Appendix 7: Structure of the IW:LEARN Web Site
- Appendix 8: Montague Institute Search Page
- Appendix 9: Montague Institute Index Search Page
- Appendix 10: World Bank Web Site Map
- Appendix 11: European Environmental Agency Theme Map
- Appendix 12: Overview of European Environmental Agency Products
- Appendix 13: List of Regional Seas Reports and Studies
- Appendix 14: XML Data for Regional Seas Report No. 184



## Appendix 1: Use of an Index Map To Show the Coverage of a Dataset.

**EEA**

European Environment Agency



# Land-cover change within the 10 km coastal zone of 17 EU countries (1990–2000)

Analytical result (language : English, version 1)

`[javascript.openmap("id=17667")]`

Downloads

PNG high resolution

[\[/download.asp?id=17667&type=png\]](#)

TIF high resolution

[\[/download.asp?id=17667&type=tif\]](#)

## Published in the following report(s)

Europe's environment — The fourth assessment [[http://reports.eea.europa.eu/state\\_of\\_environment\\_report\\_2007\\_1/en](http://reports.eea.europa.eu/state_of_environment_report_2007_1/en)]

## Meta data

### Geographical coverage :



■ Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Portugal, Spain

### Source:

EEA (European Environment Agency), 2006e. Changing faces of Europe's coastal areas, EEA report No 6/2006. [http://reports.eea.eu/eea\\_report\\_2006\\_6/en](http://reports.eea.eu/eea_report_2006_6/en). EEA, Copenhagen.

### Last upload:

09 Aug 2007

### Keyword(s) :

Belgrade07, coast, land cover  
State of the environment report No 1/2007

**Type:**

Graph

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**Theme :**

coast\_sea

**System folder:**

/dataservice/sharedfiles/applications/staticmaps/radE83A1/English\_V1

**Publish date:**

10 Oct 2007

**Owner:****European Environment Agency**<http://www.eea.europa.eu/> [<http://www.eea.europa.eu/>]

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EMAS registered environmental management at EEA

## Appendix 2: "Marine pollution" in the GEMET Thesaurus (EEA, EIONET)

**Eionet**  
**GEMET Thesaurus**

[Thematic listings](#) | [Alphabetic listings](#) | [Hierarchical listings](#) | [Search thesaurus](#) |

Select language:

**marine pollution**

Concept definition:

Any detrimental alteration of the marine environment caused by the intentional or accidental release of dangerous or toxic substances, such as industrial, commercial and urban waste water. (Source: GREMESa)

**broader terms**

water pollution

**narrower terms**

sea outfall

**related terms**

deep-sea disposal

Scope note:

scope note is not available

Themes:

pollution

water

Groups:

WASTES, POLLUTANTS, POLLUTION

<b>Български:</b>	Морско замърсяване
<b>Čeština:</b>	znečištění mořské
<b>Dansk:</b>	havforurening
<b>Deutsch:</b>	Meeresverunreinigung
<b>Ελληνικά:</b>	θαλάσσια ρύπανση
<b>English (US):</b>	marine pollution
<b>Español:</b>	contaminación marina
<b>Eesti keel:</b>	merereostus
<b>Euskara:</b>	itsas poluzio; itsas kutsadura
<b>Suomi:</b>	meren saastuminen
<b>Français:</b>	pollution de la mer
<b>Magyar:</b>	tengeri szennyezés
<b>Italiano:</b>	inquinamento del mare
<b>Nederlands:</b>	zeevervuiling
<b>Norsk:</b>	havforurensning
<b>Polski:</b>	zanieczyszczenie mórz
<b>Português:</b>	poluição marinha
<b>Русский:</b>	загрязнение моря
<b>Slovenčina:</b>	znečistenie mora
<b>Slovenščina:</b>	onesnaženje morja
<b>Svenska:</b>	havsförorening

2004 GEMET Thesaurus version 1.0

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## Appendix 3: "Marine pollution" in the European Environmental Agency Glossary

### Terminology Service

- » Home / Search
- » A-Z Index
- » Terminology sources

### Specific glossaries

- » Looking for the old EEA Glossary?

### Environmental Terminology Discovery Service

0-9 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

### marine pollution

#### Definitions

“Any detrimental alteration of the marine environment caused by the intentional or accidental release of dangerous or toxic substances, such as industrial, commercial and urban waste water.  
(Source: GREMESa)  
**Terminology source:** <http://www.elonet.europa.eu>

“Direct or indirect introduction by humans of substances or energy into the marine environment (including estuaries), resulting in harm to living resources, hazards to human health, hindrances to marine activities including fishing, impairment of the quality of sea water and reduction of amenities.  
[definition source: United Nations. glossary of environment statistics.]  
**Terminology source:** <http://glossary.eea.europa.eu>

 Find more definitions (via Google) »

#### Translations

- ar تلوث بحري
- bg Морско замърсяване
- cs znečištění mořské
- da havforurening
- de Meeresverunreinigung
- el θαλάσσια ρύπανση

### EEA website search

Search powered by Google

#### marine pollution

EEA - Global search Publications Maps and graphs Data sets Indicators

Environmental Terminology Discovery Service — EEA

M **marine pollution**. Definition (english only). Direct or indirect introduction by humans of substances or energy into the **marine** environment (including ...  
[glossary.eea.europa.eu](http://glossary.eea.europa.eu)

Accidental tanker oil spills to the **marine** environment  
framework for co-operation in the field of accidental **marine pollution** (COM(1999) 641), which aims to improve these three actions and integrate them into a ...  
[themes.eea.europa.eu](http://themes.eea.europa.eu)

epaedia - **Marine** and coastal ecosystems

Biodiversity concerns in the **marine** ecosystems are thus an overall issue linked to the sustainable use of fish stocks, **pollution** control in rivers and ...  
[epaedia.eea.europa.eu](http://epaedia.eea.europa.eu)

Energy » EN15 Accidental oil spills from **marine** shipping — EEA

Indicator: EN15 Accidental oil spills from **marine** shipping [2007.04] . anthropogenic **marine pollution** being constituted by land-based discharges). ...  
[themes.eea.europa.eu](http://themes.eea.europa.eu)

epaedia - Impact of **pollution** and intervention

Industrial **pollution**. **Marine** transport has a direct impact on the **ma** environment through illegal discharges of oil and oily and other waste  
[epaedia.eea.europa.eu](http://epaedia.eea.europa.eu)

State and pressures of the **marine** and coastal Mediterranean ...

governments to assess and control **marine pollution**, to formulate national environment policies, to improve the ability of governments identify ...  
[reports.eea.europa.eu](http://reports.eea.europa.eu)

Indicators - Water — EEA

Nutrients in transitional, coastal and **marine** waters (CSI 021) - Assessment published Nov 2005 ... European waters - Water **pollution** Status and monitoring ...

- [en-US](#) marine pollution
- [es](#) contaminación marina
- [et](#) merereostus
- [eu](#) itsas poluzio; itsas kutsadura
- [fi](#) meren saastuminen
- [fr](#) 1) pollution marine; 2) pollution de la mer
- [hu](#) tengeri szennyezés
- [it](#) inquinamento del mare
- [nl](#) zeevervuiling
- [no](#) havforurensning
- [pl](#) zanieczyszczenie mórz
- [pt](#) poluição marinha
- [ru](#) загрязнение моря
- [sk](#) znečistenie mora
- [sl](#) onesnaženje morja
- [sv](#) havsförorening

### See also

- [International Convention for the Prevention of Marine Pollution from Ships](#)
- [land-based marine pollution](#)



[www.eea.europa.eu](http://www.eea.europa.eu)

[epaedia](#) - [Marine management](#)

Macro-**pollution** sources in open **marine** systems include **marine** oil gas platforms and the ... **Marine pollution**. More on the impact of **n** **pollution** ...

[epaedia.eea.europa.eu](http://epaedia.eea.europa.eu)

[1](#) [2](#) [3](#) [4](#) [More results »](#)

 powered by [The Google AJAX Search API](#) and  [Google Custom Search Engines](#)



## Appendix 4: "Marine pollution in the UNESCO Thesaurus"

SP Recursos minerales marinos

UF Submarine mineral deposits

BT1 [Marine resources](#)

BT2 [Natural resources](#)

RT [Marine geology](#)

RT [Mineral resources](#)

RT [Ocean floor](#)

RT [Sea bed mining](#)

~~Marine plants~~ USE [Marine algae](#)

**Marine pollution** 

MT 2.60 Pollution, disasters and safety

FR Pollution marine

SP Contaminación marina

BT1 [Water pollution](#)

BT2 [Pollution](#)

BT3 [Environmental degradation](#)

RT [Chemical oceanography](#)

RT [Marine ecosystems](#)

RT [Oil pollution](#)

RT [Sea water](#)

~~Marine resources~~

MT 2.65 Natural resources

FR Ressources de la mer

SP Recursos marinos

UF Sea resources

BT1 [Natural resources](#)

NT1 [Marine mineral resources](#)

RT [Fishery resources](#)

RT [Law of the sea](#)

RT [Oceanography](#)

Marine safety USE [Transport safety](#)

Marine science USE [Oceanography](#)

Marine water USE [Sea water](#)

**Marital status**

MT 4.40 Family

FR Statut conjugal

SP Estado civil

BT1 [Marriage](#)

NT1 [Married men](#)

NT1 [Married women](#)

NT1 [Single persons](#)



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Thesaurus

Powered by MultiTites

Facet Categories

- 006.05.01
- 009.01.01
- 01.01.01 World Bank Administrative Vocabulary
- 01.01.02 IMF Administrative Vocabulary
- 01.01.03 MIGA Administrative Vocabulary
- 01.01.04 IFC Administrative Vocabulary
- 01.02.01 World Bank Organizational Vocabulary
- 01.02.02 IMF Organizational Vocabulary
- 01.02.03 MIGA Organizational Vocabulary
- 01.03.01 Project Cycle & Program Vocabulary
- 01.03.02 Business Process Vocabulary
- 01.03.03 Project Identifiers Vocabulary
- 01.03.05 Staff Services Vocabulary
- 01.03.06 Conflict Resolution Network Vocabulary
- 01.03.07 World Bank Procurement Vocabulary
- 01.06.00 Collaborative & Nonorganizational Initiatives Vocabulary
- 013.04.01
- 03.01.00 Markets & Commerce Vocabulary
- 03.02.00 Consumption Vocabulary
- 03.03.00 Economic Theory & Research Vocabulary
- 03.04.00 Fiscal & Monetary Policy Vocabulary
- 03.04.01
- 03.05.00 Political Economy Vocabulary
- 03.06.00 Economic Conditions Vocabulary
- 03.06.10
- 03.07.00 Economic Systems Vocabulary
- 03.08.00 Income Vocabulary
- 03.0803
- 03.09.00 Subnational Regional Economics Vocabulary
- 03.10.00 Taxation & Subsidies Vocabulary
- 03.11.00 Investments Vocabulary
- 03.12.00 Commodities Vocabulary
- 03.13.00 Economic Sector Adjustment
- 03.14.00 Adjustment Lending Vocabulary
- 03.15.00 Aid Effectiveness Vocabulary
- 03.16.00 Economic Growth, Investment & Savings
- 03.17.00 Country Strategy & Performance Vocabulary
- 036.08.04
- 04.01.00 Social Assessment Vocabulary
- 04.02.00 Social Inclusion & Institutions Vocabulary
- 04.03.00 NGOs & Civil Society Vocabulary
- 04.04.00 Children's Issues
- 04.05.00 Social Analysis Vocabulary
- 04.06.00 Social Problems Vocabulary
- 04.07.00 Human Rights Vocabulary
- 04.08.00 Post Conflict Reconstruction Vocabulary
- 04.09.00 Participations Vocabulary
- 04.10.00 Involuntary Resettlement Vocabulary
- 04.11.00 Social Capital Vocabulary
- 04.12.00 Quality of Life & Leisure Vocabulary
- 04.13.00 Psychology Vocabulary
- 04.14.00 Social Funds Vocabulary
- 05.01.00 Cultural Heritage & Preservation Vocabulary
- 05.02.00 Literature & Folklore Vocabulary
- 05.03.00 Ethics & Belief Systems Vocabulary
- 05.04.00 Indigenous Peoples Vocabulary
- 05.05.00 Cultural Policy Vocabulary
- 05.06.00 Culture in Sustainable Development
- 05.07.00 Language & Communication Vocabulary
- 05.08.00 Language Identifiers Vocabulary
- 05.09.00 Arts & Music Vocabulary
- 05.10.00 Anthropology Vocabulary
- 05.11.00



05.11.01  
06.01.00 Legal Products Vocabulary  
06.02.00 International Law  
06.03.00 Corruption & Anticorruption Law Vocabulary  
06.04.00 Insurance Law Vocabulary  
06.05.00 Contract Law Vocabulary  
06.06.00 Real & Intellectual Property Law Vocabulary  
06.07.00 Labor & Employment Law Vocabulary  
06.08.00 Administrative & Regulatory Law Vocabulary  
06.09.00 Environmental Law Vocabulary  
06.09.04  
06.10.00 Tax Law Vocabulary  
06.11.00 Water Resources Law Vocabulary  
06.12.00 Banking Law Vocabulary  
06.13.00 Settlement of Investment Disputes Vocabulary  
06.14.00 Gender & Law Vocabulary  
06.15.00 Health Law Vocabulary  
06.16.00 Child Labor Law Vocabulary  
06.17.00 Indigenous Peoples Law Vocabulary  
06.18.00 Involuntary Resettlement Law Vocabulary  
06.19.00 Judicial & Enforcement Systems Vocabulary  
06.20.00 Judicial Systems Reform Vocabulary  
07.01.00 National Governance Vocabulary

07.01.6

07.02.00 Subnational Governance Vocabulary  
07.03.00 NGOs & Civil Society Vocabulary  
07.04.00 International Governmental Organizations Vocabulary  
07.05.00 Government Policies Vocabulary  
07.06.00 Parliamentary Government Vocabulary  
07.07.00 Political Systems Vocabulary  
07.08.00 Multinational & Corporate Governance Vocabulary  
07.09.00 Election Systems Vocabulary  
07.10.00 Country Name Identifiers Vocabulary  
07.11.00 Nationalities & Ethnic Group Identifiers Vocabulary  
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08.01.00 Housing & Human Habitats Vocabulary  
08.01.12  
08.02.00 Communities & Community Development Vocabulary  
08.02.01  
08.03.00 Rural Settlements Vocabulary  
08.04.00 Urban Settlements Vocabulary  
08.05.00 Human Migrations & Resettlements Vocabulary  
08.06.00 Land Use & Management Vocabulary  
08.07.00 Real Estate Development Vocabulary  
08.08.00 City Development Strategies Vocabulary  
08.09.00 Urban Slums Upgrading Vocabulary  
09.01.00 Enterprise Development & Reform Vocabulary  
09.02.00 Corporate Governance Vocabulary  
09.03.00 Private Sector Economics Vocabulary  
09.04.00 Microfinance & SME Vocabulary  
09.05.00 Private Participation in Infrastructure Vocabulary  
09.06.00 Business Environment Vocabulary  
09.07.00 Land & Real Estate Development

1

1.07.01

10.01.00 Industrial Management Vocabulary  
10.02.00 Small Scale Enterprise Vocabulary  
10.03.00 Industrial Economics Vocabulary  
10.04.00 Chemical & Petrochemical Industry Vocabulary  
10.05.00 Construction Industry Vocabulary  
10.06.00 Fishing Industry Vocabulary  
10.07.00 Primary Metals Vocabulary  
10.08.00 Mining & Extraction Industry Vocabulary  
10.09.00 Oil Refining & Petroleum Industry Vocabulary  
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11.07.00 Urban Water & Waste Management Vocabulary  
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30.09.00 Health Informatics Vocabulary  
30.10.00

6.05.02



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## Appendix 6: "Marine pollution" in the World Bank Thesaurus



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[Projects & Operations](#)

[Publications](#) [Topics](#)



## Thesaurus

Powered by MultiTes

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Yahoo! -

Marine pollution



Broader Term

[Pollution](#)  
[Water pollution](#)

Related Term

[Chemical oceanography](#)  
[Coastal pollution](#)  
[Discharge at sea](#)  
[Dumping conventions](#)  
[Heavy metals](#)  
[Land based activities](#)  
[Litter](#)  
[Marine biology](#)  
[Marine pollution control](#)  
[Marine pollution prevention](#)  
[Marine resources](#)  
[MARPOL](#)  
[Nutrients](#)  
[Ocean dumping](#)  
[Oceans](#)  
[Oil pollution](#)  
[Oils](#)  
[Persistent organic pollutants](#)  
[Radioactive substances](#)  
[Sediment mobilization](#)  
[Sewage](#)

Facet Categories



[12.05.00 Pollution Management & Control Vocabulary](#)  
[12.06.00 Environmental Disasters & Degradation Vocabulary](#)  
[12.08.00 Freshwater, Coastal & Marine Environment Vocabulary](#)  
[27.04.00 Ports & Waterways Vocabulary](#)

[New search](#)



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## Appendix 7: Structure of the IW:LEARN Web Site

Note: Numbers in brackets [ ] indicate the number of documents listed on the given page.

About IW:LEARN

Description of IW:LEARN

Project Factsheet

- A. Information sharing (2 sub-activities)
- B. Learning (4 sub-activities, each with its own outputs)
- C. Dialog (2 sub-activities reference GEF IW conferences)
- D. Innovation (3 sub-activities)
- E. Partnership (2 sub-activities)

Project Structure and Partners

Principal Funder > GEF

Implementing Agencies > 3 links

Executing Agency > UNOPS

Steering Committee

Partnership Activity Leads (PALS) > 18 links

Project Coordination Team (PCT) Personnel

Stakeholder Involvement

Publications and Newsletters

Introduction to IW:LEARN [2]

IW:LEARN Newsletters

GEF IW Bridges (2005-present, issues)

IW:LEARN Waves (2001-2003, issues)

Knowledge Products

On International Water Management [1]

On Information Management [7]

Project Management

IW:LEARN Operational Phase (2004-2008) [2]

IW:LEARN Pilot Phase (2000-2003) [1]

Articles / Presentations [2]

Workshops [9]

IW:LEARN Project Events

IW Conferences [3]

IW:LEARN Workshops [13]

IWForums

International Waters e-forums—List of electronic discussion forums [9]

## Structure of the IW:Learn Web Site (continued)

### Documents

- Strategic Action Programmes (SAP)—Agreements to resolve priority threats, actions, and mechanisms [19]
- Transboundary Diagnostic Analyses (TDA)—Science-based analyses of transboundary concerns and opportunities; basis for agenda in SAPs [17]
- Monitoring and Evaluation (M&E)—IW Evaluations and Studies from the GEF Evaluation Office (table of categories of M&E documents)
  - Monitoring and Evaluation Indicators [1]
  - IW Project Evaluations and Reviews
    - Speciality Management Project Reviews (SMPR) [10]
  - Overall Performance Studies (OPS) [3]
  - Programme Evaluations and Thematic Studies [4]
  - Annual Performance Reports (APR) [6]
  - M&E Council Documents (Working and Information Papers) [40]
- GEF Policies and Programmes Documents
  - Focal Areas Strategies and Strategic Programming for GEF 4 [1]
  - International Waters Strategy: Revised Draft [1]
  - Operational Strategy for International Water 1995 [2]
  - Operational Strategy/Operational Programmes (OP 8, 9, & 10) [3]
- Lessons Learned (developed by various stakeholders) [64]
- GEF IW Experience Notes
  - Process
    - Development and tracking of indicators [0]
    - Financing mechanisms for TWM [0]
    - Knowledge management database for IT for TWM [0]
    - Public/private partnerships in TWM [2]
  - Participation
    - National/regional/local participation [2]
    - NGO participation [1]
    - Public relations/outreach/visibility [1]
    - Leveraging of local funds (public and private) [2]
    - Workshops, training, and education programmes [3]
  - Performance [0]
    - TDA/SAP approvals [0]
    - Regulatory development and enforcement [0]
    - Measurable environment improvement [0]
    - Applied scientific research [0]
    - Species, habitat, and ecosystem protection/rehabilitation [0]
    - NAP development and approval [0]
    - Engineering/investment project complete [0]

## Structure of the IW:Learn Web Site (continued)

### GEF IW Experience Notes

#### Performance [0] (continued)

- Public / private partnerships & market-based mechanisms [0]

- Water quality monitoring programme implementation [0]

- Sustainability issues (post GEF investment) [0]

#### Technical

- Wetland restoration practices [0]

- Primary and secondary wastewater treatment [0]

- Cleaner industrial production [0]

- Optimization of wetlands as nutrient sinks [3]

- Tertiary wastewater treatment [0]

- Nutrient management in agricultural practices [1]

#### M&E Process Indicators

- 7 categories [4]

#### M&E Stress Reduction

- 4 categories [0]

#### M&E Environmental Status Indicators

- 3 categories [0]

#### Other Areas

- 7 categories [6]

### Project Related Documents (Reports produced in addition to TDAs and SAPs)

- Project Fact Sheets [15]

- Project Briefs & PDF-Bs [73]

- Project Documents [40]

- Project Information Documents [15]

- Reports [21]

- Log-Frame Analyses (These documents seem to be grouped by project number and document type) [7620]

- Legal Conventions [2]

- Terminal Evaluations [10]

- Final Project Summaries [7]

- Project Proposal Preparations Materials (Project appraisal and environmental assessment documents with one full project proposal) [14]

- Other Related Documents (Includes a number of project concept papers) [74]

### Courses and Guidelines (IW:LEARN courses and guidelines) [8]

- Others (Many PowerPoint presentations, external links to reports, speeches) [429]

Project Database (Basic information on GEF IW projects) [186]

Calendar (Calendar showing international meetings and GEF/IW:LEARN workshops)

## Structure of the IW:Learn Web Site (continued)

### Contacts (Databases of people)

- Global Environment Facility Secretariat
- IW:LEARN Project Coordination Unit
- Contacts for GEF International Waters Project (Searchable file)
- UNDP Personnel
- World Bank (IBRD)
- UNEP Personnel

### Events (Descriptions of future meetings with links to sponsors' Web pages) [48]

Note: There is also a list of "old events." These should not be confused with IW:LEARN Meetings

### QUICKLINKS (Menu on left side of Home page)

- Experience Notes > GEF IW Experience Notes (see above)

#### Website Toolkit

- Features (of toolkit)

- User Community (List of IW projects that use the IW:LEARN Toolkit) [18]

#### Toolkit Documentation Center

- Frequently Asked Questions (FAQ) [4]

- How-to's [60]

- Instructional videos [1]

- Project Websites > Project Database table (186 projects from Project Database, above) [76 projects have URLs to Web sites; the remaining 110 projects do not]

- Workshops > IW:LEARN Workshops listed under About IW:LEARN (above) [13]

- IW Jobs (A service for GEF projects and partners needing staff [50 positions listed]. This page is given under IWForums (above).

- E-Bulletin (Subscription page to an online bulletin about IW:LEARN activities. The navigation menu on this page indicates that E-Bulletin is part of the Website Toolkit (above).

On the Home page's Quicklinks navigation menu, it is shown as an independent section.



## Appendix 8: Montague Institute Search Page

### Index and Thesaurus

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#### Terms

[business intelligence](#) (3)  
.....[competitive intelligence](#) (6)  
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.....[usability and user behavior](#) (8)  
.....[Web publishing](#) (10)  
[reviews and surveys](#) (8)  
.....[book reviews](#) (7)

#### How to use the indexes

This index covers articles in the [Montague Institute Review](#) and selected pages on the Montague Institute Web site. Some topics include cross references to the index for the [Knowledge Base Editor's Digest](#).

1. Use the menu at the top of the screen to select the type of retrieval tool:

- **Site search** Full text search of the Montague Institute Web site;
- **A - Z links** show index terms in alphabetical order, one section at a time;
- **Subject Index** lists a hierarchy of subject terms (some index terms are not listed);
- **By date** lists back issues of the Montague Institute Review by year;
- **Organizations** lists organizations mentioned in the articles;
- **People** lists personal names mentioned in the articles;
- **Member Q&A** lists all articles based on Member Questions and Answers;
- **Search A - Z index** allows you to search the index entries for a term;
- **Home** takes you to the Montague Institute home page.

2. Select a term from the left sidebar.

3. Click on the list of related (*see also*) terms in the right-hand frame to explore related topics. Not all index terms have *see also* terms.

4. Click on the document title to view the full text or abstract. Some documents require a password to view the full text. Passwords can be obtained through

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[search and navigation](#) (6)  
.....[metadata](#) (18)  
.....[ontologies](#) (8)  
.....[search engines](#) (29)  
.....[tagging](#) (12)  
.....[taxonomies](#) (16)  
.....[thesauri](#) (10)

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membership in the [Society of Knowledge Base Publishers](#).

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## Appendix 9: Montague Institute Search Results Page

### Index and Thesaurus

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#### Terms

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[accountability](#) (2)

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AICPA see [American Institute of Certified Public](#)

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[American Institute of Certified Public](#)

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analysts see [Investment analysts](#)

Andersen Consulting see [Accenture](#)

[annotations](#) (5)

[annual reports](#) (3)

[anthropologists](#) (1)

API's see [application program interfaces](#)

Apple Computer (1)

#### Index detail

##### Adobe Acrobat

Digest term:

[Adobe Acrobat](#)

##### Documents for this term:

###### [How to manage PDF metadata](#)

Members tell how they add metadata to PDF documents and use it in retrieval applications. *Montague Institute Review* August 2006

###### [Economics and ABCs of indexes](#)

The role of A - Z indexes in publications and corporate intranets, cost/benefit considerations, and software tools for indexing. *Montague Institute Review* April 2002

###### [Adobe Acrobat: The Swiss Army Knife of Knowledge Base Publishing](#)

Like the Swiss Army Knife, Acrobat 5 can perform an amazing variety of practical tasks for authors, publishers, and readers. *Montague Institute Review* February 2002

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The World Bank

Home • Site Map • Index • FAQs • Contact Us

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## Site Map

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## Appendix 11: European Environmental Agency Theme Map



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Home Products

Overview of EEA products

Reports

In this section you will find all the reports produced by the EEA.  
The section starts with an overview of most recent reports. There is also a link to the list of all reports. This list can be sorted in several ways:

- by [report title](#)
- by [serial title](#)
- by [publication date](#)
- by [language](#)

Reports can also be accessed through [environmental themes](#).

Indicators

Indicators measure developments in selected issues, including progress towards agreed targets. EEA publishes indicators on a regular basis, both in the a "Environmental Signals" report and in indicator-based reports covering specific sectors and topics. The indicators can be accessed individually in the [indic section](#) and through [environmental themes](#).

Live maps and data


In this section you will find interactive tools enabling you to examine environmental data and to explore maps of Europe.

[Explore ozone today](#)

Up-to-date information on ozone conditions across Europe. Check out today's ozone level in your city/area through the ozone interactive map.

[WISE - My river basin district](#)

Water quality, biological conditions and the amount of water flowing in a river ultimately depend on what happens in the river basin. Find out detail about your river basin district.

 [EPER - The European Pollutant Emission Register](#)

Explore information on industrial emissions in your neighbourhood by searching the map.

- » **Education**
- » **Multimedia centre**
- » **More products ...**
- » **SERIS - Links to national SOE reports**
- » **EPER - Pollutant register (EC / EEA)**
- » **EUNIS - Find species, habitats and sites**
- » **Economic instruments (OECD / EEA)**
- » **Environmental events calendar**
- » **Multilingual glossary**

#### [Eunis - Find species, habitats and sites](#)

Explore Europe's biodiversity and nature through this interactive map.

#### [Environmental technology atlas](#)

Explore Europe's environmental technology atlas.

### Maps and graphs

In this section you can find and download static maps and graphs used in EEA products.


### Data

The data section provides access to data sets used in EEA periodical reports. The data sets contain aggregated data, typically on a country level, with a geographical coverage of at least the 15 EU Member States. Graphs and, in the future, maps can be generated from the datasets. Information about the content of each data set and its geographical and temporal coverage is provided.

### Educational products

- [Epaedia](#) - Environment explained

### Products for a younger audience

-  [Honoloko: the game](#)
- [Eco-Agents website](#)

### Multimedia centre

A collection of videos and animations about Europe's environment.

### Environmental multilingual glossary

The **EEA glossary** contains about **1500 English terms (1200 unique concepts)** with definitions and definition sources, synonyms and links as well as translations into the **23 other EEA languages**. The terms are translated by the Translation Centre for the Bodies of the European Union, and most of them have been validated by our national focal points.

The glossary contains only terms used on the EEA web site. They have been selected for their importance and/or because a clear definition is needed to prevent potential difficulties in translation.



## **Calendar of environmental events**

Browse the calendar to find interesting environmental events around the world.

## **Economic instruments**


A database on economic instruments used in environmental policy

This database was created in close collaboration between the OECD and the EEA. It contains information on the use of economic instruments such as environmentally related taxes and charges, environmentally motivated subsidies, tradable permits, and deposit refund systems. It also outlines voluntary approaches such as environmental agreements, negotiated with industry, and public programs in which firms can volunteer to participate.

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## APPENDIX 13 -- List of Regional Seas Reports

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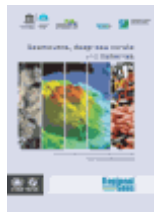
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Deep-sea biodiversity and ecosystems:  
A scoping report on their socio-economy, management and governance



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Seamounts, deep-sea corals and fisheries



 [Full Report \(PDF File - 1.12 mb\)](#)

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Accounting for Economic Activities in Large Marine Ecosystems and Regional Seas



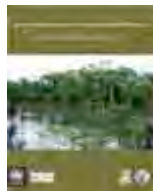
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Financing the implementation of regional seas conventions and action plans



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Pacific Island Mangroves in a Changing Climate and Rising Sea



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[Full Report \(PDF File - 11362 KB\)](#)

- **Regional Seas Reports and Studies 175:** Ecosystem-based Management of Fisheries – Opportunities and challenges for coordination between marine Regional Fishery Bodies and Regional Seas Conventions. UNEP 2001 52 pages  [Full Report \(PDF File - 417 KB\)](#)

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## Appendix 14: XML Data for Regional Seas Report No. 184

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