

## The BALANCE portal



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The Balance Data Portal: Background, documentation and perspectives					
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## 1 INTRODUCTION

The main objectives of the BALANCE Work Package 1 are to create a platform for the data on which the subsequent derivation of marine landscape classification and mapping will be based and to harmonise the data available, i.e. ensuring that different types of data from different sources and countries can be used together.

This report mainly describes the platform, a portal for marine metadata relating to the Baltic Sea aimed for communicating data between Balance partners and end users. In addition, spatial referencing and data exchange formats are outlined as well as categories for the data and links to associated existing standards for data collection and management. Guidelines for harmonising geological data and data used in marine habitat mapping and modelling are annexed.

As more data will continuously be published on the Balance data portal throughout the project, the portal should be viewed as adaptive, allowing for continuous improvements.

This report is a working document describing the metadata portal in the BALANCE project. Please note that this working document is primarily intended for internal use and for reporting activities so far. The metadata portal will continuously be developed, adjusted and revised within the framework of BALANCE. This includes finding a viable long-term solution for maintaining the portal after the end of the BALANCE project. For this reason the portal fulfil the requirements of the INSPIRE Directive. However, this report will be relevant for anyone, whether BALANCE partner or not, wanting to know more about the set-up of a GIS portal applicable across sectors and national boundaries.

The BALANCE project is part-financed by the EU BSR INTERREG IIIB Neighbourhood Programme and partly by the involved partners. More information on BALANCE and electronic copies of the BALANCE Interim Reports are available at [www.balance-eu.org](http://www.balance-eu.org) and information on BSR INTERREG IIIB is available at [www.bsrinterreg.net](http://www.bsrinterreg.net).

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*February 2007*

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## 2 DESCRIPTION OF THE DATA PORTAL

The BALANCE project involves a large number of organizations from countries surrounding the Baltic Sea. Many of them will contribute to the project with existing resources of spatial information (e.g. datasets, reports, map services, documents) from their geographic and thematic areas of interest, or produce new datasets within the BALANCE project. Others will perform analysis on these basic datasets to produce harmonized information for the entire project area. Others still will develop management guidelines using information produced by the BALANCE project.

### 2.1 What is a GIS Portal?

Given the complexity of the information flow in a project like BALANCE, a single point of access to spatial information was identified as an important part of the BALANCE project. This is realized through a GIS Portal. GIS Portals are built on top of underlying World Wide Web technology and provide the framework for collaborative geospatial user communities and facilitate the discovery, sharing, and delivery of GIS content and services, see Fig. 1 (ESRI 2005). GIS portals organize content and services such as directories, search tools, community information, support resources, data and applications. They provide capabilities to query metadata records for relevant data and services and link directly to the online sites hosting content services. The content can be visualized as maps and used in geographic queries and analyses.

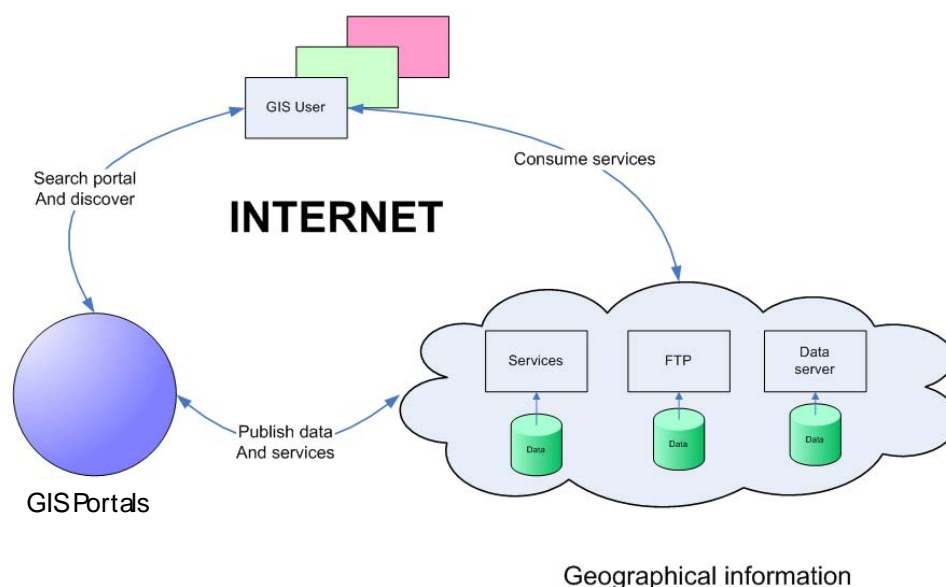


Figure 1. A key component of a GIS Portal is a metadata catalog that supports search and discovery of geospatial resources.

GIS Portals is an underlying concept in Spatial Data Infrastructures (SDI) that has been emerging during the last decade.

## **2.2 Metadata in a GIS Portal**

Metadata can be defined as “data about data”. In the context of GIS Portals a more appropriate definition is used within the INSPIRE directive (PE-CONS 3685/2006): “information describing spatial resources, making it possible to discover, inventory and use them”. Metadata is often categorized based on the intended use of the metadata:

Metadata for discovery – the minimum amount of information that needs to be provided to convey the inquirer the nature and the content of the data resources.

Metadata for evaluation (or inventory) – the amount of information sufficient to enable an inquirer to ascertain that a spatial resource fit/suitable for a given purpose exists, to evaluate its properties, and to reference some point of contact for more information.

Metadata for use – information required to access, transfer, load, interpret and apply a spatial resource in the end application where it is exploited.

In order to make queries on metadata records produce responses of high quality, it is necessary that metadata conforms to common specifications. A number of metadata standards have emerged over the years, both on national levels and within thematic communities. Since 2003 there exists an international standard for spatial metadata (ISO 19115), which has become widely adopted in the design of GIS Portals and SDI's.

ISO 19915 contains a large number of metadata elements and a flexible model to describe information on different levels, e.g. data series, datasets, feature types, feature instances, and the implementation of the standard is far from trivial. However, a basic set of metadata elements focused on the discovery and basic evaluation of spatial datasets is also defined in the standard (ISO 19115 Core Metadata), which often forms the basis for metadata requirements in GIS Portals. Still, in a GIS Portal it is often necessary to define more specific requirements adapted to the needs of the user community of the GIS Portal.

## **2.3 Description of the BALANCE Data Portal**

The GIS Portal used in the BALANCE project is implemented using GIS Portal Toolkit developed by ESRI Inc. The ESRI GIS Portal Toolkit provides the necessary elements of a GIS portal. Through its framework, map viewer, administration, publishing and harvesting modules, the portal extension supports and facilitates a complete workflow for enabling a fully functional GIS Portal.

The GIS Portal Toolkit was at the time of project startup close to a commercial of the shelf (COTS) product, which was an important factor in selecting the technical solution for the BALANCE Data Portal.

The GIS Portal Toolkit is based on ArcGIS® and requires ArcIMS and ArcSDE. The ArcGIS Desktop ArcCatalog™ application can optionally be used for creating metadata. In addition, the portal requires a Web server development and deployment environment and a standard RDBMS. This system environment fitted well with the existing GIS environment at SGU that was to host the BALANCE Data Portal, as well as with the environment at other key partners. With the basic GIS environment already in place at SGU the GIS Portal Toolkit meant that no additional licensing costs was generated.

The GIS Portal Toolkit is implemented at several relevant reference sites like:

- Geodata.gov (<http://www.geodata.gov>)
- INSPIRE (<http://eu-geoportal.jrc.it>)
- India NSDI (<http://gisserver.nic.in/nsdiportal>)
- Norway (<http://www.geonorge.no>)

### 2.3.1 Key Features

The BALANCE Portal consists of the following key components:

#### GIS Portal application and Metadata repository

The GIS Portal offers end user functionality (e.g., searching metadata, sorting results, customizing views, browsing metadata records by categories), administrator functionality (e.g., record administration, advanced searches, and sorting) and publisher functionality (e.g., ability to enter metadata, upload documents, and remove previously published documents).

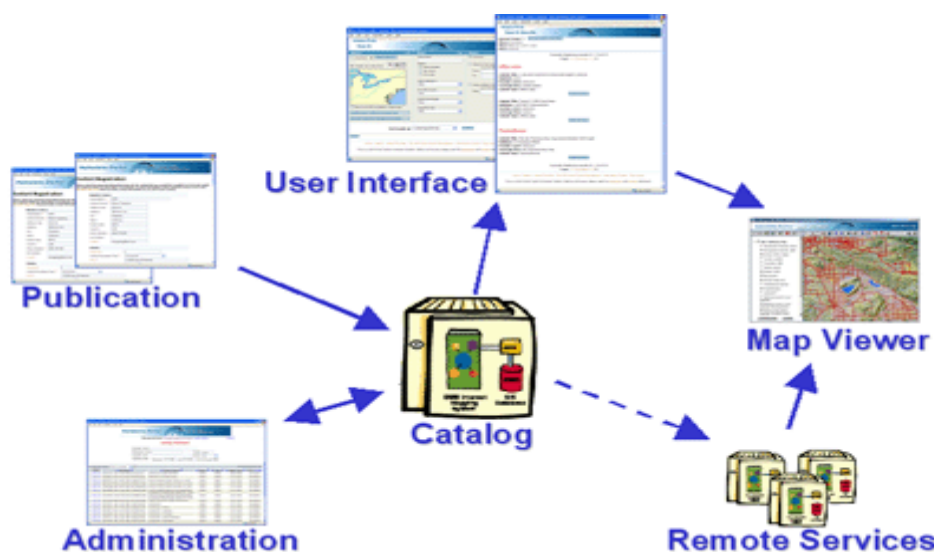


Figure 2. Key components of the Data Portal

#### Map Viewer application

The Map Viewer allows portal users to browse, navigate and query map data, view multiple map services, change projections on the fly, and save map views. The Map

Viewer supports OGC - ISO WMS, WFS, and WCS services as well as ArcIMS based map services, see Fig. 2.

## **2.4 How to use the Portal**

In order to use the portal there are a few key concepts of which a user should be aware. These include the different roles of the people using the portal, the features within the portal and the handling of the data.

### **2.4.1 Roles in the Portal**

There are four different roles with different properties in the BALANCE Data Portal. They are Administrator, Publishers, Channel Stewards and Public users.

#### **Administrator**

The Administrator handles account management, metadata reviewing and approval and batch loading. This role is handled by SGU.

#### **Publishers**

Publishers can publish metadata records as single records one at a time, either as uploading XML-metadata files or through the on-line form within the Portal.

Most BALANCE partners have Publisher accounts, but have not yet (at the time of writing 2007-02-12) published any metadata.

#### **Channel Stewards**

The Channel steward is responsible for managing different channels (themes or categories) used to support browsing of metadata records and present other relevant information. So far in the BALANCE project SGU is the channel steward for all channels.

#### **Public users**

Any user with an Internet connection has access to the BALANCE Data Portal. Public users can browse and search the Portal for metadata. They can also view Live Data and Maps with the Map viewer.

### **2.4.2 Features of the BALANCE Data Portal**

The BALANCE Portal has several different features:

#### **Data Categories:**

Web pages that help you discover and access a wide variety of geographic information for a particular data theme or data community by browsing metadata records. The content of Data Categories is customized using a channel editor tool creating the necessary XML files. In the BALANCE Data Portal this has been done by SGU, and the metadata records are so far organized by contributing organization.



### Current Event or Application Topics:

Web pages that help you discover and access a wide variety of geographic information for a specific application area or current event.

### Search Page:

The Search page enables you to discover and access a wide variety of geographic information within the GIS Portal Toolkit. This geographic information, provided by government, commercial, and noncommercial organizations, includes map images, map services, geographic datasets, geographic activities, spatial solutions, clearing-houses, and land references.

### Performing a Search:

set a search area by place name or you can use the Map Viewer to define your search, Fig. 3. Once your search area is established, you can set your search criteria based on content type, such as map service, geographic datasets, activities etc., data theme, keywords or date ranges. The results of the search are displayed along with metadata and if appropriate a map.

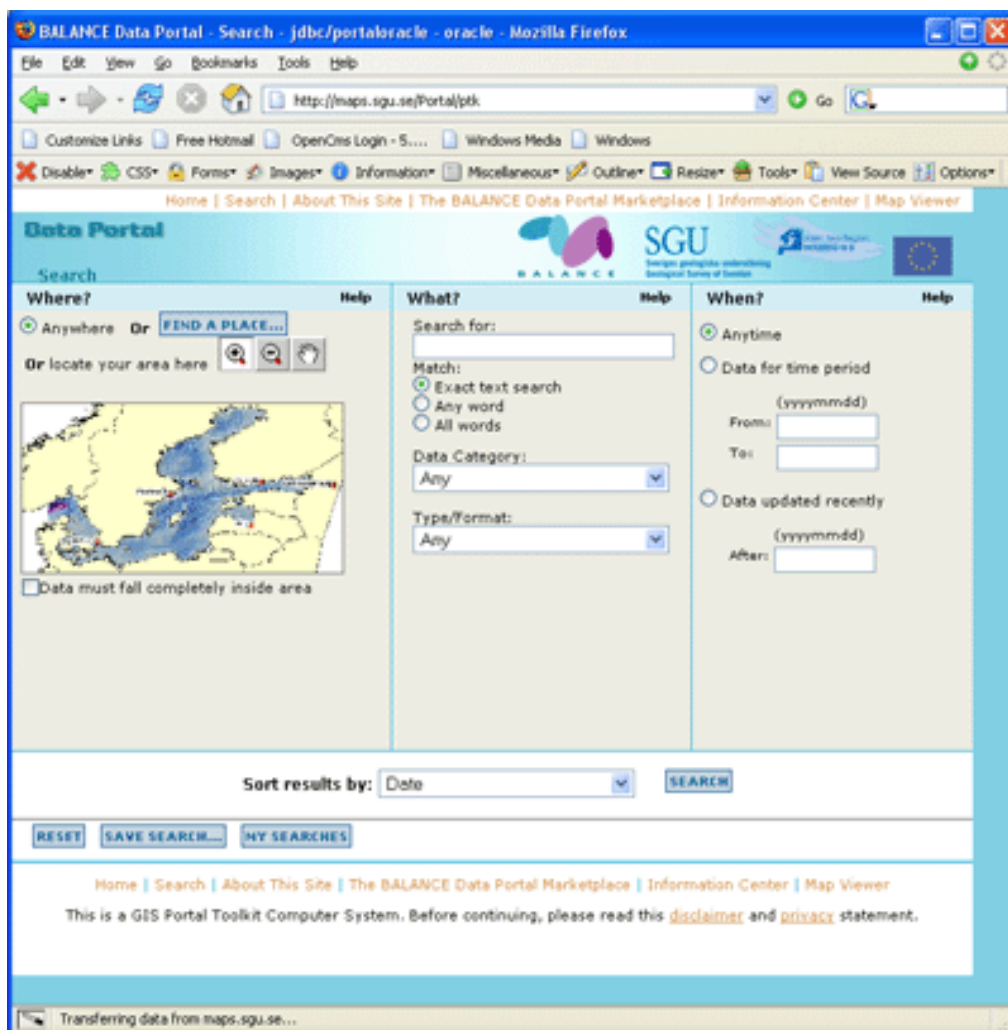


Figure 3. Advanced search page

### 2.4.3 **Data types**

There are a variety of data types that can be available to discover and use on the Balance Data Portal.

**Live Data and Maps** - GIS users can access "live" data and maps, such as ArcIMS or Web Map Server (WMS) map services, using software tools such as ArcGIS, ArcExplorer-Java Edition or ArcExplorer Web available on this site.

**Downloadable Data** - Data downloads enable you to perform custom downloads of digital data you are viewing to access locally with GIS software. Visit the Free Viewers page for a list of free GIS data viewers.

**Offline Data** - Many publishers offer data that can be ordered online and delivered in CD or DVD format or as other shippable media. This data cannot be directly downloaded to your computer.

**Documents** - Several types of documents are available:

**Map files** - digital maps that can be viewed in a GIS mapping application. Map files are typically completed maps that are ready for viewing, publishing, and printing.

**Static Maps** - You cannot directly interact with static map images as you can with dynamic data and maps. You can view them and download them to your computer.

**Other Documents** - includes geographic information stored in text files, spreadsheets or other formats and can be used in conjunction with geographic data. In many cases, they can be viewed and downloaded.

**Applications** - An online application is built using geodata.gov content, map services or other Internet-hosted data. The application includes a complete user interface and set of geographic content needed to perform one or more tasks in a Web browser.

**Geographic Services** - Geographic services are Internet applications with a geographic focus-using data and related functionality to perform basic geoprocessing tasks such as place name searches, address matching or routing.

**Clearinghouses** - A clearinghouse is a Web site that contains references and links to a variety of free geographic data. Many clearinghouses offer geographic data for download while other sites include metadata references or links to datasets that may be acquired through other mechanisms.

**Geographic Activities** - Geographic Activities show what people are doing, what data they need (Marketplace Data Requests) and what data collection activities they have planned (Marketplace Planned Acquisitions).

#### **View Metadata**

You can use the metadata detail and the full metadata view to display the contents of a metadata record, Fig.4 . Map data can be viewed in the Map Viewer or with GIS

software to display multiple data sources from the BALANCE Data Portal along with data from local sources.



Figure 4. Example of Metadata document from BALANCE Data Portal

### Map Viewer:

The Map Viewer tool allows you to interact with map services referenced in the metadata, and to browse through datasets provided by project partners, Fig. 5. The Map Viewer also allows you to save maps for later use, set transparency levels, query map information, and provides rich functionality to overlay map services. Several map services both ArcIMS services and OGC WMS services can be combined to one map view.

The Map Viewer has support for OGC WMS 1.0, 1.1 and 1.1.1 map services. OGS WFS 1.0 and OGS WCS 1.0 are also supported.

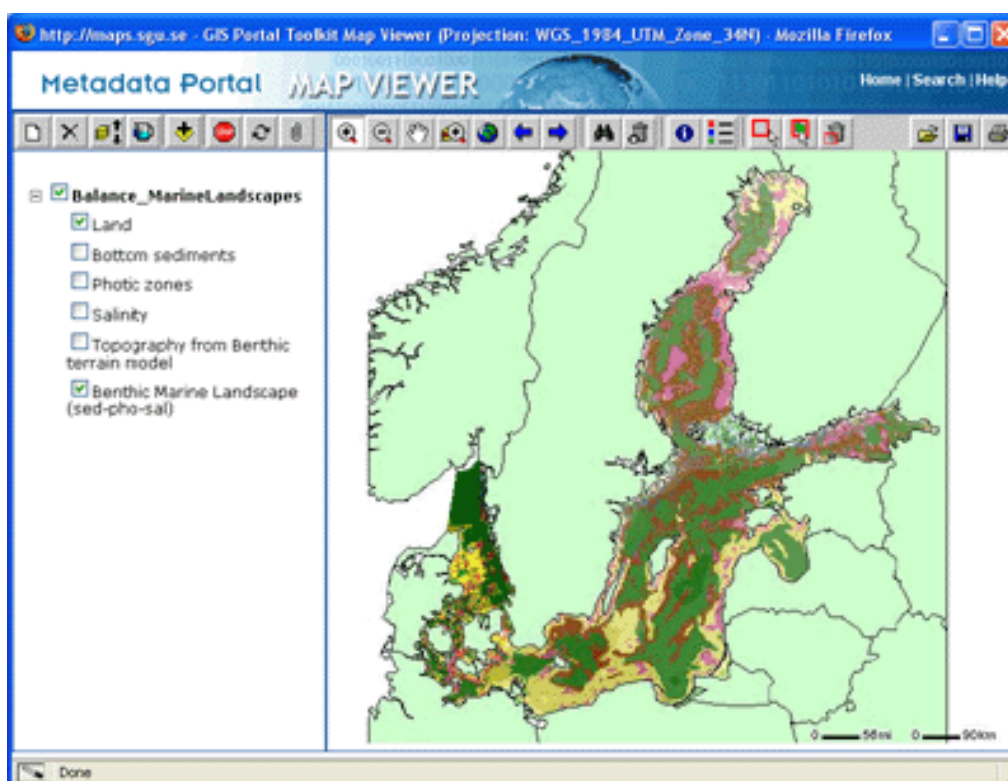


Figure 5. Marine landscapes map viewed in BALANCE Portal Map Viewer

### **Publish Data**

You can provide geographic data by publishing map services and images, geographic datasets, geospatial services, spatial solutions, geographic and land reference material and geographic activities or events to share with others through submission of on-line provider forms within the GIS Portal Toolkit portal. Publishing is performed via an online form or an upload utility.

#### **2.4.4 How to Publish Metadata to the BALANCE Data Portal**

To be able to publish metadata a user has to have the role of a publisher, granted by the administrator of the BALANCE Data Portal. Today metadata records can be published to the BALANCE Data Portal in two ways, Fig. 6:

- I) Upload ISO XML-formatted metadata to the Portal, or
- II) create metadata using the Portal online publication form

The option to automatically harvest metadata from existing metadata services or web accessible folders is not implemented to date.

The metadata requirements for the BALANCE Data Portal are described in section 3.1.

## Metadata Upload

In the Balance project the preferred way to publish metadata was intended to be by uploading XML-formatted metadata created using the ISO-metadata editor available in the ESRI ArcCatalog application. By default ArcCatalog creates and stores metadata compliant with the US Federal metadata standard (FGDC). To create ISO-metadata to be used in the Balance project some preparations must be made in ArcCatalog. This is described in appendix 7.2.

To upload your XML-formatted metadata the publisher uses the "Upload Metadata file" tool. After uploading the metadata records it is recommended to navigate to "Manage my metadata" and check the content by clicking "update". This will bring up the online publication form with the most relevant metadata elements. At this stage metadata elements that were not present in the original XML-formatted metadata file can be added.

## Metadata Direct Entry

If publishers do not have access to the ArcCatalog metadata editor, they can use the online publication form provided at the BALANCE Data Portal. The online publication form has been used by a majority of users, since there has been some inconsistencies in using the upload method.

To enter metadata using the form the publisher navigates to "Publish online form", selects the type of content and proceeds to enter the metadata elements manually.

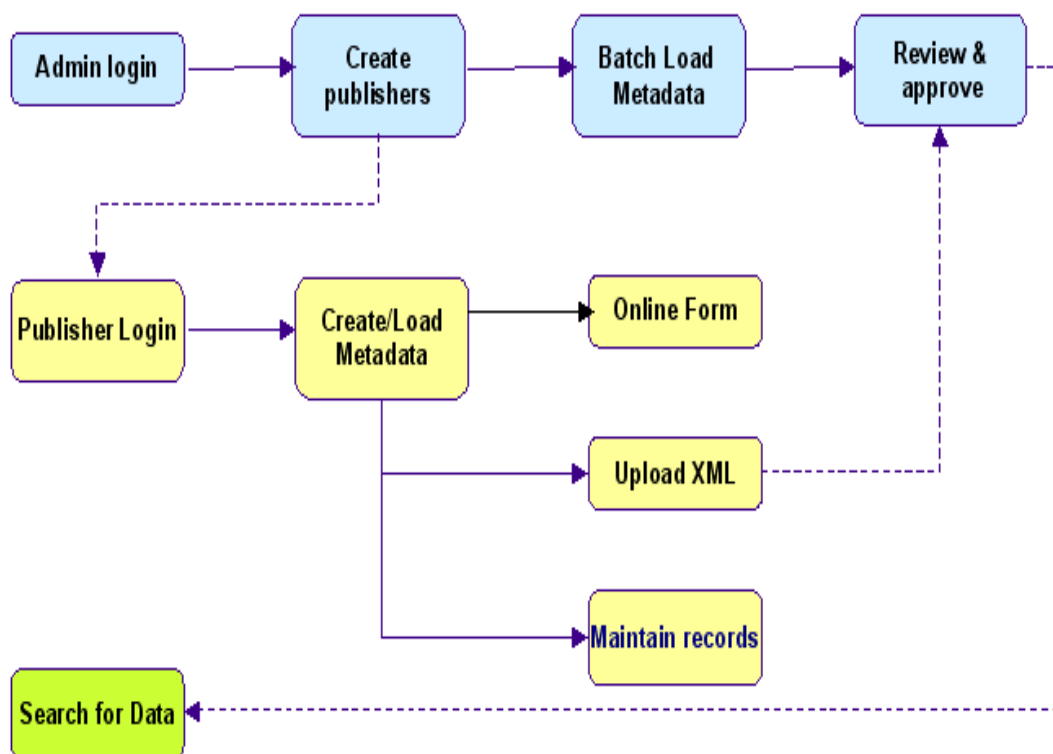


Figure 6. Portal workflow for publishing and reviewing

## 2.5 **Technical overview**

Software Requirements for GIS Portal Toolkit 2

OS: Windows Server 2003

Database: Oracle9i

ArcSDE 9.1, ArcIMS 9.1, (ArcGIS 9.1 optional)

Web server: Apache 2.0.48

Java SDK: J2SDK1.4.2\_06

Servlet engine: Tomcat 5.0.28

Web application logic: Different open source Java Class Libraries e.g. Struts, Batik.

### **Architecture**

The BALANCE Data Portal architecture is a multi-tier web application with Data management components, Spatial management components and Web Portal components, Fig. 7.

It is based on Java Beans and Java Servlets for application logic and JSP templates for presentation. A large part of the core functionality is based on third party Java class libraries, Table 1.

E.g Struts from apache.org is a framework for building MVC (Model-View-Control) webapplications and is used in the Portal Design. The Portal uses standard web technology for the presentation layer including HTML, JavaScript, CSS, XML and xslt.

ESRIs ArcIMS and ArSDE are required for Metadata services and Spatial Data management.

### **Portal application folder structure**

htm – html help files

images – image buttons, banners and other graphical elements

js – JavaScripts for dynamic interactions with the application

jsp – JSP template files for the administration tool and publication tool

style – style sheets for presentation layer

WEB-INF – application logic e.g. Java Class Libraries, Java Beans

xsl – xsl style sheets for presentation of XML metadata

# GIS Portal Architecture

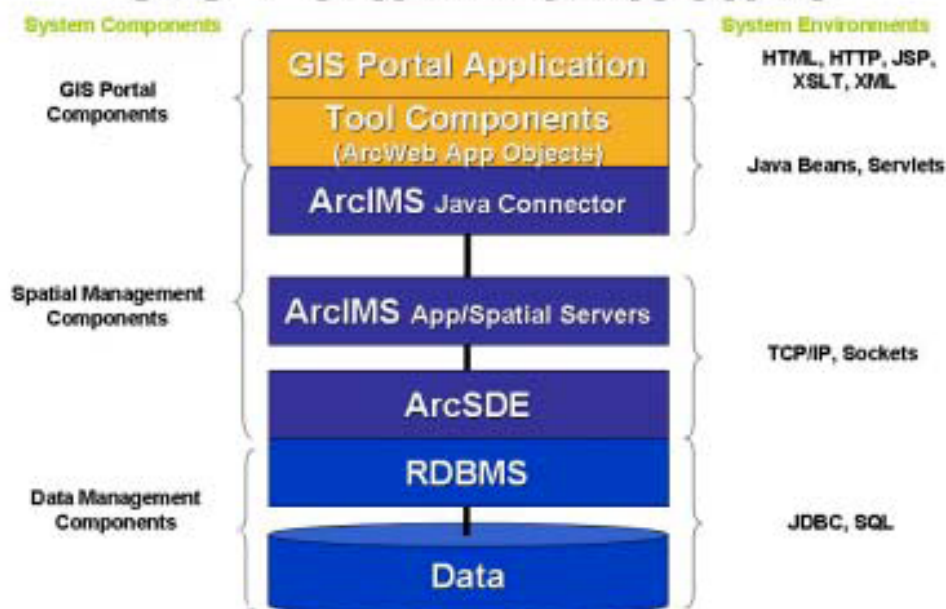


Figure 7. Architecture of the Portal

**Table 1. 3rd Party Package JARs Used by Portal**

Third party package	.JAR	Third party package	.JAR
Sun JAF	activation.jar	Sun JSSE	jcrt.jar
ESRI	arcims_jconnect.jar	Sun	jdom.jar
Apache Axis	axis.jar	Sun JSSE	jnet.jar
Apache Axis	axis-ant.jar	Sun JSSE	jsse.jar
Apache Commons	commons-beanutils.jar	SourceForge JTDS	jtjds-1.0.1.jar
Apache Commons	commonscollections.jar	Java Exchange	jxcb.jar
Apache Commons	commons-collections-3.0.jar	JDBCGlobalBrok er	
Apache Commons	commons-dbc-1.2.1.jar	Apache Axis	log4j-1.2.8.jar
Apache Commons	commons-digester.jar	Sun JavaMail	mail.jar
Apache Commons	commons-discovery.jar	Oracle 9i JDBC Driver	ojdbc14_g.jar
Apache Commons	commons-fileupload-1.0.jar	Oracle 9i JDBC Driver	xdb.jar
Apache Commons	commons-lang.jar	Apache Axis	saaj.jar
Apache Commons	commons-lang-2.0.jar	Apache Velocity	servlet.jar
Apache Commons	commons-logging.jar	Apache Struts	struts.jar
Apache Commons	commons-pool-1.2.jar	Apache Struts	struts-legacy.jar
Apache Commons	commons-validator.jar	Apache Velocity	velocity-dep-1.3.1.jar
Enterprise Distributed Tech.	ftp.jar	Apache Axis	wsdl4j.jar
Apache HTTP	HTTPClient.jar	Apache Xalan	xalan.jar
	isglobal.jar	Apache Xalan	xercesImpl.jar
Sun JAX-RPC	jaxrpc.jar	Apache Xalan	xml-apis.jar
		Megginson Technologies	xml-writer.jar
		XML-Writer	

### 3 STANDARDS

The BALANCE implementation of ESRI's GIS Portal Toolkit is using the international standard ISO 19115. ISO 19115 defines an extensive set of metadata elements that can be used to describe data on different levels, e.g. database, data set, feature type. To facilitate basic implementations primary used for discovery purposes a core of 22 basic metadata elements is identified in the standard itself, and the BALANCE Data Portal is based on this core metadata set. Metadata is restricted to dataset level.

#### 3.1 *Metadata in the BALANCE Data Portal*

In the BALANCE project two methods of creating metadata documents is recommended. Most partners have access to an ISO metadata editor in ESRI's ArcCatalog application, which produces metadata documents that can be uploaded to the BALANCE Data Portal. An alternative is to use the online entry form in the GIS Portal Toolkit application.

##### 3.1.1 *Requirements and recommendations*

The ISO Core Metadata has mandatory, conditional and optional elements and the implementation of the core metadata differs slightly between the ISO editor in ArcCatalog and the online form. Both applications have marked what elements the application regards as mandatory. The ArcCatalog editor is a much more complete and flexible tool and is the preferred way to create metadata documents. The online form is more focused on the needs of the portal application, and has some mandatory elements that are not part of the ISO Core, and are not mandatory in the ArcCatalog editor. An inventory of the different implementations was made to form a basis for recommendations of metadata requirements in the BALANCE project, Table 2.

When formulating requirements for metadata it is important to reach a balance between a large number of mandatory elements that give a user a good description of the dataset, and the practical implications of gathering all this metadata for the publisher. Ideally, requirements should not discourage the publication of metadata. The BALANCE project does not enforce a formal set of elements to be mandatory other than the elements that are required by the GIS Portal Toolkit application. Instead a practical approach is promoted to regard all the elements present in the online form as recommended and of importance for the intended users. In the table above a simple prioritization of the elements is made to guide publishers. By using the ISO editor in ArcCatalog more elements could be added, and any publisher is free to do so.

*Table 2. Rows in dark grey marks elements that are mandatory in the GIS Portal Toolkit application, light grey marks highly recommended elements, white marks recommended elements.*



<b>Comparison between ISO 19115 Core Metadata and metadata entry in GIS Portal Toolkit and ArcCatalog (M = Mandatory, O = Optional, C = Conditional)</b>			
<b>ISO Core metadata</b>	<b>ISO obligation</b>	<b>Portal online form</b>	<b>ArcCatalog ISO editor</b>
Dataset title	(M)	Title (M)	Title (M)
Dataset reference date	(M)	Publication date (M)	Creation date (M) Publication date (O)
Dataset language	(M)	Not present! -add manually as supplemental information	Language in data (M)
Dataset topic category	(M)	Primary theme (M) 1:1	Themes or Categories (M) 1:*
Abstract describing the dataset	(M)	Abstract (M)	Abstract (M)
Dataset responsible party	(O)	Originator (O) Publisher (M)	Choose function from list 0:*
Geographic location of the dataset (by four coordinates or by geographic identifier)	(C)	Spatial domain (M) Bounding box in decimal degrees	Geographic bounding box in decimal degrees (M)
Additional extent information for the dataset (vertical and temporal)	(O)	Time Period of Content (O)	Temporal (O) Vertical (O)
Lineage	(O)	Not present! -add manually as supplemental information	History (O)
Dataset character set	(C)	Not present	Not present
Spatial resolution of the dataset	(O)	Data resolution (O) Mandatory for Raster Data	Resolution (O) or Scale (O)
Spatial representation type	(O)	Data Type (O)	Automatic
Reference system	(O)	Data projection (O) 0:* Free text	Coordinate system (M) Automatic or list
Metadata point of contact	(M)	Organisation (M) Contact Person (M) Phone Number (M)	Name (M) Organisation (M) Position (M) Function(M)
Metadata date stamp	(M)	Automatic	Automatic
Metadata language	(C)	Not present –should always be English	Metadata Language (M)
Metadata character set	(C)	Not present	Automatic
Metadata file identifier	(O)	Automatic	Automatic
Metadata standard name	(O)	Free text (O)	Automatic
Metadata standard version	(O)	Free text (O)	Automatic
Distribution format	(O)	Data Formats (O) Free text; 0:*	Publication Format (C) Free text
On-line resource	(O)	Online Linkage (O)	URL
<b>Non-Core metadata in the GIS Portal Toolkit online form</b>	<b>ISO obligation</b>	<b>Portal online form</b>	<b>ArcCatalog ISO editor</b>
Purpose	Non-Core	Purpose (M)	Not present (add into abstract)
Distributor information	Non-Core	Organisation (M) Contact Person (M) Phone Number (M) Email (M)	Distribution information (C)
Supplemental information	Non-Core	Supplemental information (O) –add lineage and dataset language here if not added elsewhere	Not present
Status	Non-Core	Progress (O) Maintenance and update (O)	Maintenance (C)
Keywords	Non-Core	Theme Keywords (O) + reference Place Keywords (O) + reference	Theme Place Temporal Stratum Discipline + reference
Constraints	Non-Core	Access (O) Use (O) Other (Free text) (O)	Access (O) Use (O) Legal (O) Security (O)
Browse Graphic	Non-Core	Browse Graphic URL (O) Browse Graphic Caption (O) Browse Graphic File Type (O)	Automatic if thumbnail is present (file path)

## 3.2 *Spatial Reference*

Datum: **WGS 84**

Coordinate system for whole Balance area: **UTM zone 34N (extended)**

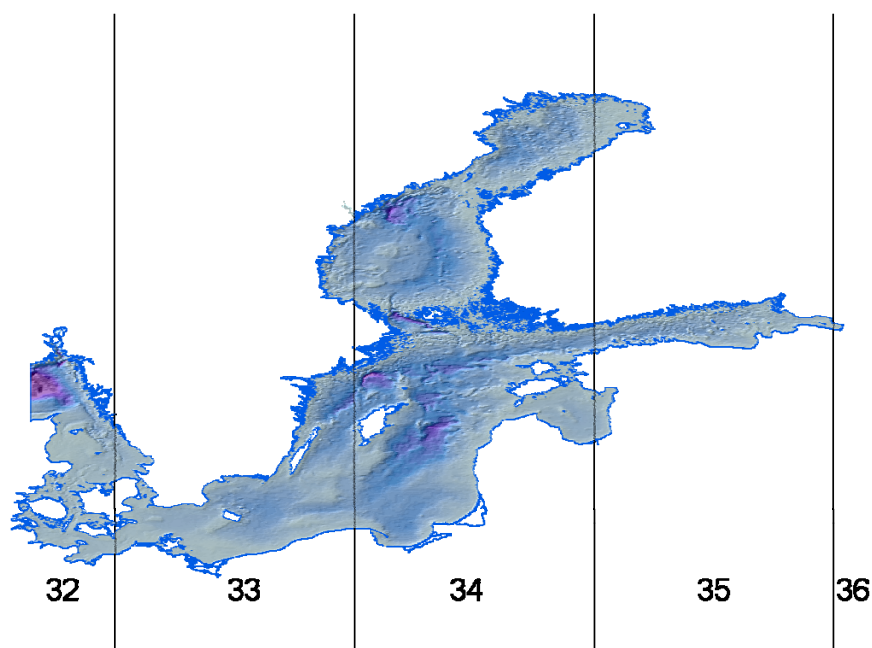
Coordinate system for detailed pilot areas: **UTM with appropriate zone**

### 3.2.1 *Discussion*

The criteria for choosing spatial reference system were as follows:

- a) Standard reference system
- b) Easy to use (implemented in most commercial GIS)
- c) Minimal areal distortion

The choice of UTM based on WGS 84 and with a single extended zone fulfils the two first objectives. The Balance area covers parts of UTM zones 32N – 36N with its major part within zone 34N, Fig. 8.



*Figure 8. UTM zones*

Total minimal areal distortion is obtained if zone 34N is chosen as the extended zone for the whole Balance area. The picture below depicts the relative areal errors of the Balance area within the different UTM zones.

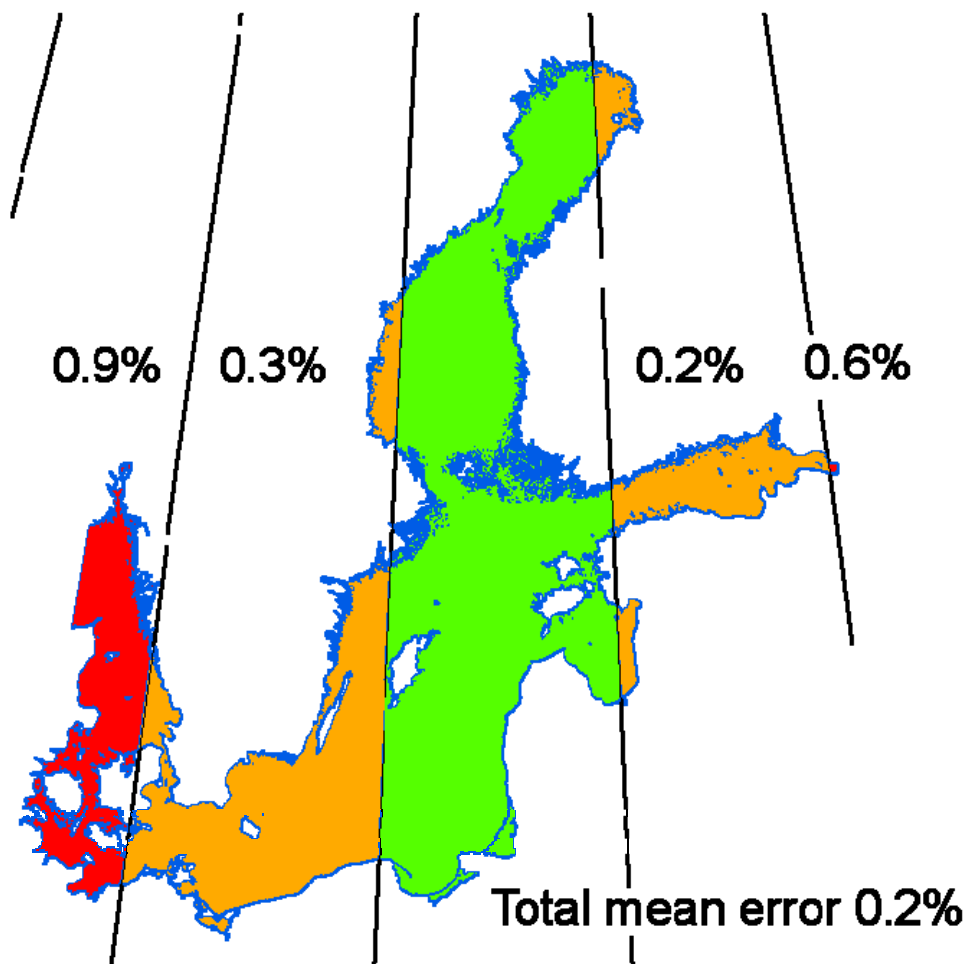


Figure 9. The relative areal errors of the Balance area within the different UTM zones.

### 3.3 Base Maps

The following datasets are recommended and may, by the courtesy of ESRI Inc., be freely used within the Balance project

#### Coastlines 1:15 000 000

Excerpt from the "World Countries 2002" dataset published in "ESRI Data & Maps". Originator: ESRI Inc.

#### Coastlines 1:250 000

Excerpt from the "Europe Countries" dataset published in "ESRI Data & Maps".

Originator: AND Data Solutions B.V. and ESRI Inc.

### **3.4 Data Exchange Formats**

Exchange of spatial data within the Balance project is done with one of the following formats:

- a) Vector data as shape files with projection files
- b) Raster data as ESRI GRID, binary or ASCII format
- c) Images as TIFF (uncompressed), JPEG, PNG or other "standard" image format.

The images should be georeferenced by ESRI worldfiles.

All data shall be in WGS 84 datum, geographic or UTM projection

### **3.5 Physical, biological and socio-economical data**

The aim is to apply categories, which fit with common use and most recent international standards, for the data that are used for the derivation of marine landscape classification and mapping. The categorisation is arrived through common practice and accepted standards, see for example the European "SEASEARCH" project <http://www.sea-search.net/>. In addition, links to existing standards for data collection and management as well as examples of data sets to be used in the process of deriving marine landscapes are provided.

#### **3.5.1 Bathymetry**

##### **Data Sets:**

Depth contours (Vector elevation curves), Gridded surface (DEM)

Depth areas: Dredged areas, dredged disposal areas

##### **Standards for data collection and management:**

Remote sensing methods: Satellite imagery, Airborne techniques, see Development of a framework for Mapping European Seabed Habitats (MESH) <http://www.searchmesh.net/>.

Hydroacoustic methods: Multibeam echosounder, Echosounder (single-beam AGDS), Interferometry, see MESH <http://www.searchmesh.net/>.

#### **3.5.2 Shoreline Morphology**

##### **Data Sets:**

Shorelines, land cover, topographic maps, imagery, unclassified images, annotations

Natural Topography: Sea Cover: Coastal Type, Ice, Bedform

Hydrology: Lakes, Rivers

Land uplift areas

### **3.5.3 Substrates (geology)**

#### **Data Sets:**

Seabed Sediments, erosion/sedimentation, Holocene and Pleistocene geology, Bedrock geology, Cores and Samples, Results of analyses, Interpretations, Reports and Maps

The data should be harmonised toward regional and area specific maps of bottom substrate with Balance substrate classification, see Kotilainen et al., 2007 .

#### **Standards for data collection and management**

Hydroacoustic methods: Multibeam echosounder backscatter, Interferometric sonar,

Sidescan sonar, Sub-bottom profiling, seismic, see MESH

<http://www.searchmesh.net/>.

Video and imagery: Camera, remote operated vehicles, see MESH

<http://www.searchmesh.net/>.

In situ sampling: Core sampling, Grab sampling, Particle size analysis of sediments, see MESH <http://www.searchmesh.net/>.

### **3.5.4 Geochemistry**

#### **Data Sets:**

Sample locations and sample analyses of sediment and organic and inorganic components.

#### **Standards for data collection and management**

See MESH <http://www.searchmesh.net/>.

### **3.5.5 Physical Oceanography**

#### **Data sets:**

In situ: Wave measurements, surface and subsurface water temperatures, surface and subsurface currents, surface and subsurface salinity, sea level, secchi depth, tidal amplitudes

Satellite: Sea level, geostrophic currents

Model: Gridded modelled nowcasts and hindcasts of most of the above parameters at a range of resolutions in time and space.

### **Standards for data collection and management**

International Council for the Exploration of the Seas (ICES) provides guidelines at <http://www.ices.dk/committe/occ/mdm/guidelines/> for most types of measurements of Physical oceanography.

## **3.5.6 Chemical Oceanography**

### **Data sets**

Water Column Chemicals: Organic and inorganic, nutrients from “Smart Buoys”, moorings (temporary and permanent), monitoring stations (temporary and permanent), cruises, radiation Monitoring

Suspended Sediments: From “Smart Buoys”, moorings (temporary and permanent), monitoring stations (temporary and permanent), cruises, remote sensing.

See for example <http://www.dmu.dk/Vand/Havmilj%C3%B8/MADS/Vandkemi/>

### **Standards for data collection and management**

See, the European project QUASIMEME (Quality Assurance of Information for Marine Environmental Monitoring in Europe - <http://www.quasimeme.org/>).

Also refer to the ICES guidelines

(<http://www.ices.dk/committe/occ/mdm/guidelines/>)

## **3.5.7 Marine meteorology**

### **Data sets**

In situ: Surface wind velocities, surface temperatures (air and sea surface), sea level pressure, relative humidity, wave measurements, wave exposure, ice cover

Satellite: Surface winds and waves, sea surface temperatures, ice cover

Model: Gridded modelled nowcasts and hindcasts of most of the above parameters at a range of resolutions in time and space.

### **Standards for data collection and management**

See various documentation available through the World Meteorological Office (<http://www.wmo.ch>) JCOMM (<http://www.wmo.ch/web/aom/marprog/index.htm>) and World Meteorological Office Websites, e.g WMO Guides on Quality Management - Guide to Meteorological Instrumentation (<http://www.wmo.ch/web/www/QMF-Web/Documentation.html>), and the JCOMM observations programme area (<http://www.wmo.ch/web/aom/marprog/Programme-Areas-and-Activities/jcomm-observations-programme-area.htm>)

### 3.5.8 **Biology**

#### **Data sets**

- in situ data sets (+ diving)
- modelled data (+ fish stocks) e.g. habitat modelling data

Distribution of key organisms

Plankton surveys, trawls

#### **Fish (including fisheries related / derived data)**

Fish Spawning Areas, Fish Nursery Areas, fish abundance and spatial distribution, Fish behaviour, age, scales

*Fisheries:* Fish Catches? mean length on age, year class strength, catch per unit effort

#### **Marine Mammals**

Populations of e.g. seal; breeding sites

#### **Marine Birds**

Populations of waders and wildfowl, seabirds, breeding sites

#### **Benthic Marine Flora/ Fauna**

Marine Benthic surveys of species and habitats, images and videos, ROV image data and side scan sonar image data

#### **Standards for data collection and management**

See appendix 3

Video and imagery: Towed video sledges, Camera, Sediment profile imagery, Remote operated vehicles, see MESH <http://www.searchmesh.net/>.

In situ sampling: Diver surveys, Trawls and dredges, Grab sampling, Drop-trap, Beam-trawl, Push-net, white plates and scoops, Juvenile trawl, Low Impact pressure wave, see MESH <http://www.searchmesh.net/>.

See also the EU project Biological Effects Quality Assurance in Monitoring (BEQUALM) <http://www.bequalm.org>

### 3.5.9 **Structures**

#### **Data sets**

#### **Shoreline Constructions**

Piers, Pontoons, Slipways, Training Walls

### **Obstructions**

Outfalls, Diffusers, Barriers,

### **Offshore Installations**

*Surface Structures:* wind turbines, wave energy devices

*Sub-surface Structures:* marine turbines, pipelines (oil and gas, other), cables (communication, electrical, other)

### **Navigational Aids**

Buoys, Beacons, Light Vessels,

### **Wrecks, Archaeology**

## **3.5.10 Human Activities**

### **Data sets**

#### **National Limits and boundaries**

Administrative Boundaries: Port Limits, Exclusion Zones, Pollution Control Zones

Political and administrative boundaries

#### **Shipping, Transportation**

Traffic Separation, Reporting Areas, Anchorage Areas, Vessel Routes, Shipping Density

Transportation / Shipping Routes

#### **Activity and Licence Areas**

Military Exercise Areas, Aggregate Extraction Areas, Wind Farm Development Areas, Disposal Sites, Standing Approvals for Dispersants

#### **Aquaculture**

Fish and Shellfish Farm Areas,

#### **Fisheries**

Fisheries Areas, Sensitive Fish Areas, Fish Shellfish Growing Waters, Closed fishing areas



### **3.5.11 Natural Environment**

#### **Data sets**

Reserves with marine components, Natura 2000 sites, BSPA etc., including seal sanctuaries

Bathing Waters, Recreational Waters, Environmental pollution, environmental impact assessment, monitoring environmental risk, Nitrate vulnerable zones, Industrial Discharge Surveys, Bathing Water Quality, Marine Litter Surveys

Other Examples: HelCOM Regional Seas Boundaries, EA River Basin Districts, EA Coastal Waterbodies, EA Transitional Waterbodies, environmental resources, protection and conservation

### **3.5.12 Derived Data Sets**

#### **Data Sets**

Topographically distinct areas that suffer of anoxia, habitat classifications, biodiversity, coastal habitats, wave exposure data, marine landscapes, bed-forms.

#### **Integrated Assessments:**

Strategic Environmental Assessments? Environmental Impact Assessments?

#### **Standards for data collection and management**

OSPAR nutrient status assessments <http://www.ospar.org>

#### **Habitats**

The European MESH programme (<http://www.searchmesh.net/>) is aiming to develop a set of internationally agreed protocols and standards for seabed habitat mapping.

Habitat types are defined within the European Environment Agency's EUNIS system (see <http://eunis.eea.eu.int/habitats.jsp>)

#### **Biodiversity**

<http://www.marbef.org/data/> An integration of different resources related to marine biodiversity.

#### **Socio-Economic Data**

Water Information System for Europe (Water Framework Directive)

<http://wise2.jrc.it/wfdwebinterface/php/index.php>

## **4 PERSPECTIVES**

### **4.1 Experiences from the BALANCE Data Portal**

#### **4.1.1 Functionality**

The BALANCE Data Portal is using ESRI's GIS Portal Toolkit 2.01 and was put into production during the autumn 2005. Installation and localization of the application and setup of the database was relatively straightforward, after attending the mandatory 3-day training course at ESRI Sweden.

The GIS Portal Toolkit allows for some basic localization and customization, but to adopt the overall organization and functionality is more cumbersome and has not been part of the BALANCE project. The localization and customization carried out has focused on creating relevant documentation, a BALANCE start page, and map services covering the project area to be used for geographical searches and background in the map viewer application. Channels or categories have been created for every partner to be used for browsing the content of the Portal. This is done with a separate desktop tool provided by ESRI, which has been functioning well. Some administration tools for handling users and channels would have made administration easier.

Since production start the application has been running very stable with few disturbances. However, there have been some disturbing problems related to uploading, editing and displaying metadata documents.

When creating ISO-formatted metadata documents using the ISO-editor in ArcCatalog, the GIS Portal has had problems to display the documents correctly for editing and review. This has caused a lot of manual work for the administrator, and has made it difficult to use the ISO-editor as the preferred way to publish metadata. Using the online form instead has meant more manual work for publishers and caused less metadata to be entered.

The search functions and the map viewer application have generally performed well with small disturbances.

Since the start of the project at least two releases of GIS Portal Toolkit has been distributed. So far, it has not been considered efficient to up-date the application given the amount of work involved, and that several problems stills seems to remain unsolved.

#### 4.1.2 **The metadata content**

The number of metadata documents published has not at all reached the expected. In February 2007 a total number of 54 documents were published and approved on the BALANCE Data Portal, while more than a hundred relevant documents was expected. The existing metadata documents describes different data types with the following distribution:

Live Data and Maps	8
Downloadable data	0
Offline data	38
Map documents	2
Other documents	6
Other resources/activities	0

As mentioned above there have existed some problems in the functionality for publishing metadata, but this is not considered as a major explanation of the “lack” of published metadata documents. Publishers that have tried to publish documents have managed to publish with some extra effort.

A possible explanation is that it has been up to every partner to decide what resources or data types that should have metadata published on the BALANCE Data Portal, and that the requests for data has found other channels.

#### 4.1.3 **User survey**

To evaluate the BALANCE Data Portal a user survey was conducted during December 2006 to January 2007. The survey questionnaire was distributed to 39 participants in the BALANCE project representing all partners, Table 3. The response frequency was 23%. The survey consisted of eight questions, whereof the first four was targeted for appointed publishers. Five of the questions could be answered with a grade from 1 to 5, where 1 was a negative “No, not at all”, and 5 was a positive “Yes, absolutely”. There was also the opportunity to give comments in free text.

A summary of the results are given below:

*Table 3. The survey questionnaire*

Question	Avg.	Individual answers	Comments
1. Have you had access to relevant instructions from the Data Portal team in order to publish your metadata records?	3,9	5,4,2,4,5,2,4	"I tried to find instructions on the web page but what little I found there was not of much use. I did, however, get great help via e-mail"
2. Have you published any metadata documents on the Portal?		Yes: 6 No: 3	"Later towards the end of the project we will most likely publish the results of our part of the work in wp3":
3. How have you published metadata documents on the Portal?		Online form: 4 ArcCatalog: 2	"It was very unfortunate that despite our efforts and support from the Data Portal team, we were not able to use ArcCatalog for metadata creation";  "I would have uploaded an ArcCatalog XML-document but was instructed not to because there had been some problems with this method"
4. Are you satisfied with the functionality for publishing metadata records?	3,3	4,4,3,4,2,3	"...we would have liked to use ArcCatalog. The online form also sometimes caused problems in the middle of data insert, forcing us to re-write of already inserted data";  "It is really hard, if you're not very familiar with the project, to find adequate instructions on the webpage..."
5. Are you satisfied with the overall search and display functionality of the Data Portal?	3,4	4,4,2,4,4,4,2,3,4	"I would like to have the possibility to browse all layers uploaded in the portal without having to go through each partner./.../.The search functionality and the map viewer seem to works very well";
6. Are you satisfied with the information content of the Data Portal?	2,6	2,3,2,3,4,1,2,3,3	"Well, so far there is not much data uploaded...";
7. Are you satisfied with the support from the Data Portal team?	4,3	5,4,2,5,5,3,5	"Very good personal support!"
8. Please add any comments on improvements or other issues relevant to the Data Portal team		2 suggestions	"Perhaps it would be great to have a function where it is possible to sign up for to receive an e-mail whenever a new file has been posted?";  "It would be good to be able to see more maps on the Data Portal. We do not have our own server so we would like to be able to download our maps directly to the Portal and I suppose others feel the same way"

The relatively low response frequency makes interpretation of the results uncertain, and in itself indicates that the BALANCE Data Portal has not had as great impact as anticipated. However, there is an indication that it is not technical problems with the application, but rather the lack of relevant metadata that is limiting the usability. Focus should be on organizational issues to secure that relevant metadata documents are published.

#### 4.1.4 **Possible improvements**

There are a number of considerations regarding maintaining a data portal for marine information within a Marine Region, such as the Baltic Sea Region. These include:

- Create Portal group (not technical staff) to monitor and set requirements and guidelines for metadata content. This include defining which datasets /documents /resources must have metadata published, which must not.
- Reorganizing Channels into countries (expressed from project members).
- Guidelines for download (clarify how to make data available, the implications of access to external users (public site), the intention was not to have data stored in one organization e.g. SGU).
- Interface between BALANCE Home Page and Data Portal.
- Group datasets according to categories as country of origin, region, themes (boundaries, hydrographical, habitats, communities, species etc.), habitat classification schemes (EUNIS, substrates etc.) and survey techniques.
- For an international data portal to be efficient it requires some official recognition from national authorities, which link deliverables to e.g. national needs or international obligations. This could be for reporting under the INSPIRE Directive or the Marine Strategy Framework Directive.

## 5 **REFERENCES**

Esri 2005. Creating Metadata for the ESRI GIS Portal 2.0.1 Working with ESRI Portal Toolkit 5. Prepared by ESRI 380 New York Street, Redlands, California 92373-8100 46 pp.

ISO 19115:2003 Geographic information—Metadata

PE-CONS 3685/2006 “Directive of the European Parliament and of the Council establishing an Infrastructure for Spatial Information in the European Community (INSPIRE).

Kotilainen et al., Guidelines for Geological Data harmonisation (2007)

## **ANNEX I – QUICKSTART GUIDE – HOW TO USE THE PORTAL**

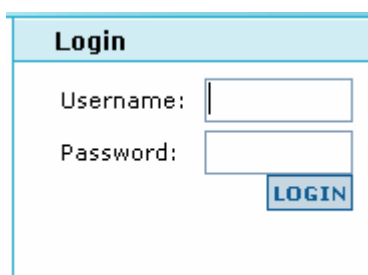
It is straightforward to use the portal, and the steps to get started are explained below:

### **Login**

To Login to the BALANCE Data Portal:

1. Your Username and a Password can be obtained by the Portal Administrator by e-mailing your name, organisation to [balance-portal@sgu.se](mailto:balance-portal@sgu.se).
2. Type your Username and Password in the fields provided.
3. Click the LOGIN button.

Note: To Log Out, simply click the Log Out link.

A screenshot of a web form titled "Login". The form has a light blue header with the word "Login" in bold. Below the header, there are two input fields: "Username:" followed by a text box, and "Password:" followed by a text box. To the right of the password field is a blue button with the word "LOGIN" in white capital letters.

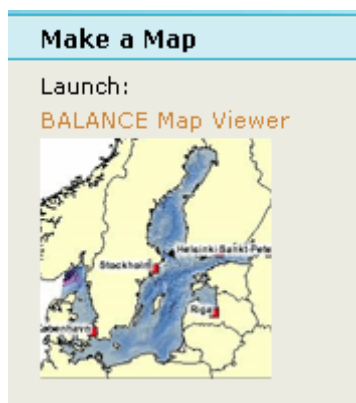
### **View a Data Category Page**

Data Categories are located on the BALANCE Data Portal Home page by clicking at the "Browse Catalog" link in the right menu. To view a Data Category page:

1. Click on the data category you want to view.
2. A new page opens displaying the most relevant metadata of Web services, downloadable data, and other resources for the data category.

### **Make a Map**

The BALANCE Data Portal Map Viewer is a Web-based geographic information system (GIS) application that allows you to view and interact with geographic data. To launch the Map Viewer, click The Map Viewer hyperlink in the Make a Map section of the Home page (see image below). The Map Viewer opens in a new window displaying a general map; use the Map Tools to customize your map.



## Search for Data

The BALANCE Data Portal search function, located in the Search for Data section of the Home page, provides two search options, 1) basic and 2) advanced.

To search for data using the basic search option:


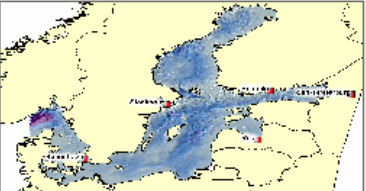
1. Enter information in the text field.
2. Click the GO button.



The Advanced Search option allows you to further define To search for data using the advanced search option:

1. Click the Advanced Search hyperlink.
2. The Portal Search page opens (see image below).
3. Use the search options on this page to further define your search criteria: Where, What and When.

Tip: The more information you provide in the search fields, the closer the data matches

Where?	Help	What?	Help	When?	Help
<input checked="" type="radio"/> Anywhere Or <a href="#">FIND A PLACE...</a> Or locate your area here   <input type="checkbox"/> Data must fall completely inside area		Search for: <input type="text"/> Match: <input checked="" type="radio"/> Exact text search <input type="radio"/> Any word <input type="radio"/> All words Data Category: <input type="text" value="Any"/> Type/Format: <input type="text" value="Any"/>		<input checked="" type="radio"/> Anytime <input type="radio"/> Data for time period (yyyyymmdd) From: <input type="text"/> To: <input type="text"/> <input type="radio"/> Data updated recently (yyyyymmdd) After: <input type="text"/>	
Sort results by: <input type="text" value="Date"/> <a href="#">SEARCH</a>					
<a href="#">RESET</a> <a href="#">SAVE SEARCH...</a> <a href="#">MY SEARCHES</a>					

## The BALANCE Data Portal Marketplace

To quickly find the latest geographic activities or data sharing initiatives in the country, click the BALANCE Data Portal Marketplace hyperlink located at the bottom of the Home page (see image below). This Marketplace hyperlink performs a quick database search for all geographic activities; matching results are displayed in the Search Results page for you to review and access.

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| [About This Site](#) | [The BALANCE Data Portal Marketplace](#) | [Information Center](#) |

## Information Centre

The Information Center contains useful information regarding data standards, tools, and resources of interest to the geo-community. Click the Information Center hyperlink located at the bottom of the Home page (see image below) and the Information Center page opens in a new window.

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| [Information Center](#) | [Map Viewer](#)



## About This Site

The About This Site section of the home page contains the Partnerships hyperlink and the Contact Us hyperlink. Click the Partnerships hyperlink to view the partners of the GIS Portal Toolkit initiative and click the Contact Us hyperlink to provide your feedback.

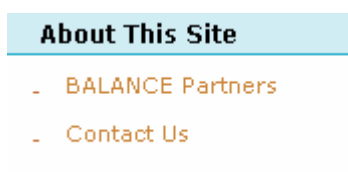
[Home](#) | [Search](#) | [About This Site](#) |

## Contact Us

We welcome your feedback and we want to hear from you. To contact us, click the Contact Us hyperlink located in the About This Site section on the Home page (see image below). A new window appears displaying a feedback form. Please complete the form and click the Submit Form button. Note: Some fields are required; you must complete them to submit your feedback form. Required fields are identified with a red asterisks.

## BALANCE Data Portal Partnerships

To view the partners of the BALANCE Data Portal initiative, click the Partnerships hyperlink located in the About this Site section of the Home page (see image below).



## Publishing

To publish, you must obtain a username/password from the BALANCE Data Portal Administrator. As a publisher, you can publish metadata through ESRI ArcCatalog.

## How To Publish Data Collection Activities

To learn how to publish data collection activities, click the How Do I Publish Data Collection Activities hyperlink located in the Help section of the Home page (see image below).

### Help

- [Quick Start Guide](#)
- [How to Publish metadata](#)
- [How to participate](#)

## How To Manage Published Data Collections

Publishers of metadata can manage their metadata collections online. They have three tools available to do this:

- \* Update
- \* Delete
- \* XML Download

Name	Last Updated	Status
1: 1:50K Image Maps on Demand for Indian Ocean Area <a href="#">Update</a>   <a href="#">Delete</a>   <a href="#">XML</a>	08-31-2005	Incomplete

Update allows the owner to update the content of selected metadata records that are part of that users collection. A online form is availabel to quickly update teh contents.

Delete allows the owner of the metadata record the remove the selected document from the collection

XML Download allows the owner to download the sotred metadata in XML format to the local harddisk. This doucment can be imported in Arccatalog with the original dataset or updated using XML editors.

## About the BALANCE project:

The BALANCE project aims to provide a transnational marine management template based on zoning, which can assist stakeholders in planning and implementing effective management solutions for sustainable use and protection of our valuable marine landscapes and unique natural heritage. The template will be based on data sharing, mapping of marine landscapes and habitats, development of the blue corridor concept, information on key stakeholder interests and development of a cross-sectoral and transnational Baltic zoning approach. BALANCE thus provides a transnational solution to a transnational problem.

The work is part financed by the European Union through the development fund BSR INTERREG IIIB Neighbourhood Programme and partly by the involved partners. For more information on BALANCE, please see [www.balance-eu.org](http://www.balance-eu.org) and for the BSR INTERREG Neighbourhood Programme, please see [www.bsrinterreg.net](http://www.bsrinterreg.net)

## The BALANCE Report Series includes:

- BALANCE Interim Report No. 1** "Delineation of the BALANCE Pilot Areas"
- BALANCE Interim Report No. 2** "Development of a methodology for selection and assessment of a representative MPA network in the Baltic Sea – an interim strategy"
- BALANCE Interim Report No. 3** "Feasibility of hyperspectral remote sensing for mapping benthic macroalgal cover in turbid coastal waters of the Baltic Sea"
- BALANCE Interim Report No. 4** "Literature review of the "Blue Corridors" concept and its applicability to the Baltic Sea"
- BALANCE Interim Report No. 5** "Evaluation of remote sensing methods as a tool to characterise shallow marine habitats I"
- BALANCE Interim Report No. 6** "BALANCE Cruise Report - The Archipelago Sea"
- BALANCE Interim Report No. 7** "BALANCE Cruise Report - The Kattegat"
- BALANCE Interim Report No. 8** "BALANCE Stakeholder Communication Guide"
- BALANCE Interim Report No. 9** "Model simulations of blue corridors in the Baltic Sea"
- BALANCE Interim Report No. 10** "Towards marine landscapes of the Baltic Sea"
- BALANCE Interim Report No. 11** "Fish habitat modelling in a Baltic Sea archipelago region"
- BALANCE Interim Report No. 12** "Evaluation of remote sensing methods as a tool to characterise shallow marine habitats II"
- BALANCE Interim Report No. 13** "Harmonizing marine geological data with the EUNIS habitat classification"
- BALANCE Interim Report No. 14** "Intercalibration of sediment data from the Archipelago Sea"
- BALANCE Interim Report No. 15** "Biodiversity on boulder reefs in the central Kattegat"
- BALANCE Interim Report No. 16** "The stakeholder - nature conservation's best friend or its worst enemy?"
- BALANCE Interim Report No. 17** "Baltic Sea oxygen maps"
- BALANCE Interim Report No. 18** "A practical guide to Blue Corridors"
- BALANCE Interim Report No. 19** "The BALANCE Data Portal"
- BALANCE Interim Report No. 20** "The reproductive volume of Baltic Cod – mapping and application"
- BALANCE Interim Report No. 21** "Mapping of marine habitats in the Kattegat"
- BALANCE Interim Report No. 22** "E-participation as tool in planning processes"
- BALANCE Interim Report No. 23** "The modelling *Furcellaria lumbricalis* habitats along the Latvian coast"
- BALANCE Interim Report No. 24** "Towards a representative MPA network in the Baltic Sea"
- BALANCE Interim Report No. 25** "Towards ecological coherence of the MPA network in the Baltic Sea"
- BALANCE Interim Report No. 26** "What's happening to our shores?"
- BALANCE Interim Report No. 27** "Mapping and modelling of marine habitats in the Baltic Sea"
- BALANCE Interim Report No. 28** "GIS tools for marine planning and management"
- BALANCE Interim Report No. 29** "Essential fish habitats and fish migration patterns in the Northern Baltic Sea"
- BALANCE Interim Report No. 30** "Mapping of Natura 2000 habitats in Baltic Sea archipelago areas"
- BALANCE Interim Report No. 31** "Marine landscapes and benthic habitats in the Archipelago Sea"
- BALANCE Interim Report No. 32** "Guidelines for harmonisation of marine data"
- BALANCE Interim Report No. 33** "The BALANCE Conference"

In addition, the above activities are summarized in four technical summary reports on the following themes 1) Data availability and harmonisation, 2) Marine landscape and habitat mapping, 3) Ecological coherence and principles for MPA selection and design, and 4) Tools and a template for marine spatial planning. The BALANCE Synthesis Report "Towards a Baltic Sea in balance" integrates and demonstrates the key results of BALANCE and provides guidance for future marine spatial planning.