
D.5.1: report on user requirements for the EuroGEOSS Drought operating capacity – Revised Version

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ACRONYMS AND ABBREVIATIONS

Abbreviation	Name
AIP-2	Architecture Implementation Pilot, Phase 2
AOC	Advanced Operating Capacity
CHE	Confederación Hidrográfica del Ebro, Spain
CNIG	Centro Nacional de Información Geográfica, Spain
CSW	Web Catalogue Service
DMCSEE	Drought Management Centre for Southeastern Europe
DoW	Description of Work
DOPA	Digital Observatory of Protected Areas
EC-JRC	European Commission, Joint Research Centre
EDO	European Drought Observatory
FGDC	Federal Geographic Data Committee
FGUA-OSE	Fundación General de la Universidad de Alcalá, Observatorio de la Sostenibilidad en España
IDE	Spatial Data Infrastructure
IDEE	Infraestructura de Datos Espaciales de España (National Spanish Spatial Data Infrastructure) Spatial Data Infrastructure of Spain
IOC	Initial Operating Capacity
MARM	Ministerio de Medio Ambiente y Medio Rural y Marino (Ministry of Environment, Rural and Marine Affairs), Spain
ONS	Observatorio Nacional de Sequía (National Drought Observatory), Spain
OWS	OGC Web Services
SAIH	Sistema Automático de Información Hidrológica (Automated hydrology information system for Spain)
SBA	Societal Benefit Area
SEE	Southeastern Europe
SIA	Sistema de Información del Agua (Water Information System), Spain
SLD	Styled Layer Descriptor
ULBF	Univerza v Ljubljani
UMN	University of Minnesota
UNEP	United Nations Environment Programme.

UNIZAR	Universidad de Zaragoza
WCMC	World Conservation Monitoring Centre
WCS	Web Coverage Service
WCTS	Web Coordinate Transformation Service
WFS	Web Feature Service
WMC	Web Map Context
WMS	Web Map Service
WP	Work Package

1 INTRODUCTION

In May 2010 the first version of the report on user requirements for the drought initial operating capacity (IOC) has been published [EuroGEOSS, 2010d]. In the meantime the initial operating capacity of the drought thematic area has been put in place and satisfies the requirements that were stated in the named document. This revised version summarizes the functionality of the drought initial operating capacity and presents slightly refined use scenarios.

The scenarios focus on an administrative user who needs an overview of the drought situation in Europe and an expert user who needs drought-related data for analysis purposes. The revised scenarios take the additional functionality of the IOC into consideration that has been prepared by the Drought Work-Package (WP5). This functionality refers to: the metadata model, the drought thesaurus, a connector for managing language in the user interface of the European Drought Observatory (EDO) map server, and web coverage services for data download.

Section 2 provides a summary of the current state of the drought IOC. Section 3 briefly explains the added functionality of the system that is currently under development and section 4 presents the revised use scenarios. Section 5 discusses the validation of the use scenarios and IOC functionality in the future course of the project.

2 SUMMARY OF FUNCTIONALTIY PROVIDED BY THE DROUGHT IOC

The main requirements that were identified in the user requirement analysis focused on the search, discovery and display of data and services related to drought. A particular emphasis was also put on data from different scale levels (continental, national, local) for comparing the drought situation reported by various data providers. A system addressing these requirements has to deal with metadata, discovery services, access services and data quality issues. The IOC was designed according to these requirements and incorporated existing services of the project partners.

A short description of the IOC and its components is taken from the deliverable description provided in November 2010 [EuroGEOSS, 2010e]: The system architecture of the drought IOC is based on open web services. The key elements of the system architecture are the metadata catalogue for data and service discovery and the EDO map server for display of services. The resources, which are drought related data and services, are coming from WP5 partner institutions. The resources of the drought work package are registered in the EuroGEOSS broker. This allows discovering the resources through the broker for users from outside the work package.

A central feature of the drought IOC is the interaction between the EDO map server and the metadata catalogue. All drought-related resources can be found in the metadata catalogue and can be imported into the EDO map server for viewing them.

The two main ways of using the drought IOC are:

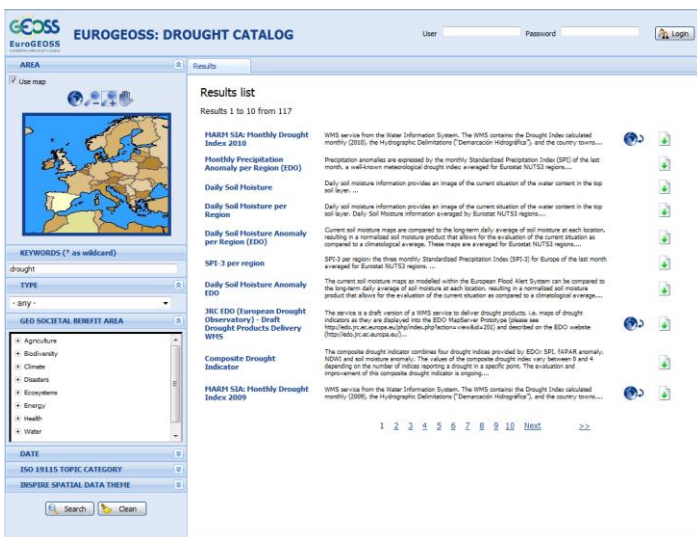
1. Start from the metadata catalogue: a user can access the drought metadata catalogue and search for specific data and services of interest. Services are marked with a world icon and can be displayed in the EDO map server when clicking on this icon (Figure 2a).
2. Start from the EDO map server: a user can access the EDO map server and display data on continental, national/multinational, and regional/local levels (Figure 2b). Some drought data from Europe (EC-JRC), Spain (MARM-SIA, CHE), France (BRGM) and South-eastern

Europe (DMCSEE) are directly integrated in the EDO map server. This gives an overview of the available drought data in the drought monitoring service and allows a quick display of the data. For accessing additional data the metadata catalogue can be started and searched for data sets of interest.

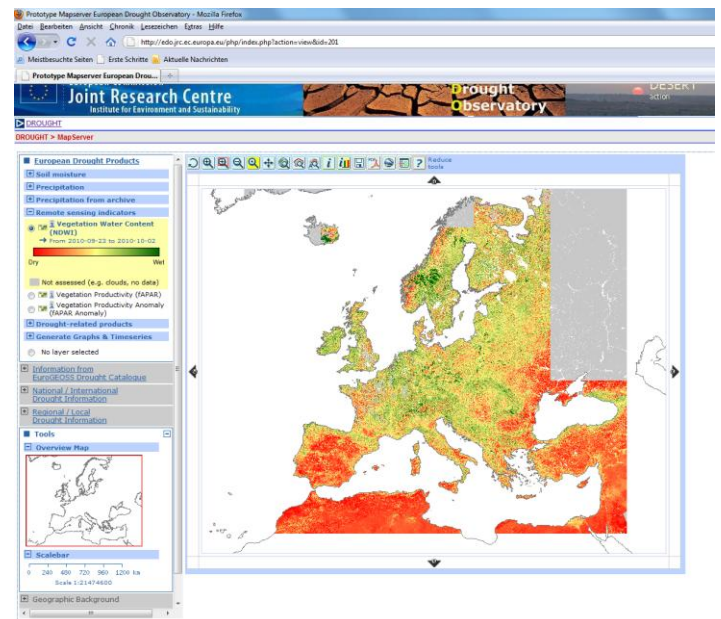
The European Drought Observatory is accessible at:
<http://edo.jrc.ec.europa.eu/php/index.php?action=view&id=201>

The metadata catalogue is accessible through a service compliant with the OGC Catalogue Service for the Web (CSW) specification as described in detail in D5.2 [EuroGEOSS, 2010a]. Additionally, there is a set of applications to facilitate the creation, management, discovery and access to metadata. All the documentation and links to applications and services developed for the metadata catalogue are available at <http://eurogeoss.unizar.es/home/>. It is worth noting that within the context of the IOC, a guidelines document was created in order to facilitate the updating of metadata entries in the catalogue [EuroGEOSS, 2010b].

Three kinds of services are provided by the WP5 partners – web map services (WMS), web feature services (WFS), and web catalogue services (CSW). The complete list of services contains 19 entries. Detailed descriptions of the services are available in the metadata catalogue and also in Report D5.3 on data models [EuroGEOSS, 2010c].



a)



b)

Figure 2: a) Metadata Catalogue displaying a list of drought related resources; b) EDO map server

displaying a drought indicator for Europe.

The development of the drought IOC went hand in hand with the development of infrastructures at the partners' sides to provide drought related data. The main achievements of establishing the IOC are:

- Drought data at partner institutions have been made available in WMS or WFS services;
- An interoperable infrastructure for a drought monitoring system is in place;
- Access to drought-related data on continental, national/multinational, regional/local level is provided;
- The resources of partners are documented with metadata;
- The drought resources are included in the EuroGEOSS broker;
- All services are available for cross-thematic analyses.

The drought IOC covers the user requirements that were identified in the respective analysis with a focus on search, discovery and display of drought-related data. In the course of developing this functionality a series of improvements of the IOC have been developed respectively designed. These include a thesaurus of drought related terms for specific searches in the metadata catalogue, a metadata model capturing metadata that are relevant to drought experts, a connector for retrieving map services in different languages, and the exploration of web coverage services for data download. These developments are discussed in section 3 before refined use cases are described in section 4.

3 EXTENSIONS OF THE IOC FUNCTIONALITY UNDER DEVELOPMENT

Work package 5 is preparing a series of improvements of the current IOC. These improvements focus on the information provided in metadata descriptions, the multilingual issue of the user interface and services for data download. The extensions are discussed subsequently.

3.1 Metadata model and Thesaurus

One of the main objectives of the metadata catalogue is to make drought related data and services findable. The INSPIRE directive on metadata provides the mandatory basis for describing data and services. Starting from this basis the drought WP identified the need for more specific metadata descriptions of datasets that serve the information needs of drought experts. These additional elements have been identified in the metadata model and matched to ISO 19115 metadata elements for their inclusion in the descriptions provided in the metadata catalogue [EuroGEOSS, 2010c].

The EuroGEOSS project suggests the use of societal benefit areas (SBA) categories and GEMET keywords for looking for resources. The reference to drought and drought-related concepts is weak in these keyword lists. For this reason WP5 developed a drought vocabulary that allows users of the metadata catalogue to search for specific terms that are included in the descriptions (respectively keyword lists) of the metadata [in EuroGEOSS, 2011 under preparation].

3.2 Connector

The connector is an extension of WMS interface for retrieving the description and legend of a WMS in different languages. The plan of BRGM is to reuse the connector prepared for the OneGeologyEurope project¹. The specification of the connector is currently discussed; the developers of the connector are BRGM. WP5 plans to provide service descriptions in three languages: English, Spanish, French.

¹ http://onegeology-europe.brgm-rec.fr/how_to201002/201004_1GEconnector.pdf

The EDO map viewer could thus be extended for a language selection tool that allows the user to specify the preferred language. The language selection tool would also add the language parameter to the WMS request and sends the request to the respective WMS.

3.3 Web Coverage Services (WCS)

The discovery of data is the first step in a procedure of data analysis. After previewing the data, for example, in the EDO map viewer, the user needs access to the data. One way of providing data is web coverage services (WCS). Web coverage services will be prepared by DMCSEE and EDO for testing data download services of some freely available datasets. The WCS client should provide functionality for downloading a series of data files at once for serving time series of drought data to data analysts. Since the WCS standard specification do not take the download of a series of files into account, client applications accessing WCS to get data for a time period [T1, T2] should make several requests of data for any time t in [T1, T2] available in the WCS, store them temporally and return them to the user in a compressed file.

4 REFINED USE CASES OF THE IOC

The first generation of use cases covered general aspects of the drought IOC with a focus on discovering and displaying drought related data. The IOC was developed according to these scenarios and their usefulness was verified. The extensions of the IOC functionality presented in section 3 aim at improving existing procedures of using the IOC: the metadata are refined for suiting the needs of drought experts, the search in the metadata catalogue has been improved, and the interface shall be enhanced by providing different languages. A new feature that is added to complement the IOC is the download of data through the employment of WCS.

Table 1 summarizes the refined use scenarios of WP5. The extensions of the first use scenarios are generally linked to the extensions of the IOC functionality; they are marked in light blue.

Table 1: Using interoperable services of drought information

Brief Summary
The use scenarios identified within WP5, exploit the up- and downscaling capabilities that will be enabled through an established interoperability between the European Drought Observatory and national and regional drought resources provided by WP5 partners. Up- and downscaling refers to the accessing and visualization of drought information on different spatial scale levels. Accessing multi-scale drought information allows, for example, comparing and validating the representation of droughts by different drought indices.
Community Objectives
The objective of the drought community is to improve the monitoring and detection of drought events.
The European Drought Observatory under development at JRC provides consistent continental-scale drought information. This type of information is appropriate to acquire a fast overview on the hydric state of the environment in Europe. Due to limitations in data availability and spatial resolution, however, the level of detail of this type of information is restricted. On the other hand, national and regional information systems such as the Spanish National Drought Observatory or the operational water information systems of the Ebro Catchment Authority and the Drought Management Centre for Southeastern Europe can provide drought information in higher spatial detail, and complement the picture with local observations not available at the continental scale.

The interoperability between drought information systems at continental, national, and regional level allows for a direct comparison and validation of various drought indicators and indices produced by the systems. An expert user gains the opportunity to compare drought indices and to depict a comprehensive picture of a drought event in a region. A non-expert user, e.g. at the policy level of the European Commission, receives a rapid overview in the entire continent, and at the same time more detailed information where required.

Since droughts are not bound to administrative and political boundaries, in case of a drought event, a close collaboration and cross-border information exchange between neighboring regional or national users in affected European Union Member States can enhance the efficiency of mitigation measures.

Actors

Drought data user: Users of drought data can be experts in this field or non-experts. Expert users focus on the detailed analysis of drought events. These expert users are called EuroGEOSS users, because they use the EuroGEOSS broker respectively the drought metadata catalogue as starting point of the acquisition of drought data.

Non-experts or administrative users require a general assessment of the drought situation in a region; these users are referred to as EDO users, because their point of access to drought information is EDO.

Portal of the European Drought Observatory (EDO): EDO provides drought information at continental level for all of Europe. The provided drought data contain data on precipitation, vegetation water content, and soil moisture.

Drought data providers offering drought data through web services: national and regional data providers supply drought information on more detailed scales than the EDO system.

Drought Metadata Catalogue: The data resources coming from EDO and national and regional data providers are registered in the metadata catalogue of WP5.

Context and pre-conditions

Data providers supply drought data at continental, national, and regional level. These data and services for data provision are registered in the WP5 metadata catalogue.

Scenario Events

step	description
Assessment of the drought situation in Europe	
1.	An administrative user looks for drought data in Europe and accesses the EDO portal. Her objective is to get an overview of the drought situation in Europe.
2.	The user goes to the EDO map server.
2.1	The user investigates maps of drought indices and zooms to a region affected by a drought.

3.	The metadata catalogue can be searched for drought data from national and regional data providers.
3.1	In case detailed data are available as a WMS they are displayed in the EDO map server.
Analysis of drought data through a drought expert	
1.	A drought expert user wants to find out what drought-related datasets exist for her drought study with defined spatio-temporal context.
1.1	The user accesses directly the EuroGEOSS broker and looks for metadata of drought or related data of interest to her.
1.2	The broker redirects the user to the drought metadata catalogue.
2.	The expert user searches in the metadata catalogue for data sets that fulfill specific characteristics. These characteristics can refer to the data provider, the time period, the type of drought index, the geographic area, etc.
2.1	The metadata catalogue lists datasets and/or services that comply with the query of the user.
2.2	The user can read the metadata descriptions that are covering at least the INSPIRE metadata elements and ideally also more detailed descriptions of the metadata model of WP5. In addition, the geographic extent of the datasets can be visualized in an overview map.
3.	In a next step the user wants to get access to the drought data: for this purpose she can consult the distribution information to see if the data are online available.
3.1	If the data are available in a web service, the user can search for services from a specific provider and load the service into a map viewer client (i.e., EDO map server).
3.2	Subsequently the service is shown in the EDO map server. In the EDO map server the user can zoom in to regions of interest and load additional services if required.
Download of data for data analysis	
1.	An expert user might be interested in downloading drought data for analysis purposes in specific software tools.
1.1	After previewing data in the EDO map server, the user can access the download page for data served through web coverage services (WCS).
1.2	On the WCS download page the user can specify for the downloaded data: format, spatial reference system, width and height of the coverage, and the

	spatial extent of the area provided in the coverage.
1.3	A function will be required that allows the download of a series of data sets at the same time since drought data are generally time series data.
2.	The expert user now has the data for performing her analysis available locally. Thereby the aims of the drought IOC to serve data for multi-scale analyses of drought data and deriving new insights on drought monitoring and detection have been achieved.
Post-Conditions	
The user is provided with data on droughts on different scale levels. Drought data for Europe provide her with an overview of the drought situation; national and regional drought data allow a more detailed assessment on the drought situation in a certain region.	
Special Requirements	
Data providers need to provide at least one drought index that is suitable for assessing the drought situation in their region of interest; the drought data need to be available through standard web services.	
References	
The data and services available for the drought thematic area can be found in the WP5 metadata catalogue: http://eurogeoss.unizar.es/Search/Search.html .	

5 VALIDATION OF USE SCENARIOS

The drought IOC is developed for serving the needs of administrative users and expert users as described in the use scenarios. Expert users are interested in retrieving specific data sets they require for answering their research questions. These research questions propose, for example, the comparison of drought indices on various scale levels, the validation of specific drought indices for assessing drought events in Spain and Slovenia and some additional issues (see Annex A). The focus of the revised use scenarios presented in this report was therefore on providing the tools the experts need for finding and retrieving the required data.

The second half of the project will explore and answer the research questions related to drought. Part of the purpose of this study will be to identify the added research capabilities of the drought IOC. In the course of conducting these research tasks, the functionality of the drought IOC will implicitly validated and potential needs for additional functionalities revealed. The added research capabilities of the IOC will be explored in more detail in deliverable D5.6 (analysis of added research capabilities) and requirements of an improved drought operating capacity will be provided in D5.8 (validation and assessment).

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ANNEXES

A Drought research questions identified in the 1st EuroGEOSS WP5 meeting, Zaragoza, 23./24. June 2009

Topic	Spatial domain and scale	Potential partners	Relation to EuroGEOSS	Timeframe
Inter-comparison of (a) selected drought index (indices) such as SPI, derived e.g. from gridded continental-scale, representative national or station data, and high-density regional network data	Spain; regional, national, continental	CHE, OSE/SIA, JRC, CSIC, BRGM-Water	Supported by EuroGEOSS approach; within scope; within timeframe	By 2011
Improving the dissemination of drought information, benefitting from DMSEE and EDO experience and existing IDE Ebro	Ebro catchment area; regional	CHE, JRC, ULBF	Not core objective of EuroGEOSS, but partly supported through EuroGEOSS; achievable within timeframe	By 2011
Analyse various methods for drought forecasting from medium-range to monthly meteorological ensemble forecasts as well as seasonal prediction by statistical relationships with large-scale circulation patterns (e.g. NAO, classification of "Wetterlagen")	All Europe; continental to regional	EDO, CSIC, ULBF, CHE	Outside scope and timeframe	Long-time perspective of years
Case study on selected drought event(s) for inter-comparison of different drought indices derived from datasets of different spatial resolution, including impact information on vegetation, agriculture	Ebro catchment area; regional	EDO, CSIC, CHE, OSE/SIA, BRGM-Water, CNIG	Supported by EuroGEOSS approach; within scope; requires R&D resources probably beyond EuroGEOSS; achievable within timeframe	within few years

Topic	Spatial domain and scale	Potential partners	Relation to EuroGEOSS	Timeframe
Identification of common drought indices for all scales and hydrological systems as starting point for multi-scale comparison	All Europe; continental to regional	OSE/SIA, CSIC, EDO, ULBF, BRGM-Water	Supported by EuroGEOSS approach; within scope; within timeframe	By 2011
Application of drought information for improved assessment of sustainability (tb specified); derivation and application of drought hazard and risk maps as input to sustainability analysis	Spain; National	OSE/SIA, EDO, CHE, CNIG	Supported by EuroGEOSS approach; marginal to scope; achievable within timeframe; might require additional R&D resources	Within few years
Use of drought impact information within drought indicators, with special focus on economic impacts	Predominantly regional	CHE, EDO, CSIC	Outside scope and approach; requires additional R&D resources	Within (few) years
Inter-comparison of drought indices between national, international, and continental scale; evaluation of international/sub-continental focal point and respective information	SE Europe, national to continental	ULBF, EDO, BRGM-Water	Supported by EuroGEOSS approach, within scope; first results achievable within timeframe, to be continued for all DMCSEE MS	First results by 2011, to be continued