VISCA (H2020/ Research and Innovation action) Grant Agreement no. 730253

VISCA

VINEYARDS INTEGRATED SMART CLIMATE APPLICATION

Deliverable D1.3: Data Management Plan

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[1] Dissemination level: **PU** = Public, **PP** = Restricted to other programme participants (including the JU), **RE** = Restricted to a group specified by the consortium, **CO** = Confidential, only for members of the consortium

[2] Nature of the deliverable: **R** = Report, **P** = Prototype, **D** = Demonstrator, **O** = Other

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1.0	31-10-17	Issam JABEUR / Eric MINO (SEMIDE)	Final draft
1.1	31-10-17	Claudio Rossi (ISBM), Ignasi Porras (MET), Garcia Tejera, Omar (IRTA)	Additional inputs and clarifications
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1.5	27-12-18	Maria Navarro (MET)	Final validation - Revisions done following the comments of the mid term review (version 1.2) • More complete abstract and keywords • Adding references to Responsive Web Application (RWA) instead of Mobile application in various part of the report • Chapter 6 - Data security updated for « Personal data management » to consider data stored by VISCA platform • Chapter 6 – Open access : revised according to decision taken on ODRP at VISCA general meeting in Naples (10/12/2018) : list of datasets and links with scientific publications foreseen • Chapter 7 – Ethical aspects : the description of EU GDPR management has been added.

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Deliverable abstract

VISCA 'Vineyards´ Integrated Smart Climate Application' is an R&I project co-funded under the Horizon 2020 programme for a period of 3 years starting from May 2017. VISCA consortium is led by Meteosim and is composed of 11 members from different fields including end-users (Codorniu, Mastroberardino and Symington).

VISCA will provide a Climate Service (CS) and Decision Support System (DSS) that integrates climate, agricultural and end-users´ specifications in order to design medium- and long-term adaptation strategies to climate change. The project will be validated by real demonstrations with end-users, who are included in the consortium, on three demo sites in Spain, Italy and Portugal.

The Data Management Plan describes the VISCA data management life cycle for the data to be collected, processed and/or generated by the project. It will be used as a standard data guideline for the project consortium to ensure interoperability and possible sharing for public of dataset generated by the project.

VISCA intends, as much as possible, to participate to the Open Research Data Pilot (ORDP) initiated in H2020, in particular for data used in scientific publications issued during the lifetime of the project. Foreseen datasets linked to scientific publications are described in this report. Both scientific publications and underlying data will be published on the open science platform XENODO, compliant with the EU OpenAire initiative.

Ethics requirements and personal data management are also addressed under this deliverable.

Keywords

Data management, Open access, data standards, interoperability, metadata, data security

List of acronyms and abbreviations

CMIP5	Coupled Model Inter-comparison Project Phase 5 from the World Climate Research Program (WCRP)
CMWF	European Centre for Medium-Range Weather Forecasts
CS	Climate Service
DMP	Data Management Plan
DSS	Decision Support System
EU	European Union
Euro-CORDEX	European branch of the international CORDEX initiative supported by the World Climate Research Program (WCRP)
NCAR	National Center for Atmospheric Research
RWA	Responsive Web Application (VISCA platform)
WMO	World Meteorological Organisation

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1. VISCA project overview

Climate change is threatening different varieties of agriculture species; the wine-grapes are especially sensitive to subtle differences in micro-climate impacts causing changes in the crops (i.e. decrease of the grape quality and quantity, changes in alcohol, acid, sugar, etc.) which directly affects the European wine industry.

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The main objective of VISCA is making European wine industries resilient to climate changes, minimizing costs and risks through an improvement of the production management (quality and quantity of final product), while evaluating its replicability to other high-added value agriculture sectors. The integration of climatic and phenological data supplied by 3 demo core groups into a DSS tool - co-designed with relevant South-European wine companies - capable of supplying well-founded decisions for an appropriate crop planning (i.e. pruning, ripening, harvesting, fertilization, pest-control, etc.), with the ultimate goal of making the wine production industry resilient to effects due to climate change. The objectives to be achieved:

- Development of a tool that supplies climate-informed decisions to the wine industry
- Demonstration of the strategic adaptation decisions supplied by this tool in 3 areas where wine business is most sensitive to climate change (Spain, Italy and Portugal)
- Definition of an action plan to tackle barriers and opportunities derived from the full deployment of VISCA on the 3 demo areas.
- Evaluation of the replicability potential in other relevant sectors (forestry, food security, etc.) at international level.

2. Document objectives and structure

VISCA data will be easily accessible and interoperable according to international standards. The project intends, as much as possible, to participate to the Open Research Data Pilot (ORDP) initiated in H2020, in particular, for data used in scientific publications issued during the lifetime of the project.

This Data Management Plan (DMP - D1.3) has been prepared within WP1 – Management of the consortium, during the first 6 months of the project implementation and revised after the 1st project review (M19).

It details what datasets the project will acquire and generate, how they will be exploited and made accessible for verification and re-use, and how it will be curated and preserved.

The DMP is also defining metadata standards for the geo-information and data according to the EU INSPIRE directive, as well as pre-define the work flow for the data processing, storage, and access of all data used and products generated within the project.

The DMP will ensure a high level of data quality and accessibility for final users and stakeholders, and allowing the application of data analytics techniques. This approach is particularly relevant when dealing with huge quantity of data (Big Data) as is in the case of VISCA.

VISCA aims at collecting and processing multiple types of data from different and heterogeneous sources leveraging the paradigms of Open, Linked and Big Data management. Specifically, the DMP is addressing the following main aspects:

- **Collected and the delivered datasets**: datasets reference and naming rules, the main characteristics of the data, their provenance, their set scope and goal for the project
- **Data standards**: protocols used for data exchange within the VISCA system, and between the VISCA system and the external world (as required for WP3 Climate Service and responsive web application).
- **Metadata content and format**: Metadata are commonly used to describe data, maps and services, to facilitate access and harvesting in global catalogues. It will describe which metadata will be used within VISCA while being compliant with INSPIRE recommendations.
- **Data sharing**: this section describes the policies used to share data among partners and non-partners of the project. Particular emphasis is given to privacy issue for those data that cannot be delivered as open access data. It also provides the standard for web application integration and web mapping services (OGC and INSPIRE compliant), and product dissemination.
- **Archiving and preservation:** standard techniques will be implemented to store and preserve both collected and generated data in order to allow the exploitation of the data also after the end of the project, when relevant.

3. Data summary

The figure below provides an overview of VISCA data flows

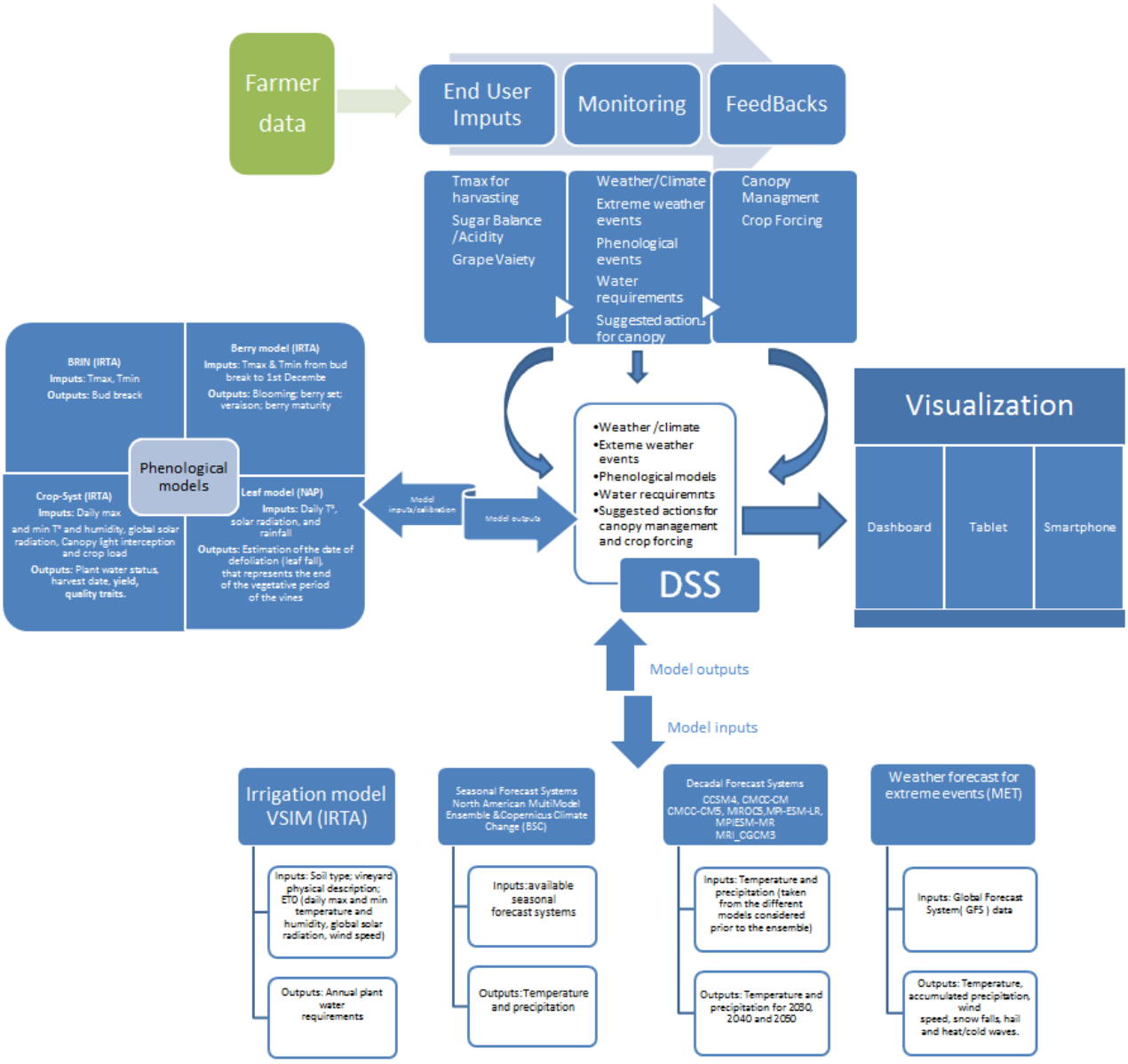

Figure 1: Overview of VISCA data flows

To provide information and advice services to farmers, VISCA is managing different types of data:

- Input data at farm level
  - Data provided online with interactive forms (i.e. end-users inputs and feed-back – see data flow figure)
  - Monitoring data collected by end-user and uploaded to VISCA platform (no connected in-situ sensors available on the demo sites)

- Input data for models
  - Farmer input data (see above)
  - Outputs from other models (from weather forecast models to phenological and irrigation models)
  - External data for the weather forecast models
- Data generated
  - By models and processed internally
  - By models for end-user visualisation through the DSS on different terminals (access through web services could also be provided if requested by users and third parties for integration in another software application).

The DSS is also playing the role of data hub for the different models.

List of datasets collected or generated by VISCA platform (DSS + models):

Table 1: Collected or generated datasets

Name	***Content (parameters)***	***In/out (VISCA)***	***Frequency / Source***
Initial user inputs	*Tmax for harvesting* *Sugar Balance /Acidity/Grape Variety*	*IN*	*Once* *Provided by end user with online form*
Monitoring	*Weather stations data* *Phenological events* *Irrigation* *Suggested actions for canopy*	*IN*	*Uploaded manually with forms or csv file by end-users*
Validation data	*Must composition* *Wine quality parameters* *Real phenological dates* *Observational weather data* *Final vineyards description*	*OUT/IN*	*Once* *Provided by end user with online form pre-filled*
Visualisation service	Weather Forecast (Short-term: 1-3 days) Weather Forecast (Medium-Short-term: 5-15 days) Seasonal Forecast (: 1-3 months) Climate Forecast (10 years) Phenological & Irrigation recommendations	*OUT*	*On demand*
Short term weather forecast	*Global Forecast System -GFS* *Rain/T°/wind/Relative Humidity* *obtained from WRF-ARW (Weather Research and Forecasting) Model*	*IN* *OUT*	*Updated every 12h* *Source: National Center for Atmospheric Research (NCAR)*
Medium term weather forecast	*Global Ensemble Forecast System-GEFS* *Rain/T°/wind/Relative Humidity*	*IN* *OUT*	*Updated every 12h* *Source: National Center for Atmospheric Research (NCAR)*
Seasonal forecast	*EU seasonal forecasts system* *Rain/T*	*IN* *OUT*	*Monthly updates* *Source: ECMWF*
Climate forecast	*Decadal climate predictions* *Rain/T for 10 years*	*IN* *OUT*	*No update* *Source: euro-Cordex and CMIP5*

Name	*Content (parameters)*	*In/out (VISCA)*	*Frequency / Source*
Irrigation model	*Soil type; vineyard physical description; daily max and min temperature and humidity, global solar radiation, wind speed, Annual plant water requirements*	*IN* *OUT*	*Depending on the parameter Source: end users and weather forecast models*
BRIN model	*Tmax, Tmin* *Bud breack*	*IN* *OUT*	*Depending on the parameter Source: end users and weather forecast models*
Berry model	*Tmax & Tmin from bud break to 1st December, Blooming; berry set; veraison; berry maturity*	*IN* *OUT*	*Depending on the parameter Source: end users and weather forecast models*
Crop-Syst model	*Daily max and min T° and humidity, global solar radiation, Canopy light interception and crop load Plant water status, harvest date, yield, and quality traits.*	*IN* *OUT*	*Depending on the parameter Source: end users and weather forecast models*
Leaf model	*Daily T°, solar radiation, and rainfall Estimated date of defoliation (leaf fall)*	*IN OUT*	*Depending on the parameter Source: end users and weather forecast models*

All input data from third parties used weather and climate models are open source.

4. Data standards and naming

VISCA platform manages alpha-numerical and geographical datasets. The main data formats used for VISCA implementation are

Table 2: data and file standards used

Data type	standards
User geographical layers (e.g. vineyards parcels)	Shape files (SHP)
End-user time series (e.g. observed climate data)	Excel or csv
Coordinate system	WGS84
Date & time	ISO 8160
Internal geographical layers (exchanged between models and DSS)	GeoJSON
Input data files for short/medium and seasonal weather forecasts	GRIB
Input data files for climate forecasts	NetCDF

File naming conventions for user inputs are not necessary as VISCA platform will rename the files uploaded for internal use.

The standard units used are:

Table 3: Standard units used

Parameters	Standard unit
Rain	mm
Temperature	°C
Wind Speed	m/s
Relative humidity	%
Pressures (Stress threshold Preveraison, Stress threshold Veraison, Stress threshold Post Harvest)	MPascal
Facing, Spacing, Soil depth	m
Soil texture (% sand&clay)	%
Drip flow rate	l/h
Sugar Level	Brix
Acidity Level	g/l tartaric acid
Alcoholic level	%
Yield	Kg/Ha
Irrigation	mm/day

5. Metadata

All spatial and numerical datasets that will be produced shall be accompanied by metadata. Metadata will be delivered in a INSPIRE Directive (2007/2/EC) conform ISO 19115/ISO 19119 metadata standard.

The overall structure of the ISO 19115/ISO 19119 metadata set supporting the requirements expressed in the INSPIRE Implementing rules for metadata, is included and explained in the "INSPIRE Metadata Implementing Rules: Technical Guidelines based on EN ISO 19115 and EN ISO 19119" document, which is available online (http://inspire.ec.europa.eu/documents/Metadata/MD_IR_and_ISO_20131029.pdf).

The minimum set of metadata elements necessary to comply with INSPIRE Directive have been provided to the partners (see annex).

Metadata will be produced for:

- User datasets introduced in VISCA (time series and parcel layers) for internal uses;
- Web services that will allow access to visualisation data (output of VISCA platform) for possible integration into third party application
- Datasets that could be provided in open access (Seasonal weather forecast, Climate forecasts, weather station data) – pending on Steering Committee decision.

6. Data security

Personal data management

The management of personal data is limited to

- user accounts for the responsive web application (RWA). VISCA platform will store personal data about end-users profiles (username, name, surname, email, phone, company name, company address and country). This data will not be shared nor transferred to the different VISCA models. The use of personal data will be restricted to login credential to the RWA to send automatic reports and alerts.
- Contacts for dissemination: some personal data are collected for dissemination purpose and stored in a spreadsheet (name of the contact, the organisation, the position, email, phone number, country, and the type of stakeholder (e.g. end-user, policy maker). To foster data security and privacy issues, VISCA is taking into account the EU directives related to both users' rights relating to electronic communications networks and services, and to the processing of personal data and the protection of privacy in the electronic communications sector (see Ethical issues chapter). This spreadsheet is stored on a file located on a local server of the partner in charge of dissemination (SEMIDE) and shared only with the project coordinator.

VISCA has been implementing the latest EU Data Protection Directive (2016/680s) even before its formal application date (25 May 2018). This Directive is repealing Directive 95/46/EC (General Data Protection Regulation).

Data sharing

VISCA DSS is a data hub for data sharing between the different models integrated in the VISCA platform. There is no other form of data sharing with external third party in the framework of the VISCA platform, in particular because the system is managing sensitive data on vineyards management in a very competitive environment.

All data exchanges will be performed throughout web services based on HTTPS protocol with OAuth 2.0 authentication. Access rights to services (and therefore to data) will be managed using the concept of permissions: every user (including models) of the DSS platform can have usage permission on single API.

Open access

The VISCA project is part of the Open Data Research Pilot. A first overview of potential datasets to be provided in open access was provided in M6 with the 1st version of the DMP, subject to decision by the project Steering Committee. These datasets were:

- Seasonal weather forecast
- Climate Forecast
- Weather station data

At project mid-term, partners reviewed datasets that could be opened while considering competitive issues for industrial partners as well as datasets underlying scientific publications. A specific session was held with all project partners at the 2nd general meeting in Naples, 10 December 2018.

The overall VISCA exploitation approach is based on data delivery through a web responsive platform. So open provision of data is conflicting with exploitation scenarios. But recognising the importance of open research data and the necessity to protect various models' approach with copyright through scientific publications, datasets collected and generated during the project lifetime and supporting scientific publications will be provided on an open access platform.

The partners selected the general purpose ZENODO platform for open science (https://zenodo.org/) provided by CERN and compliant with the EU OpenAIRE tools. The main advantages are:

- Storage and open access of both publication and data (up to 50GB by dataset)
- Provision of Digital Object Identifier (DOI) for citation
- Possibility to store data and publication with an embargo date, as the effective scientific publications foreseen may occur far after the end of VISCA project, even if the publication process start during the project.

Peer reviewed scientific publications are planned in scientific journals and conference proceedings by VISCA research partners (IRTA, NAP, UPORTO, BSC) either individually or jointly together with other partners. The table 4 presents the topics to be tackled by publications and the supporting foreseen datasets, while table 5 is providing an overview of datasets content and partners providing these datasets. Detailed content of open access datasets will be defined according to the data used in the publications.

Table 4: List of datasets underlying planned scientific publication topics

Topics	Datasets	Partners
Downscaling of seasonal forecasts for vineyards	Seasonal forecast	BSC
Multi-model seasonal forecasts for vineyards (methodology to accommodate seasonal weather data into phenological models)	Seasonal weather forecast	IRTA, BSC
Management of meteorological risks at short and medium term on vineyards	Short term deterministic weather forecast Mid term probabilistic weather forecast Phenological events	MET, SV, MBD, COD[4]
Effects of Crop forcing on bloom and fruit set in two grapevine varieties	Phenological events Demo site weather station data	IRTA (NAP[5])

[4] All or one end-user (vineyards)
[5] To be confirmed

Table 5: Content of foreseen open access data sets if linked to scientific publications

Data sets	Content	Partners
Seasonal forecast	Rain, temperature by month for 6 months	BSC
Climate Forecast	Rain, temp for 10, 20 and 30 years (all Europe)	MET
Demo sites observations (Weather station data)	Rain, min and max temperature, relative humidity by day	SV MBD
Demo site Raimat weather station data	Rain, temp min/max, wind speed, ETO, humidity, solar irradiation by day Available online at RURALCAT (download) and meteo.cat (visualisation)	COD
Short term deterministic weather forecast	Temp, wind speed, accumulated precipitation, relative humidity, downward short-wave flux	MET
Mid-term probabilistic weather forecast	Mean temp, wind speed, accumulated precipitation, relative humidity, downward short-wave flux	MET
Phenological Records	Records of phenological stages of the grape varieties included in the project: historical records and measurements taken during the project lifetime	IRTA, NAP

The selected datasets generated during the project will be archived on XENODO server and registry to the Registry of Research Data Repositories https://www.re3data.org/ will be ensured. Datasets will be provided under the Creative Commons Licences CC-BY.

After the end of the project, access to updated data sets will be offered as SaaS (Software as a Service) under licence as well as through the VISCA web responsive platform for registered users. This will be further defined as part of the exploitation plan within WP5.

Storage and preservation

All data sets and files shared between models and with end-users are stored in the DSS. Back-up rules will be set as follow:

- SQL-based services: automatic back-up, done every 30 min. Back-ups are kept from 7 to 35 days, according to the service level.
- Files: are replicated (3 copies of each file are kept within the same data center) and backed-up in a different storage system.

For the duration of VISCA project, historical data will be kept in the DSS (weather stations and climate/weather forecasts) as long as the data fits in the 500TB limit, above this limit the older datasets will be erased.

7. Ethical aspects

VISCA project does not cover any action related to ethical issues identified by H2020 programme, and therefore there is no data related to such ethical issues managed by the platform.

All the personal data management in the framework of VISCA project is implemented according to the latest EU General Data Protection Regulation. Personal data is collected for 2 main purposes: dissemination (internal stakeholder database) and end-user access to the VISCA platform.

Following, the entry into force of the EU GDPR in May 2018, the privacy statement of the VISCA web portal has been updated, including a designed referent person for data protection issues that can be contacted by any person. It describes what personal information is collected in specific cases and its purpose as well as the use of cookies. Specific consents are collected for registration into VISCA newsletter mailing list, and VISCA events. These are reported into the VISCA stakeholder database for tracking purposes.

In a similar way, end-users registering to the VISCA platform are required to accept the privacy statement and give their consent on the few personal data stored for their login credential. The end-users will be required to accept the general condition of use with a message similar to:

"VISCA partners do their best to secure your personal data in accordance with applicable data protection regulations based on European Directive 95/46/CE. Your personal data will be used only to grant you a secure access to VISCA platform. You can modify at any time your personal data by logging into your VISCA platform account. In accordance with the law, you have the right to access, rectify and delete information concerning you by contacting the VISCA data protection officer from the VISCA web site privacy section.

By accepting these conditions, you agree to receiving e-mails related to the use of your account. "

All personal data collected will be kept only for the duration of the VISCA project and used only for disseminating project activities and results or access to the VISCA platform. A person can contact at any time the VISCA Data Protection Officer to get access to his personal data and to modify it or withdraw from VISCA stakeholder database (see content and security under chapter 6 -Data security).

8. References

- Creative Commons Licences CC-BY: This license lets others distribute, remix, tweak, and build upon your work, even commercially, as long as they credit you for the original creation. This is the most accommodating of licenses offered.
- NetCDF is a set of software libraries and self-describing, machine-independent data formats that support the creation, access, and sharing of array-oriented scientific data
- GRIB is a WMO format for gridded data. GRIB is used by the operational meteorological centers for storage and the exchange of gridded fields. GRIB's major advantages are files are typically 1/2 to 1/3 of the size of normal binary files (floats), the fields are self describing, and GRIB is an open, international standard.

9. Annex: Minimum set of metadata elements

Minimum set of metadata elements necessary to comply with Directive 2007/2/EC

A) Metadata according to INSPIRE Metadata Regulation (COMMISSION REGULATION (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata)

ref	group of metadata elements	metadata element	multiplicity regarding services	multiplicity regarding dataset, series	description	Required, optional, not included
1	IDENTIFICATION					
1.1		Resource Title	1	1	This a characteristic, and often unique, name by which the resource is known. The value domain of this metadata element is free text.	Required
1.2		Resource Abstract	1	1	This is a brief narrative summary of the content of the resource. The value domain of this metadata element is free text.	Required
1.3		Resource Type	1	1	This is the type of resource being described by the metadata. The value domain of this metadata element is defined in Part D.1. 1.1. Spatial data set series (series) 1.2. Spatial data set (dataset) 1.3. Spatial data services (services)	Required
1.4		Resource Locator	0..* Mandatory if linkage to the service is available.	0..* Mandatory if a URL is available to obtain more information on the resource, and/or access related services.	The resource locator defines the link(s) to the resource and/or the link to additional information about the resource. The value domain of this metadata element is a character string, commonly expressed as uniform resource locator (URL).	Not included
1.5		Unique resource identifier	0	1..*	A value uniquely identifying the resource. The value domain of this metadata element is a mandatory character string code, generally assigned by the data owner, and a character string namespace uniquely identifying the context of the identifier code (for example, the data owner).	Not included
1.6		Coupled Resource	0..* Mandatory if linkage to data sets on which the service operates are available.	0	If the resource is a spatial data service, this metadata element identifies, where relevant, the target spatial data set(s) of the service through their unique resource identifiers (URI). The value domain of this metadata element is a mandatory character string code, generally assigned by the data owner, and a character string namespace uniquely identifying the context of the identifier code (for example, the data owner).	Not included
1.7		Resource language	0	0..* Mandatory if the resource includes textual information.	The language(s) used within the resource. The value domain of this metadata element is limited to the languages defined in ISO 639-2.	Required

2	CLASSIFICATION OF SPATIAL DATA AND SERVICES					
2.1		Topic category	0	1..*	The topic category is a high-level classification scheme to assist in the grouping and topic-based search of available spatial data resources. The value domain of this metadata element is defined in Part D.2. (Topic categories in accordance with EN ISO 19115) - see CELEX_32008R1205_EN_TXT.pdf for details	Optional
2.2		Spatial Data Service Type	1	0	This is a classification to assist in the search of available spatial data services. A specific service shall be categorised in only one category. The value domain of this metadata element is defined in Part D.3. (discovery, view, download, transformation, invoke)	Required
3	KEYWORD				If the resource is a spatial data service, at least one keyword from Part D.4 shall be provided. If a resource is a spatial data set or spatial data set series, at least one keyword shall be provided from the general environmental multilingual thesaurus (GEMET) describing the relevant spatial data theme as defined in Annex I, II or III to Directive 2007/2/EC. For each keyword, the following metadata elements shall be provided:	
3.1		Keyword value	1..*	1..*	The keyword value is a commonly used word, formalised word or phrase used to describe the subject. While the topic category is too coarse for detailed queries, keywords help narrowing a full text search and they allow for structured keyword search. The value domain of this metadata element is free text.	Required
3.2		Originating controlled vocabulary	1..*	1..*	If the keyword value originates from a controlled vocabulary (thesaurus, ontology), for example GEMET, the citation of the originating controlled vocabulary shall be provided. This citation shall include at least the title and a reference date (date of publication, date of last revision or of creation) of the originating controlled vocabulary. There can be more than one because the keywords can own to more than one vocabulary	Required
4	GEOGRAPHIC LOCATION					
4.1		Geographic Bounding Box	1..*	1..*	This is the extent of the resource in the geographic space, given as a bounding box. The bounding box shall be expressed with westbound and eastbound longitudes, and southbound and northbound latitudes in decimal degrees, with a precision of at least two decimals.	Required
5	TEMPORAL REFERENCE		1..* Individually all temporal reference elements are conditional but one or more temporal reference must be provided.	1..* Individually all temporal reference elements are conditional but one or more temporal reference must be provided.	This metadata element addresses the requirement to have information on the temporal dimension of the data as referred to in Article 8(2)(d) of Directive 2007/2/EC. At least one of the metadata elements referred to in points 5.1 to 5.4 shall be provided. The value domain of the metadata elements referred to in points 5.1 to 5.4 is a set of dates. Each date shall refer to a temporal reference system and shall be expressed in a form compatible with that system. The default reference system shall be the Gregorian calendar, with dates expressed in accordance with ISO 8601.	

5.1		Temporal extent	0..*	0..*	The temporal extent defines the time period covered by the content of the resource. This time period may be expressed as any of the following: — an individual date, - an interval of dates expressed through the starting date and end date of the interval, — a mix of individual dates and intervals of dates.	Required
5.2		Date of publication	0..*	0..*	This is the date of publication of the resource when available, or the date of entry into force. There may be more than one date of publication.	Required
5.3		Date of last revision	0..1	0..1	This is the date of last revision of the resource, if the resource has been revised. There shall not be more than one date of last revision.	Required
5.4		Date of creation	0..1	0..1	This is the date of creation of the resource. There shall not be more than one date of creation.	Required
6	QUALITY AND VALIDITY					
6.1		Lineage	0	1	This is a statement on process history and/or overall quality of the spatial data set. Where appropriate it may include a statement whether the data set has been validated or quality assured, whether it is the official version (if multiple versions exist), and whether it has legal validity. The value domain of this metadata element is free text.	Not included
6.2		Spatial Resolution	0..* Mandatory when there is a restriction on the spatial resolution for this service.	0..* Mandatory for data sets and data set series if an equivalent scale or a resolution distance can be specified.	Spatial resolution refers to the level of detail of the data set. It shall be expressed as a set of zero to many resolution distances (typically for gridded data and imagery-derived products) or equivalent scales (typically for maps or map-derived products). An equivalent scale is generally expressed as an integer value expressing the scale denominator. A resolution distance shall be expressed as a numerical value associated with a unit of length.	Required
7	CONFORMITY				The requirements referred to in Article 5(2)(a) and Article 11(2)(d) of Directive 2007/2/EC relating to the conformity, and the degree of conformity, with implementing rules adopted under Article 7(1) of Directive 2007/2/EC shall be addressed by the following metadata elements:	
7.1		Specification	1..*	1..*	This is a citation of the implementing rules adopted under Article 7(1) of Directive 2007/2/EC or other specification to which a particular resource conforms. A resource may conform to more than one implementing rules adopted under Article 7(1) of Directive 2007/2/EC or other specification. This citation shall include at least the title and a reference date (date of publication, date of last revision or of creation) of the implementing rules adopted under Article 7(1) of Directive 2007/2/EC or of the specification.	Required
7.2		Degree	1..*	1..*	This is the degree of conformity of the resource to the implementing rules adopted under Article 7(1) of Directive 2007/2/EC or other specification. The value domain of this metadata element is defined in Part D.	Required

8	CONSTRAINT RELATED TO ACCESS AND USE					
8.1		Conditions for Access and Use	1..*	1..*	This metadata element defines the conditions for access and use of spatial data sets and services, and where applicable, corresponding fees as required by Article 5(2)(b) and Article 11(2)(f) of Directive 2007/2/EC. The value domain of this metadata element is free text. The element must have values. If no conditions apply to the access and use of the resource, 'no conditions apply' shall be used. If conditions are unknown, 'conditions unknown' shall be used. This element shall also provide information on any fees necessary to access and use the resource, if applicable, or refer to a uniform resource locator (URL) where information on fees is available. Additional Requirements on Metadata according to regulation 1312/2014: The technical restrictions applying to the access and use of the spatial data service shall be documented in the metadata element "CONSTRAINT RELATED TO ACCESS AND USE" set out in Regulation (EC) No 1205/2008.	Optional
8.2		Limitations on Public Access	1..*	1..*	When Member States limit public access to spatial data sets and spatial data services under Article 13 of Directive 2007/2/EC, this metadata element shall provide information on the limitations and the reasons for them. If there are no limitations on public access, this metadata element shall indicate that fact. The value domain of this metadata element is free text.	Optional
9	RESPONSIBLE ORGANISATION				Organisations responsible for the establishment, management, maintenance and distribution of spatial data sets and services	
9.1		Responsible party	1..*	1..*	This is the description of the organisation responsible for the establishment, management, maintenance and distribution of the resource. This description shall include: — the name of the organisation as free text, — a contact e-mail address as a character string. Additional Requirements on Metadata according to regulation 1312/2014: The responsible party set out in Regulation (EC) No 1205/2008 shall at least describe the custodian responsible organisation, corresponding to the Custodian responsible party role set out in Regulation (EC) No 1205/2008.	Required
9.2		Responsible party role	1..*	1..*	This is the role of the responsible organisation. The value domain of this metadata element is defined in Part D.	Required
10	METADATA ON METADATA					
10.1		Metadata Point of Contact	1..*	1..*	This is the description of the organisation responsible for the creation and maintenance of the metadata. This description shall include: — the name of the organisation as free text, — a contact e-mail address as a character string.	Required

10.2		Metadata Date	1	1	The date which specifies when the metadata record was created or updated. This date shall be expressed in conformity with ISO 8601.	Required
10.3		Metadata Language	1	1	This is the language in which the metadata elements are expressed. The value domain of this metadata element is limited to the official languages of the Community expressed in conformity with ISO 639-2.	Required
B) Additional metadata elements according to INSPIRE Implementing Rules for interoperability of spatial data sets and services (Commission Regulation (EU) No 1089/2010; Art. 13 Metadata required for Interoperability) and relevant amendments						
		Coordinate Reference System	1..*	1..*	Description of the coordinate reference system(s) used in the data set.	Required
		Distribution Format	1..*	1..*	Description of the computer language construct(s) specifying the representation of data objects in a record, file, message, storage device or transmission channel.	Not Included
		Spatial Representation Type	1..*	1..*	The method used to spatially represent geographic information. Codelist (see B.5.26 of ISO 19115), following INSPIRE Data specifications only vector, grid and tin should be used.	Not Included
		Temporal reference system	0..* Mandatory, if the spatial data set or one of its feature types contains temporal information that does not refer to the Gregorian Calendar or the Coordinated Universal Time	0..* Mandatory, if the spatial data set or one of its feature types contains temporal information that does not refer to the Gregorian Calendar or the Coordinated Universal Time	Description of the temporal reference systems used in the dataset.	Not Included
		Character encoding	0..* Mandatory if an encoding is used that is not based on UTF-8	0..* Mandatory if an encoding is used that is not based on UTF-8	The character encoding used in the data set.	Not Included