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### **Deliverable D5.5 *Standardization label proposal***

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## Executive Summary

This deliverable (D 5.5) presents the standardization label proposal in the framework of the activities into Work Package 5 *Promote interoperable solutions*. The label proposal is structured in three facets that correspond to three criteria: INSPIRE conformity (environmental criteria), WFD conformity (legal criteria) and OGC conformity (geospatial criteria), applied to the standardization and interoperability topics.

This presented label has eight possible options (graphically identified) that indicates the accomplishment of the three criteria and it represents a quality indicator for the products in the WaterInnEU marketplace in terms of standardization goals.

Finally, this proposal poses three levels of potential application in the future

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## 1. Introduction

WaterInnEU is built upon existing knowledge bases and platforms developed in previous projects. It provides new concepts, connections and components for boosting a selection of products and services from this knowledge's building. Into the Work Plan of WaterInnEU, WorkPackage5 designs a strategy to promote the interoperability as the core of the proposal solution for promoting the outcomes of these previous projects and following one of the primary WaterInnEU's goals:

*b) Assess the level of standardization and interoperability of these outcomes as a mechanism to integrate ICT-based tools, and incorporate open data platforms and generate a palette of interchangeable components that are able to use the water data emerging from the data sharing processes and data models stimulated by initiatives such as the INSPIRE directive.*

In recent years, many institutions and public agencies are providing their corresponding generated data, but in some cases so far from the more suitable way of distribution. Moe *et al.* (2013) explains the main barriers for data access, such as *data are not centralized but are stored in various formats with little compatibility* and supports Beniston *et al.* (2012) for easier access to data and information in water and climate related sciences: the establishment of a general well-defined and easily accessible 'clearinghouse' of relevant and structured data and metadata, which explicitly includes data produced by EU-funded and related project. Standards and interoperability are facilitators for data openness and reusability. In this line, WaterInnEU propose the creation of a specific label that is a visual representation of the level of standardization and interoperability of a dataset (including its metadata).

The standards provide several benefits to the community:

- Vendor independence that evolves a processing environment for commercial use without being constrained to a single vendor's offerings.
- Interoperability: It allows products and services elaborated by different vendors to communicate.
- Transparency that provides a clear account to comply with legal provisions, audits, security's verification.
- Avoid data duplication and consequently, data are collected and maintained at the most appropriate place.
- Preservation: it helps for digital sustainability enabling solutions to be maintained by others different than the initial vendor.
- Knowledge exchange: sharing any kind of expertise and information between researchers, companies and public bodies and it allows build on innovation.

The aims of interoperability and its close link to standardization are:

- Tools can easily use previous data, can easily be replaced by other compatible components and results can easily be communicated.
- Understanding and employment on the discovered information and tools, no matter what platform, whether local or remote.
- Evolvement of a processing environment for commercial use without being constrained to a single vendor's offerings.
- Facilitating through a set of standards the integration of geographic information concepts with IT concepts.

In this framework and within explained approach, the current proposal is generate a graphical indicator of the degree of adoption of standardization and interoperability elements.

On the other hand, past initiatives demonstrate in several sectors that the *label* concept can successfully symbolise the aggregation of different ratings and qualifications. We know examples

(see Figure 1) of labels used by the CD/DVD industry, energy and even in manufacture food products. Graphic labels are perceived by the users as a seal of quality (this is the case of the water rating label) or an effort of the producer to achieve some degree of conformance that removes technological barriers and ensure “compatibility” (this is the case of the CD-DVD industry label)

Some examples are the Energy Star<sup>1</sup>, the EU organic products<sup>2</sup>, the Blue Flag<sup>3</sup>, the Water Efficiency Labelling<sup>4</sup>, the OGC certified label<sup>5</sup> or the GeoViQua GEO label<sup>6</sup> that serves some of those purposes. The three last examples are more related to WaterInnEU scopes (for water domain application or for the standardization approach) and they will be deeper described in the next section. In this project, a “water standard offering” label is going to be developed and introduced in the marketplace as a sign of a compromise with a standard offering.



Figure 1: Examples of labels

In current proposal, the concept of label is associated to standardization and interoperability issues and it is defined as one of the components itself and additionally it is related to other components of the WaterInnEU approach:

- Companies & SMEs pool
- Water data
- Interoperability experiments
- Standardization label
- User Feedback

<sup>1</sup> <https://www.energystar.gov/>

<sup>2</sup> <http://www.ecolabelindex.com/ecolabel/eu-organic-products-label>

<sup>3</sup> <http://www.blueflag.global/>

<sup>4</sup> <http://www.waterrating.gov.au/>

<sup>5</sup> <http://www.opengeospatial.org/resource/products/compliant>

<sup>6</sup> <http://www.geolabel.info/About.htm>

- e-Learning
- Specialist Commercialisation Support Services

The label proposal uses the deliverable D5.1 Compendium of available standards combined with the merging of other auxiliary components developed in next sections. The deliverable D5.1 includes a list of potential relevant standards and explores the convenience of their promotion in WaterInnEU project. According to the main scope of the project, standards are focused on the geospatial and the data model component and these auxiliary components refine the water related aspects.

## 2. The framework

The proposed label considers 3 important aspects of the legal and technical interoperability. The framework of the generation of the current label proposal is integrated by three main faces specially addressed in the vision of the WaterInnEU project and they are the following ones:

### 2.1. INSPIRE

The Infrastructure for Spatial Information in the European Community (INSPIRE) aims to create a European Union (EU) spatial data infrastructure. Even if it encompasses geospatial data used in many other areas, INSPIRE was created to share the **environmental spatial information** among public sector organisations and better facilitate public access to spatial information across Europe. INSPIRE details technical provisions and implementing rules relating to a number of technical and policy areas, i.e. metadata, interoperability of spatial data sets and services and coordination and measures for monitoring and reporting.

INSPIRE is based on the following principles:

- Data should be collected only once and kept where it can be maintained most effectively.
- It should be possible to combine seamless spatial information from different sources across Europe and share it with many users and applications.
- It should be possible for information collected at one level/scale to be shared with all levels/scales; detailed for thorough investigations, general for strategic purposes.
- Geographic information needed for good governance at all levels should be readily and transparently available.
- Easy to find which geographic information is available, how it can be used to meet a particular need, and under which conditions it can be acquired and used.

INSPIRE provides annexed lists of a set of themes (including water topics) that should be part of the European SDI and in recent years INSPIRE has published data model guidelines for all themes and member states are producing several datasets that comply with these data models. In addition, technical guidelines for metadata, downloading and transformation services have been released that are also transversal and applicable to the water domain. A very interesting tool to check INSPIRE requirements is the *INSPIRE metadata validator Web Service*<sup>7</sup>. This is a RESTful Web service that can be invoked via HTTP to validate metadata and Network Services under the scope of INSPIRE and the corresponding Technical Guidelines. The response document is always a Geoportal Resource, it means that it is an envelope containing a payload plus some additional information.

The INSPIRE compliance is mandatory for official data created in Europe. INSPIRE represents the **environmental** face of the proposal label.

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<sup>7</sup> <http://inspire-geoportal.ec.europa.eu/validator2/>



## 2.2. WFD

The Water Framework Directive (2000/60/EC) is the legislation that has set the foundation of water policy in the European Member States. It has fostered integrated and sustainable water management.

For present work purposes, its article 8 *Monitoring of surface water status, groundwater status and protected areas*, is related to this study, mainly it emphasis the relevant metadata role in the *Technical specifications and standardized methods for analysis and monitoring of water status*.

The implementation of the Water Framework Directive raises a number of shared technical challenges for the Member States, the Commission, the Candidate and EEA Countries as well as stakeholders and NGOs and it is collected in related guidance documents, key events and additional resource documents. For example, the *WFD CIS Guidance Document No.9 Implementing the Geographical Information System (GIS)* of the Water Framework Directive describes some interesting aspects to be considered for the standardization label based on WFD criteria:

- Agreed terminology
- Definition of the Data Model and their main components: water Bodies, monitoring stations, administration and status:
- Definition of the Feature classes
- Categorization of the elements of the Features
- Generation of the Unique European codes
- Framework for applying quality standards based in the International Organisation for Standardisation (ISO) for quality principles (19113), evaluation procedures (19114) and metadata (1915)
- Definition of the core and mandatory elements by these standards
- ...

Other relevant document is the *Guidance Document No: 22 Updated Guidance on Implementing the Geographical Information System (GIS) Elements of the EU Water policy*, with some related key points:

- Description of the Principles of WISE compatibility and interoperability
- Proposal of Standards for data exchange
- Definition of the metadata creation methods
- Proposal of Interoperable services within Spatial Data Infrastructures
- ...

The WFD represents the **legal** face of the proposed label.

## 2.3. OGC

The Open Geospatial Consortium (OGC) is an international committee for the creation of quality open standards for the global geospatial community. The OGC provides a collaborative, consensus process for developing, approving and maintaining open, international standards that enable the modelling, sharing, and access to any location enabled content or service (Reed *et al.* 2015). The OGC is formed by a consortium of companies, governmental agencies and universities.

Its mission is to advance the development and use of international standards and supporting services that promote geospatial interoperability. OGC standards involve any technology that requires geospatial interoperability. This technology covers areas including Web services, data models, mobile platforms, encoding, and markup languages. The OGC is structured in 3 programs: the Interoperability program, the standards program and the communication and outreach program. While the standards program is devoted to the elaboration of standard documents, the OGC Interoperability Program (IP) conducts initiatives that build and exercise public-private partnerships to accelerate the development of emerging concepts and drive global trends in interoperability

through rapid prototyping of new capabilities. Additionally, it tests and demonstrates interoperability amongst standards and identifies new requirements that lead to new or revised standards.

In addition to OGC, there are other standardization committees and international organizations that produce standards relevant for ICT water domain applications: International Organization for Standardization (ISO), World Wide Web Consortium (W3C), Institute of Electrical and Electronics Engineers (IEEE), IETF, etc. Most of them are focused on very general purposes of Information and Technologies scopes, however OGC is focused on the relevant geospatial component in its applications. Some successful examples of OGC standards for general spatial purposes are Web Maps Service (WMS), Geography Markup Language (GML), Web Processing Service (WPS) and more related to the Hydrology Domain is WaterML (Hussain *et al.* 2015).

The OGC represents the **geospatial** face of the label proposal.

### 3. Standard label stories

As introduced in previous section the label concept is applied to different sectors and categories, and for focusing to the WaterInnEU goals. We are going to describe four examples as the main inspiration for the new standardization label proposal in the context of the present document. Two of these examples are applied in water domain without interoperable goals and the two other are in the line of interoperability and standardization purposes, but not focused in the water sector, mainly in geospatial domain.

#### 3.1. WELS Scheme

The Water Efficiency Labelling & Standards (WELS) water-rating label provides efficiency information for water-using household products (i.e. clothes washing machines and dishwashers) promoted by the Department of Environment of the Australian Government. The mandatory rating system is similar to the energy rating labelling, with six stars. Its main objective is to reduce water consumption by providing information about the water efficiency.

#### 3.2. European Water Label

The European Water Label is an Industry wide supported voluntary labelling scheme for water using products. The Scheme's primary role is to educate the consumer on water use and using water wisely, thus enabling an informed choice to be made at point of sale. This simple classification scheme applicable throughout Europe clearly shows the maximum volume of water that the labelled product will deliver. This scheme provides easy access to a database of bathroom products that when installed and used correctly will use less water, save energy and save money.

Additionally a provided useful tool is the energy calculator Methodology, downloaded in <http://www.europeanwaterlabel.eu/energycalculation.asp>

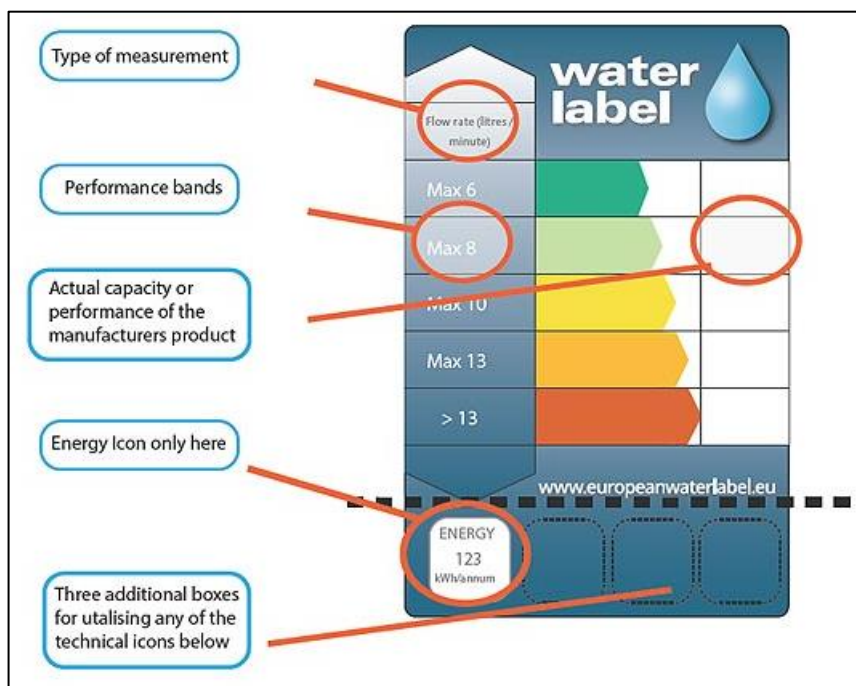


Figure 2: European water label

### 3.3. GEO label

GeoViQua<sup>8</sup>, a FP7 project, developed the concept of a data label (GEO label<sup>9</sup>) as a graphic aimed at representing a set of common principles that a dataset part of Global Earth Observation System of Systems (GEOSS) should aim to respect (Lush. et al 2013). The label had 8 facets with 8 icons each one show if a principle is followed by illuminating it with color. These eight principles were extracted as the results of 3 surveys conducted by GeoViQua among the Group on Earth Observations (GEO) community and beyond (GeoViQua 2013). This label is based in the GeoViQua Producer Quality Model (PQM) that builds on ISO19157 and includes new support for discovered issues, workarounds, usage, citations, goodness-of-fit statistics and validation. The PQM is complemented by the User Quality Model (UQM), which captures user feedback on datasets, including numerical ratings with text justification; user comments and reports of usage and problems identified (Blower *et al.* 2015).

Afterwards, this label proposal has been progressing and has been adapted to fit into the GEOSS Data Management Principles (DMP). In this upgraded version, the label is composed by 10 facets and icons (see in Figure 3). Initially designed in an EU funded project, it is now in the process of being adopted by an international organization as GEOSS. If confirmed, it will be a very interesting success story to be considered for the present project.

It is important to note that the original design was done in a bottom-up approach (where the users suggested the design and the facets to be present in the label). The current design is based in a top-down approach where the already ratified 10 DMPs are taken as they are and represented in 10 icons integrated in a single label.

<sup>8</sup> <http://www.geoviqua.org/>

<sup>9</sup> <http://geolabel.info/>

Another aspect that makes the original GEO label singular is the existence of a GEO Label Service<sup>10</sup> that is a RESTful API that allows generating a GEO label in SVG and JSON representations from supplied metadata records.

Another important aspect of the label is that the label is not a static draw but a dynamic graphical interface: Hovering and clicking on the different facet of it results in getting more information on the affected facet, connecting with the DMP description and the reason why the color (expressing conformity) has been activated.

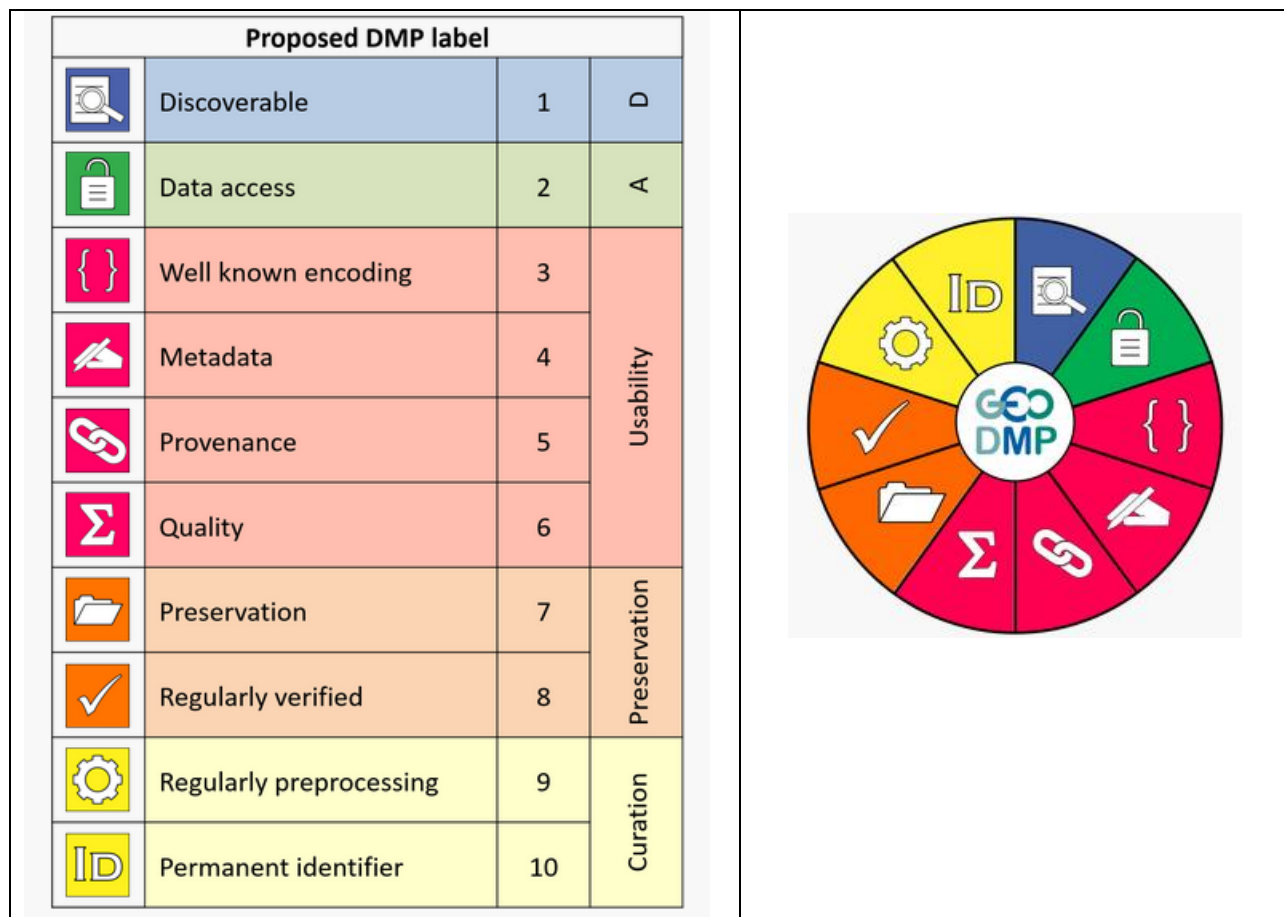


Figure 3 : GeoLabel (on the left the individual icons and its meaning, and on the right the complete label representation).

### 3.4. OGC compliant label

The OGC validator<sup>11</sup> is a set of test suite that helps organizations better implement service interfaces, encodings and clients that adhere to OGC standards. Passing the test and getting OGC certified helps organizations distinguishing their product in the market place.

The OGC Web Validator has the following features:

- Speed testing
- Detailed reporting
- Storing of sessions

<sup>10</sup> <http://www.geolabel.net/home.html>

<sup>11</sup> <http://cite.opengeospatial.org/teamengine/>

- Validation of services
- Validation of clients
- Validation of schemas
- Validation of data

This validator is available for more used OGC standards: Catalogue Service - Web (CSW), Geography Markup Language (GML), OGC KML, Sensor Observation Service (SOS), Sensor Planning Service (SPS), Simple Feature Access - SQL (SFS), Web Coverage Service (WCS), Web Feature Service (WFS) and Web Map Service (WMS) and different Test Suite Revision is provided. These tools are open and the source of the engine and the tests are available at GitHub<sup>12</sup>.

This introduces another aspect of the label. Once the test has been passed you can pay for an OGC certificate that ratifies that you are really conforming to the standard. This is common practice in other standards such as the ISO 9000 family where dedicated organizations inspect the procedures of some companies and if they find the right procedures in them, they extend a quality certification.

#### 4. WaterInnEU standards label proposal

After collecting and analysing the background explained in previous sections a three facets label is proposed. This label responds to explained three main pillars: INSPIRE conformity (environmental criteria), WFD conformity (legal criteria), OGC conformity (geospatial criteria). The facets will only consider the aspects related with standardization and interoperability. The graphical label is a combination of these three facets:

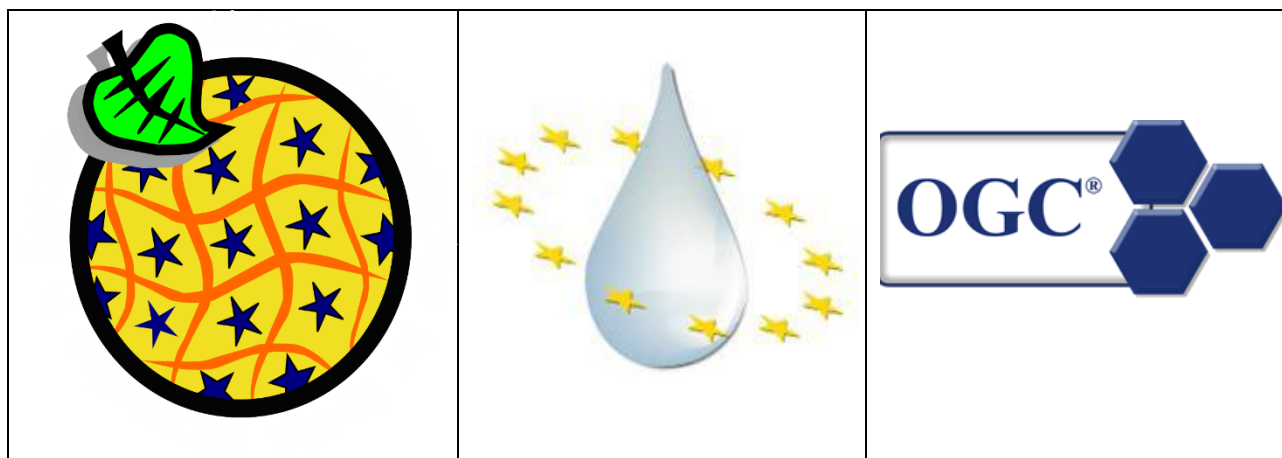


Figure 4: INSPIRE WFD and OGC original logos

The three facets are presented together with the logo of the WaterInnEU project



Figure 5: WaterInnEU logo

<sup>12</sup> <https://github.com/opengeospatial/teamengine>

The implementation of this label is the following: for an evaluated product, the three facets will be independently analysed. Of course, the three could present some overlapping goals in some cases, but their corresponding main focuses are different.

The label consists in 3 geometrical figures that are “illuminated” in blue if the corresponding criteria is met.

A product that is compliant with the INSPIRE, the WFD and the OGC requirements will present a label like this:



Figure 6: Full compliant form for the standardization label

And different combinations of partial compliant are shown here:

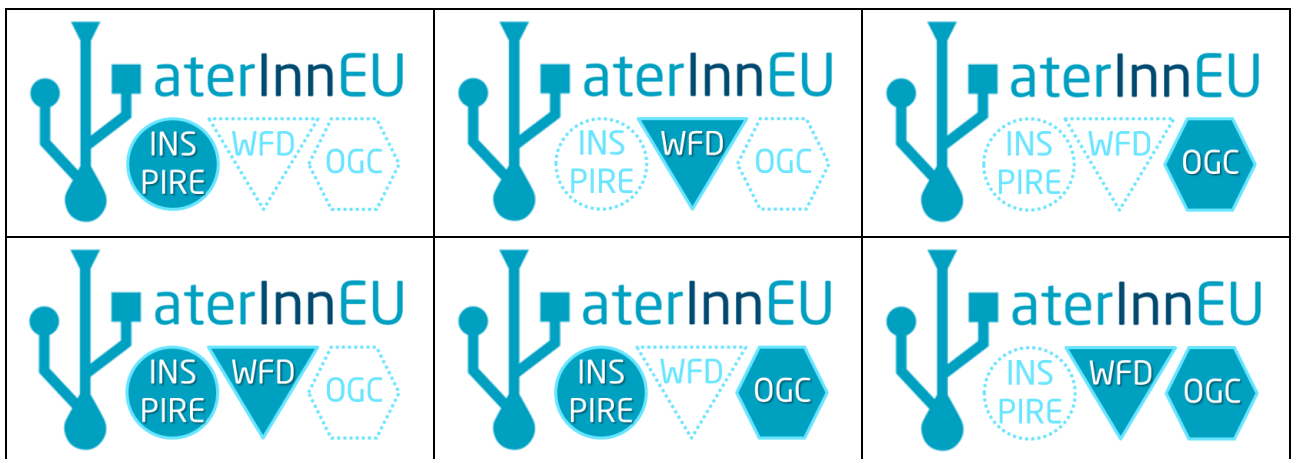


Figure 7: Different combinations of partial compliant.

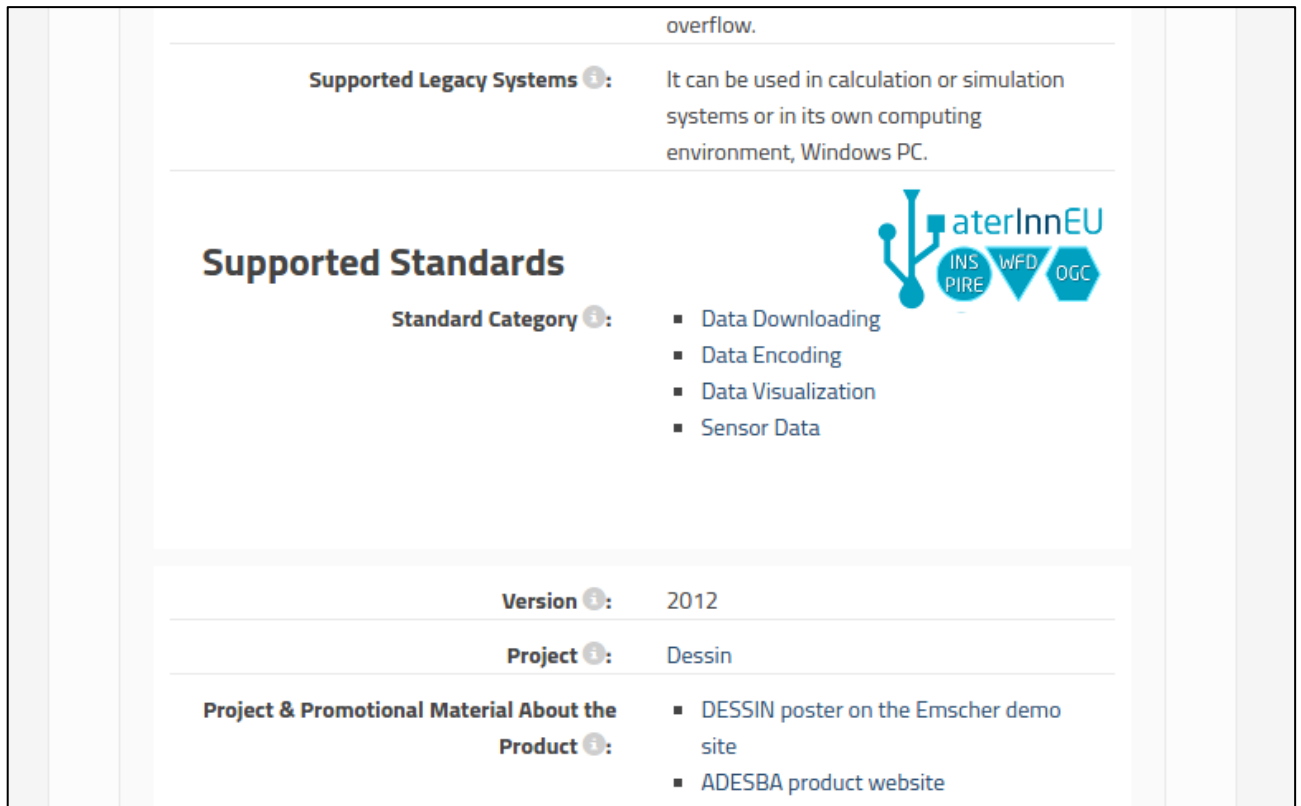
Figure 7 shows all different variants for a partial compliant labels. The upper-left label means an INPIRE compliant, but non-compliant for WFD and OGC standardization requirements. The down-right label means non-INSPIRE compliant, but WFD and OGC compliant.

And finally, the label for non-compliant in any of the three faces is:



Figure 8: Non-compliant label

The first application of these labels is the categorization of the included services and products in the WaterInnEU marketplace, and the result of the three criteria is showed in the corresponding Product Specification Sheet (PSS), see an example in Figure 9



The screenshot shows a Product Specification Sheet (PSS) for 'Supported Standards'. It includes the following information:

- Supported Legacy Systems:** It can be used in calculation or simulation systems or in its own computing environment, Windows PC.
- Supported Standards:**
  - Standard Category:**
    - Data Downloading
    - Data Encoding
    - Data Visualization
    - Sensor Data
- Version:** 2012
- Project:** Dessin
- Project & Promotional Material About the Product:**
  - DESSIN poster on the Emscher demo site
  - ADESBA product website

The WaterInnEU logo is visible in the top right corner of the screenshot, along with icons for INSPIRE, WFD, and OGC.

*Figure 9: Example of the PSS labelled.*

The label is defined both static and dynamic. In printed documents a static label can be represented as a graphic. In the web, the dynamic label will be used. By hovering or clicking into the 3 geometrical figures, information about the meaning of the facet will be shown, as well as the criteria met in the corresponding aspect. By clicking in the rest of the area, general information about the purpose of the label will be shown.

## 5. Future work

The current proposed label has three facets representing the three considered aspects: environmental, legal and geospatial of the standardization. The project has not completely defined the exact requirements that a product need to comply with to illuminate one of the facets. There is a need to create a proposal to create 3 sets of requirements grouped in three requirements classes. Requirement classes need to contain a list of individual requirements that need to have a clear wording and should be testable. The content of this three requirement classes need to be agreed by consensus in the water community. A possibility is to create a Working Group in the EIP Water.

Once these criteria have been defined, it will be possible to check the conformity for each facet or even certify that these criteria are met. This will make possible 3 levels of use of the standard label:

Level 1: Self-assessment and declaration: Data providers declare which of the criteria they are complying with and use the label to communicate conformance in their outreach materials. If data only complies with some facets of the label, then icons and a partial label are used.

Level 2: Peer review and automated conformance testing: An automatic conformance test (based on public requirement classes) accesses both metadata and the data to assess conformance. Data providers can refer to the results of the test and reviews in their outreach materials.

Level 3: Certification: The provider agrees with the peer review and automated conformance testing results and requests a certification. An independent certification entity undertakes an audit or quality controls and validates conformity. Data providers can refer to the results of the certification and reviews in their outreach materials. They use the following text below the label “Certified compliant by [entity name]”.

## 6. Conclusions

The WaterInnEU project has proposed this label to emphasise the importance of the level of interoperability as a mechanism to increase the level of adoption of data products and services generated and provided by past and future research and innovation projects in the water domain.

The proposed label is structured in 3 facets: INSPIRE conformity (environmental criteria), WFD conformity (legal criteria), OGC conformity (geospatial criteria) and shows the conformity the three criteria.

The aim of this label is to distinguish products that accomplishes the three mentioned pillars of the interoperability aspects, in order to promote their quality and helps their corresponding owner companies to bring these products to the market.

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