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DOSSIER: Supply-side

TASK: 4



Atmospheric Monitoring Services

Stage 2 of the Earthwatch GMES Services Element

PROMOTE 2

D4 Service Network

INSPIRE Technical Note

D4
Version 1
Issue **0.4**



GSE – PROMOTE 2

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EXECUTIVE SUMMARY

The second stage of PROtocol MOonitoring for the GMES Service Element (GSE), PROMOTE 2, aims at scaling-up consolidated services for atmospheric monitoring. It is a precursor of the future Atmospheric Service to be run operationally as part of the European Global Monitoring of Environment and Security (GMES). Atmospheric data and services produced by public bodies and third parties will have to be compliant with the legislation being put in place by the EU as founding of its Infrastructure for Spatial Information in the European Community (INSPIRE). INSPIRE is a European initiative to set up a harmonised network of digital environmental information and data services with a geographic facet.

This technical note summarises INSPIRE developments relevant to PROMOTE atmospheric services at the date of 22 October 2009. It also documents the contribution of PROMOTE to the development of INSPIRE Implementing Rules (IRs) relevant to the future GMES Atmospheric Services (GAS).

In accordance with the schedule of implementation measures as described in the INSPIRE Directive, implementation as regards directly atmospheric data themes has not started yet. Readers interested in taking an active part in the development of IRs should register through the INSPIRE website maintained by JRC [E-ref. 1]. Users and producers of atmospheric data and services, as well as the coordinators of spatial data infrastructures, are encouraged to visit the INSPIRE Geoportal [E-ref. 7], where they will find appropriate information, links and tools (e.g. data search and discovery tools, data viewers and metadata editors).

The material in this document has been subject to technical and policy review by ESA and the PROMOTE Core Management Team, and approved for publication with open diffusion. The views expressed by the authors, however, are their own, and do not necessarily reflect those of ESA.

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DOCUMENT CHANGE RECORD

Version	Revision	Date	Modified Items / Reason for Change
0.1	0.0	30.08.2009	Document created
0.1	0.1	28.09.2009	First draft, material from GIGAS
0.1	0.2	15.10.2009	LMO feedback on IR development; material from INSPIRE conference
0.1	0.3	21.10.2009	New Commission Regulation on Network Services (page 9)
0.1	0.4	22.10.2009	Provisional issue for review by PROMOTE Core Management team
1	0	xx.10.2009	Final version



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1. INTRODUCTION

The INSPIRE Directive

Infrastructure for Spatial Information in the European Community (INSPIRE) is a European initiative to set up a harmonised network of digital environmental information and data services with a geographic facet. This European Union (EU) infrastructure will enable the sharing of environmental spatial information among public sector organisations and better facilitate public access to spatial information across Europe, beyond national boundaries. As such, it is presented as a main, large-scale contribution of Europe to the *Global Earth Observation System of Systems* (GEOSS), together with *Global Monitoring for Environment and Security* (GMES, collaborative initiative of the EC and ESA), the *Shared Environmental Information System* (SEIS, collaborative initiative of the EC and EEA), and the global navigation satellite system GALILEO (currently being built by the EU and ESA). The spatial information targeted by INSPIRE is extensive and includes a great variety of topical and technical themes. Since it builds upon existing infrastructures at the national, regional and transboundary levels, harmonisation is required, which implies the resort to (or establishment of) common Implementing Rules (IRs) in a number of specific areas as Metadata, Data Specifications, Network Services, Data and Service Sharing, and Monitoring and Reporting. The INSPIRE Directive sets the legal framework for this European spatial data infrastructure. It came into force on 15 May 2007 and will be implemented in various stages, with full implementation required by 2019.

PROMOTE Atmospheric Services

The project *Protocol Monitoring for the GMES Service Element for Atmosphere*, PROMOTE, delivers policy-relevant services on a variety of atmospheric issues addressing the thematic domains of ozone, ultraviolet radiation, air quality, climate change, and aviation hazards due to volcanism. PROMOTE 2 services integrate observations by ground-based networks and by satellites with a hierarchy of models. They cover spatial scales from the ozone hole – at continental scale – to polluted streets, and temporal scales from climate and ozone trends across decades to hourly information on ultraviolet radiation levels on beaches. Services deliver either quantitative data directly to public authorities and other institutions, or easily understandable information to European citizens via local environment and health agencies.

Scope of this document

The INSPIRE Directive applies formally to all PROMOTE data and services produced by public institutions or by third parties acting under contract of – or more generally on behalf of – public institutions. But implementation of this ambitious directive is an exhaustive process requiring many cycles of consultation, drafting, review, negotiation, adoption and other kind of interactions between the EC and its technical representatives (e.g. JRC and Eurostat), the Member States, their Legally Mandated Organisations (LMOs), and a long list of Spatial Data Interest Communities (SDICs). Although it came into force within the PROMOTE timeframe, full implementation of the Directive is required by 2019 only. Therefore it will hardly affect PROMOTE activities. As a precursor of the *GMES Atmospheric Service* (GAS), it is nevertheless the role of PROMOTE to identify possible aspects of INSPIRE that might affect follow-on projects building the GAS on the PROMOTE heritage (like PASODOBLE, EVOSS and MACC), and to take appropriate actions in the INSPIRE implementation process to ensure proper representativeness of atmospheric services. This technical note documents INSPIRE developments relevant to PROMOTE atmospheric services at the date of October 2009.

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2. INSPIRE LEGISLATION IN FORCE

At the time being, four texts have been published in the *Official Journal of the European Union*, including the INSPIRE Directive and INSPIRE Implementing Rules. They can be found in 23 languages on the Legislation pages of the INSPIRE website [E-ref. 1]. Implementing Rules are adopted as Commission Decisions or Commission Regulations and are binding in their entirety. The Commission is assisted in the process of adopting such rules by a regulatory committee composed by representatives of the Member States and chaired by a representative of the Commission (this is known as the Comitology procedure). Hereafter we provide basic, PROMOTE related information on the legislation published so far, and also on one draft regulation agreed but still in the process of being adopted.

2.1 The INSPIRE Directive

(Directive 2007/2/EC of 14 March 2007)

The Directive can be found on the INSPIRE website [E-ref. 2]. Its full title is "*DIRECTIVE 2007/2/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)*". It was published in the *Official Journal of the European Union* on 25 April 2007 under reference *L108 25/04/2007 P. 1-14*.

This founding text outlines the rationale behind the initiative, defines its purpose and scope, sets up its general principles and makes time provisions for some forthcoming implementing rules and for the creation of metadata. Its legal section is divided into 26 articles grouped in 7 chapters covering the subject matters listed in Table 1.

Table 1. Chapters of the INSPIRE Directive.

Chapter number	Chapter title	Articles
1	General provisions	1 to 4
2	Metadata	5 and 6
3	Interoperability of spatial data sets and services	7 to 10
4	Network services	11 to 16
5	Data sharing	17
6	Coordination and complementary measures	18 to 20
7	Final provisions	21 to 26
Annex I / II / III	Spatial data themes referred to in articles...	

The thematic information and data services targeted by the INSPIRE Directive belong to a vast range of diverse professional activities grouped in three annexes (Table 2). Each Annex lists identified “spatial data themes” targeted by a common group of articles ruling the corresponding Implementation Rules (IRs) and metadata provision timeframe, the Annex numbers matching the closeness of the deadlines (see below). No obvious common feature other than this timeframe constraint binds the data themes belonging to a single Annex together.

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Table 2. Spatial data themes covered by INSPIRE.

Annex	Nature of spatial data
I	Frames of reference and grids, toponymy, administrative boundaries, transport networks, hydrography, conservation sites
II	Topography, land cover, airborne images of the Earth's surface, geology
III	Statistical tools, buildings, soil, land use, human health, social utilities, environmental monitoring facilities, industry, agriculture, demography, area management, natural risk zones, atmospheric and meteorological conditions, oceanography, ecology, energy and mineral resources

Frames of reference (e.g. coordinate reference systems and geographical grid systems) are considered as data in the INSPIRE context. They are dealt with in Annex I, since their definition is a prerequisite to the compliance of all other data sets with the INSPIRE specifications.

2.2 EC Regulation as regards Metadata

(EC Regulation N° 1205/2008 of 3 December 2008)

The document can be found in 23 languages on the legal page of the European Commission [E-ref. 3]. Its full title is "*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 (Text with EEA relevance)*". It was published in the *Official Journal of the European Union* on 4 December 2008 (L 326, 04/12/2008 P. 0012 – 0030).

This text makes statements on rules applying to the INSPIRE metadata defined in Article 5-2 of the Directive above. Due to the heterogeneity of data themes covered, only metadata of a very high level are considered.

2.3 EC Decision as regards Monitoring and Reporting

(EC Decision N° 2009/442/EC of 5 June 2009)

The document can be found on the legal page of the European Commission [E-ref. 4]. Its full title is "*COMMISSION DECISION of 5 June 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards monitoring and reporting (Text with EEA relevance)*", notified under document number C(2009) 4199. It was published in the *Official Journal of the European Union* on 11 June 2009 (L148, 11/06/2009 P. 0018-0026).

This text lays down detailed rules on monitoring by Member States of the implementation and use of their infrastructures for spatial information and on reporting. Member States have to establish and communicate annually to the Commission a list of the spatial data sets and spatial data services corresponding to the themes listed in Annexes I, II and III to Directive. Moreover, they must measure and report the existence (Article 3) and conformity (Article 4) of metadata, the implementation of the requirements for interoperability of spatial data sets (Chapter III), and the implementation of network services requirements (Chapter IV). They must also report on their contribution to the functioning and coordination of the infrastructure (Article 13), use of the infrastructure (Article 14), data sharing arrangements (Article 15), and provide an estimation of the costs and benefit aspects resulting from the implementation of the Directive (Article 16).

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Coordination and quality assurance aspects are developed in Article 12. This article addresses more QA aspects of the spatial data infrastructure itself than QA of the data products. It is interesting to bring to the attention of the PROMOTE services the QA reporting requirements outlined in this Article 12:

- (a) a description of quality assurance procedures, including the maintenance of the infrastructure for spatial information;
- (b) an analysis of quality assurance problems related to the development of the infrastructure for spatial information, taking into account the general and specific indicators;
- (c) a description of the measures taken to improve the quality assurance of the infrastructure;
- (d) where a certification mechanism has been established, a description of that mechanism.

2.4 EC Regulation as regards the Network Services

(EC Regulation N° 976/2009 of 19 October 2009)

The document can be found on the legal page of the European Commission [E-ref. 5]. Its full title is “*COMMISSION REGULATION (EC) No 976/2009 of 19 October 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the Network Services.*” It was published in the *Official Journal of the European Union* on 20 October 2009 (L 274, 20/10/2009 P. 0009-0018).

This text lays down the requirements for the establishment and maintenance of the Network Services provided for INSPIRE and obligations related to the availability of those services to the public authorities of the Member States and third parties. After defining concepts like performance, response time, capacity and availability, the document details in three Annexes the minimum requirements relevant to the Quality of Service (Annex I), the Discovery Services (Annex II, Search criteria requirements and Operations requirements), and the View Services (Annex III).

2.5 Draft EC Regulation on Data and Service Sharing

(Draft implementing measure D004992/02 of 5 June 2009)

This draft regulation has been agreed upon by the INSPIRE Committee but is still in the process of being adopted. Favourite opinion of the Committee was sent to the European Parliament and the Council on 19 October 2009. Its current title is “*Draft COMMISSION REGULATION implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the access to spatial data sets and services by the Member States to the Community institutions and bodies under harmonised conditions.*” This document can be found on the European Commission Comitology Register [E-ref. 14].

This text establishes harmonised conditions of access to spatial data sets and services. It lays down regulations for the restrictions on data and service access, arrangements regarding data and service access, use of spatial data sets and services, metadata, transparency, and response times for providing access to data and services after receipt of a written request.

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3. ATMOSPHERIC DATA THEMES IN THE DIRECTIVE

In the context of the INSPIRE Directive, the term “spatial” does not primarily refer to the three-dimensional space as space scientists usually understand it, but rather to the surface of the Earth – and more precisely the surface of the European continent. The first obvious focus of the Directive is to provide at the European scale a common, continuous two-dimensional framework to administrative data related in some way to geography. Only three themes of Annex III of the Directive have explicit relationship to atmospheric data:

- Natural Risk zones (Theme #12): Vulnerable areas characterised according to natural hazards (all atmospheric, hydrologic, seismic, volcanic and wildfire phenomena that, because of their location, severity, and frequency, have the potential to seriously affect society), e.g. floods, landslides and subsidence, avalanches, forest fires, earthquakes, volcanic eruptions;
- Atmospheric conditions (Theme #13): Physical conditions in the atmosphere. Includes spatial data based on measurements, on models or on a combination thereof and includes measurement locations;
- Meteorological geographical features (Theme #14): Weather conditions and their measurements; precipitation, temperature, evapotranspiration, wind speed and direction.

Several other aspects pertaining in one way or another to the atmosphere (as input, reference, boundary or contextual conditions, interfacing or constitutive elements, output) appear as parts of other data themes, often through the involvement of satellite imagery. One can cite in example:

- Human health and safety (Annex II, Theme 5): Geographical distribution of dominance of pathologies (allergies, cancers, respiratory diseases, etc.), information indicating the effect on health (biomarkers, decline of fertility, epidemics) or well-being of humans (fatigue, stress, etc.) linked directly (air pollution, chemicals, depletion of the ozone layer, noise, etc.) or indirectly (food, genetically modified organisms, etc.) to the quality of the environment.

At the time of this technical note, IRs have been negotiated and adopted for spatial data themes of Annex I, that is, Coordinate reference systems, Geographical grid systems, Geographical names, Administrative units, and five other themes. IRs for the spatial data themes under Annex II (Elevation, Land cover, Orthoimagery, and Geology) are being established. Data themes under Annex III will have the more direct application to PROMOTE-like atmospheric services. They will be addressed after 2009, thus after completion of the present project PROMOTE Stage II, but they will impact follow-on projects like MACC, PASODOBLE and EVOSS. Among the relevant themes of Annex III: Atmospheric conditions, Environmental monitoring facilities, Statistical units, Human health and safety, Natural risk zones, Meteorological geographic features

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The importance and potential impact of INSPIRE for and on atmospheric data and services has not escaped the international space science community's sagacity, including outside European borders, as is witnessed by the emergence of international initiatives such as GIGAS (see below). Compliance of atmospheric data and services with INSPIRE regulations may not remain unpaid for: services could benefit from a two-way interaction, the development of common standards under INSPIRE having a potential positive feedback on the exchange of information between research groups worldwide by harmonising various aspects of communication. In this respect, the scientists' contribution to INSPIRE might improve their own work environment and facilities by providing a framework of enhanced service quality. Moreover, given their immediate usefulness to society, either directly or as input to public services, scientific output that would be readily compliant with INSPIRE specifications in terms of reliability, sustainability, documentation and format might become more likely to receive the international recognition, funding, development and use they deserve.

4. RELEVANCE OF INSPIRE TO PROMOTE AND FOLLOW-ON PROJECTS

From the legal perspective, the INSPIRE Directive and its Implementing Rules are supposed to apply to all PROMOTE data and services provided that:

- they are produced by public institutions or by third parties acting under contract of – or more generally on behalf of – public institutions in Europe, and
- the data and services address at least one of the spatial data themes listed in the annexes to the Directive.

The thematic relevance of INSPIRE to PROMOTE immediately proceeds from (1) its spatial character, and (2) its relevance to atmospheric data products and services. Although Implementing Rules for Annexe III, which contains three spatial data themes with atmospheric relevance, will be adopted only in 2012, it is the role of PROMOTE, as a precursor of the future GMES Atmospheric Service, to identify possible aspects of INSPIRE that might affect follow-on projects building the GAS on the PROMOTE heritage (like PASODOBLE, EVOSS and MACC), and to take appropriate actions in the INSPIRE implementation process to ensure proper representativeness of atmospheric services. MACC, PASODOBLE and EVOSS will naturally be subject to the INSPIRE harmonisation endeavour. Table 3 overviews the relevance of INSPIRE spatial data themes to atmospheric data and services envisaged in these projects. Themes with the highest and most direct relevance are highlighted.

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Table 3. INSPIRE spatial data themes related to atmospheric data and services.

Annex	Theme	Spatial data theme	Relevance
I	1	Coordinate reference systems	<u>All services</u>
	2	Geographical grid systems	<u>All services</u>
	3	Geographical names	<u>Regional services</u>
	4-9	Administrative units, addresses, cadastral parcels, transport networks, hydrography, protected sites	N.A.
II	1	Elevation	Indirect relevance
	2	Land cover	Indirect relevance
	3	Ortho-imagery	Service dependent
	4	Geology	N.A.
III	1	Statistical units	<u>All services</u>
	2	Buildings	N.A.
	3	Soil	Indirect relevance
	4	Land use	Indirect relevance
	5	Human health and safety (linked to the quality of the environment)	<u>All services</u>
	6	Utility and governmental services	N.A.
	7	Environmental monitoring facilities	<u>Observational services</u>
	8	Production and industrial facilities	Indirect AQ relevance
	9	Agricultural and aquaculture facilities	N.A.
	10	Population distribution – demography	Indirect relevance
	11	Area management/restriction/regulation	N.A.
	12	Natural risk zones	<u>Volcanic services</u>
	13	Atmospheric conditions	<u>Highly relevant to all</u>
	14	Meteorological geographical features	Medium relevance
	15	Oceanic geographical features	N.A.
	16	Sea regions	N.A.
	17	Bio-geographical regions	Indirect relevance
18	Habitat and biotopes	Indirect relevance	
19	Species distribution	Indirect relevance	
20	Energy resources	Indirect relevance	
21	Mineral resources	Indirect relevance	

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5. PRACTICAL IMPLEMENTATION OF INSPIRE

The principles outlined in the INSPIRE Directive entered into force on the 15th of May 2007, shortly after its publication in the *Official Journal*. Practical dispositions need to be defined in order to implement these principles concretely. Evolution of the status of INSPIRE related activities and achievements can be found on the INSPIRE website [E-ref. 1], the INSPIRE Geoportal [E-ref. 7] and in status report [E-ref. 11] published regularly on the INSPIRE website.

5.1 Implementing Rules

The INSPIRE Directive states that Implementing Rules shall be issued to serve the above purpose. Its provisions regarding those IR are relatively precise, in terms of time schedule, as far as thematic metadata are concerned (see Table 4). The need of other types of IR, applying for example to modes of data exchange (seen as legal rather than technical issues), is not explicitly stated in the Directive but drafting teams have been formed to issue a number of them. They include IR on General Metadata, Data Sharing, Interoperability, Monitoring and Reporting. A list of adopted and currently developed sets of IR is available from the INSPIRE web portal [E-ref. 1].

5.2 Schedule

The INSPIRE Directive lays on a timeframe within which the INSPIRE measures applying to spatial data themes should be brought into force (see Table 4). Up to now, implementation of INSPIRE has unrolled according to schedule. Although atmospheric data sets and services only appear explicitly in Annex III, several IRs pertaining to Annex I are of importance to them through the definition of the adopted frames of reference and grids, which should match atmospheric scientists' needs.

Table 4. Timeframe for the implementation of INSPIRE measures.

Annex	IR adoption deadline and article of reference of the INSPIRE Directive	Metadata creation deadline and article of reference of the INSPIRE Directive
I	15 May 2009 – Article 9.a	2 years after the date of adoption of the corresponding IR – Article 6.a
II	15 May 2012 – Article 9.b	2 years after the date of adoption of the corresponding IR – Article 6.a
III	15 May 2012 – Article 9.b	5 years after the date of adoption of the corresponding IR – Article 6.b

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6. INTERNATIONAL EFFORTS SUPPORTING INSPIRE IMPLEMENTATION

A number of international initiatives or bodies embed INSPIRE or have a direct connection to it. These initiatives acknowledge:

- the need to ensure that the various harmonisation efforts currently undertaken among scientific communities do not clash with each other;
- the importance of defining reliability criteria applying to scientific data promised to document environmental issues and found political decisions;
- the crucial role of traceability for data used in such a broad context, including future uses.

Among these initiatives, two projects which include an atmospheric facet are listed below.

6.1 GIGAS

GEOSS, INSPIRE and GMES: an Action in Support [E-ref. 8].

GIGAS is a Support Action funded under the 7th Framework Programme to promote the coherent and interoperable development of the GMES, INSPIRE and GEOSS initiatives through their concerted adoption of standards, protocols, and open architectures. The project runs from June 2008 to May 2010. Technical coordination of GIGAS is carried out by JRC while ESA is responsible for the GMES space component within the project. The core consortium also includes the Open Geospatial Consortium (OGC) which, together with the previous two partners, plays a leading role in the development of the GEOSS architecture and components. Industrial players with an interest in space and geographic information also collaborate to the initiative.

6.2 SEIS

Shared Environmental Information System [E-ref. 9, E-ref. 10]

The *Shared Environmental Information System* (SEIS) is a collaborative initiative of the European Commission and the European Environment Agency (EEA) to establish together with the Member States an integrated and shared pan-European environmental information system. This system would tie in better all existing data gathering and information flows related to EU environmental policies and legislation. It will be based on technologies such as the internet and satellite systems and thus make environmental information more readily available and easier to understand to policy makers and the public.

According to the SEIS concept, environmentally-related data and information will be stored in electronic databases throughout the European Union. These databases would be interconnected virtually and be compatible with each other. The proposed SEIS is a decentralised but integrated web-enabled information system based on a network of public information providers sharing environmental data and information. It will be built upon existing e-infrastructure, systems and services in Member States and EU institutions.

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7. CONTRIBUTION OF PROMOTE (STAGE 2) TO INSPIRE IMPLEMENTATION

7.1 Formal aspects of participation

In the context of INSPIRE, an open process for stakeholder participation has been set up. Stakeholders can register on a dedicated web page [E-ref. 6] of the INSPIRE website [E-ref. 1], either as a Spatial Data Interest Community (SDIC), as a Legally Mandated Organisation (LMO), or both. SDICs are organisations that are involved in a network representing producers, transformers and users of spatial data that falls within the scope of INSPIRE. LMOs are organisations that have a legal mandate for one or more aspects of INSPIRE. Registration is continuously open and so is the *Call for Expression of Interest for INSPIRE development*. The involvement of stakeholders can be one or more of the following: to keep informed, review INSPIRE deliverables, propose experts, submit reference material, and/or test draft specifications. In close collaboration with stakeholders in the Member States the EC started the drafting of the Implementing Rules. This is being done in Drafting Teams, which are composed of experts from stakeholder organisations. For the Data Specification IR, Thematic Working Groups (TWG) have been set up for each data theme in Annex I. The TWGs are composed of specification development experts responsible for developing technical specifications for the spatial data themes that they are responsible for.

Already acting as Single Point of Contact for BIRA-IASB in the national implementation of the INSPIRE Directive, the PROMOTE Quality Assessment & Validation Office has broadened its action by advocating interests of the atmospheric science community in general and of the PROMOTE community in particular. It has taken part to several cycles of discussion, consultation and review at national and international level and has influenced choices and decisions of the drafting teams through the involvement of BIRA-IASB as:

- a registered Legally Mandated Organisation (LMO);
- a public institution whose activities are targeted by the INSPIRE Directive and its transposition into the national legislation, and which contributes material and feedback to the Belgian (Member State) Contact Point (MSCP) and the Belgian Representative to the Comitology;
- an expert in spatial data themes and services of atmospheric relevance, as a public provider and user of atmospheric data and services in the PROMOTE thematic domains of atmospheric ozone, ultraviolet radiation, climate change, air quality, and natural hazards to aviation caused by volcanism.

On the INSPIRE website JRC maintains a catalogue [E-ref. 12] of SDICs and LMOs replies to the INSPIRE data themes, making a distinction between users, producers, and coordinators of spatial data infrastructures. We reproduce in Table 5 the information relevant to the atmospheric domains as identified in Section 4 and outlined in Table 3. From this table one might conclude that atmospheric services are well represented. E.g., 35 SDICs and 28 LMOs have declared to be a producer of data and services addressing *Atmospheric conditions* (Annex III, Theme 13). The reality is more complex: SDICs and LMOs for *Atmospheric conditions* cover a broad range of activities, from environmental protection to hydrology through the production of satellite systems, and in the facts very few of them advocate PROMOTE- and GAS-relevant aspects.

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Table 5. Number of replies from LMOs and SDICs to INSPIRE spatial data themes, declaring themselves as a user, a producer or a coordinator of data, services and data infrastructure.

Annex	Theme	Spatial data theme	User	Producer	Coordinator
I	1	Coordinate reference systems	292	92	98
	2	Geographical grid systems	257	88	84
	3	Geographical names	268	102	89
II	3	Ortho-imagery	237	129	86
III	1	Statistical units	210	76	62
	5	Human health and safety	149	56	50
	7	Environmental monitoring facilities	189	124	94
	8	Production and industrial facilities	160	55	41
	12	Natural risk zones	195	117	92
	13	Atmospheric conditions	163	59	56
	14	Meteorological geographical features	167	49	44

7.2 Summary of issues raised

The PROMOTE QA & Validation Office brought several issues to the attention of the TWGs and Drafting Teams. The main issues directly followed from the initial two-dimensional flavour of the Directive viewpoint already mentioned in the first paragraph of Section 3. While the Directive scope does (and means to) include Earth's system data (particularly atmospheric data), the Directive designers gave them only a lower level of importance, when tackling the identification of the Annex III data themes. The body of the Directive itself was written with typically two-dimensional features such as cartography and photography in mind, and the Drafting Teams in charge of issuing IRs seem to have inherited this bias. As a consequence, a number of concepts which are crucial to atmospheric science – and more generally to the Earth's system sciences – were ignored in the drafted IRs, making them initially maladjusted.

Notable points raised officially by the QA & Validation Office at BIRA-IASB through the aforementioned channels included the following.

- An incomplete approach of the vertical dimension, possibly misfit to the needs of most atmospheric modelling activities (for example, pressure coordinates were discarded).
- A superficial approach of the time dimension, dealt with as a seldom casual accessory rather than as a fundamental coordinate of the frame of reference – which sounds particularly inadequate when environmental change monitoring is at stake.
- Ignorance of the spatial extent of many atmospheric datasets, the implicit assumption being that INSPIRE dataset boundaries coincide with political borders and that each European country owns the datasets covering its territory.
- Omission of the importance of data uncertainty indicators as a measure of data reliability.
- The confusion of quality and validity with lineage and spatial resolution – e.g., the precision of a dataset being identified to the number of data points per surface unit.
- Ignorance of existing monitoring networks and of archival and distribution centres, of the competences and resources required to run them, and of their operation practices.

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- Ignorance of time characteristics and constraints applying to the production and validation of atmospheric data; for example, INSPIRE measures did not seem to have taken the following cases into account: continuously growing observation datasets issued by apparatus in operation, such as satellite-borne instruments; datasets superseded with new versions; real or near real time data; data which require several months to several years of data processing and validation; etc.
- Ignorance of the intricate property rights applying to data produced or owned by international consortia and programmes – data are supposed to have been produced and to be owned by a single data producer and owner; for example, a NO₂ column data record produced from spectra measured by an ESA instrument like GOME, with level-0-to-1 processing performed at DLR and with level-1-to-2 processing performed successively at BIRA-IASB (slant column fitting) and KNMI (slant-to-vertical column retrieval) will allow the acknowledgment of only one producer and owner.
- Unawareness of general deontology principles in application within the scientific community, regarding data exchange, co-authorship, citation, distribution of data to third parties etc.

7.3 Summary of events and interventions

In practical terms, the PROMOTE QA & Validation Office's interventions took place on the occasion of the events listed in this section. It is encouraging to note that several of those interventions brought tangible results despite the small weight of atmospheric stakeholders in the INSPIRE community. E.g., the EC Regulation on Metadata, dated 03/12/2008 [E-ref. 3], foresees that only one responsible organisation can be referred to. But in the revised edition of the Technical guidelines for these Metadata IRs, dated 03.02.2009 [E-ref. 13], multiplicity of responsible organisations is accepted (see page 42). Nevertheless, many issues have not been addressed satisfactorily yet and atmospheric stakeholders are recommended to take an active part in the upcoming development of IRs for Annex III data themes.

7.3.1 Participation to official INSPIRE IR reviews

- 21/12/2007 – Participation to the *Public consultation on INSPIRE Draft Implementing Rules for Metadata*.
- 30/03/2007 – Participation as LMO to the restricted *Consultation on INSPIRE Draft Implementing Rules for Metadata*, open to registered LMOs and SDICs only.
- 13/02/2009 – Official review submitted both as LMO and through the Belgian MSCP, on D4.9 - *Implementing rules for governing access and rights of use of spatial data sets and services for Community institutions and bodies*.
- 20/2/2009 – Official review submitted both as LMO and through the Belgian MSCP, on D2.8.1 - *Draft Structure and Content of the Implementing Rules on Interoperability of Spatial Data Sets and Services*.

7.3.2 Participation to national and international meetings

- 11/01/2007 – Federal meeting on INSPIRE implementation, held at the Belgian Science Policy Office (BELSPO), Brussels, Belgium.
- 22-26/06/2008 – INSPIRE Conference, organised by JRC in Maribor, Slovenia.

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- 13/11/2008 – National coordination meeting on the Belgian implementation of the INSPIRE Directive, held at the Royal Library of Belgium in Brussels.
- 29/01/2009 – Meetings of EU-funded projects and initiatives relevant for INSPIRE Annex II and III data specifications development, held at Centre Albert Borschette, Brussels, Belgium. Two interventions made on the importance of uncertainty indicators for data quality and on the fundamental difference between spatial accuracy and data precision.
- 29/01/2009 – National review of the INSPIRE IR on Data and Services Sharing, held at the Ministry of Finances, Schaerbeek, Belgium.
- 13/02/2009 – National meeting of Belgian stakeholders and of participants to the review of the IRs on Coordinate Reference Systems (CRS) and Geographical Grid Systems (GGS), held at the National Geographic Institute (NGI), Ixelles, Belgium.

7.3.3 Participation to / interaction with GIGAS

- 28-29/01/2009 – Workshop towards Harmonisation of Spatial Data Infrastructure (SDI) initiatives, Centre Albert Borschette, Brussels. Active part taken in the meeting, in particular on the difference between spatial accuracy and data precision and on the importance of the third and fourth dimensions for spatial datasets.
- 30/01/2009 – Feedback to GIGAS Project Coordinator (Eva Klien, Fraunhofer Institute for Computer Graphics Research, Darmstadt) through written comments (filled in Stakeholder Questionnaire).

7.4 Information and feedback relayed to PROMOTE

Information and feedback was relayed to PROMOTE partners, mainly the Service Leaders and the Core Management Team (CMT), on the occasion of the following events.

- 03-04/05/2007 – Introduction to the INSPIRE Directive and its relevance to PROMOTE data and services, given by the QA & Validation Office as part of its report “PROMOTE-2 Validation Office: May 2007 Status” during the Third PROMOTE 2 Progress Meeting held at WMO, Geneva, Switzerland.
- 12-13/06/2008 – Information on the INSPIRE Directive and its IR development given by the QA & Validation Office as part of its presentation about “Atmospheric information quality strategy” during the Joint EEA-PROMOTE User Workshop on GMES Atmospheric Services, held at EEA in Copenhagen, Denmark.
- 27/02/2009 – Information on the INSPIRE Directive and call to participate to INSPIRE Implementing Rules reviews sent by email to the PROMOTE Service Leaders and CMT.
- 12/03/2009 – Email call to the PROMOTE Service Leaders to take part to the review of INSPIRE Draft Implementing Rules on Download Services.
- 06/05/2009 – Summary of the QA & Validation Office’s activities related to INSPIRE were provided to the Service Leaders and Core Management Team as part of the presentation given at the 9th PROMOTE Progress Meeting, Helsinki, Finland.
- 14/10/2009 – Inclusion of latest INSPIRE status information in Version 3 of the PROMOTE C5 *Atmospheric Services Validation Protocol*.
- 29-30/10/2009 – Presentation of this PROMOTE D4 document and of information on future actions to take, given during the PROMOTE final meeting held in Frascati, Italy.

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8. ELECTRONIC REFERENCES

E-ref. 1. INSPIRE website

<http://inspire.jrc.ec.europa.eu/>

E-ref. 2. Text of the INSPIRE Directive

<http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2007:108:SOM:EN:HTML>

E-ref. 3. Text of the INSPIRE Metadata Regulation

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008R1205:EN:NOT>

E-ref. 4. Text of the Commission Decision as regards the INSPIRE Monitoring and Reporting

<http://eur-lex.europa.eu/JOHtml.do?uri=OJ%3AL%3A2009%3A148%3ASOM%3AEN%3AHTML>

E-ref. 5. Text of the Commission Regulation as regards the INSPIRE Network Services

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:274:0009:0018:EN:PDF>

E-ref. 6. INSPIRE LMO and SDIC registration page

<http://inspire.jrc.ec.europa.eu/index.cfm/pageid/7/type/welcome>

E-ref. 7. INSPIRE Geoportal

<http://www.inspire-geoportal.eu/>

E-ref. 8. GIGAS website

<http://www.thegigasforum.eu/project/project.html>

E-ref. 9. SEIS website

<http://ec.europa.eu/environment/seis/>

E-ref. 10. Towards a Shared Environmental Information System (EC communication)

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52008DC0046:EN:NOT>

E-ref. 11. INSPIRE Status Report of October 2009

http://inspire.jrc.ec.europa.eu/documents/INSPIRE/_INSPIRE_Status%20Report_OCT_09.pdf

E-ref. 12. INSPIRE database of SDICs and LMOs replies.

<http://inspire.jrc.ec.europa.eu/index.cfm/pageid/42>

E-ref. 13. INSPIRE Metadata Implementing Rules: Technical Guidelines based on EN ISO 19115 and EN ISO 19119

http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/metadata/MD_IR_and_ISO_20081219.pdf

E-ref. 14. European Commission Comitology Register

<http://ec.europa.eu/transparency/regcomitology>

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9. ABBREVIATIONS AND ACRONYMS

BIRA-IASB	Belgisch Instituut voor Ruimte-Aëronomie / Institut d’Aéronomie Spatiale de Belgique (Belgian Institute for Space Aeronomy)
CRS	Coordinate Reference Systems
CEOS	Committee on Earth Observation Satellites
CMT	Core Management Team
DLR	Deutschen Zentrums für Luft- und Raumfahrt (German Aerospace Centre)
DT	Drafting Team(s)
EC	European Commission
EEA	European Environmental Agency
ESA	European Space Agency
EU	European Union
EUROSTAT	Statistical Office of the European Communities
EVOSS	European Volcano Observatory Space Services (FP7)
FP	EC Framework Programme
GALILEO	European global navigation satellite system
GAS	GMES Atmospheric Service
GEOSS	Global Earth Observation System of Systems
GGG	Geographical Grid Systems
GIGAS	GEOSS, INSPIRE and GMES: an Action in Support (FP7)
GMES	Global Monitoring for the Environment and Security
GNSS	Global Navigation Satellite System
GOME	Global Ozone Monitoring Experiment
GSE	GMES Service Element
INSPIRE	Infrastructure for Spatial Information in the European Community
IR	Implementing Rule(s)
JRC	Joint Research Centre
KNMI	Koninklijk Nederlands Meteorologisch Instituut (Royal Netherlands Meteorological Institute)
LMO	Legally Mandated Organisation
MACC	Monitoring Atmospheric Composition and Climate (FP7)
MSCP	Member State Contact Point (for INSPIRE)
OGC	Open Geospatial Consortium
PASODOBLE	PROMOTE Air Quality Services integrating Observations – Development Of Basic Localised Information for Europe (FP7)
PROMOTE	PROtocol MOniToring for the GMES Service Element: Atmosphere
QA	Quality Assurance or Quality Assessment
QC	Quality Control
SDI	Spatial Data Infrastructure(s)
SDIC	Spatial Data Interest Community
SEIS	Shared Environmental Information System
TWG	Thematic Working Groups
UBA	Umweltbundesamt (Austrian Environmental Protection Agency)

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