Open Geospatial Consortium, Inc.
35 Main Street, Suite 5
Wayland, MA 01778-5037, USA
tel: +1 508-655-5858
fax: +1 508-655-2237
www.opengeospatial.org

7 March 2011

National Institute of Standards and Technology
National Science and Technology Council's Sub-Committee on Technology

Subject: Standardization Feedback for Sub-Committee on Standards. Open Geospatial Consortium Response to Federal Register Request for Information entitled "*Effectiveness of Federal Agency Participation in Standardization in Select Technology Sectors for National Science and Technology Council's Sub-Committee on Standardization*".

OGC staff with the support of OGC representatives from the US Army Corps of Engineers Army Geospatial Center, the US Department of Homeland Security, the US Census Bureau, the US Environmental Protection Agency, the US Federal Aviation Administration, the US Federal Communications Commission, the US Geological Survey, the US National Aeronautics and Space Administration, the US National Geospatial Intelligence Agency, and the National Oceanic and Atmospheric Administration offers the following summary of experiences of its US and international government members in the OGC process. We hope that this Consortium level perspective on government effectiveness in standardization in the OGC process will be of use to the Sub-Committee.

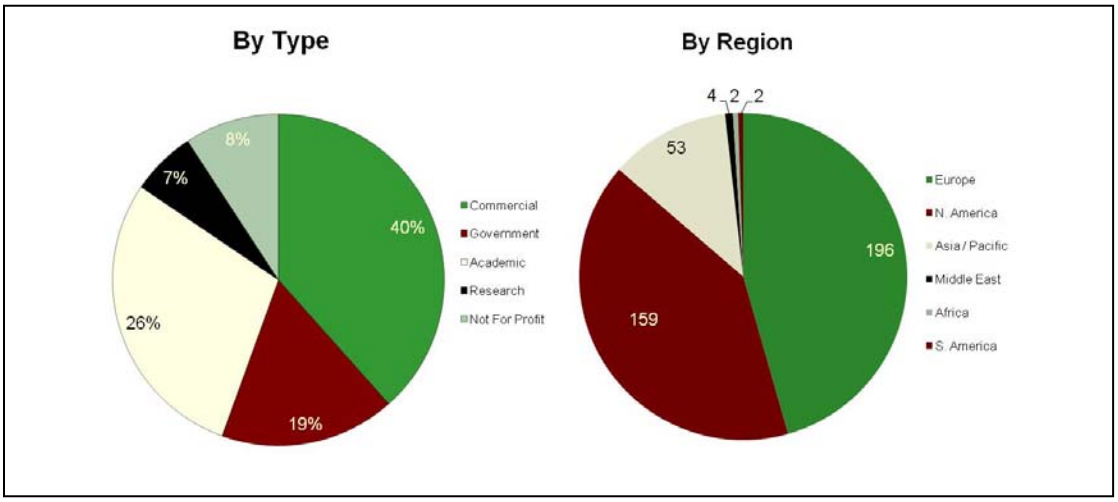
BACKGROUND:

The Open Geospatial Consortium (OGC) is an international voluntary consensus standards organization devoted to the advancement of open standards that make it easy to discover, share, fuse and apply geospatial or location information in government and business decision making, applications for citizens and consumers, research and collaboration, and enterprise level applications.

Most government information has a geospatial or location context – but often cannot be easily processed in a location context to benefit decision-making. The ability to seamlessly integrate location from multiple sources for improved situational awareness, analysis and decision making is therefore critical to meeting government mission needs. Open standards help meet this challenge.

The OGC membership includes over 410 international industry, government, academic, research, and not for profit organizations.

Since its inception in 1994, representatives from OGC's membership have advanced over 30 standards, which have been implemented in the US and worldwide to improve location based visualization, analysis, situational awareness and decision-making. The standardization process is



cooperatively led by technology user organizations and technology provider organizations that work together to identify interoperability issues and formulate standards solutions to address these issues. A list of the OGC government organizations participating in OGC is provided as enclosure 1.

OGC member organizations pay annual membership fees that support the consensus standards process. OGC members also fund OGC Interoperability Program government / industry collaborative testbeds and pilot projects to accelerate the pace of standards development, testing and validation. This business model enables OGC standards to be offered globally free of charge.

OGC's policies and procedures assure balance of interest, due process, transparency and openness and a low barrier to participation as expected of a voluntary consensus standards organization, and as defined by OMB Circular A-119.

The OGC has a formal and well-documented Intellectual Property Rights (IPR) Policy, which is approved by OGC membership. Requirements from Federal agencies related to intellectual property rights for OGC standards were factored into the development of the policy. As such, US Federal agencies have been able to effectively submit government-developed standards into the OGC process for approval as international standards. To date, there have been no issues related to OGC standards, IPR, and use of these standards by the Federal government. OGC standards are provided on a Royalty Free, non-discriminatory basis. Fortunately, there are few patents that are in any way specifically related to the work of the OGC. There are no particular obstacles that either prevent intellectual property owners from obtaining reasonable returns or cause intellectual property owners to make IP available on terms resulting in unreasonable returns when their IP is included in the standard. Risks associated with hold-up or buyers' cartels have never been an issue in the OGC.

To fully address due process, appeals, and standards lifecycle management, the OGC established an OGC Architecture Board (OAB) comprised of OGC government, industry and academic

members elected as individuals for their expertise and knowledge of the OGC, OGC standards, and technology. The OAB supports the overall review of OGC activities and deliverables and is empowered to provide guidance to all OGC program activities to assure consistency and harmonization of OGC standards and related work efforts.

As described below under the heading "Cooperative standards advancement with the Broader Standards Community", the OGC maintains strong relationships with many other standards development organizations.

WHAT MOTIVATES GOVERNMENT ORGANIZATIONS TO PARTICIPATE IN OGC PROGRAMS?

Our discussions with OGC US Government member representatives over the years indicate that government organizations participate in OGC programs to:

- Establish a broad dialog with industry to determine their interest in advancing standards to address key interoperability issues that impede their missions
- Reduce technology risk and systems costs by encouraging industry agreement and alignment on development and maintenance of open standards to improve access, sharing and application of location information across systems and networks.
- Collaborate with other government agencies in OGC membership to understand and shape standards requirements of mutual interest
- Encourage a more competitive market by promoting industry use of open standard interfaces vice proprietary interfaces that may limit the government's ability to extend and adapt ICT solutions to address new and unforeseen mission requirements.
- Minimize the cost of establishing interoperability by leveraging the collective resources of the OGC membership to advance standards of interest.
- Maximize the life span and value of legacy systems by "wrapping" these with standard interfaces and extending them with standards-implementing components from best-of-breed vendors.

OGC Consensus Programs

Government organizations also participate heavily in OGC consensus Domain Working Groups to cooperate nationally and internationally on the development not only of standards but also of formal OGC best practice recommendations that help define the optimal use of OGC and complementary standards for information sharing and usage within and between communities of interest. Government organizations engage actively in ongoing dialog and best practice development in a number of OGC Domain Working Groups (DWG) including:

- Aviation – This DWG provides a forum for the US Federal Aviation Administration (FAA), EuroControl (FAA's counterpart in Europe), and other OGC members to advance OGC standards to support aviation information management and operations as part of multi-year modernization programs underway in the US and Europe.
- Defense & Intelligence – The US National Geospatial-Intelligence Agency (NGA) serves as co-chair of this DWG with the European Satellite Centre. NGA works with other US

government agencies such as the US Army Geospatial Center, and international organizations such as the NATO sanctioned multi-national Defense Geospatial Information Working Group (DGIWG), the Australian DOD, Institut Geographique National (IGN) France and other government, industry, and university and research members have helped to align government and industry cooperation on open standards for the defense and intelligence community.

- Hydrology - The Hydrology Domain Working Group provides a venue and mechanism for seeking technical and institutional solutions to the challenge of describing and exchanging data describing the state and location of water resources, above and below the ground surface. Numerous national organizations are involved in this activity.
- Meteorology and Oceanography – This Working Group establishes an international forum to ensure that OGC standards allow the meteorological and oceanographic communities to develop effective interoperability of web services and sharing of content to address increasingly complex issues being addressed by these communities.
- 3D Information Management (3DIM) – This Domain Working group facilitates the definition and development of interface and encoding standards (notably CityGML) that enable solutions that allow infrastructure owners, builders, emergency responders, community managers, service providers and the public to better manage and navigate complex urban / built environments.

Other OGC working groups (working in many cases with other standards organizations) focus on a range of cross-cutting technology domains working on government requirements for standards to address interoperability issues such as geospatial rights management, workflow, security, decision support, data quality, data provenance, data uncertainty, data ordering, and interoperability between models such as climate models.

Interoperability Program – Rapid prototyping with industry

US Government organizations and other OGC member organizations provide requirements and funding to OGC's interoperability program of testbeds and pilots to engage OGC technology provider members with the user community in rapid development, testing, prototyping and demonstration of candidate standards and best practice guidance to address urgent government interoperability challenges. Examples include:

- Aviation Information Management -- The US FAA, US NGA and EuroControl are working collaboratively to develop, test and evaluate standards based approaches to delivery of important aviation and weather safety information to the cockpit during both preflight and in-flight situations. Emphasis is placed on just-in-time delivery of critical information as conditions change.
- Global Earth Observing System of System (GEOSS) – US government along with other OGC member organizations are conducting multi-phased GEOSS Pilot initiatives to advance a service oriented architecture based on interoperability arrangements for the sharing of Earth Observation assets operated by nations worldwide. The Pilots are being conducted by OGC in cooperation with the Group on Earth Observations.

- A common standards-based encoding, OGC Water Modeling Language (WaterML), and associated best practice guidance for worldwide use in coordinated water resources / hydrology research, analysis and monitoring
- Standards approaches for monitoring and responding to disasters including floods, wildfires, landslides and debris flows, and tsunami events.

Funding of these activities by the US government is routinely supplemented by funding from other OGC government and industry members worldwide, significantly improving each sponsor's return on their investment. This funding is multiplied 3-4 times through investment of in-kind resources (labor, travel, software, etc.) provided by industry to develop, test, incorporate and demonstrate candidate standards.

The results of these initiatives not only produce candidate standards, but also industry technologies that use these candidate standards, and live demonstrations to illustrate the value of these candidate standards in the context of user scenarios. Results are submitted to the OGC consensus process for consideration by members. Given the testing and evidence that accompanies candidate standards from this process; it is not unusual for candidate standards resulting from the Interoperability Program to move quickly toward international adoption through the OGC consensus process.

Cooperative standards advancement with the Broader Standards Community

OGC maintains formal relationships with many other standards organizations. This is done to insure that all standards work related to geospatial content/location is coordinated across standards organizations and communities. International standards of interest to OGC work activities are identified through staff and member involvement in a wide range of standards development organizations and industry and academic conferences.

Based on interest of OGC government members, OGC has established formal liaison agreements with relevant ISO technical committees to support collaboration on common standards objectives, and to submit OGC adopted standards for approval as ISO international standards. OGC has formal alliance partnerships with over 20 Standards Development Organizations worldwide. These Alliances are leveraged by OGC membership to coordinate the consistent processing of geospatial information across standards in the broader ICT standards "stack".

Currently, the OGC has formal relationships with ISO Technical Committee 211 (Geographic Information / Geomatics), OASIS, IEEE Technical Committee 9 (Sensor Technology), World Wide Web Consortium, Web3d Consortium, World Meteorological Association, and the European Committee for Standardization (CEN), many of which were driven by the public sector interests of government organizations in the OGC. OGC is also a key contributor to a NIST facilitated Sensor Standards Harmonization Working Group that is bringing together government, industry, academic and research organizations to identify and recommend standards needed to enable the integration, access, fusion, use, and delivery of sensor-derived data for application across government.

Results of such cooperation include the integration of the OGC standards into standards that support emergency and disaster management and other public sector needs. Examples include the incorporation of OGC Geography Markup Language into the OASIS Common Alerting Protocol,

the OASIS Emergency Distribution Exchange Language (EDXL), IETFs Presence Information Description Format Location Object (PIDF-LO) extension (to identify the location of a device on the network for emergency response purposes), and the National Information Exchange Model (NIEM).

Compliance Testing and Certification

Government and industry users need some guarantee of actual compliance to provide a degree of assurance that products and online services from diverse vendors will interoperate. OGC government members have influenced the development and implementation of a compliance test and certification program to enable formal industry certification of products that implement OGC standards (see http://www.opengeospatial.org/compliance).

Compliance testing and certification gives users as much assurance as possible that their products and solutions will interoperate with other systems that have also implemented OGC standards. Revenue derived from compliance certification through this program is directed to the deployment of tests as new standards are adopted, as well as the maintenance of the over compliance testing environment.

OGC Compliance tests and test software are available as open source and are being repurposed by government organizations to support compliance testing of industry products within their information system / enterprise environments.

HOW IS GOVERNMENT MAXIMIZING THEIR INVESTMENT IN OGC AND OPEN STANDARDS?

By participating in OGC programs, government organizations help articulate to industry their preference for interoperability through open standards in their ICT solutions. OGC industry members are influenced by government requirements, and often support the development and product implementation of OGC standards in anticipation of meeting government needs in potential future sales. Hundreds of technology solutions now implement OGC standards and are available in the global marketplace (see: http://www.opengeospatial.org/resource/products).

Government agencies are reinforcing their investment in OGC and other standards organization programs by incorporating standards in their technology programs and acquisition policies. By requiring or favoring open standards in their policies, government further encourages industry to adopt and implement open standards to maximize their competitiveness. The following are some examples of policy statements citing OGC standards:

- US Federal Geographic Data Committee (FGDC) – The US FGDC has endorsed OGC standards as Non-Federally Authored Geographic Information Standards and Specifications. This endorsement identifies OGC and complementary standards as "standards or specifications that are relevant to the missions and spatial data responsibilities of Federal agencies". See: www.fgdc.gov/standards/fgdc-endorsed-external-standards/index_html
- Integrated Ocean Observing System (IOOS) – Administered by the US National Ocean and Atmospheric Agency (NOAA), IOOS specifies OGC geospatial and sensor standards as a means to rapidly integrate ocean sensors into its national network, and to tie this network to other global ocean observing assets. The IOOS Data Integration Framework

identifies OGC and other standards as an underpinning of their technology architecture. See www.ioos.gov/dif/

- Geospatial Intelligence – the National Geospatial-Intelligence Agency as functional manager for Geospatial-Intelligence, has implemented a formal process to promote, evaluate and adopt standards of importance to the US and its allies. The Geospatial Intelligence Standards Working Group (GWG) coordinates evaluation of GEOINT standards for potential adoption as baseline standards in the Defense Information Standards Registry (DISR). See www.gwg.nga.mil/.
- Army Geospatial Enterprise (AGE) – The AGE defines "an integrated system of technologies, standards, data, and processes that delivers a standard and shareable geospatial foundation, to facilitate a Common Operational Picture (COP) to the Soldier at all echelons". The AGE standards profile referenced in the AGE Policy signed by the Army Geospatial Information Officer includes OGC and complementary standards and is part of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology Common Operating Environment Implementation Plan. This plan will require the use of relevant OGC standards in all Army acquisition programs involving geospatial information processing.
- The European Union, through a pan European INSPIRE (Infrastructure for Spatial Information In Europe) Implementing Directive, is leveraging ISO, OGC and other complimentary standards to achieve interoperability in the sharing and application of geospatial information across Europe. Experience from INSPIRE government and industry implementers is also providing OGC with invaluable feedback to support standards maintenance.

WHAT METRICS ARE AVAILABLE TO DETERMINE EFFECTIVENESS?

The value of OGC and other complimentary geospatial standards for government agencies was carefully documented in the NASA-funded April 2005 Booz Allen Hamilton study, "Geospatial Interoperability Return on Investment Study" (http://www.egy.org/files/ROI_Study.pdf), which compared proprietary and standards-based large scale implementations. They showed that geospatial standards (primarily OGC standards) delivered significant governmental operational value in terms of ease of integration, intra-governmental collaboration, public participation/accountability, interagency collaboration, reuse, adaptation and consolidation, mainstreaming of GIS and IT Performance. Dollar savings were calculated to be 119.0 percent throughout the five-year project lifecycle. Looking over a 10-year project lifecycle, it had a risk-adjusted ROI of 163.0 percent. This project saved 26.2 percent compared to the project that relied on a proprietary standard. One way to express this result is by saying that for every $100 million spent on projects based on proprietary platforms, the same value could have been achieved with $75 million if the projects had been based on open standards.

The value of OGC standards to technology providers is evident in the growth of the geospatial industry over the last decade as well as the participation of virtually all the major geospatial technology providers and many smaller software companies and solution providers. Industry implements OGC standards in a wide range of technology offerings. (See http://www.opengeospatial.org/resource/products.)

Below are a few of the many government implementations of OGC standards:

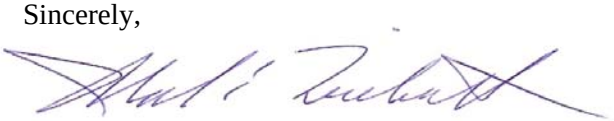
- US Geological Survey - Many USGS organizations have been actively involved in OGC activities for many of the reasons outlined above. A component of the USGS, the National Geospatial Program (NGP) which includes *The National Map (TNM)*, has long been involved in defining requirements for OGC standards, supporting the development of OGC standards and using those standards to support its mission. TNM in particular has benefited from these OGC standards. Today, TNM information is available on the Web publicly via OGC-compliant web services. OGC standards based systems are allowing the USGS and its federal and state partners to maintain their geospatial information locally, while enabling synchronization, maintenance and sharing of geospatial data in a seamless, real-time manner.
- USGS and NGA – A capability to be available soon will allow geographic names information to be modeled and communicated via a OGC based Gazetteer. Through this capability, the National Geospatial Intelligence Agency (NGA) foreign place names and USGS domestic place names will be available to customers seamlessly through a single interface. State partners will be able to post updates to the USGS and have access to updates from USGS and other federal agencies.
- The US Department of Homeland Security (DHS) Unified Incident Command and Decision Support (UICDS) program is advancing quickly through a series of pilot projects that are seeding widespread use of the UICDS open architecture. Open Geospatial Consortium (OGC) standards specified in the architecture have helped overcome interoperability obstacles to implementation.
- NOAA's National Weather Service, in coordination with the U.S. FAA and EUROCONTROL, is involved in the advancement of the Aeronautical Information Exchange Model (AIXM), a global standard for the representation and exchange of aeronautical information, and the Weather Exchange Model (WXXM), the proposed standard for the exchange of aeronautical weather information. Based on the OGC Geography Markup Language standard, AIXM and WXXM are being developed to support the U.S.'s Next-Generation Air Transportation System (NextGen) and Europe's Single European Sky initiatives. WXXM development is also coordinated with the World Meteorological Organization, the United Nations organization that promotes the standardization of meteorological information exchange. Current development and demonstration activities include the representation of probabilistic weather forecast information for airport decision making, and reviewing, updating, and validating the WXXM standard.
- The European Space Agency and various partner organizations in Europe are collaborating on the Heterogeneous Mission Accessibility (HMA) project (http://earth.esa.int/hma/). HMA's high level goals include, among other things, consolidating earth imaging and other geospatial interoperability requirements; defining interoperable protocols for cataloging, ordering and mission planning; and addressing interoperability requirements arising from security concerns. HMA involves a number of OGC standards, including the Sensor Planning Service, which supports the feasibility analysis requirements of Spot Image optical satellite missions.
- The Ordnance Survey of Great Britain's OS MasterMap, a geographical database of the whole of Great Britain that is updated up to 5000 times daily, provides data encoded using a GML application schema in order to deliver rich feature and attribute information.

The decision to implement in this way made OGC standards central to the UK spatial data infrastructure.

- OGC and complementary ISO standards are recognized as an underpinning component of National Spatial Data Infrastructure (NSDI) programs of the US, India, Canada (GeoConnections), Spain (IDEC), Germany (GDI-DE), Australia (ANZLIC) and many other countries worldwide.
- The Debris Flow Disaster Information System developed by the Taiwanese government by the GIS Center at Feng Chia University is leveraging OGC geospatial and sensor standards to support rapid configuration and deployment of debris flow disaster management capability across Taiwan. All phases of disaster management are addressed from monitoring to prediction, to citizen alerts and warnings, and response. The full range of OGC standards as well as OASIS alerting / messaging standards are essential components of this government sponsored system.

On behalf of the OGC US government member representatives noted above and OGC staff, I submit this information for consideration by the Sub-Committee on Standards. I offer our support to provide further information to the Sub-Committee as required.

Sincerely,



Mark E. Reichardt
President & CEO
mreichardt@opengeospatial.org

Enclosure 1

OGC Government Members
As of 7 March 2011

Government Organization Name	Country	Type
City and County of San Francisco	United States	Government-Local
Arizona Geological Survey	United States	Government-Subnational
North Carolina Dept. of Environment & Natural Resources	United States	Government-Subnational
FAA System Operations Airspace and AIM Office	United States	Government-National
Federal Communications Commission (FCC)	United States	Government-National
Joint Program Executive Office for Chemical & Biological Defense, SSA	United States	Government-National
Naval Meteorology & Oceanography Command	United States	Government-National
Oak Ridge National Laboratory	United States	Government-National
US Army Geospatial Center	United States	Government-National
US Census Bureau	United States	Government-National
US Department of Homeland Security (DHS)	United States	Government-National
US Environmental Protection Agency (EPA)	United States	Government-National
US General Services Administration (GSA)	United States	Government-National
US Geological Survey (USGS)	United States	Government-National
US National Aeronautics and Space Administration (NASA)	United States	Government-National
US National Geospatial-Intelligence Agency (NGA)	United States	Government-National
US National Oceanic and Atmospheric Administration (NOAA)	United States	Government-National
Gosford City Council	Australia	Government-Local
Department of Environment & Resource Management (DERM)	Australia	Government-Subnational
Land and Property Management Authority (LPMA)	Australia	Government-Subnational
Landgate	Australia	Government-Subnational
NSW Dept. of Environment & Climate Change	Australia	Government-Subnational
Victorian Dept. of Primary Industries	Australia	Government-Subnational
Australian Bureau of Meteorology	Australia	Government-National
CSIRO	Australia	Government-National
Department of Defence (Australia)	Australia	Government-National
Geoscience Australia	Australia	Government-National
City of Vienna	Austria	Government-Local
Central Informatics Organization (GIS Directorate)	Bahrain	Government-National
Agentschap voor Geografische Informatie Vlaanderen (AGIV)	Belgium	Government-Subnational
Eurocontrol	Belgium*	Government-International
Ministère des Ressources naturelles et de la Faune (Gouvernement du Québec) (MRNF)	Canada	Government-Subnational
Ministère des transports du Québec (MTQ)	Canada	Government-Subnational
GeoConnections - Natural Resources Canada	Canada	Government-National
Danish National Survey & Cadastre	Denmark	Government-National
European Environment Agency (EEA)	Denmark*	Government-International
National Land Survey of Finland	Finland	Government-National
BRGM	France	Government-National
CNES	France	Government-National
Institut Geographique National (IGN) (France)	France	Government-National
METEO-FRANCE	France	Government-National
Ministry of the Environment	France	Government-National
Wupperverband	Germany	Government-Local
AdV (Working Committee of the Surveying Authorities of the States of the Federal Republic of Germany)	Germany	Government-Subnational
Service Centre Information Technology of the BMVBS (DLZ-IT BMVBS)	Germany	Government-Subnational
Deutscher Wetterdienst	Germany	Government-National

Enclosure 1

OGC Government Members
As of 7 March 2011

Federal Agency for Cartography and Geodesy (BKG)	Germany	Government-National
Federal Institute of Hydrology (BfG)	Germany	Government-National
German Aerospace Center - DLR	Germany	Government-National
Ktimatologio SA	Greece	Government-National
Additional Director General Military Survey (GSGS)	India	Government-National
Indian National Centre for Ocean Information Services (INCOIS)	India	Government-National
Joint Research Centre (JRC)	Italy*	Government-International
European Space Agency (ESA)	Italy*	Government-International
Geospatial Information Authority of Japan (GSI)	Japan	Government-National
National Geographic Information Institute	Korea, Republic of	Government-National
Geonovum	Netherlands	Government-National
Ministry of Transport, Public Works & Water Management	Netherlands	Government-National
Land Information New Zealand (LINZ)	New Zealand	Government-National
National Office of Building Technology and Administration	Norway	Government-National
Diputació de Barcelona-Oficina Tècnica de Cartografia i Sig Local	Spain	Government-Local
Generalitat Valenciana	Spain	Government-Subnational
IDEC (SDI of Catalonia)	Spain	Government-Subnational
Marine Technology Unit (CSIC)	Spain	Government-Subnational
Instituto Geográfico Nacional (IGN of Spain)	Spain	Government-National
INTA (National Institute of Aerospace Technology from Spain)	Spain	Government-National
European Union Satellite Centre	Spain*	Government-International
Natural Environment Research Council (NERC)	United Kingdom	Government-Subnational
Department of Energy & Climate Change	United Kingdom	Government-National
Ordnance Survey	United Kingdom	Government-National
UK Met Office	United Kingdom	Government-National
European Centre for Medium-Range Weather Forecasts (ECMWF)	United Kingdom*	Government-International