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Implementation and adoption of standards for the global geospatial information community

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Note by the Secretariat

Summary

The present paper contains the report, prepared jointly by the Open Geospatial Consortium, technical committee 211 of the International Organization for Standardization, and the International Hydrographic Organization, on the implementation and adoption of standards for the global geospatial information community for consideration by the Committee of Experts on Global Geospatial Information Management.

At its seventh session, held in New York from 2 to 4 August 2017, the Committee of Experts adopted decision 7/113, in which it expressed its appreciation to the international standards organizations for their continuing support and valuable work in international geospatial standards and noted their contributions towards the provision of geospatial standards in the implementation of the Sustainable Development Goals and statistical-geospatial integration. The Committee welcomed the proposed survey on considering a review and update of the standards guide and companion document, and noted the encouragement by the standards development organizations of participation by Member States in the international geospatial standards development processes. In this report, the international standards organizations provide a review and update of the guide to the role of standards in geospatial information management and its technical companion document, together with insights into the global adoption of standards and pertinent results drawn from a survey circulated to Member States and related organizations and industry sectors. The report includes details on collaborative efforts, such as the harmonization of standards and common vocabularies, by the statistics domain working group of the Open Geospatial Consortium and the Expert Group on the Integration of Statistical and Geospatial Information that will mutually benefit the geospatial and statistical domains. Also described in the report is the status of development of the Land Administration Domain Model, which will benefit the wider geospatial community.

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I. Introduction

1. At its seventh session in August 2017, the Committee of Experts adopted decision 7/113, in which it noted the efforts of the international standards organizations in their contributions towards the provision of geospatial standards in the implementation of the Sustainable Development Goals (SDGs), statistical-geospatial integration, and the Discrete Global Grid System. The Committee also welcomed the proposed survey on considering a review and update of the standards guide and its companion document, and urged Member States to contribute and provide feedback, along with their experiences in the use of the standards guide and the implementation of standards within their national frameworks.

2. The present report provides an update on the work of the three standards development organizations (SDOs); the Open Geospatial Consortium (OGC), the technical committee 211 of the International Organization for Standardization (ISO/TC 211), and the International Hydrographic Organization (IHO), towards standards interoperability between the statistics and geospatial community, and standards requirements for the SDGs. The Committee of Experts is invited to take note of the report and to express its views on the way forward for the implementation and adoption of standards for the global geospatial information community. Points for discussion and decision are provided in paragraph 37.

II. Update on the work of standards development organizations

3. Underpinning the global capacity for sharing geospatial information is an ecosystem of SDOs. Each plays a role in developing standards for a key technology or domain area, but no suite of standards can exist in isolation; therefore, collaboration to ensure interoperability is key. For the geospatial domain, the key SDOs are the OGC, ISO/TC 211 and the IHO. Each SDO convenes technical and/or plenary meetings each year. The following is a brief update of the significant developments for each organization and key areas of joint and collaborative work being undertaken.

Update from the Open Geospatial Consortium

4. Since August 2017 the OGC membership has convened four technical meetings in the United Kingdom of Great Britain and Northern Ireland, New Zealand, France, and the United States of America. Future technical meetings of the OGC will take place in Germany (September 2018), United States of America (December 2018), Singapore (February 2019), and Belgium (June 2019). The Committee of Experts are invited to take note and participate in these future meetings. OGC has approved a number of new standards since August 2017 and encourages the Committee of Experts to review and implement these where appropriate.

5. OGC wishes to highlight the ongoing work related to Web Feature Service (WFS) 3.0, WaterML, Web Coverage Service (WCS), SensorThings API, and Common DataBase (CDB). A key feature of the new work is the OGC Technology Trends[1]. This work is a collaborative effort of its members, overseen by its Open Architecture Board (OAB), and updated quarterly. The purpose of this activity is to identify the industry technology trends that will impact or guide geospatial standards work.

6. In making its decision 6/107, the Committee of Experts adopted the five principles of the Global Statistical Geospatial Framework (GSGF). In recognition of the GSGF's growing importance to the 2030 Agenda for Sustainable Development and the 2020 Round of Population and Housing Censuses, the Economic Commission for Europe (ECE) and the Regional Committee of United Nations Global Geospatial Information Management for Europe (UN-GGIM: Europe) held a workshop on the Integration of Geospatial and Statistical

[1] The trends are available for public viewing at https://github.com/opengeospatial/OGC-Technology-Trends

Standards in Stockholm, Sweden, in November 2017[2]. This workshop preceded the fourth meeting of the Expert Group on Integration of Statistical and Geospatial Information (also in Stockholm, Sweden). The workshop and meeting considered the progress, and refinement of the GSGF, and furthered the work regarding Principle 4 "Statistical and geospatial interoperability – Data, Standards and Processes" which has the most relevance for the SDOs, and the work of the Expert Group on Integration of Statistical and Geospatial Information (EG-ISGI). This meeting helped foster increased collaboration between the statistical and geospatial communities and is further strengthened by the work of the SDOs in improving uniformity, compatibility, and interoperability of statistical and geospatial information.

7. There are several OGC working groups[3] that discuss domain specific requirements. Since August 2017, two new Domain Working Groups (DWG) have been established, the Earth Observation Exploitation Platforms DWG and the Interoperable Simulation and Gaming DWG. The Office for National Statistics in the United Kingdom of Great Britain and Northern Ireland and the Australian Bureau of Statistics held a meeting on the margins of the OGC Technical Meetings of March 2018, and refined the charter for a permanent Statistics DWG, which will consider technical interoperability challenges faced by the integration of geospatial and statistical data. This charter has been released for public comment[4]. The intent of the Statistics DWG[5] is to work in collaboration with the EG-ISGI and provide the technical capacity towards better coordination with the framework and policy guidance activities of EG-ISGI.

8. The Statistics DWG has the advantage that participants do not have to be members of the OGC. This is aimed at increasing participation from across the geospatial and statistical communities. The five activities of the Statistics DWG are to:

(a) Discuss and identify primary statistical use cases that would benefit from OGC standards;

(b) Identify statistical domain requirements for inclusion in existing or new OGC standards;

(c) Identify other practice areas in the OGC that support or could be influenced by statistics;

(d) Identify statistics-related use cases and workflows for Interoperability Experiments or Testbeds; and

(e) Identify work and standards related to other domains that could be adopted by the statistical community.

2 The report of the meeting is here: http://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.58/2017/mtg3/Workshop_on_integrating_geospatial_and_statistical_standards_-_meeting_report.pdf.

3 See http://www.opengeospatial.org/projects/groups/wg

4 http://www.opengeospatial.org/pressroom/pressreleases/2832

5 Technical standards already under consideration are: Discrete Global Grid Systems, Table Join Service (TJS), Statistical Data and Metadata Exchange (SDMX) and Geopackage. With the Australian Bureau of Statistics announcing in 2017 the publication of all their statistical boundaries in the open data format of Geopackage.

9. The Smart Cities domain continues to be an important focus for OGC. Through the collection of use cases, the Smart Cities DWG has also been reviewing their relationship to the SDGs, specifically case studies that highlight the relationship between geospatial standards and the SDGs[6]. The OGC, in collaboration with Singapore Land Authority, will hold an international summit in Singapore titled 'Location Powers: Data, Interoperability and our Urban World'[7], to be held on 25-26 September 2018.

10. The OGC held the first OGC Canada Forum on Geospatial Standards on the margins of the OGC Technical Committee Meetings, 6 June 2018, in Fort Collins, United States of America. The Forum supports regional coordination and communication regarding geospatial standardization activities. Other OGC regional forums include Asia; Australia and New Zealand; China; Europe; France; ILAF (Iberian and Latin-American Forum); India; Korea; Middle East and North Africa; Nordic; North American; and, UK & Ireland. The Committee of Experts is welcomed to take note and participate in these regional forums and the DWGs.

11. The OGC informs the Committee of key international interoperability projects that have concluded since August 2017 and encourage Member States to take note of the outcomes:

(a) OGC Testbed 13 including Aviation, Compliance, Cross-Community Interoperability, Dynamic Source Integration, Earth Observation Clouds, Streaming & 3D Data, and Compliance Testing;

(b) ESPRESSO Project (Europe)[8] is funded as part of the European Union's Horizon 2020 program and seeks to develop a systemic standardized approach to empower smart cities and communities;

(c) Underground Infrastructure Concept Development Pilot Study based in New York, supported by participation by the Fund for the City of New York, United States of America, Singapore Land Authority, Singapore, and the Ordnance Survey, United Kingdom;

(d) API (Application Program Interface) Concept Development Study focused on how APIs can be developed and used in a consistent interoperable manner in the geospatial community; and

(e) Environmental Linked Features Interoperability Experiment (ELFIE)[9].

12. The OGC informs the Committee of Experts of key international interoperability projects that have been initiated or are ongoing since August 2017, and encourages the Committee to consider participating in these significant international projects: OGC Testbed 14 including Aviation, Compliance and Interoperability Testing (CITE); Earth Observation & Clouds (EOC); Modelling, Portrayal and Quality of Service (MoPoQ) and Next Generation Services (NextGen); Augmented Reality (AR) Pilot (in collaboration with W3C); Borehole Interoperability Experiment; Citizen Science Interoperability Experiment; DataBio; Disasters Interoperability Concept Development Study; Earth Observation Exploitation Platform Hackathon; Future City Pilot, Phase 2; Geospatial to the Edge Interoperability Plugfest; Indian Plugfest; Indoor Mapping and Navigation Pilot; Maritime Limits and Boundaries (MLP) Pilot; NextGEOSS; GC Geopackage (GPKG) Related Tables Extension Interoperability Experiment; Portrayal CDS; Precision Agriculture Pilot; Smart City Interoperability Reference Architecture (SCIRA); Strengthening Disaster Risk Reduction Across the Americas Summit - Simulated Exercise; Underground Infrastructure Pilot (to

6 http://external.opengis.org/twiki_public/SmartCitiesDWG/UseCaseList
7 www.locationpowers.net
8 http://espresso-project.eu/
9 http://www.opengeospatial.org/projects/initiatives/elfie

create the Model for Underground Data Definition and Interchange (MUDDI)); and WFS 3.0 Hackathons.

13. As part of the celebration of the 50th Anniversary of Earth Day in 2020, the OGC is partnering with the Earth Day Network, the Woodrow Wilson International Center for Scholars, and the U.S. Department of State, through the Eco-Capitals Forum, the Earth Challenge 2020, a Citizen Science initiative. This initiative is also in collaboration with Connect4Climate – World Bank Group, Conservation X Labs, Hult Prize, National Council for Science and the Environment (NCSE), Reset, SciStarter, UN Environment and others to be announced. Specifically, the OGC Citizen Science DWG is assisting in the development of the necessary schema for citizen collected (crowdsourced) geospatial data.

Update from the technical committee 211 of the International Organization for Standardization

14. Since August 2017, the ISO/TC 211 membership has convened two plenary meetings, in New Zealand (45th) and Denmark (46th), with one Member State becoming a new Participating Member, namely Slovakia. ISO/TC 211 actively participated in the Workshop on Integrating Geospatial and Statistical Standards, 6-8 November 2017 in Stockholm, Sweden.

15. The international standard on land administration, ISO 19152 Geographic information - Land Administration Domain Model (LADM), has gained wide use and interest. Through expanding upon the Social Tenure Domain Model (STDM) and the fit-for-purpose approach recommended by UN-Habitat, the World Bank and International Federation of Surveyors (FIG), ISO 19152 has proven especially important for less developed countries and has become the basis for a global set of national land administration domain profiles. The land administration communities have for many years discussed potential extensions to the LADM, and a new project has now been established to resolve how the current standard can be further developed to meet new requirements from different domains. This includes possibilities such as modules for taxation and valuation, enhanced 3D and 4D support, land management processes, volunteered land administration and crowdsourcing, support for harmonized land indicators, the link between legal space to physical objects, blockchain technology for land administration, and many more aspects. Several organizations will take part in the development, including OGC, IHO, FIG, United Nations Office of Legal Affairs' Division for Ocean Affairs and Laws of the Sea (DOALOS), World Bank, FAO, and UN-Habitat.

16. Addresses provide one of the most common ways to unambiguously determine an object for purposes of identification and location; assisting such services as postal delivery, emergency response, marketing, mapping, utility planning and land administration. ISO/TC 211 has published a multi-part Addressing Standard (ISO 19160) to assist the many stakeholders involved in addressing. The parts cover such topics as a conceptual data model, terms and definitions for address information; good practices for address assignment; quality of address data; and a standard jointly developed with the Universal Postal Union (UPU) on international postal address components and template language, aimed at designers and developers of computer systems for rendering and processing of global address data. Since August 2017, several developments have taken place: i) ISO 19160-4:2017, Addressing - Part 4: International postal address components and template language, was published; ii) ISO 19160-5, Addressing - Part 5: Address rendering for purposes other than mail, was concluded in June 2018; and, iii) Draft International Standard for ISO 19160-3, Addressing - Part 3: Address data quality, is scheduled to be ready by the end of 2018.

17. ISO/TC 211 continues to strengthen its relationship with other ISO committees requiring geospatial information. The joint task force together with ISO/TC 204, Intelligent Transport

Systems (ITS), continued its good cooperation and plan on establishing a joint working group (JWG) and combined work items under ISO/TC 211. A technical report is in the process of being developed by ISO/TC 211 and ISO/TC 59/SC13 on the interoperability between Geographic Information Systems and Building Information Modelling (GIS-BIM). This Technical Report will describe requirements for interoperability between the two domains and to describe measures to lower the barriers and increase interoperability between GIS and BIM, and specify standardization needs in the field of GIS-BIM interoperability[10].

18. Land cover and land use data are fundamental in monitoring several aspects of sustainable development, and many indicators can be directly measured using these types of data. While new sensors allow more and more data of higher resolutions, the current classification schemes need to be improved. Furthermore, many schemes do not properly differentiate land use and land cover, making the use of the data less efficient. In response to these challenges, a new project on land cover/land use classification has been established, with the support of FAO, to improved classifications and to align classifications currently in use globally and regionally. The project will include discussions on how to develop further the current standard, how to align schemes such as the ones used by FAO and EAGLE[11] (EIONET Action Group on Land monitoring in Europe - a partnership network led by the European Environment Agency).

19. The standard for classifications systems for land cover, ISO 19144-2, Geographic information - Land Cover Metalanguage (LCML), is widely used. It is a cooperative standard with FAO and is in the process of being reviewed. A Land Cover/Land Use seminar was held at the ISO/TC 211 meeting in Copenhagen in May 2018. A study is being undertaken to revise the standard to address additional aspects of Land Cover/Land Use.

20. The ISO Central Secretariat has created a task force on the SDGs to help users to navigate the ISO standards catalogue and to identify standards that support the SDGs, and to understand how these standards can have an impact. ISO/TC 211 are following this work closely.

21. The next meeting of the ISO/TC 211 will be held in China from 12-16 November 2018, the week preceding the UN World Geospatial Information Congress (UNWGIC) in Deqing, Zhejiang Province, China.

Update from the International Hydrographic Organization

22. The technical programme of the IHO continues to focus on developing the S-100 series of new standards and Product Specifications in support of e-navigation and spatial data infrastructures, while keeping the current IHO standards fit for purpose. The technical programme remains the principal responsibility of the IHO Hydrographic Services and Standards Committee (HSSC) and continues to draw on the active contributions of representatives from IHO Member States and partner international organizations as well as expert contributors from industry. Since August 2017, the IHO has conducted two HSSC meetings, and it will hold its 11th and 12th meetings in Cape Town, South Africa (6-9 May 2019) and Taunton, UK (May 2020) respectively.

10 A revised draft to be published by October 2018

11 https://land.copernicus.eu/eagle

23. At its 10th meeting, the HSSC endorsed a new Edition 4.0.0 of the S-100 - Universal Hydrographic Data Model Standard for circulation and approval by the IHO Member States. The new edition includes new types of geometry, a scripting language for portrayal and extensions for data streaming and for data security. The S-100 infrastructure is underpinned by the on-line S-100 Geospatial Information Registry owned and managed by the IHO.

24. Much effort is being devoted to the ongoing development of the S-100 based product specifications, including S-101 - Electronic Navigational Chart Product Specification and several product specifications related to nautical information, tides and surface currents, maritime limits and boundaries. The data quality model and the decision tree for designating the quality of bathymetric data in S-101 were developed. The first draft of the S-100 interoperability specification for Electronic Chart Display and Information Systems (ECDIS) has been completed.

25. Other Technical Standards that are maintained by IHO Working Groups include: i) S-4 - Regulations for International (INT) Charts and Chart Specifications of the IHO; ii) S-11 Guidance for the Preparation and Maintenance of International (INT) Chart and ENC; iii) S-44 Standard for Hydrographic Surveys; iv) S-52 Specifications for Chart Content and Display Aspects of ECDIS; v) S-57 Transfer Standard for Digital Hydrographic Data; vi) S-58 ENC Validation Checks; vii) S-61 Product Specification for Raster Navigational Charts (RNC); and vii) S-63 Data Protection Scheme.

26. At the request of DOALOS, the IHO is developing a standard for the deposit of a nation's maritime limits and boundaries to the United Nations. This standard is built upon the IHO S-100 standard and the ISO 19152 LADM standard.

27. At the invitation of the Organization for Economic Cooperation and Development (OECD), the IHO has agreed to participate in the partnership with other international organizations led by the OECD on ensuring the quality of international rule-making. The IHO highlighted the standard-related activities of the Committee of Experts as an example of best practice.

III. Geospatial standards and the Sustainable Development Goals

28. Since August 2016, the three SDOs have had ongoing discussions regarding the use of geospatial standards in supporting the measurement and monitoring of the SDGs. The focus areas include:

(a) Goal 2 - Zero Hunger (land cover/land use – ISO/TC 211);

(b) Goal 11 - Sustainable Cities and Communities (Smart Cities DWG is supporting use case definition including SDGs and standards, SCIRA and ESPRESSO Projects - OGC); and

(c) Goal 14 - Life Below Water (maritime boundary limits - IHO).

29. The SDOs will continue to work with the Inter-agency and Expert Group on Sustainable Development Goals Working Group on Geospatial Information (IAEG-SDGs: WGGI) and the EG-ISGI to ensure a synergistic approach to providing guidance on the use of geospatial standards, and enable the geospatial and metadata needs which the measurement and monitoring of the SDGs will require.

IV. Adoption and implementation of standards in geospatial information management

30. Since the second session of the Committee of Experts, the issues related to standards setting in the global geospatial information community have been extensively discussed and reflected in the decisions of the Committee. The work carried out by the SDOs have been recognized as valuable to the geospatial information community. These organizations are developing consistent and precise technical geographic standards that form the core building blocks to enable data and information interoperability, and to facilitate the integration and use of diverse sources of geospatial data and services.

'Guide to the Role of Geospatial Standards' and its companion document 'Standards Recommendations by Tier'

31. The Committee of Experts, in its decision 7/113 at its seventh session, welcomed the proposed survey by the SDOs to consider a review and update of the 'Guide to the Role of Geospatial Information Management' and its companion document on 'Standards Recommendations by Tier'. The three SDOs conducted a survey of the national geospatial information or mapping agencies, national statistical agencies, national hydrographic organizations, non-government organizations, academic and research institutions, and the private sector to identify gaps and opportunities for the improvement of these two documents.

32. The survey received 60 responses, primarily from national geospatial information or mapping agencies and national statistical agencies. The results of the survey reinforced the focus of the documents in targeting standards information towards the executive and managerial levels within the agencies implementing geospatial standards in Member States. Information regarding the implementation of standards within national frameworks was also captured by the survey, the insights of which helped in the update of the substantive content of the documents.

33. Substantively, a number of new standards and examples were added to the documents and include topics such as Spatial Data on the Web, Geopackage, and the Discrete Global Grid System. New technological advancements within the Internet of Things, Linked Data, Unmanned Aerial Systems, and other developments, were considered under the section pertaining to "Tier 4 – Towards a Spatially Enabled Web of Data – Emerging Standards, Best Practices and Trends" within the companion document on 'Standards Recommendations by Tier'.

34. A review process regarding the documents was carried out by the three SDOs amongst their membership in the revision of these two documents. The request was for reviewers to critically assess how these documents will inform, leverage, and build upon the ongoing standards activities of the Committee of Experts, Member States, and the SDOs. This process was completed with the documents endorsed collectively by the OGC, ISO/TC 211 and IHO.

35. In light of the benefits of developing and implementing standards, such as uniformity, compatibility, and interoperability, the SDOs have now revised the 'Guide to the Role of Geospatial Information Management' and its companion document on 'Standards Recommendations by Tier'. These are provided as background documents to this present report under this agenda item, and for the Committee of Experts to consider the revised versions as international good practice.

36. The three SDOs would like to express appreciation to Member States that completed the survey regarding the use of geospatial standards. The information has been invaluable to the revision of the Guide and to understand how to best address the needs for capacity building and education for Member States. The SDOs also urge Member States to consider translating the 'Guide to the Role of Geospatial Information Management' and its companion document on 'Standards Recommendations by Tier', into their languages to further contribute towards

capacity building and sharing of good practices to leverage the experiences from other nations.

V. Points for discussion

37. The Committee of Experts is invited to:

(a) Take note of the present report and express its views on the activities and work undertaken by the three standards development organizations;

(b) Take note of the revision of the 'Guide to the Role of Standards in Geospatial Information Management' and its companion document on 'Standards Recommendations by Tier';

(c) Encourage the participation of Member States in the Statistics Domain Working Group and the revision of ISO 19152 - Land Administration Domain Model; and

(d) Take note of the encouragement for Member States to participate, through membership, in the international geospatial standards development processes of OGC, ISO/TC 211, and IHO.