



Measurements to know and understand our world

*How ISO/TC 211 can contribute
to monitoring climate change*

*Olaf Østensen,
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The challenge



- Our planet is a complex, dynamic system that continuously undergoes adjustments.
- So how and with what certainty can we know that the earth's climate is changing, and at what speed ?
- How can we establish whether this rate of change is increasing or decreasing, or whether it is due to natural variability or human influence (anthropogenic variability) ?

Standards

Standards ensure that measurements and comparisons are meaningful and sustainable. For instance, by providing guidelines for

- making, documenting, and interpreting measurements,
- integrating, archiving, and disseminating data,
- reporting results, and
- managing processes.

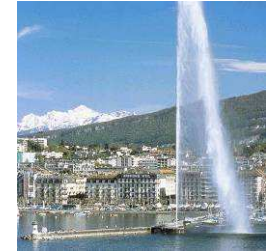




International
Organization for
Standardization

ISO/TC 211

International Organization for Standardization – ISO



ISO (International Organization for Standardization) is the world's **largest developer** and publisher of **International Standards**.

ISO is a **network** of the national standards institutes of **157 countries**, one member per country, with a Central Secretariat in Geneva, Switzerland, that coordinates the system.

ISO is a **non-governmental organization** that forms a bridge between the public and private sectors.

ISO/TC 211

Geographic information/Geomatics



ISO Technical Committee 211, Geographic information/Geomatics, is developing a suite of standards for geographic information that forms a basis upon which geomatics – the measurement of the earth – can be performed.

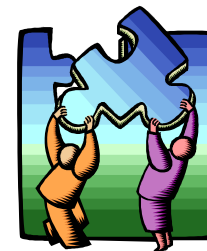
The ISO process for standardizing provides an open, consensus based public method for establishing standards.



The goal of ISO/TC 211...

... is to develop a family of international standards that will

- support the understanding and usage of geographic information
- increase the availability, access, integration, and sharing of geographic information, enable inter-operability of geospatially enabled computer systems
- contribute to a unified approach to addressing global ecological and humanitarian problems
- ease the establishment of geospatial infrastructures on local, regional and global level
- contribute to sustainable development





Scope of ISO/TC 211

- Standardization in the field of digital geographic information.
- This work aims to establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth.
- These standards may specify, for geographic information, methods, tools and services for data management (including definition and description), acquiring, processing, analyzing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations.
- This work shall link to appropriate standards for information technology and data where possible, and provide a framework for the development of sector-specific applications using geographic data.



International
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ISO/TC 211

Who are we ? ...member list

Active members (P-members), 31 countries

Australia

Austria

Belgium

Canada

China

Czech Rep.

Denmark

Ecuador

Finland

Germany

Hungary

Italy

Japan

Rep. of Korea

Malaysia

Morocco

Netherlands

New Zealand

Norway

Peru

Portugal

Russian Federation

Saudi Arabia

Serbia

South Africa

Spain

Sweden

Switzerland

Thailand

United Kingdom

United States of
America



Member list

Observing members 30

Argentina	Iceland	Philippines
Bahrain	India	Poland
Brunei Darussalam	Indonesia	Romania
Colombia	Isl. Rep. of Iran	Slovakia
Croatia	Ireland	Slovenia
Cuba	Jamaica	Tanzania
Estonia	Kenya	Turkey
France	Mauritius	Ukraine
Greece	Oman	Uruguay
Hong Kong	Pakistan	Zimbabwe





International
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ISO/TC 211

External liaisons, 1 of 2

- CEOS, Committee on Earth Observation Satellites
- DGIWG, Digital Geographic Information Working Group
- EuroSDR, European Spatial Data Research
- ESA, European Space Agency
- FIG, International Federation of Surveyors
- GSDDI, Global Spatial Data Infrastructure
- IAG, International Association of Geodesy
- ICA, International Cartographic Association
- ICAO, International Civil Aviation Organization
- IEEE Geoscience and Remote Sensing Society
- IHB, International Hydrographic Bureau
- ISCGM, International Steering Committee for Global Mapping
- ISPRS, International Society for Photogrammetry and Remote Sensing
- JRC, Joint Research Centre, European Commission
- OGC, Open Geospatial Consortium, Inc.
- OGP, International Association of Oil and Gas Producers
- PAIGH, Panamerican Institute of Geography and History



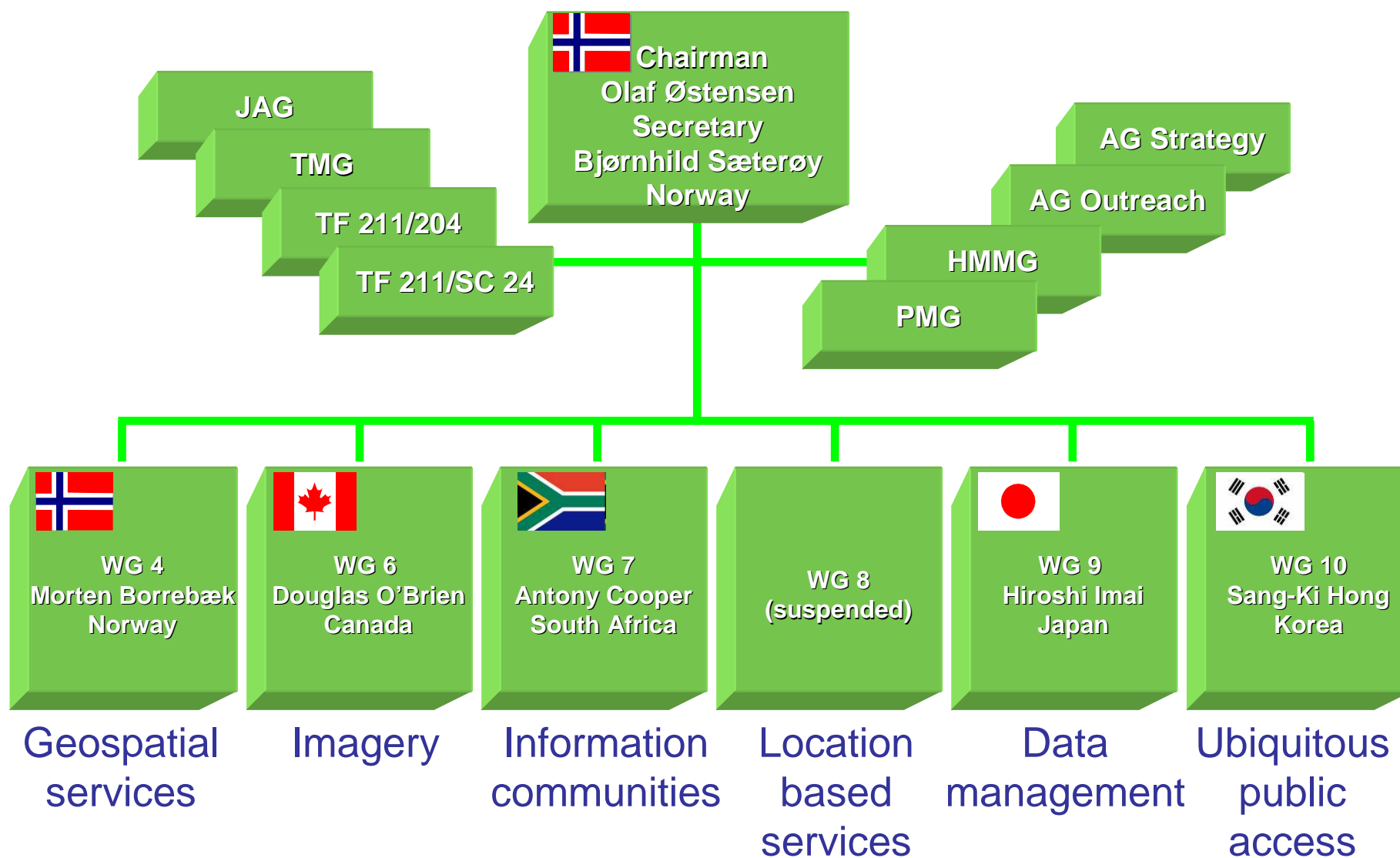
External liaisons, 2 of 2

- PCGIAP, The Permanent Committee on GIS Infrastructure for Asia and the Pacific
- PC IDEA, Permanent Committee on Spatial Data Infrastructure for the Americas
- SCAR, Scientific Committee on Antarctic Research
- UN Economic Commission for Africa
- UN Economic Commission for Europe, Statistical Division
- UNGEGN, United Nations Group of Experts on Geographical Names
- UNGIWG, United Nations Geographic Information Working Group
- UN FAO, Food & Agriculture Organization of the United Nations
- WMO, World Meteorological Organization
- CEN/TC 287, Geographic information
- CEN/ISSS Workshop on Metadata for Multimedia Information - Dublin Core
- CEN/TC 278, Road Transport and Traffic Telematics





ISO/TC 211 organization





Published standards 1/3

- ISO 6709:1983 Standard representation of latitude, longitude and altitude for geographic point locations
- ISO 19101:2002 Geographic information - Reference model
- ISO 19101-2:2008 Geographic information - Reference model – Part 2: Imagery
- ISO/TS 19103:2005 Geographic information - Conceptual schema language
- ISO 19105:2000 Geographic information - Conformance and testing
- ISO 19106:2004 Geographic information - Profiles
- ISO 19107:2003 Geographic information - Spatial schema
- ISO 19108:2002 Geographic information - Temporal schema
- ISO 19108:2002/Cor 1:2006
- ISO 19109:2005 Geographic information - Rules for application schema
- ISO 19110:2005 Geographic information - Methodology for feature cataloguing
- ISO 19111:2007 Geographic information - Spatial referencing by coordinates (new edition)
- ISO 19112:2003 Geographic information - Spatial referencing by geographic identifiers
- ISO 19113:2002 Geographic information - Quality principles



Published standards 2/3

- ISO 19114:2003 Geographic information - Quality evaluation procedures
- ISO 19115:2003 Geographic information – Metadata
- ISO 19116:2004 Geographic information - Positioning services
- ISO 19117:2005 Geographic information - Portrayal
- ISO 19118:2005 Geographic information - Encoding
- ISO 19119:2005 Geographic information – Services
- ISO 19119:2005/Amd. 1:2008
- ISO/TR 19120:2001 Functional standards
- ISO/TR 19121:2000 Imagery and gridded data
- ISO/TR 19122:2004 Geographic information / Geomatics – Qualification and certification of personnel
- ISO 19123:2005 Schema for coverage geometry and functions
- ISO/RS 19124 Imagery and gridded data components
- ISO 19125-1:2004 Simple feature access - Part 1: Common architecture
- ISO 19125-2:2004 Simple feature access - Part 2: SQL option



Published standards 3/3

- ISO/TS 19127:2005 Geodetic codes and parameters
- ISO 19128:2005 Geographic information - Web Map Server Interface
- ISO 19131:2007 Data product specification
- ISO 19132:2007 Location-based services -- Reference model
- ISO 19133 :2005 Location based services tracking and navigation
- ISO 19134:2007 Location-based services -- Multimodal routing and navigation
- ISO 19135 :2005 Procedures for registration of geographic information items

- ISO 19136:2007 Geography Markup Language (GML)
- ISO 19137:2007 Core profile of the spatial schema
- ISO/TS 19138:2006 Data quality measures
- ISO/TS 19139:2007 Metadata -- XML schema implementation

- ISO 19141:2008 Moving features schema

= a total of more than 40 international standards and other deliverables



Still under work, revisions and new work

- Revision of ISO 6709 Standard representation of geographic point location by coordinates
- Revision of ISO/TS 19103 Conceptual schema language
- ISO 19104 Terminology
- ISO 19110 Methodology for feature cataloguing - Amendment 1
- ISO 19111-2 Spatial referencing by coordinates – Part 2: Extension for parametric values
- ISO 19115-2 Metadata - Part 2: Extensions for imagery and gridded data
- Revision of ISO 19117 - Portrayal
- Revision of ISO 19118 - Encoding
- ISO 19126 Feature concept dictionaries and registers
- Revision of ISO 19125-1:2004 Simple feature access - Part 1: Common architecture
- Revision of ISO 19125-2:2004 Simple feature access - Part 2: SQL option
- ISO 19129 Imagery, gridded and coverage data framework



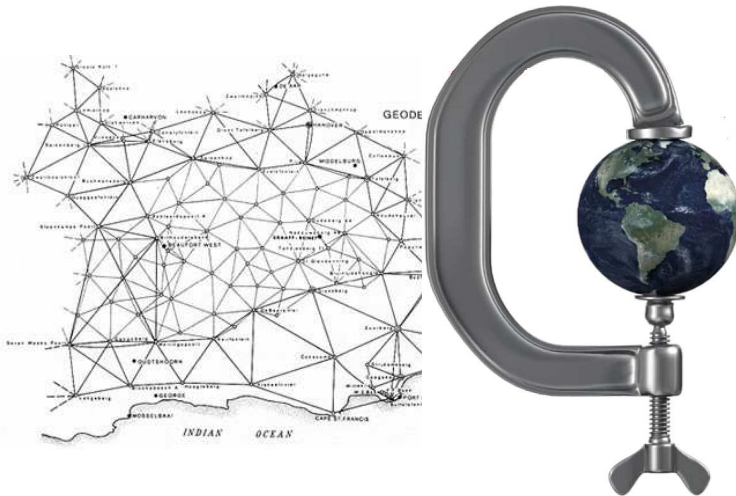
Still under work, revisions and new work

- ISO 19130 Sensor and data model for imagery and gridded data
- ISO 19131:2007/Amd. 1
- ISO 19142 Web feature service
- ISO 19143 Filter encoding
- ISO 19144-1 Classification Systems – Part 1: Classification system structure
- ISO 19144-2 Classification Systems – Part 2: Land Cover Classification System LCCS
- ISO 19145 Registry of representations of geographic point location
- ISO 19146 Cross domain vocabularies
- ISO 19147 Location Based Services - Transfer Nodes (stage 0)
- ISO 19148 Location Based Services – Linear Referencing System (stage 0)
- ISO 19149 Rights expression language for geographic information — GeoREL
- ISO 19150 Ontology (stage 0)
- ISO 19151 Dynamic position identification scheme for Ubiquitous space (u-position)
- ISO 19152 Land Administration Domain Model (LADM)
- ISO 19153 Geospatial Digital Rights Management reference Model (GeoDRM/RM)

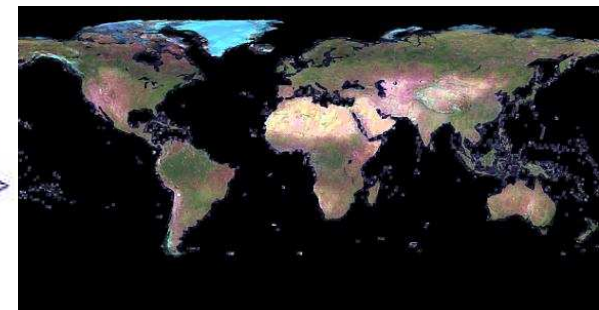


ISO/TC 211 provides ...

... a structure for representing standardized measurements in a consistent manner. It includes the geodetic framework for identifying where measurements were taken and for encoding and disseminating data.



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ISO/TC 211 provides ...

... significant focus on metadata (i.e. data about data). International Standards in this area will facilitate the assessment of current data, so that user communities can establish its fitness for use, as well as the conditions for the employment and retrieval of this data.





ISO/TC 211 provides ...

... tools to describe spatially distributed information.

Information about our planet can be reasonably static, as in basic topography, or very dynamic, as in weather conditions. The ISO 19100 family of International Standards allows spatial and temporal aspects to be described together precisely, including quality information that is essential for making decisions based on collected information.





Terrestrial ECVs



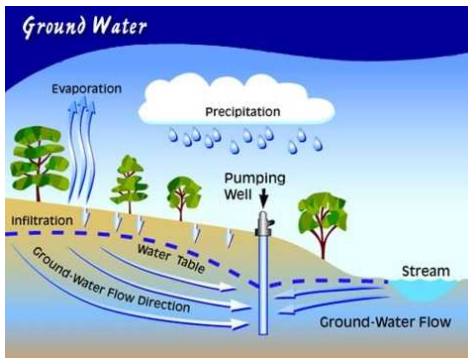
River discharge

Freshwater discharge from rivers into oceans influences the climate system and can affect oceanic circulation patterns. Monitoring is important to detect changes resulting from climate change.



Lake levels

Information on water volume changes and monitoring is crucial for water resources management and regional and global water-cycle studies. It can provide critical indicators of climate change in the region.



Ground water

Nearly 30 % of global freshwater resources are taken from groundwater supplies and in some developing countries this accounts for the greatest part of their supply. As a result of a changing climate and a growing population, these resources are threatened with depletion, salinization and contamination. Despite its importance, ground water is rarely monitored.



Terrestrial ECVs

Water use



Fresh water is used in agricultural, industrial and household activities, as well as for maintaining ecosystems. In developing countries, irrigation accounts for more than 90 % of the water taken. Water is therefore crucial for food production and security, and reliable observations are essential to predict the effects of climate change on food production.

Snow cover



Over 50 % of the Earth's land surface can be covered by snow during the winter of the Northern Hemisphere. Snow affects the surface's albedo and energy balance, as well as modifying the overlying atmospheric thickness and surface temperature. Its characteristics will determine the state of permafrost (continuously frozen land), as well as the depth and timing of seasonal freezes and thaws, glaciers, ice sheets and sea ice.



Terrestrial ECVs



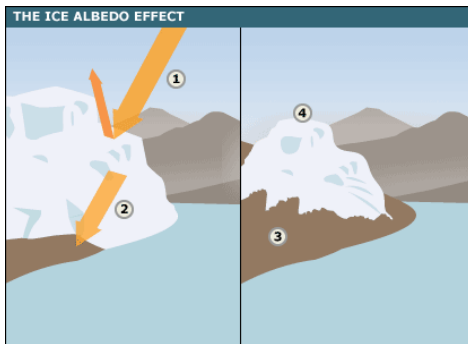
Glaciers and ice caps

Glaciers react strongly to climatic changes and therefore constitute a good source for monitoring changes. Glacier shrinking could affect sea-level rise, fresh water resources and human activities.



Permafrost and seasonably frozen ground

Earth materials that remain frozen for at least two years in a row are referred to as permafrost. As the globe warms, permafrost landscapes begin to thaw and erode. Permafrost temperature provides a useful indicator of terrestrial climate changes.



Albedo and reflectance anisotropy

Land surface albedo is a key parameter that controls the planetary radiative energy budget. Changes in snow cover and flooding patterns for instance are linked to changes in land albedo.



Terrestrial ECVs



Land cover

Land cover refers to the observed surface of the earth, whether vegetation or human settlements. Observations are important for ensuring a sustainable management of natural resources, understanding and mitigating climate change, addressing food security, and other important issues.



Fraction of Absorbed Photosynthetically Active Radiation (FAPAR)

Referring to the photosynthetically active radiation absorbed by vegetation canopy, FAPAR, provides a reliable variable for monitoring seasonal cycle and variability of vegetation activity related to photosynthesis. This is important for the energy balance of ecosystems and the estimation of the carbon balance.



Leaf Area Index (LAI)

Referring to the amount of leaf material in ecosystems, this variable is important for monitoring the growth and strength of vegetation on the planet.



Terrestrial ECVs

Biomass



Biomass refers to the mass of all organic matter at a specific moment, and is affected by photosynthesis (produces biomass) and fires (destroys biomass). It acts as a carbon sink during through photosynthesis, and is increasingly used for generating bioenergy. Forests are an important source of biomass, playing a crucial role in reducing carbon dioxide and mitigating the effects of climate change. Deforestation on the other hand, is the largest source of greenhouse gas emissions in developing countries.

Fire disturbance



Fire can transform land cover as well as produce atmospheric emissions. It's also an important land management practice. This information is used for estimating atmospheric emission, developing assessments and for planning and operation of fire management and preparedness.



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INSPIRE – a European example



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) was published in the official Journal on the 25th April 2007. The INSPIRE Directive entered into force on the 15th May 2007.



Inspire themes

Annex 1 data:

- coordinate reference systems
- geographical grid syst.
- geographical names
- administrative units
- addresses
- cadastral parcels
- transport networks
- hydrography
- protected sites

Annex 2 data:

- elevation
- land cover
- orthoimagery
- geology

Annex 3 data:

- statistical units
- buildings
- soils
- land use
- human health and safety
- utility and government services
- environm. monitoring facilities
- production and industrial facilities
- agriculture and aquaculture facilities
- population distribution - demography
- area management/restriction/regulation zone and reporting units
- natural risk zones
- atmospheric conditions
- meteorological geographical features
- oceanographic geographical features
- sea regions
- bio-geographical regions
- habitats and biotops
- species
- energy resources
- mineral resources





Data specifications in INSPIRE



INSPIRE
Infrastructure for Spatial Information in Europe

Drafting Team "Data Specifications" Methodology for the development of data specifications

Title	Drafting Team "Data Specifications" – deliverable D2.6: Methodology for the development of data specifications
Creator	INSPIRE Drafting Team "Data Specifications"
Date	2007-08-23
Subject	Methodology for the development of data specifications
Publisher	INSPIRE Drafting Team "Data Specifications"
Type	Text
Description	Proposed methodology for the development of INSPIRE data specifications for the spatial data themes as specified in the Annexes of the INSPIRE Directive
Contributor	Members of the INSPIRE Drafting Team "Data Specifications"
Format	MS Word (doc)
Source	
Rights	Open access; comments limited to registered SDICs and LMOs
Identifier	D2.6_v2.0_final.doc
Language	En
Relation	n/a
Coverage	Project duration

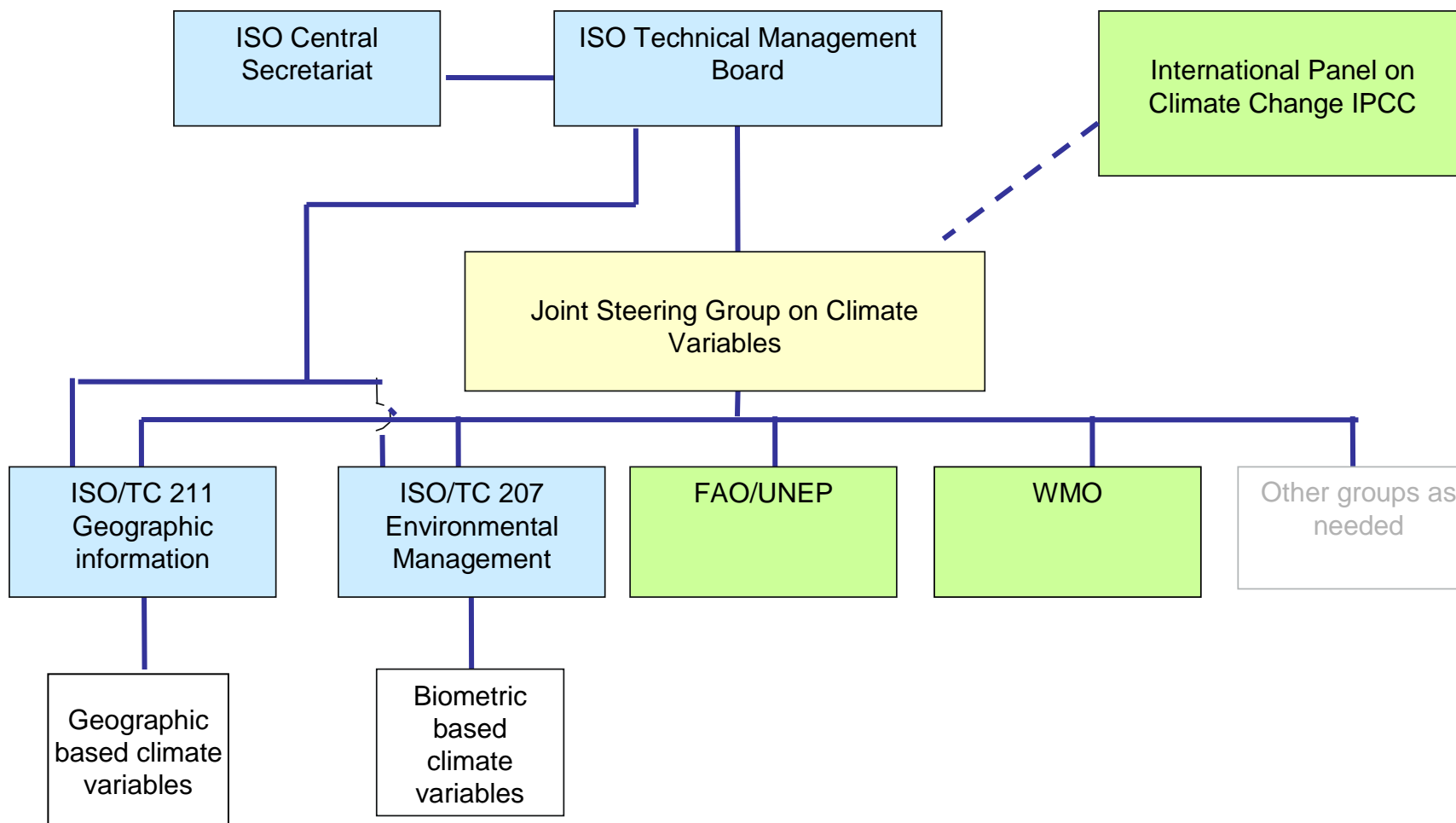
A long range of ISO 19100-series standards

INSPIRE Data Specifications	Reference: D2.6_v2.0_final.doc
Methodology for the development of data specifications	2007-08-23 Page 10 of 151

2 Normative references

- ISO/TS 19103:2005, Geographic Information – Conceptual Schema Language
- EN ISO 19107:2005, Geographic Information – Spatial Schema
- EN ISO 19108:2005, Geographic Information – Temporal Schema
- ISO 19108:2002/Cor 1:2006, Geographic Information – Temporal Schema, Technical Corrigendum 1
- EN ISO 19109:2005, Geographic Information – Rules for Application Schemas
- EN ISO 19110:--⁷, Geographic Information – Methodology for feature cataloguing
- EN ISO 19111:2007, Geographic Information – Spatial referencing by coordinates
- EN ISO 19113:2005, Geographic Information – Quality principles
- EN ISO 19114:2005, Geographic Information – Quality evaluation procedures
- EN ISO 19114:2005/AC:2006, Geographic Information – Quality evaluation procedures, Technical Corrigendum 1
- EN ISO 19115:2005, Geographic Information – Metadata
- ISO 19115/Cor.1:2006, Geographic Information – Metadata, Technical Corrigendum 1
- EN ISO 19119:2006, Geographic Information – Services
- EN ISO 19123:2007, Geographic Information – Schema for coverage geometry and functions
- ISO 19126:--⁸, Geographic Information – Feature Concept Dictionaries and Registers
- ISO 19131:2007, Geographic Information – Data Product Specification
- EN ISO 19135:2007, Geographic Information – Procedures for item registration
- ISO 19136:--⁹, Geographic Information – Geography Markup Language
- ISO/TS 19138:2006, Geographic Information – Data quality measures
- ISO/TS 19139:2007, Geographic Information – Metadata – XML schema implementation
- ISO/IEC 19501:2005, Information technology — Open Distributed Processing — Unified Modelling Language (UML) Version 1.4.2
- Glossary of Generic Geographic Information Terms in Europe, v1.07, unpublished
- INSPIRE DS-D2.5, Generic Conceptual Model, v2.0
- Terms of Reference for developing Implementing Rules laying down technical arrangements for interoperability and harmonisation of spatial data sets, July 2007

Joint Steering Group? *proposal*





Summary

ISO/TC 211 has the tools, methods, and processes to

- describe the semantics, structures and quality aspects of variables
- describe the geospatial distribution and temporal aspects
- describe the metadata
- encode data and visualize them for a variety of user communities



Summary

- ISO/TC 211 supports the establishment of a Joint Steering Group on Climate Variables and will work with other organizations, like FAO/UNEP/WMO, to develop this concept further





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