



The International Framework of Geospatial Standards



Pillar 5: Data, Standards, and Open Access

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South African Geodesy Working Group, Pretoria | 01 October 2026



● Agenda

- 01 Why Geospatial Standards Matter
- 02 The Geospatial Standards Ecosystem
- 03 South African Standards
- 04 Metadata and Data Quality
- 05 Implementation gap and questions

01

Why Geospatial Standards Matter



● Why standards matter

A geodetic observation, a cadastral parcel and a municipal address only become national infrastructure when another institution can find them, read them and trust them.

- 1 Discoverable** Metadata makes a dataset visible beyond the team that created it.
- 2 Interoperable** Shared models and services let systems exchange data without bespoke translation.
- 3 Trusted** Documented quality, lineage and reference frame let others rely on your numbers.
- 4 Durable** Persistent identifiers keep records coherent as the landscape changes.

● Key point

Standards are not simply technical documents. They support the wider geospatial information ecosystem.



"Everything happens somewhere" — but only standardised location is shareable.

02

The Geospatial Standards Ecosystem



● The Geospatial Standards Ecosystem

1

ISO/TC 211

The formal international standards: the 19100 series of models, metadata, quality and reference systems.

2

OGC

Implementation and interface specifications that make those models work on the web.

3

UN-GGIM IGIF

The governance framework that turns standards into a national capability.

4

SANS/ SASDI

National adoption and gazetted obligation for South African custodians.

Global consensus → Web implementation → National governance → Legal compliance

● ISO/TC 211: The Reference Vocabulary

Established in 1994, ISO Technical Committee 211 develops the ISO 19100 series — the abstract models everything else in this chain builds on.

ISO 19101

Reference model — the conceptual foundation for geographic information

ISO 19107 / 19109

Spatial schema and rules for application schemas

ISO 19111

Referencing by coordinates — the geodetic backbone (CRS, datums, transformations)

ISO 19115-1

Metadata for geographic information — discovery and documentation

ISO 19157

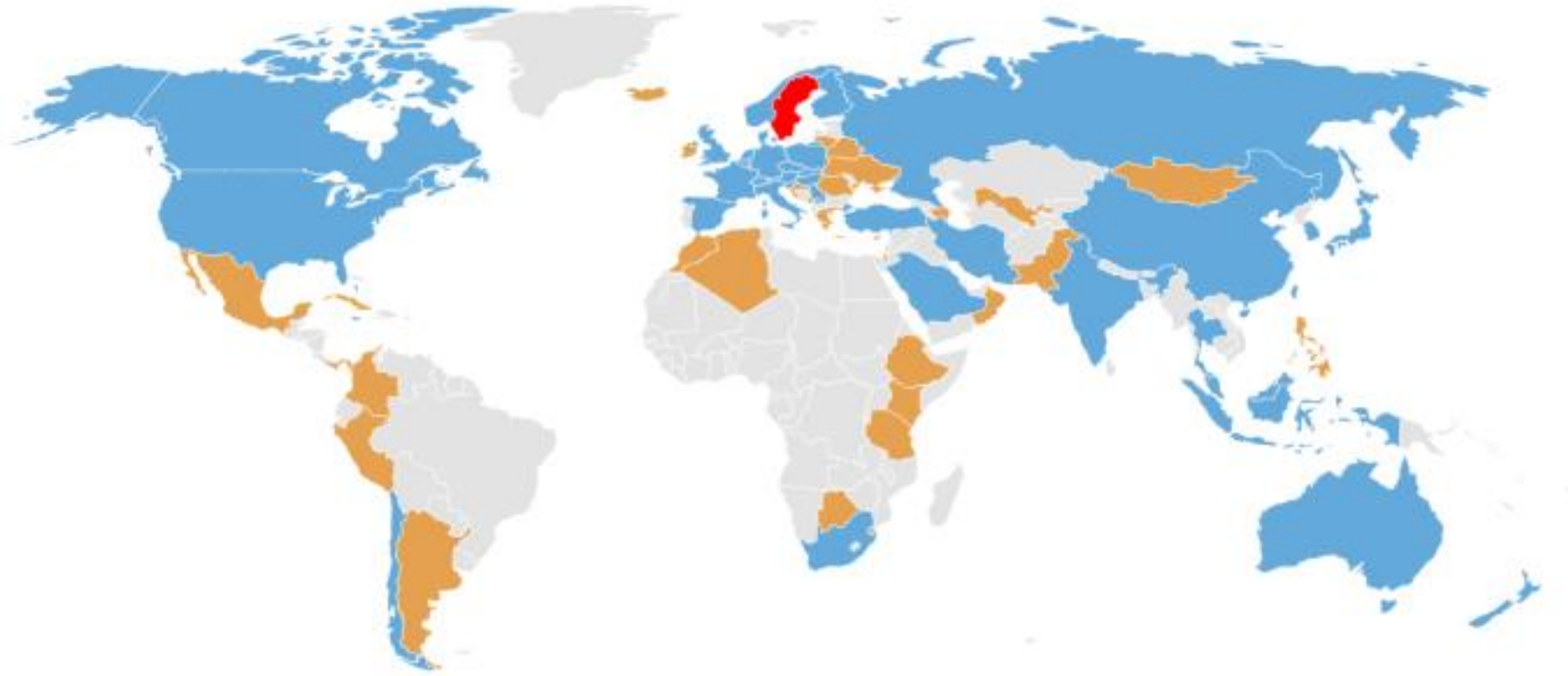
Data quality — measures, evaluation and reporting

ISO 19160-1 / -3

Addressing: conceptual model, lifecycle identifiers and address quality

Geodesy note: ISO 19111 is where the working group's reference-frame work meets the wider standards stack.

- **ISO/TC 211: Membership**



Geodesy note: ISO 19111 is where the working group's reference-frame work meets the wider standards stack.

● ISO/TC 211: Observing members

OBSERVING MEMBERS (37)

Algeria (IANOR)

Bahrain (BSMD)

Botswana (BOBS)

Croatia (HZN)

Eswatini (SWASA)

Hong Kong (ITCHKSAR)

Israel (SII)

Luxembourg (ILNAS)

Montenegro (ISME)

Pakistan (PSQCA)

Philippines (BPS)

Tanzania (TBS)

Uzbekistan (O'TTZA)

Argentina (IRAM)

Barbados (BNSI)

Brunei Darussalam (ABCI)

Cuba (NC)

Ethiopia (ESA)

Iceland (IST)

Kenya (KEBS)

Mexico (DGN)

Morocco (IMANOR)

Panama (COPANIT)

Romania (ASRO)

Uganda (UNBS)

Azerbaijan (AZSTAND)

Belarus (BELST)

Colombia (ICONTEC)

Cyprus (CYS)

Greece (NQIS ELOT)

Ireland (NSAI)

Lithuania (LST)

Mongolia (MASM)

Oman (DGSM)

Peru (INACAL)

Singapore (SPRING SG)

Ukraine (DSTU)

● Open Geospatial Consortium (OGC)

Services

- WMS — Web Map Service
- WFS — Web Feature Service
- WCS — Web Coverage Service
- CSW — Catalogue Service

Encodings and formats

- GML
- GeoPackage
- GeoTIFF
- Well-Known Text (WKT)

OGC APIs

- OGC API – Features
- OGC API – Coverages
- OGC API – Tiles
- OGC API – Records
- OGC API – Processes

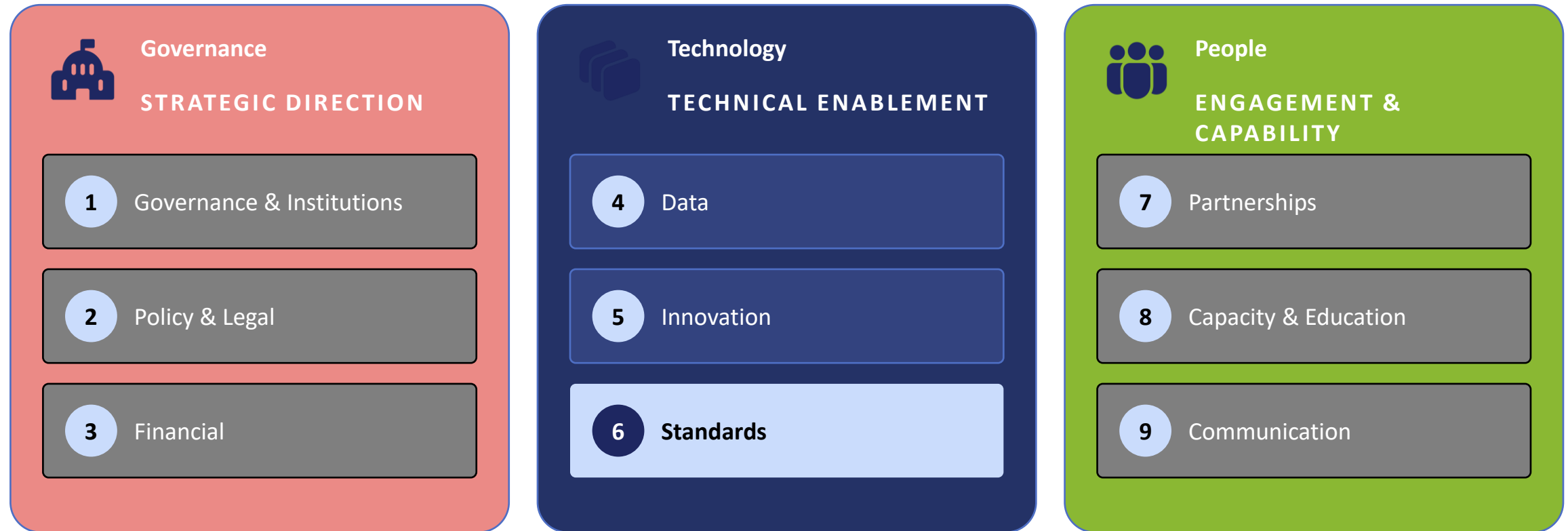
● Key point

OGC provides implementation specifications and standards that support interoperability between geospatial systems

UN-GGIM Integrated Geospatial Information Framework



Adopted by the United Nations in 2018 (Second Edition 2023), developed with the World Bank. The framework is how a country turns standards into a governed, funded, staffed capability.



● EPSG: The common language for coordinates

The EPSG Geodetic Parameter Dataset — maintained by the IOGP Geomatics Committee — is the public registry of coordinate reference systems, datums, projections and transformations. It gives each one a stable integer code, so that “EPSG:4148” means exactly the same thing in QGIS, ArcGIS, PostGIS and a web API.



The ISO link

Implements ISO 19111

The registry's entities — datum, CRS, coordinate operation — are the ISO 19111 model made concrete and populated.



The OGC link

CRS URIs, WKT, GML

Carried in OGC WKT and CRS URIs and passed in GeoPackage, WMS/WFS and OGC API requests as the CRS identifier.



The SANS link

Cited in metadata

A SANS 1878-1 record states its reference system by EPSG code — machine-readable, not a free-text note.



The SA link

Hartebeesthoek94 & Lo.

EPSG:4148 (Hartebeesthoek94), EPSG:4326 (WGS 84) and the Lo. belt Transverse Mercator systems, EPSG:2046–2055.

A code is not a datum realisation. Always record the epoch and the transformation path you applied — EPSG identifies the system, your metadata must state how you got there.

03

South African Standards



● SANS: Where international becomes national

South African National Standards adopt the ISO texts so that national prescriptions can reference an enforceable local instrument. Government Notice 4966 of 2024, issued under the SDI Act, makes four of them a legal obligation for every data custodian and data vendor.



Metadata
SANS 1878-1 and ISO 19115-1
Makes datasets discoverable in the national catalogue



Addressing

SANS 1883 / ISO 19160-1

One address model, from formal streets to informal settlements



Address quality

ISO 19160-3 / ISO 19157

Measurable, auditable quality statements



Unique identifiers

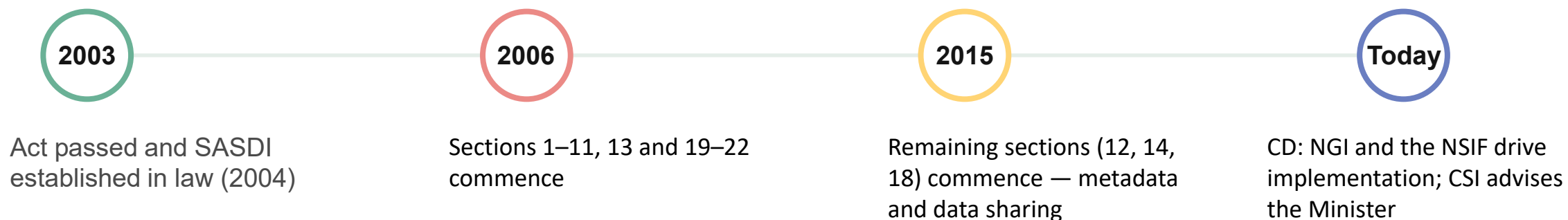
ISO 19160-1 lifecycle class

Persistent IDs as erven subdivide and streets are renamed

● SASDI



The **Spatial Data Infrastructure Act, Act 54 of 2003**, establishes the South African Spatial Data Infrastructure.



● SABS/ TC 211 Standards

- SABS/TC211 standards numbered from 1800 to 1899
- 7 SABS standards published- 59 ISO standards adopted

SANS Number	Title	Date Approved
SANS 1876:2018	Rules for unique feature identifiers in South African geospatial datasets	2018-04-13
SANS 1877:2004	A standard land-cover classification scheme for remote-sensing applications in South Africa	2004-06-18
SANS 1878-1:2011	South African spatial metadata standard Part 1: Core metadata profile	2011-12-09
SANS 1880:2014	South African geospatial data dictionary (SAGDaD) and its application	2014-05-23
SANS 1883-1:2009	Addresses Part 1: Data format of addresses	2009-10-02
SANS 1883-2:2018	Addresses Part 2: Addresses data exchange	2018-05-04
SANS 1883-3:2009	Addresses Part 3: Guidelines for address allocation and updates	2009-10-02
SANS 6709:2009/ISO 6709:2008	Standard representation of geographic point location by coordinates	2009-10-23
SANS 19111:2023/ISO 19111:2019	Spatial referencing by coordinates	2023-06-27
SANS 19112:2023/ISO 19112:2019	Spatial referencing by geographic identifiers	2023-06-27
SANS 19115-1:2016/ISO 19115-1:2014	Metadata - Part 1: Fundamentals	2016-06-10
SANS 19127:2006/ISO/TS 19127:2005	Geodetic codes and parameters	2006-10-20
SANS 19161-1:2023/ISO 19161-1:2020	Geodetic references - Part 1: International terrestrial reference system (ITRS)	2016-12-14
SANS 19162:2016/ISO 19162:2015	Well-known text representation of coordinate reference systems	2016-07-29

04

Metadata and Data Quality



● Metadata: Making geospatial information discoverable



Metadata
can
describe:

- Dataset title
- Abstract
- Purpose
- Geographic extent
- Temporal extent
- Data lineage
- Data quality
- Coordinate reference system
- Responsible organisation
- Distribution information
- Access conditions
- Update information

- ISO 19115-1
- SANS 1878-1

● Key point

Metadata provides information **about the data.**

● Data Quality

A standards-based geospatial environment requires more than simply publishing information.

- ISO 19157 Provides a framework for geographic information quality.

Users need
to
understand:

- How accurate is the information?
- What is its lineage?
- What processes were used to produce it?
- What limitations apply?
- Is it complete?
- Is it logically consistent?
- Is it fit for the intended purpose?

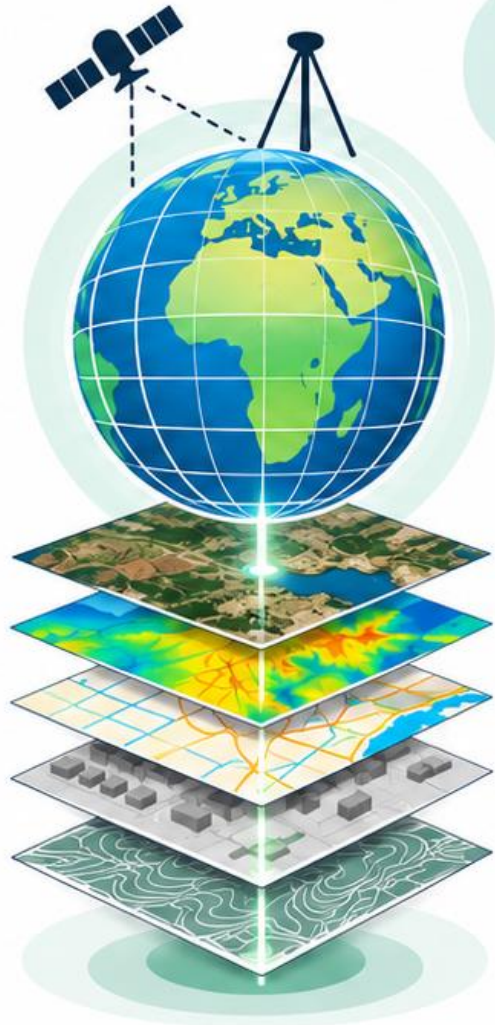
04

Where does Geodesy Fit?



● Where does geodesy fit?

Geodesy provides the reference layer beneath much of the geospatial information ecosystem.



1

Geodetic observations

High-precision measurements from satellites, GNSS and ground networks.



2

Reference frame

A consistent, real-world framework for positioning and orientation.



3

Datum / CRS

Defines the shape of the Earth and the coordinate system used (e.g. WGS84, ITRF, etc.).



4

Coordinate operations and transformations

Enable data to be converted between datums, projections and coordinate systems.



5

Metadata and quality

Provides context, traceability and assurance of accuracy and reliability.



6

Geospatial databases

Stores and manages spatial and attribute data in a common reference frame.



7

Services and APIs

Delivers data and functionality to users and applications across platforms.

05

Implementation gap and questions



● The implementation gap

1 Standards may be known but not implemented



Organisations may be aware of metadata requirements but publish incomplete metadata.

2 Capacity constraints



Smaller institutions may lack:

- Skilled personnel
- Appropriate software
- Validation tools
- Resources for standards implementation

3 Fragmented custodianship



Different institutions may maintain similar information using different:

- Data models
- Classifications
- Identifiers
- Metadata profiles

4 Limited conformance testing



A standard may be referenced without actually testing whether an implementation conforms to it.

● Questions for discussion

1

How do we move from standards awareness to consistent implementation?

2

Where are the biggest gaps in current geodetic and geospatial workflows?

3

How can we improve metadata and conformance testing?

4

How can the SA Geodesy Working Group strengthen the connection between:
Geodesy → Standards → SASDI → ISO/TC 211 → OGC → UN-GGIM?





The objective is simple:

Reliable, interoperable and trusted geospatial information that can be used consistently across South Africa.

Thank you



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