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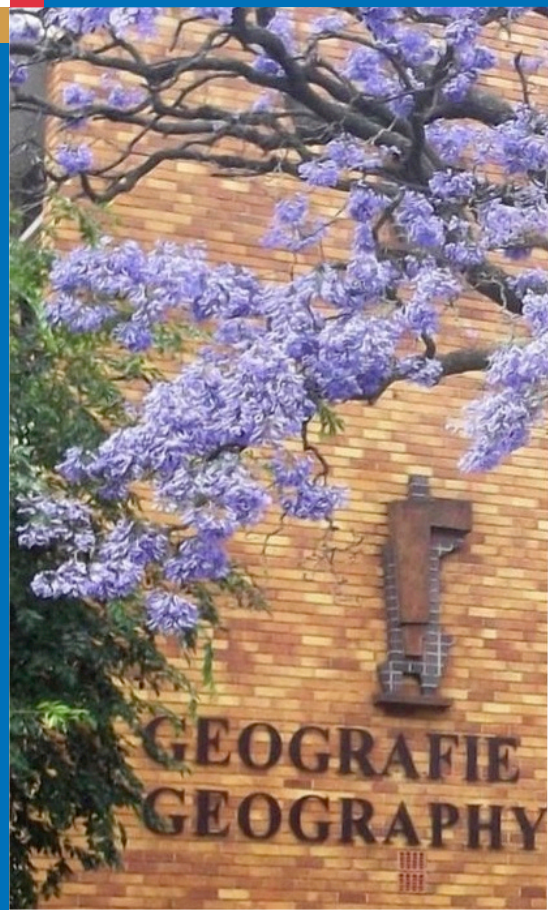
Implementing geospatial data quality standards – motivators and barriers



Presented by Serena Coetzee

2nd International Workshop on Spatial Data Quality, Valletta, Malta, 6-7 February 2018

Make today matter

International Cartographic Association
Association Cartographique Internationale

www.icaci.org

To promote the
disciplines and professions of
Cartography and GIScience
in an international context

ICC 2019 TOKYO
Mapping Everything for Everyone

http://www.icc2019.org/

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ICA Commission on SDI & Standards

SDIs – What is the impact and use of cartography, **standards**, spatial semantics, ontologies, volunteered geographical information (VGI), data quality, virtual globes and other technological developments?

What we do…

- Research & Education
- Collaborate with other Commissions
- Liaise and collaborate with other organizations, e.g. ISO/TC 211, OGC, EuroGeographics…
- Reports, conference papers, journal articles, educational material

Register on the Commission website to get notifications

http://sdistandards.icaci.org/

International Cartographic Association
Association Cartographique Internationale

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ICA Commission on SDI & Standards

Selected publications

- SDI-Open (with ICA Commission on Open source geospatial technologies)
  - SDI-Open 2015 proceedings
  - SDI-Open 2017 presentations

- Academic SDI
  - Coetzee S et al. (2017). *The Academic SDI – Towards understanding spatial data infrastructures for research and education.*
  - Coetzee S et al. (2017). *SDI implementations at universities and research institutes*.

- SDI model
  - Cooper AK et al. (2013) A spatial data infrastructure model from the computational viewpoint.
  - Cooper AK et al. (2011) Extending the formal model of a spatial data infrastructure to include volunteered geographical information
  - Hjelmager et al. (2008) An initial formal model for spatial data infrastructures

- Standards
  - Standards Wiki
  - Moellering H et al. (eds) (2005). *World of spatial metadata standards.* Elsevier.
  - Moellering H (ed) (1991). *Spatial Database Transfer Standards: Current International Status*. Elsevier Applied Science.

https://sdistandards.icaci.org/resources/

Exploratory research…

July 2017

- ICA Commission on SDI & Standards - business meeting
  - Next topic: quality management of geographic information
  - EuroGeographics Quality Knowledge Exchange Network (QKEN)
    - Offer to use their questionnaire on ISO standards for quality

Sept 2017

- Commission members from non-EuroGeographics countries
  - Requested to fill in the QKEN questionnaire
  - 7 responses

http://www.eurogeographics.org/content/qken-quality

Feb 2018

- In-depth interviews with 4 responding organizations
- Interview questions based on the ISO Methodology toolbox

https://www.iso.org/benefits-of-standards-the-iso-materials.html

QKEN Questionnaire

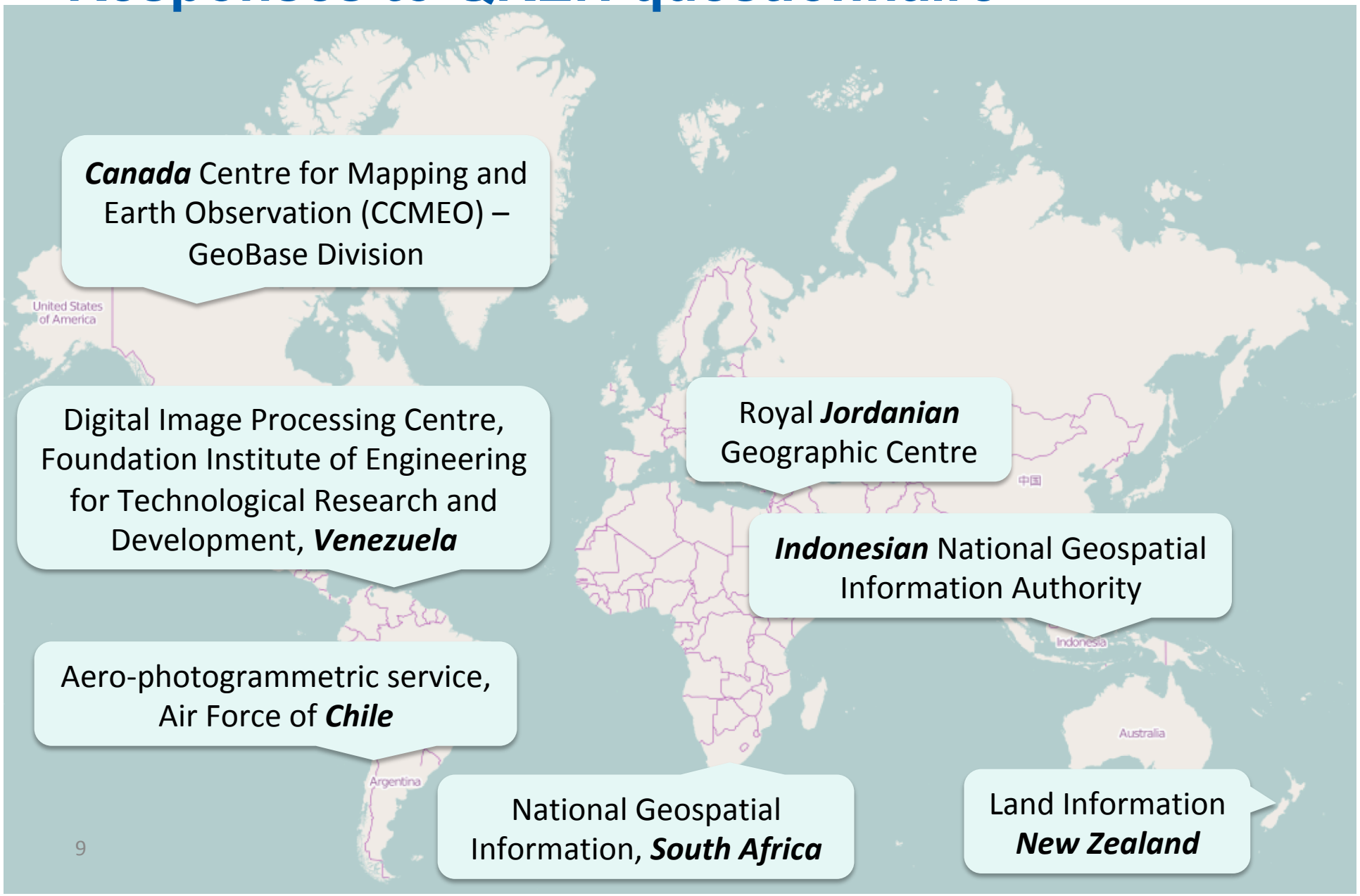
❑ Yes
❑ No
Comment

- Is your NMCA using
  - Quality Principles in **ISO 19157**?
  - Quality Evaluation Procedures in **ISO 19157**?
  - Data Quality Measures in **ISO 19157**?
  - **ISO 19158** Quality assurance of data supply?
  - **ISO 19115-1** Metadata?
  - **ISO 19115-2** Metadata Part 2: Extensions for imagery and gridded data?
  - Metadata section of **ISO 19119** Services?
  - **ISO 19131** Data product specifications?

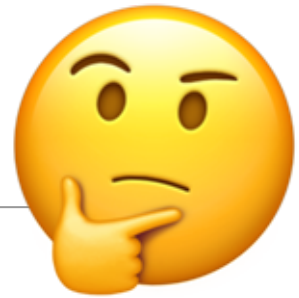
- Do you have reference documents that
  - describe how the standards are implemented?
  - could be of interest to other NMCAs?

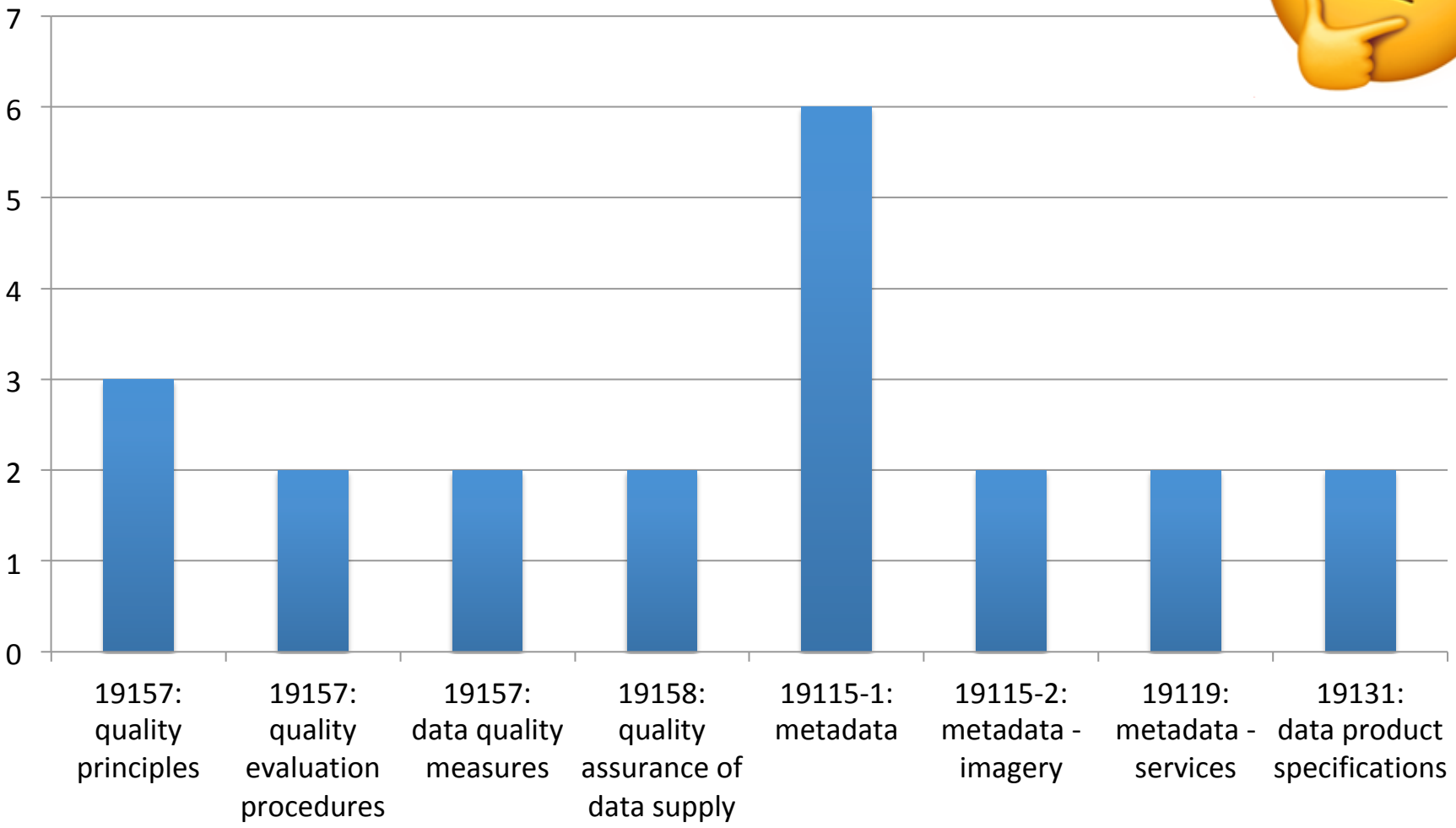
- Have you used
  - "Guidelines for Implementing the ISO 19100 Geographic Information Quality Standards in National Mapping and Cadastral Agencies"?

Responses to QKEN questionnaire

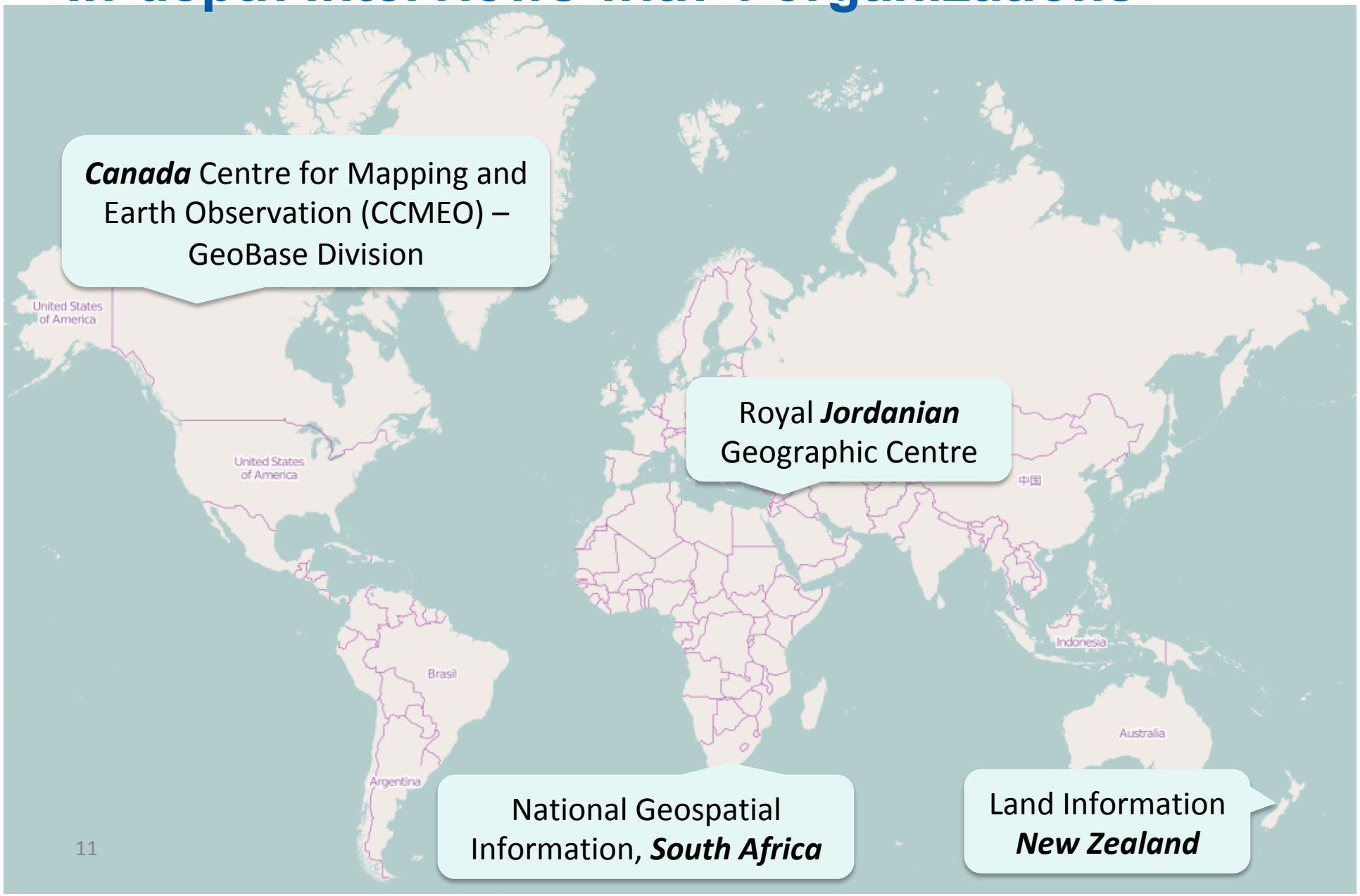


Responses to QKEN questionnaire





In-depth interviews with 4 organizations






	Canada	Jordan	New Zealand	South Africa
Land mass	9,984,670 km^2 (2nd)	89,342 km^2 (110th)	270,467 km^2 (75th)	1,221,813 km^2 (24th)
Population (2018)	37,005,900	10,065,240	4,852,890	56,717,000
Population density	4/km^2 (232nd)	113/km^2 (100th)	18/km^2 (208th)	46/km^2 (166th)
Government	*Federal* parliamentary constitutional monarchy	Unitary parliamentary constitutional monarchy	Unitary parliamentary constitutional monarchy	Unitary dominant-party parliamentary constitutional republic
GDP (2017)	$1,640,385	$40,487	$200,837	$344,064
GDP (PPP) per capita	$46,437 (23rd)	$12,278 (92nd)	$37,294 (32nd)	$13,225 (89th)
Gini	31.6 medium	35.4 medium	33.0 medium	63.1 very high
HDI	0.920 very high	0.748 high	0.915 very high	0.666 medium

Source: Wikipedia

Questions for the in-depth interview

- **Part 1 – About the organization**
  - Information about the organization
  - Market information
  - Strategy of the organization

- **Part 2 – About standards implementation**
  - Involvement in standardization and the use of geographic information standards
  - Motivators for implementing geographic information quality standards
  - Barriers to implementing geographic information quality standards
  - Perceived benefits of implementing geographic information quality standards

Interview discussions digressed from quality standards to standards in general, because three countries had not implemented quality standards…

				
	Canada	**Jordan**	**New Zealand**	**South Africa**
	NRCan-CCMEO www.nrcan.gc.ca	RJGC www.rjgc.gov.jo	LINZ www.linz.govt.za	NGI www.ngi.gov.za
Founded	1842	1975	1876	ca. 1920
# employees	4000 NRCan 240 CCMEO	200	600	185
Main data products/ services	Geospatial **data** for CA government	All kinds of maps, **data** and imagery Surveying work Geodetic network Training courses	Land title register LINZ **data** service Notices to Mariners Portal for NZ geodata GNSS data streams LINZMaps (internal)	National control survey system, mapping, topographic **information**, aerial imagery
Main purpose	Produce authoritative data for government and citizens	Surveying (terrestrial, air and space) for all types of maps to meet the Kingdom's needs, and to provide services	Create value for NZ through the use of geographic information	Facilitate national geodetic framework, mapping, aerial imagery; implement SASDI; provide geoinformation and services to the country
Strengths	Ability to partner and collaborate	Legal protection from competition Own MSc program	LINZ datasets Policies & mechanisms to make data accessible Technical expertise	NGI data Internal standards Data is free

	 Canada	 Jordan	 New Zealand	 South Africa
	NRCan-CCMEO www.nrcan.gc.ca	RJGC www.rjgc.gov.jo	LINZ www.linz.govt.za	NGI www.ngi.gov.za
Attitude towards standards	Culture of understanding the value of standards, adoption of standards for Canada's needs Advocate for ISO and OGC standards	Mostly internal standards and procedures. Some international standards in new products, e.g. ISO metadata, WFS	*Bottom-up* promotion of standards and standardization. Statements of intent and strategic planning documents highlight standardisation and interoperability	Internal standards well developed. Positive attitude but lack of understanding of value of national & international standards
Involvement	ISO/TC 211 OGC UN GGIM W3C IHO DGIWG	None	ISO/TC 211 OGC Standards Australia & Standards NZ ANZLIC	ISO/TC 211

Motivators for implementing (quality) standards

- Improving the quality of the data
  - Requires evaluation and description of the quality (ISO 19157)
- Standards contain good practice or ‘wisdom’
  - Valuable for first-time implementations
  - e.g. data product specifications (ISO 19131) in Canada
- Compliance with international agreements
  - e.g. Arctic SDI, Safety of Life at Sea (SOLAS) convention

Motivators for implementing (quality) standards

- Data sharing / integration beyond the organization
  - Metadata
  - Quality metadata
  - Standards facilitate interoperability and consistency

- Shift focus to data/information and its use
  - Rather than on cartographic products
  - Users need metadata to determine fit for purpose

Barriers to implementing (quality) standards

- Well established internal quality standards
  - No value proposition for implementing international standards
- ‘Fatigue’ from metadata implementation
  - Evidence of return on investment required before commencing with quality standards…
- Metadata ‘easy’ to capture
  - For quality metadata, technical expertise is required
- Nobody else implements the quality standards
  - No value proposition for implementing national or international quality standards

Barriers to implementing (quality) standards

- Focus on internal data use only
  - No need to share / integrate data beyond organization
- Standards are difficult to read and understand
  - Need tools to implement them!
- Resistance to change
  - “My way works, why should I change?”
- Value proposition of metadata not understood
  - Better to have 3 products with poor metadata, than 2 products with good metadata

Barriers to implementing (quality) standards

- Resources
  - Technical expertise
  - Money

- ISO standards not freely available
  - Slow development / implementation refinement

Perceived benefits

- More effective implementation of quality management
  - Describe quality and then improve it
  - Internal standards can achieve the same…?
- Streamline internal operations
  - Internal standards can achieve the same…?
- Reduced liability costs
  - Possibly because metadata describes the data
  - Terms and conditions of use actually reduce liability

Perceived benefits

- Expanded network of suppliers
  - Metadata / data product specifications useful for describing requirements
- New product lines?
  - Tools need to mature (e.g. linked data)
- Market uptake?
  - More organizations and people use the data
- Enter new markets?
  - n/a

What next?

- Improve understanding of motivators and barriers
  - More in-depth interviews and/or more detailed questionnaire
  - Focus on one (type of) standard, such as metadata or web services?
  - Focus on one kind of data, e.g. topographic data or foundational/base layers?
  - Adapt questions for public sector, e.g. type of government instead of market
  - Involve European countries

- Find/describe more motivators: Evaluate the impact of standards
  - Case studies of standards implementations in organizations
  - Adapt ISO methodology
    - Seems to focus on manufacturing, supply chains, private companies
    - Adapt questions on perceived benefits for public sector / geospatial data

- How to overcome the barriers…

- Upcoming events of the ICA Commission on SDI & Standards
  - Meeting during ISO/TC 211 week, May/June 2018 in Copenhagen, Denmark
  - Workshop at AfricaGEO 2018, Sept 2018 in South Africa?
  - International Cartographic Conference, July 2018 in Tokyo, Japan

Acknowledgements

- Respondents to QKEN questionnaire

- Interviews
  - Canada
    - Jean Brodeur, Geosemantic Research, Canada
    - Cindy Mitchell, Natural Resources Canada
    - Cameron Wilson, Natural Resources Canada
  - Jordan
    - Nisreen Ghazi, RJGC, Jordan
  - New Zealand
    - Richard Murcott, Land Information New Zealand
    - Byron Cochrane, Land Information New Zealand
    - Geoff O'Malley, Land Information New Zealand
  - South Africa
    - Bulelwa Semoli, National Geo-Spatial Information, South Africa
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