




Introduction to Spatial Data Infrastructures (SDIs)

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SDI Workshop, Cape Town, South Africa
 30 May 2011



Infrastructure

- the basic, underlying *framework* or features of a system or organization
- the *fundamental facilities and systems* serving a country, city, or area, as transportation and communication systems, power plants, and schools

www.dictionary.com

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An SDI is...

- ... a framework of **spatial data, metadata, users and tools** that are interactively connected in order to **use** spatial data in an efficient and flexible way [Wikipedia]
- ... the relevant base collection of **technologies, policies and institutional arrangements** that facilitate the **availability of and access to** spatial data [SDI Cookbook]
- ... the **technology, policies, standards, human resources, and related activities** necessary to **acquire, process, distribute, use, maintain, and preserve** spatial data [White House 2002]

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An SDI is...

- ... a coordinated series of **agreements on technology standards, institutional arrangements, and policies** that enable the **discovery and use** of geospatial information by users and for purposes other than those it was created for [Kuhn 2005]
- ... an evolving concept that can be viewed as an **enabling platform linking data producers, providers, and value adders** to data users [Masser et al 2008]
- ... an evolving concept about **facilitating and coordinating the exchange and sharing of spatial data and services** between stakeholders from different levels in the spatial data community [Hjelmager et al 2008]

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An SDI is...

Technologies Hardware Software
Standards Legislation
Stakeholders Policies People
Economic resources
Data Agreements
 Organizational arrangements

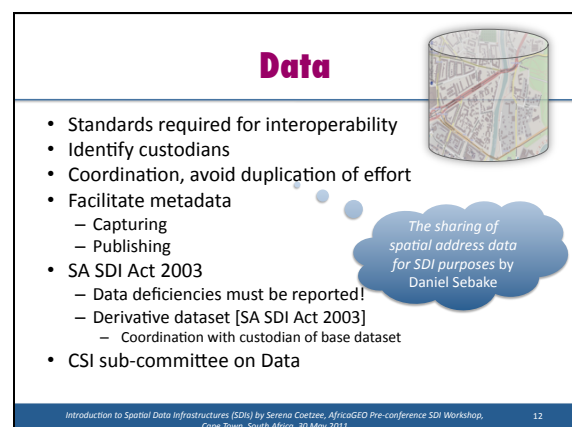
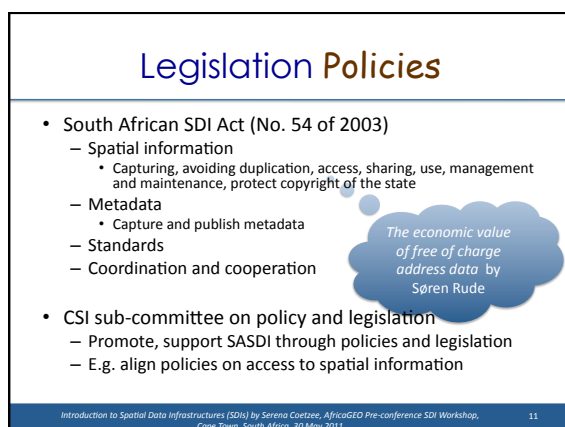
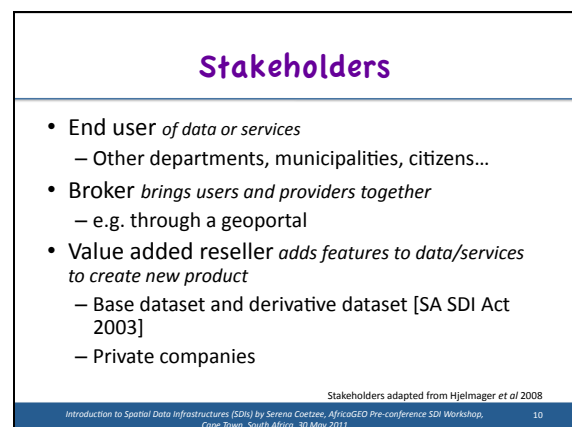
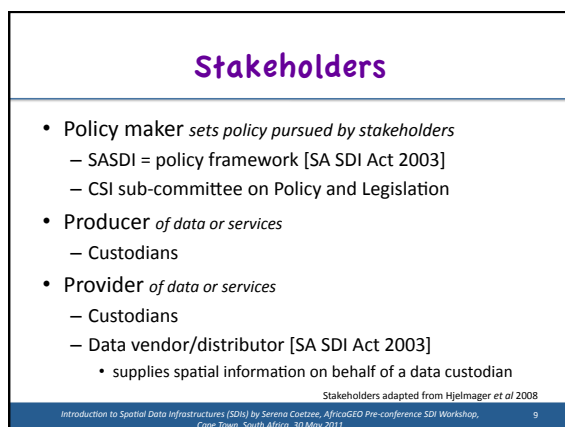
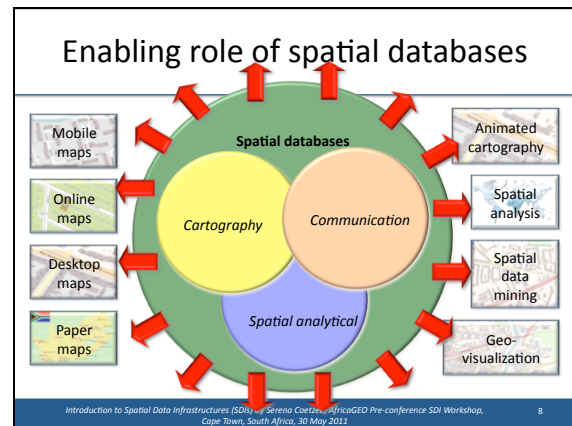
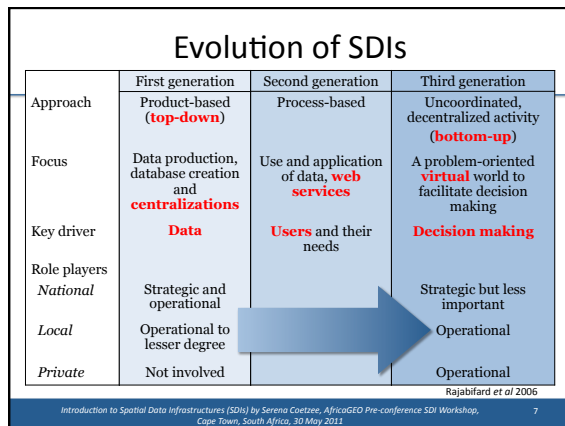
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An SDI is...

- SDI in South Africa
 - South African SDI Act (No. 54 of 2003)
 - Objectives
 - Committee for Spatial Information (CSI)
 - CSI sub-committees
 - SASDI implementation
 - SDI-related activities
 - Other agreements, arrangements, systems ...
 - Role of the private sector?
 - Role of citizens?

Vision of an SDI for South Africa by Derek Clarke

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Technologies *Hardware* Software

- Architecture options
 - Manual aggregation into centralized database
 - Federated databases
 - Decentralized service oriented architectures [Coetsee 2009, 2011]
- Clearinghouse
 - Repository of geospatial data
- Geportal
 - Web portal provides access to geospatial data
 - Metadata catalogue
 - Web mapping to view the data
- CSI sub-committee on Systems



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Agreements

Organizational arrangements

- Agreement
 - Who is the custodian
 - Exchange
- Coordination arrangements
 - Custodians of base and derivative dataset
- Licensing
 - Copyright
 - Intellectual property right
 - Special cases: disaster, elections

Towards a single metropolitan address dataset by Marcelle Hattingh



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Standards

- Standards provide **interoperability** for data and services (systems)
 - Facilitate the discovery, access, sharing
- CSI sub-committee on Standards

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Standards

- International organization for standardization (ISO)
 - www.iso.org
 - ISO from *isos* (Greek) meaning 'equal'
 - Standards are developed by consensus
 - 162 countries
 - World's largest developer and publisher of international standards
 - Examples
 - ISO 9000 series on *Quality management systems*
 - ISO 14000 series on *Environmental management*
 - **ISO/TC 211, Geographic information/Geomatics**

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Standards

- Free membership (SABS SC71E)
- Buy standards (+/- R300)

- ISO/TC 211 *Geographic information/Geomatics*
 - www.isotc211.org
 - Scope
 - Standardization in the field of digital geographic information
 - Examples
 - ISO 19115:2003 *Geographic information – Metadata*
 - ISO 19101:2002 *Geographic information – Reference model*
 - ISO 19160, *Addressing* (in progress)
 - ISO/TC 211 Standards Guide
 - Introduction to the standards in general and each standard specifically
 - http://www.isotc211.org/Outreach/Standards_Guide.htm

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Standards

- SABS SC 71E, Geographic information
 - www.sabs.co.za
 - Local mirror committee of ISO/TC 211
 - Free membership for South African companies, departments
 - Examples
 - SANS 19115:2003 *Geographic information – Metadata*
 - Adopted
 - SANS 1878-1:2005 *South African spatial metadata standard Part 1: Core metadata profile*
 - Adopted
 - SANS 1883:2009 *Geographic information – Addresses*
 - Developed locally

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OGC
Making Location Count

Standards

- Expensive membership
- Standards are free

- OGC www.opengeospatial.org
 - Industry consortium
 - non-profit, international, voluntary consensus standards organization
 - Membership
 - South African members: CSIR, University of Pretoria
 - SA Fees (GovFuture)
 - National Government \$1,100 – \$27,500
 - Local Government \$100
 - University \$250 – \$27,500
 - Company \$2,200 – \$55,000

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OGC
Making Location Count


Standards

- OGC
 - Some standards are developed jointly with ISO/TC 211
 - Examples
 - Open GIS Web Map Server (WMS) 1.3.0
 - same as ISO 19128
 - Web Feature Service (WFS)
 - Web Processing Service (WPS)
 - Style Layer Descriptor (SLD)
 - etc.

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Economic resources

- Sustainable funding!
 - Software, hardware, people, data
 - Education and training
 - Standards development
 - Communication
 - Research
- Difficult to quantify the benefits




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People

Biggest challenge!

- Stakeholder representatives
- Human resources
- Users
- CSI sub-committees on
 - Education and Training
 - Communication



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Examples of SDIs

GGIM | United Nations Initiative on Global Geospatial Information Management


- International
 - United Nations Initiative on Global Geospatial Information Management (UN GGIM)
 - <http://ggim.un.org/>
 - UN's initiative to enhance and coordinate global geospatial information management
 - Formal mechanism under UN auspices
 - Member states
 - Spatial data to address global cross-border issues
 - Climate change, disasters

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Examples of SDIs

Return of investment of INSPIRE by Max Craglia

- Regional
 - Infrastructure for SPatial InfoRmation in Europe (INSPIRE) <http://inspire.jrc.ec.europa.eu/>
 - European SDI
 - 27 member states
 - 34 spatial data themes
 - Geographic names, administrative units, addresses, cadastral parcels, transport, hydrography...
 - Key components specified through technical implementing rules (binding!)



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Examples of SDIs

*SDIs in Africa
by Julian Smit*

- National examples
 - US National SDI (NSDI)
 - http://www.whitehouse.gov/omb/circulars_a016_rev
 - OMB Circular A-16
 - guidelines for the management of digital spatial data and the use of those assets
 - NSDI Clearinghouse <http://www.fgdc.gov/dataandservices>
 - Geoportal
 - Geospatial One-Stop <http://gos2.geodata.gov/wps/portal/gos>
 - Norway, India, Netherlands, Chile, ...

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Examples of SDIs

*The value of
collaboration and SDI
services by Basil Heald*

- Provincial, Municipal
 - Sometimes not full-blown SDI, rather SDI activities
 - User-driven bottom-up approach [Smit et al 2009]
 - Local-government data sharing is fundamental to coordinating other government activities [Harvey and Tulloch 2006]
- Corporate
 - Focus is internal, otherwise similar to other SDIs
 - Example: United Nations SDI (UN SDI)
 - <http://www.ungis.org/unsdi.htm>



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SDI organizations

- Global Spatial Data Infrastructure Association (GSDI)
 - www.gsdi.org
 - Goal
 - promote international cooperation and collaboration in support of local, national and international spatial data infrastructure developments that will allow nations to better address social, economic, and environmental issues of pressing importance
 - Newsletters, discussion list
 - Regular conferences
 - Proceedings available online

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SDI organizations

International Cartographic Association
Association Cartographique Internationale



- International Cartographic Association (ICA)
 - www.icaci.org
 - Goal
 - promote the discipline and profession of cartography in an international context
 - Commission on Geospatial Data Standards
 - Proposed new scope: *SDI and Standards*
 - Chair: Antony Cooper
 - SDI modeling (Hjelmager et al 2008)
 - Technology independent blueprint for an SDI

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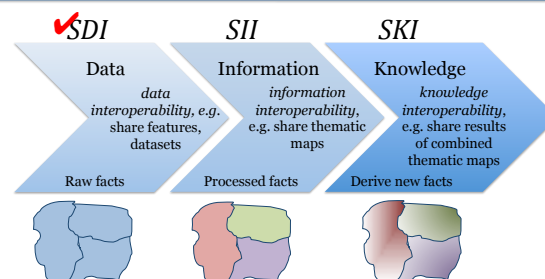
SDI organizations

- International Society for Photogrammetry and Remote Sensing (ISPRS) www.isprs.org
 - Commission IV Geodatabases and Digital Mapping
 - Commission IV/1 *Geospatial Data Infrastructure*
 - Commission IV/5 *Distributed and Web-Based Geoinformation Services and Applications*
 - Commission IV/6 *Global DEM Interoperability*

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From data to information to knowledge



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SDI Challenges

VGI in SDIs by
Antony Cooper

- Increased distribution requires more integration (interoperability)
 - Ever increasing demand for spatial data
 - When and how to incorporate crowd sourcing, VGI
 - Where and how to store large volumes of data
 - Increased number and heterogeneity of stakeholders
 - Distributed computing requirements (grids, clouds)

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SA SDI Challenges

- The role of the private sector in SA's SDI?
- The role of VGI and/or crowd sourcing?
- From talking to implementing...
- First SDI, then SII, then SKI
 - The sky is the limit ☺

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Other (free/open) resources on the Web

- SDI Cookbook by the GSDI
http://www.gsdi.org/GSDIWiki/index.php/Main_Page
- Wiki on Geo-standards
http://geostandards.geonovum.nl/index.php/Main_Page
- Past GSDI conferences <http://www.gsdi.org/gsdiConferences>
- International Journal of SDI Research
<http://ijdir.jrc.ec.europa.eu/>
- Presentations from this workshop will be available at www.up.ac.za/cgis

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Acknowledgements

This presentation was made possible via the support of the 'Improving Institutional address data with VGI' project of the *University of Pretoria Research and Development Programme (UP RDP)*, as well as *AfriGIS* (www.afriGIS.co.za) and the *Technology and Human Resources for Industry Programme (THRIP)* managed by the *South African National Research Foundation (NRF)* and financed by the *South African Department of Trade and Industry*.

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Thank you

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