UNIVERSITY OF TWENTE.

SDI FOR DISASTER RISK MANAGEMENT

CONCEPTS & REQUIREMENTS

LECTURE SERIES – SDIT GROUP
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REALITY CHECK

"Neither MapQuest or Google Maps could give me directions to happiness."

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OUTLINE

SDI CONCEPTS

- Background
- Exploitation
- Components
- The value chain

SDI – DEFINED

An infrastructure that allows the exploitation of geospatial principles, geospatial functions and geospatial data within and across application and scientific domains, transforming the way in which production, use, development, research and education are conducted by the geospatial community

Goodchild , et.al., 2010

SDI – THE BACKGROUND

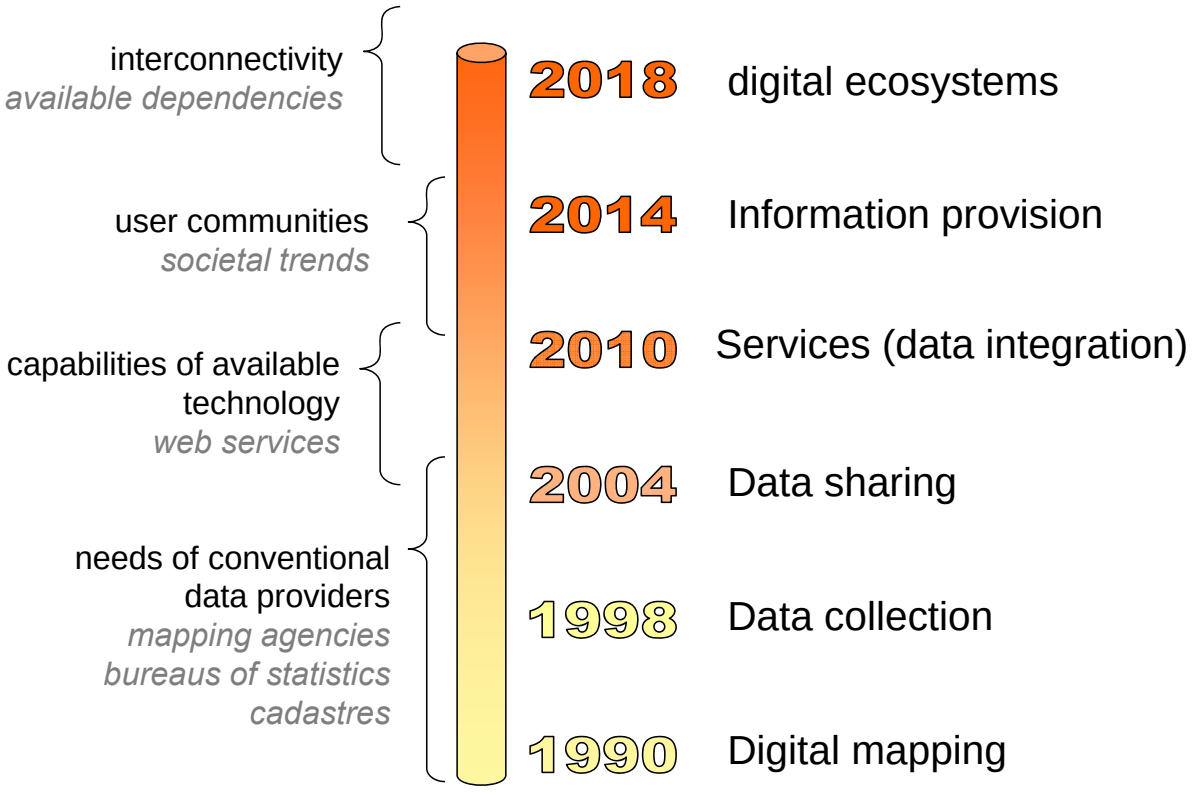
SOME HIGHLIGHTS ON RELEVANT EVENTS

1963 Canadian GIS (CGIS): world's first 'GIS' (Roger Tomlinson)
1964 Harvard Lab for Computer Graphics and Spatial Analysis (Howard Fisher)
1973 Canadian invents topologically integrated triangulation (TIN) (Tom Poiker)
1981 US Global Positioning System (GPS) becomes operational
1993 Xerox PARC launches first web based interactive map (Steve Putz)
1994 Establishment of ISO/TC 211 Geomatics standards body
1994 Establishment of Open Geospatial Consortium (OGC) standards body
1999 Canadian company (Galdos) creates the GML standard (Ron Lake)
1999 Canadian Geospatial Data Infrastructure (Jeff Labonté)
2001 Japan adopts *GML* as Japanese Industry Standard (Akifumi Nakai)
2001 UK Ordnance Survey adopts *GML* as standard (Vanessa Lawrence)
2004 EU legislates Infrastructure for Spatial Information in Europe (INSPIRE)

???? – • • •

EVOLUTION

SDI COMMUNITY & INFORMATION TECHNOLOGY



SDI – THE ORIGINAL PROBLEM

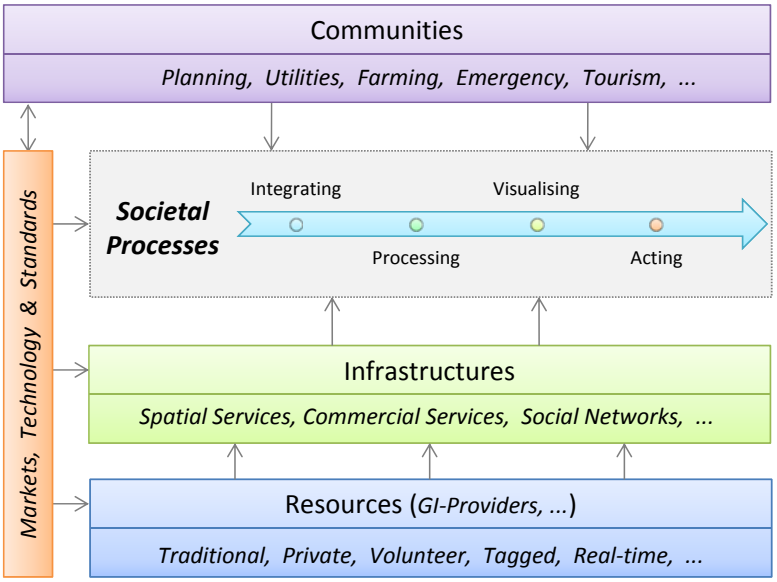
WE HAVE ISLANDS OF SPATIAL DATA

SDI – THE REALITY

SOCIETAL NEEDS

SDI – THE VALUE CHAIN

OPERATING ENVIRONMENT – SDI MACRO LEVEL



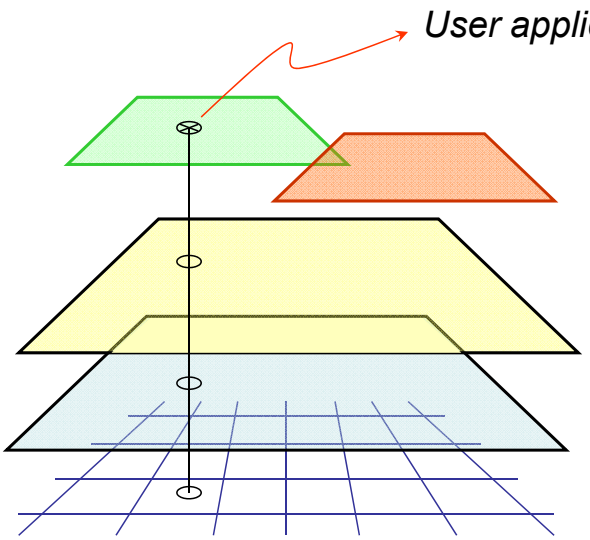
SDI – SOCIETAL PROCESSES ARE INTERCONNECTED

THE REASONING

- Land use planning
- Development and construction
- Buried Services [particularly utilities, pipes and cables]
- Property transaction [seeking, buying, selling]
- Transport management
- Democracy
- Disaster risk management
- Health
- Security

SDI – PRODUCTS ARE INTERCONNECTED

THE REASONING



→ thematic datasets

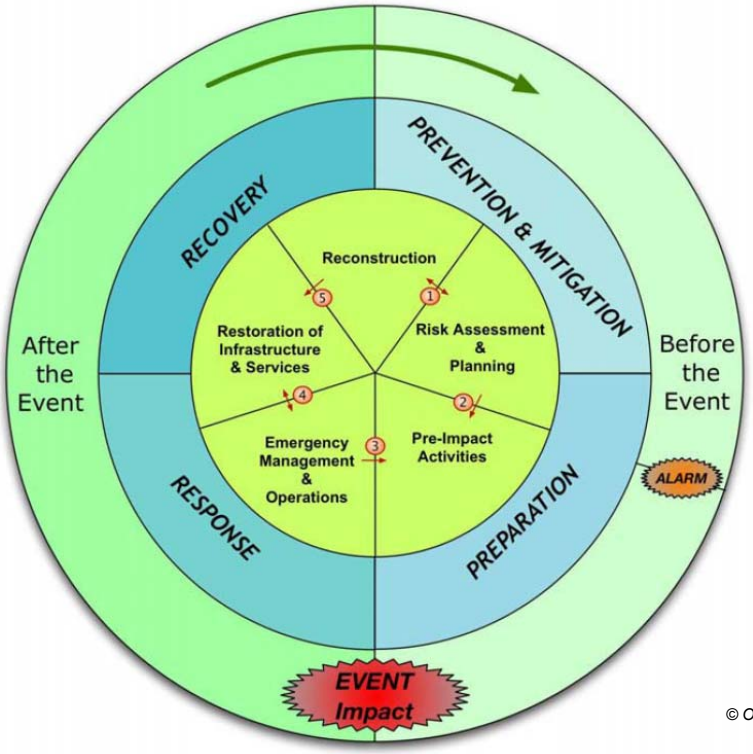
→ property dataset

→ infrastructure dataset

→ reference data set

SDI – THE VALUE CHAIN

DISASTER RISK MANAGEMENT CYCLE



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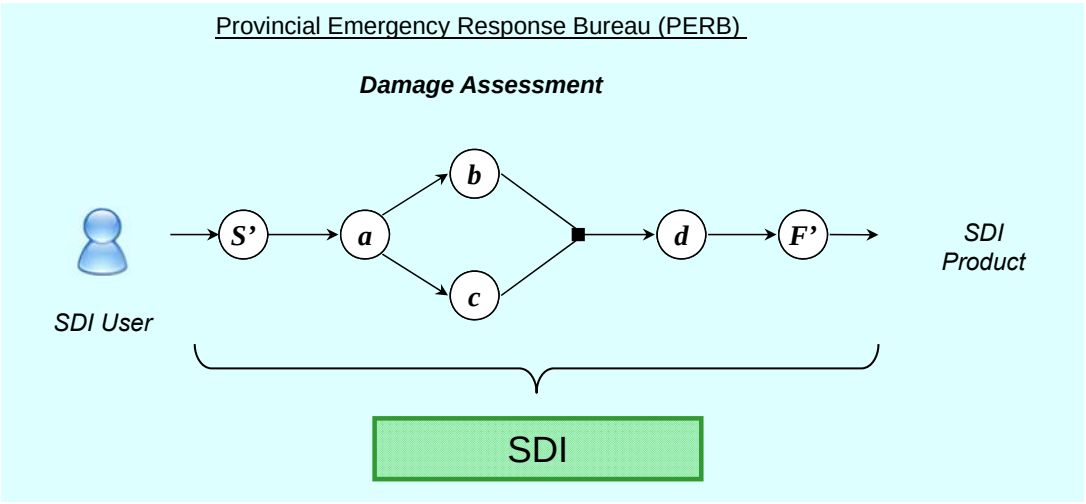
SDI – EXPLOITATION

A PROCESS



SDI – COMPOSING ELEMENTS

- The geo-information community
- The resources
- The set of principles and standards
- The key principles

SDI – THE COMMUNITY

- Organisations with a stake on data generation:
  - Geological Surveys,
  - The OpenStreetMap Foundation
- Technology provision:
  - Environmental Systems Research Institute, Inc.,
  - PostgreSQL Global Development Group
- Standards development:
  - International Organization for Standardisation,
  - Open Geospatial Consortium).

SDI – THE COMMUNITY

- Developers: individuals or organisations that
  - devise,
  - conceptualise/design
  - construct/deploy/realise

  GI-services (*eg. a data feed, an image set, a function-chain of*)
- Consumers:
  - A human or an application that uses GI-services in the execution of his/her/its daily activities. Consumers may also generate/produce content as part of crowdsourcing activities.

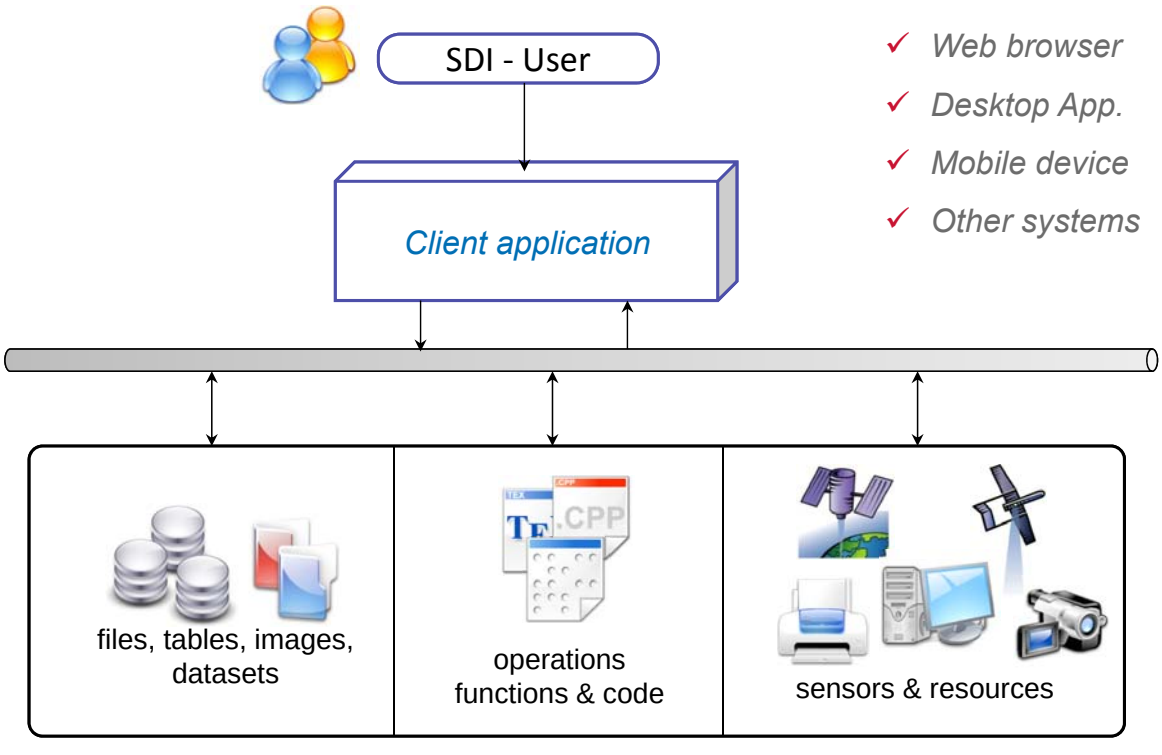
SDI – THE RESOURCES

THE FUNDAMENTAL BUILDING BLOCK OF AN SDI

- Types of geo-resources
  - Datasets (single theme or spatial database)
  - Images (rasters & grids)
  - Files, tables pictures
  - Observations (raw data)
  - Products (maps, globes, reports, intermediate results, …)
  - Sensors (weather stations, cameras, satellites, …)
  - Functions (algorithms, operations, complex models, workflows)
  - Hardware (processing or storage)

SDI – THE RESOURCES

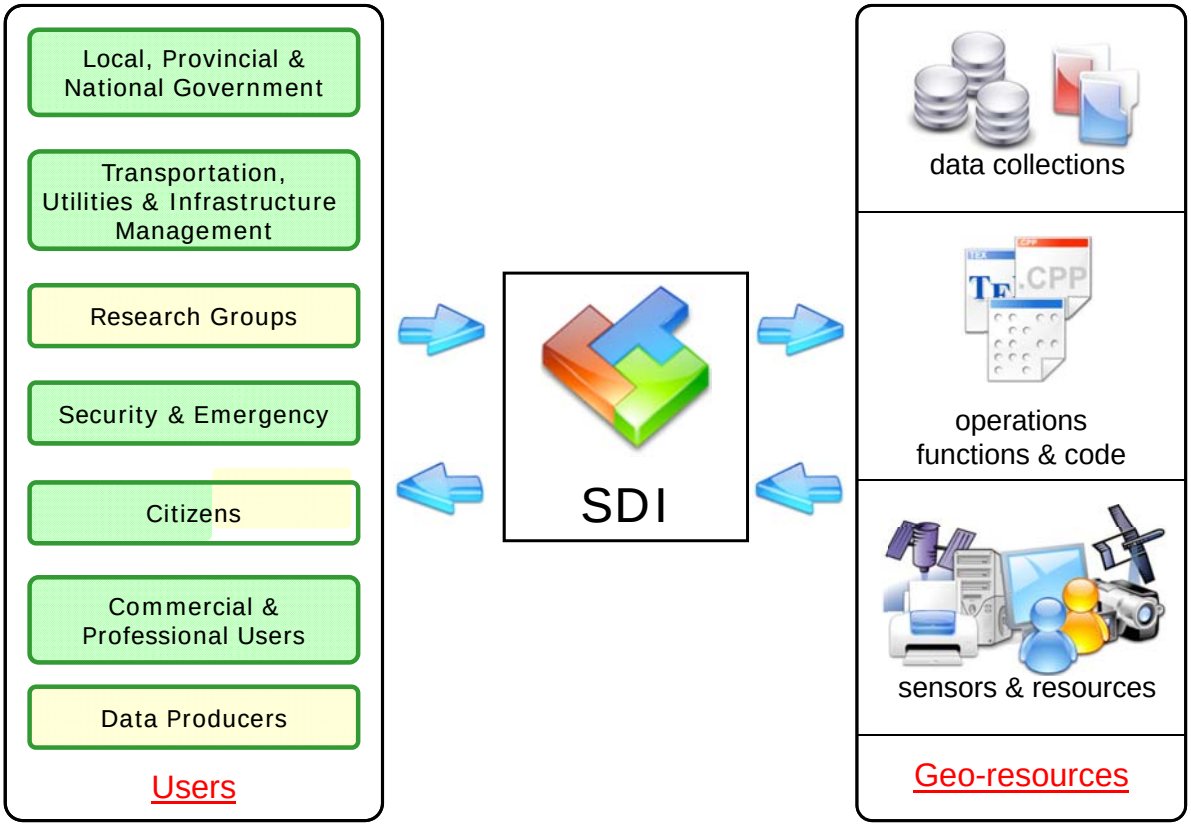
DISTRIBUTED PRINCIPLES



- ✓ *Web browser*
- ✓ *Desktop App.*
- ✓ *Mobile device*
- ✓ *Other systems*

Geo-resources

GI-RESOURCES



SDI – STANDARDISATION

- Standardisation bodies/activities relevant to the SDI community:
  - World Wide Web Consortium (W3C)
  - International Organization of Standardization (ISO TC-211)
  - Open Geospatial Consortium (OGC)
  - National Standards Organizations (≠ *every country*)

OPEN SYSTEMS & OPEN STANDARDS

- An open system

  is a system in which the components and protocols conform to open standards independent of a particular supplier and provide some combination of interoperability, portability.

- An open standard

  is a standard that is publicly available and has various rights to use associated with it, and may also have various properties of how it was designed (e.g. open process).

OPEN DATA

Data is considered to be open if

- it is and publish online,
- updated as often as possible,
- provided in a way that allows for its legal use for any purpose, and
- that allows easy processing with any arbitrary software program

SDI – STANDARDISATION

- Foundation standards (*W3C*)
- Data management standards (*19107,19125/…*)
- Documentation standards (*19115,19139,19119*)
- Data exchange standards (*GML,JSON/GeoJSON,jpeg,geotiff, …*)
- Services levels 1&2 standards (*CSW,WMS,WFS*)
- Services level 3 standards (*WFS-T,WPS,GPW,…,W3C*)
- Open data (*geonames, openstreetmap*)
- Crowdsourcing

SDI – THE BASE STANDARDS' SET

- Data management
  - ISO-19107:2003 GI - Spatial schema [..*UML*..]
  - ISO-19125:2004 Simple Feature Specification (SFS) for SQL
- Documentation
  - ISO-19115:2003 GI – Metadata [..*19115a*..]
  - ISO-19139:2004 GI – Metadata XML Schema implementation
  - ISO-19119:2005 GI – Services
- Data exchange
  - OGC – Geography Mark-up Language (GML) [..*xml technology family*..]
  - W3C – JavaScript object notation (JSON)
  - W3C – Graphic formats (jpeg, gif, png, geotiff, ...)
- Services
  - OGC – Catalogue Service Web (CSW)
  - ISO-19128:2005 GI - Web Map Server interface (WMS)
  - OGC – Web Feature Service - Transactional (WFS-T)
  - OGC – Web Processing Service (WPS) & (GPW)

OGC: IMPLEMENTATION SPECIFICATIONS

OGC WEB SERVICES (OWS)

- OWS Implementation specifications – it is a long list (…)
  - Geography Markup Language (GML)
  - Simple Feature (SFS)
  - Catalogue Service (CS-W)
  - Web Feature Service (WFS, WFS-T)
  - Web Coverage Service (WCS)
  - Web Map Service (WMS)
  - Web Processing service (WPS…)
  - Geo Processing Workflow (GPW…)
  - Sensor Web Enablement (SWE…)
  - OGC Location Services (OpenLS)
  - Geo Digital Rights Management (GeoDRM)
  - Geo-Decision Support Services (GeoDSS)
  - …

ISO: STANDARDS ON DIGITAL GI

19101:2002	Geographic information - Reference model
19103:2005	Geographic information - Conceptual schema language
19105:2000	Geographic information - Conformance and testing
19106:2004	Geographic information - Profiles
19107:2003	Geographic information - Spatial schema
19108:2002	Geographic information - Temporal schema
19109:2005	Geographic information - Rules for application schema
19110:2005	Geographic information - Methodology for feature cataloguing
19111:2003	Geographic information - Spatial referencing by coordinates
19112:2003	Geographic information - Referencing by geographic identifiers
19113:2002	Geographic information - Quality principles
19114:2003	Geographic information - Quality evaluation procedures
19115:2003	Geographic information - Metadata

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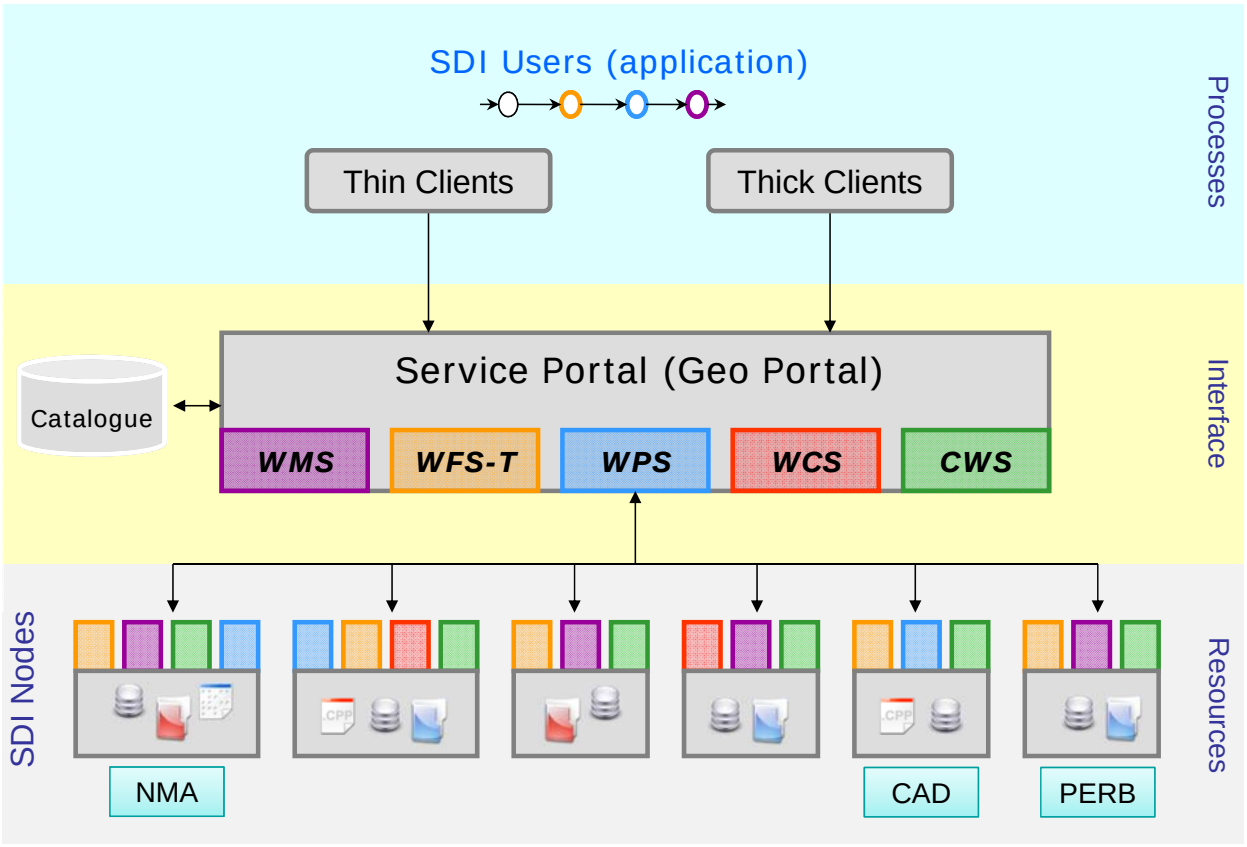
SDI – SERVICE INTERFACES



SDI – KEY ISSUES (FOR EXPLOITATION)

- No distinction between producers and consumers
  - Ever increasing number of resources
- Users and use cases
  - Use and exploitation at the center
- Participation
  - distributed contribution and responsibilities
- Service design should be based on community-processes
  - *what / where / in which form* is the information needed
- Multidisciplinary
  - Information is essentially a distributed resource (heterogeneous)

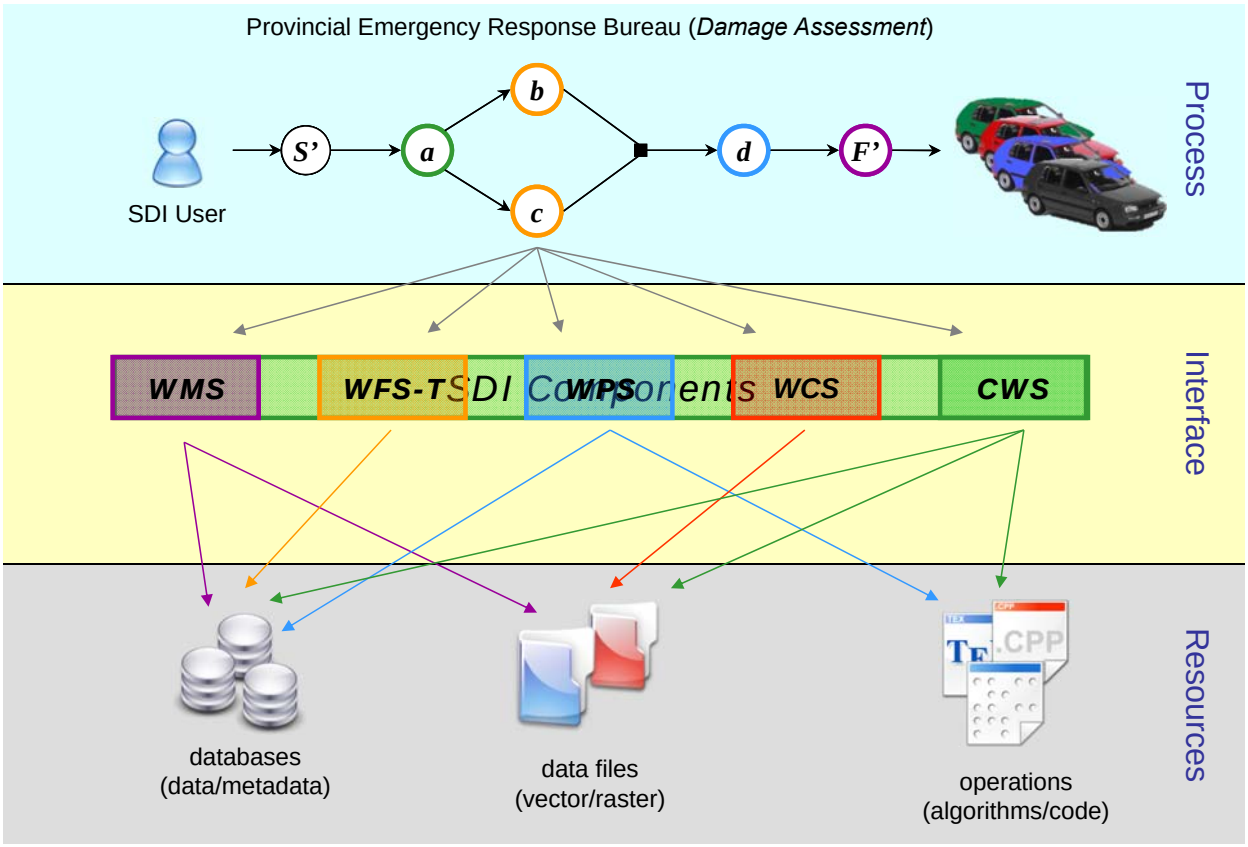
SDI – KEY ISSUES (FOR EXPLOITATION)

DO NOT DELIVER JUST DATA

SDI – KEY ISSUES (FOR EXPLOITATION)

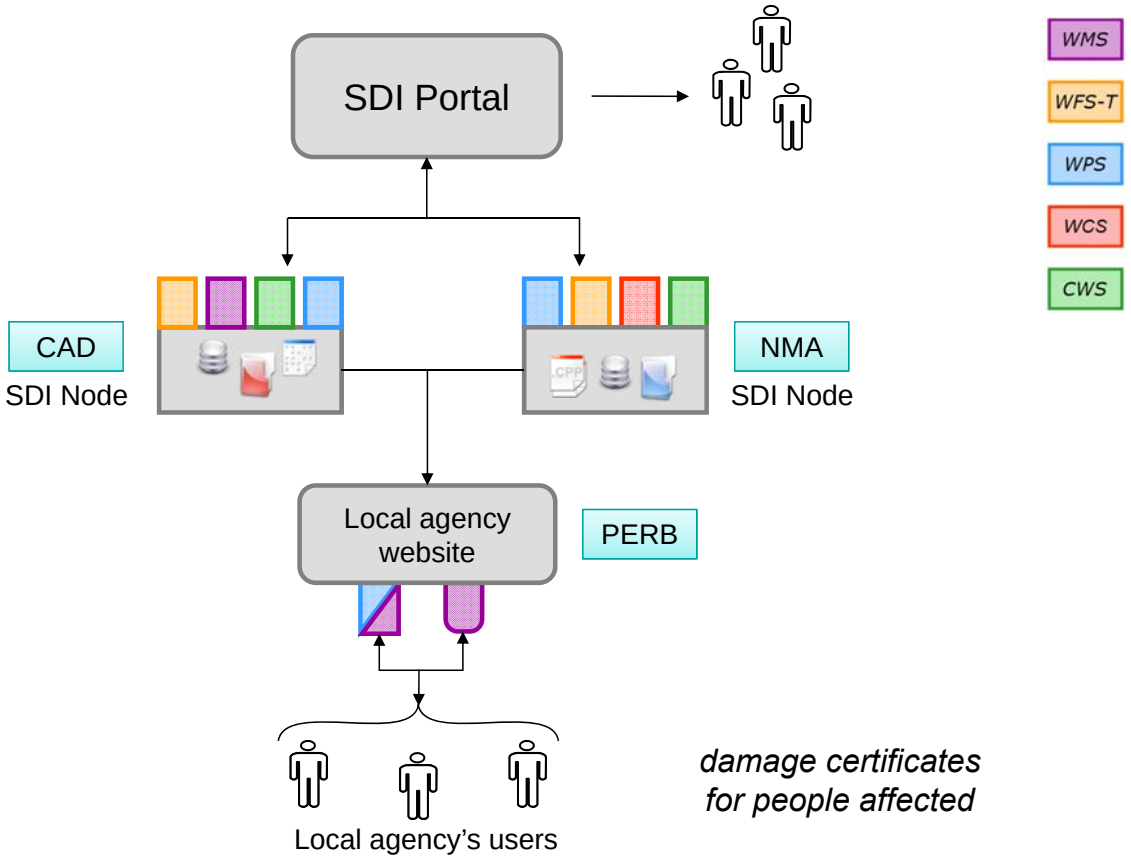
DELIVER VALUE IN TERMS OF PRODUCTS AND SERVICES

SDI – EXPLOITATION



SDI – THE VALUE CHAIN

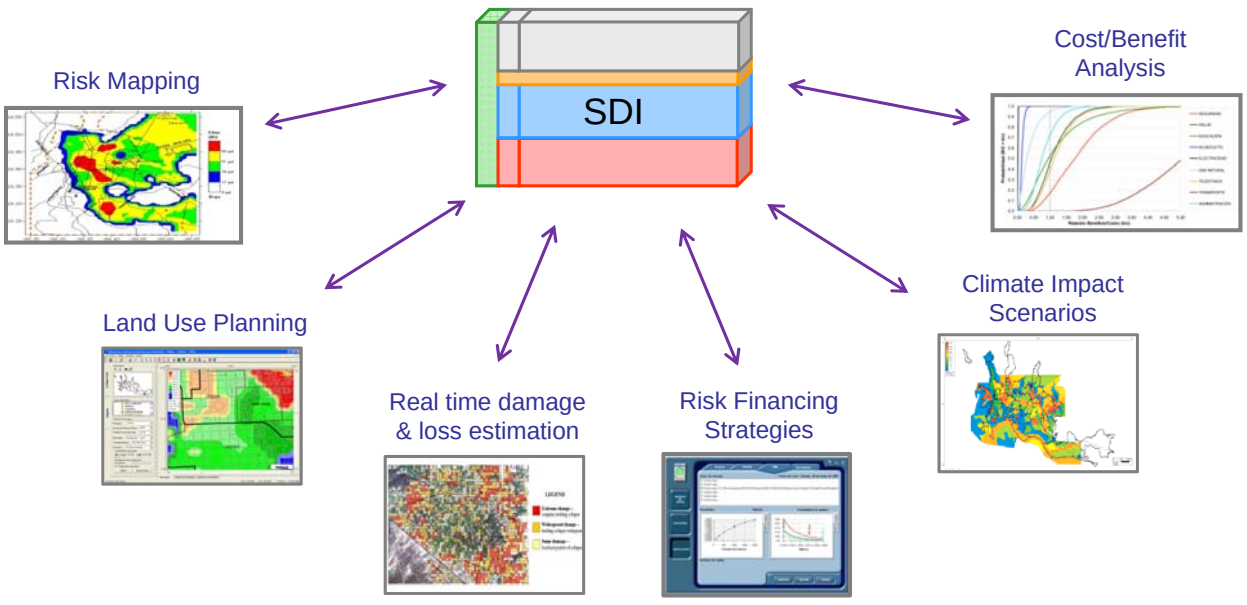
A COUPLE OF SCENARIOS



SDI – THE ACTUAL OPERATION

- Allow the creation of custom views on available data
- Enable the addition of annotations
- Provide functionality (*user-based GIS functions*)
- Let users style the data so that it fits their own objectives
- Enable data upload (*gml, Kml, shp, tiff, ...*)
- Allow editing data either through a browser or desktop clients
- Implement feedback mechanisms (*Commenting, tagging, rating*)
- Derive metadata from users actions and use

SDI – THE VALUE CHAIN



CONCLUDING REMARKS

AN SDI IS A LONG TERM INNITIATIVE

- What defines success in a SDI in the year 2020, and how to get there?
  - What do 2015 SDIs achieve?
  - What should 2030 SDIs achieve?
  - What is the pathway from 2015 to 2030?
  - Which are the critical success factors to get there?

CLOSING QUOTE

"If you would have a computer system
of infinite power and infinite storage,
where responsiveness was always instantaneous,
what information management problems
would remain to be solved?"

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