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Institute for Integrated Management of Material Fluxes and of Resources

Data collection and visualization of water services: Applications for nexus governance in Africa

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TERENO Conference,
Bonn, 29.09-02.10.2014

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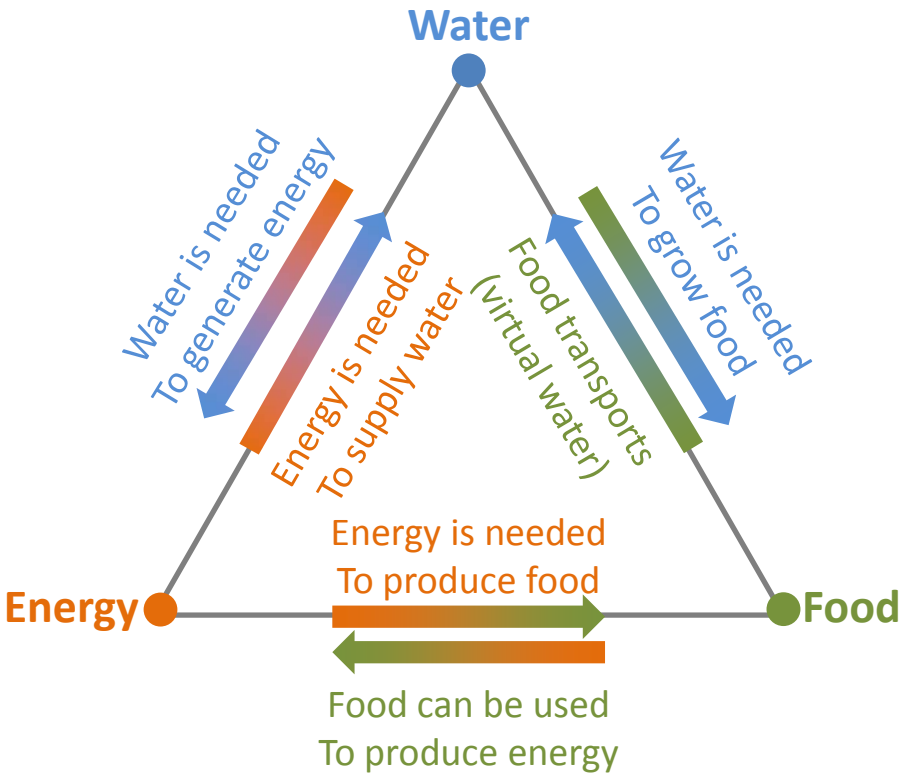
The environmental resources´ perspective on W-E-F Nexus



Source: UN Water 2013

Resources perspective:

- Water
  - ➢ Also for food and energy
- Soil
  - ➢ Food and biomass production
- Waste
  - ➢ Source of organic material and nutrients
  - ➢ Energy production

➢ Energy implicitly included

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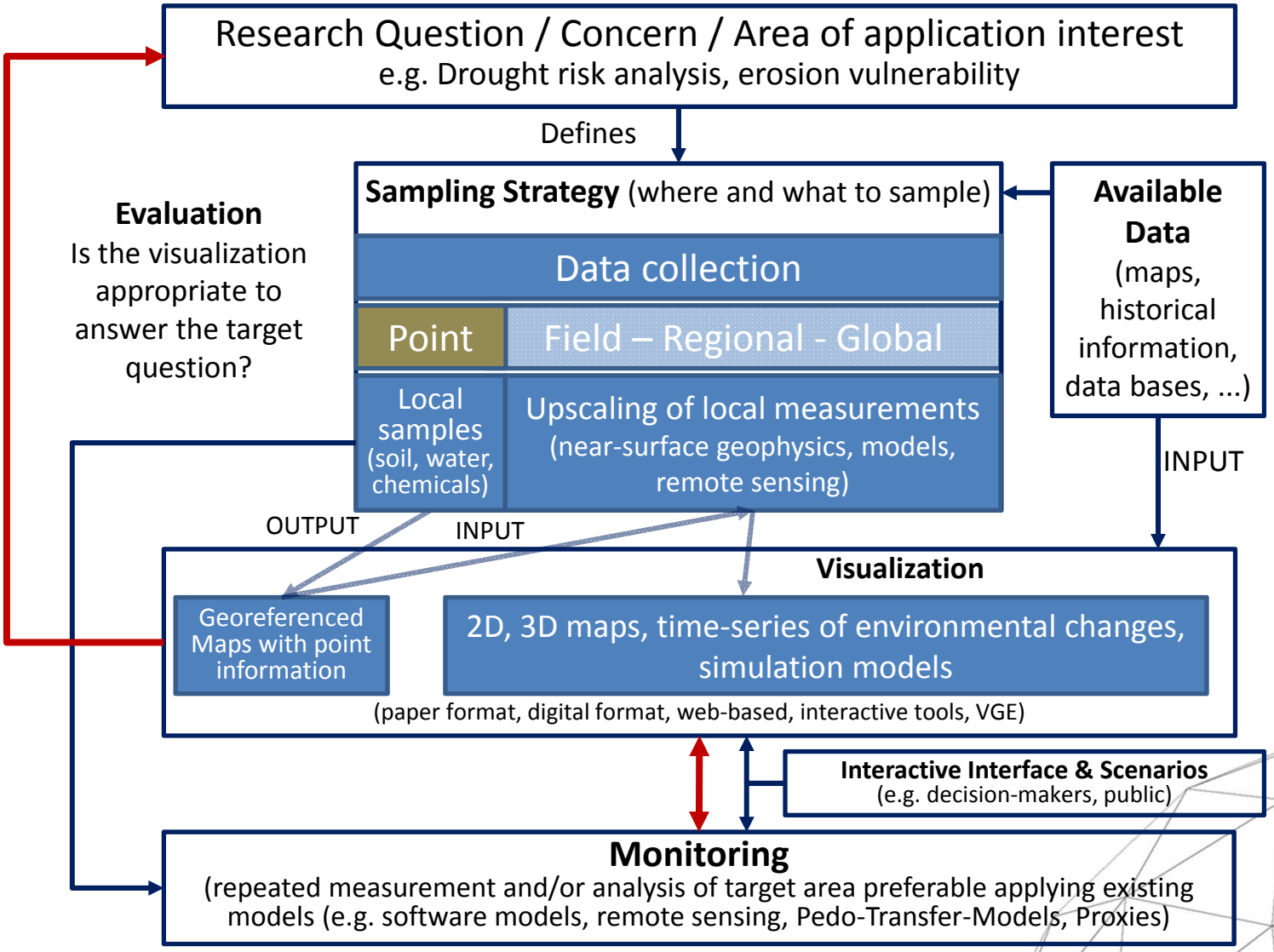
General Approach
From Research Question to Visualization



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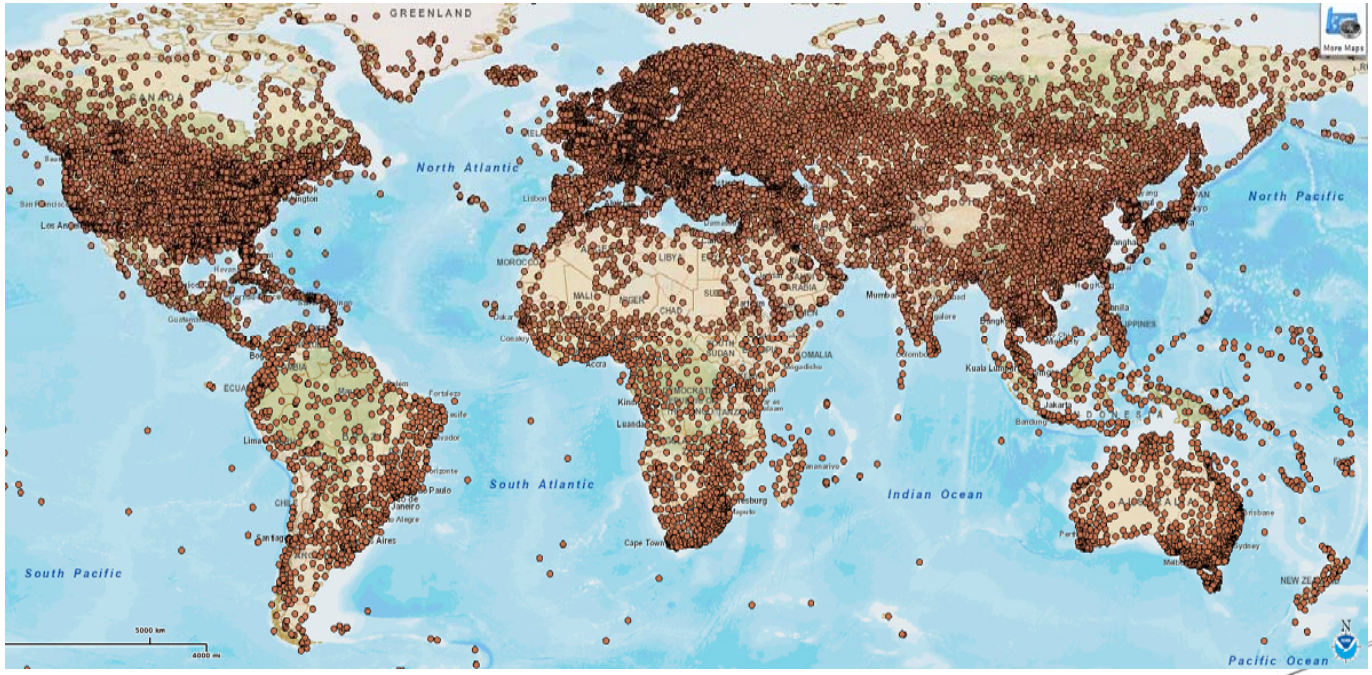
Introduction - Data Availability

- Data-Rich vs. Data-Scarce Regions



Global distribution of climate stations
(DOC/NOAA/NESDIS/NCDC, http://www.climate.gov/)

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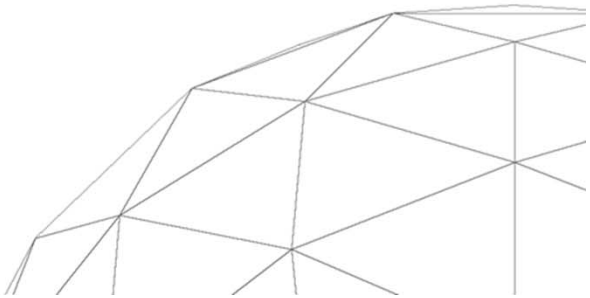
Data Assessment Methods
Data scarce Regions

- Proxies
  - simplification of reality (e.g. water quality vs. water colour)
  - substitute real data by an estimation value (easier to collect, e.g. vegetation *index* vs. biomass production)
  - overcome data scarcity
  - Substitute time-and-cost-consuming data surveys
  - Associated with uncertainty → needs to be communicated



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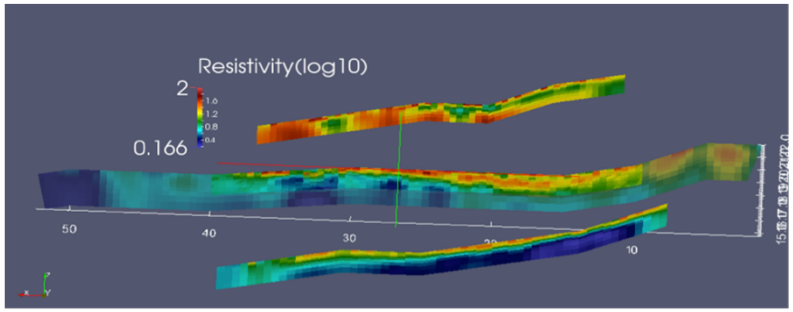
(Quasi-)Continuous Data Assessment Methods

Near-surface Geophysics

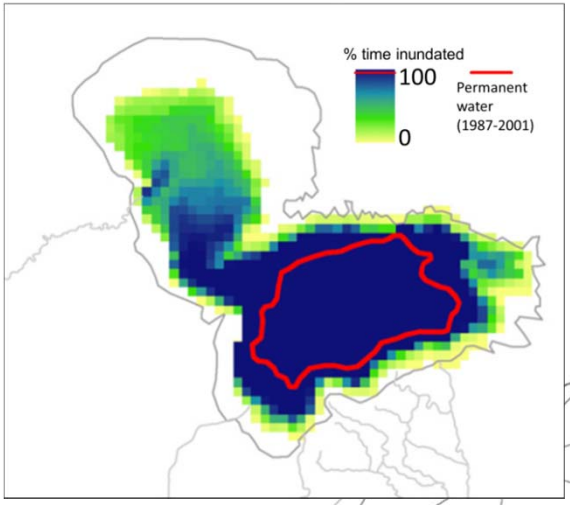
- e.g. underground structures, layering, homogeneity, proxy for hydrological properties

Remote Sensing

- **Multispectral** (e.g. land cover, indices, flooded area, impervious surface)
- **Hyperspectral** (e.g. chemistry, biophysical parameters, plant health)
- **Radar** (e.g. rainfall, topography, surface structures)
- **Thermal** (e.g. wetted area, surface temperature)



Geoelectric profile measurement
(Preliminary data by Mannschatz 2014)



Lake 'chad' mapping of water body extension (1987-2001) (Leblanc et al. 2011)

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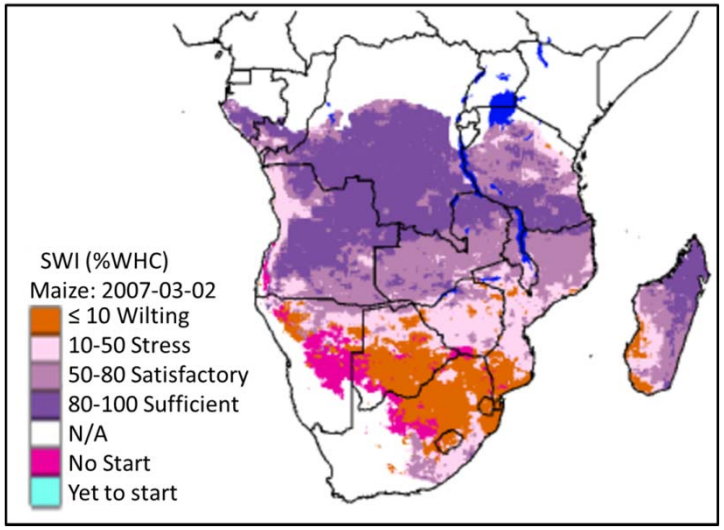
… Data Assessment Methods

- Ground-truthing needed (validation, calibration)
- Integration of different remote sensing products → *'secondary hydrological products'*
  - modelling approach (e.g. SWI, ET with RS as input)



Soil water index – Proxy for root zone water
(Melesse et al. 2007)

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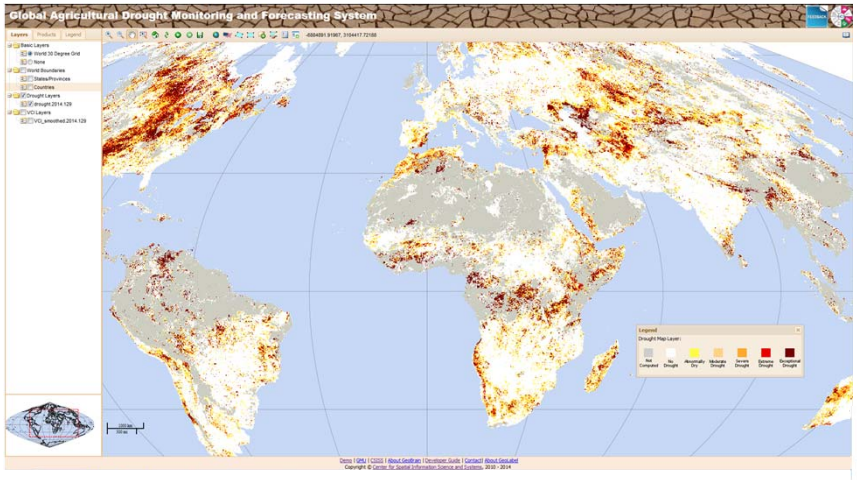
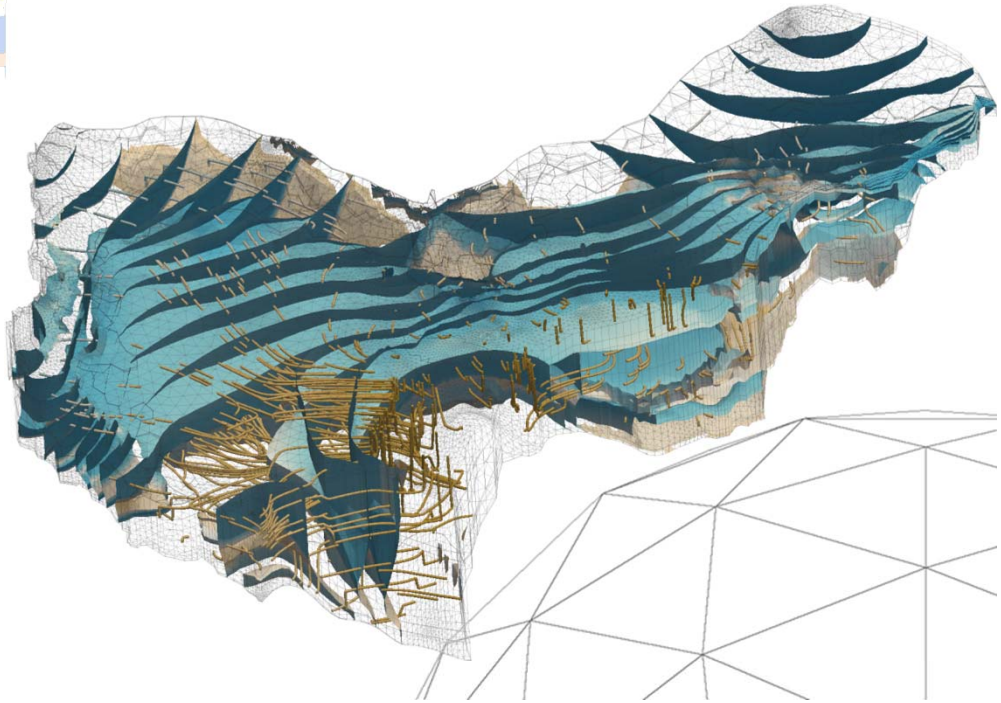
Making Use of Data
Time-Series Visualization



Near-real time (16 days) Droughts
09th May 2013 – 09th May 2014
(http://gis.csiss.gmu.edu/)



Groundwater flow model – Saudi Arabia
OpenGeoSys (Schulz et al 2014)

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Making Use of Data
Nexus Observatory

‘Problem of Big Data’ vs. Data Scarcity

Infrastructure to join data

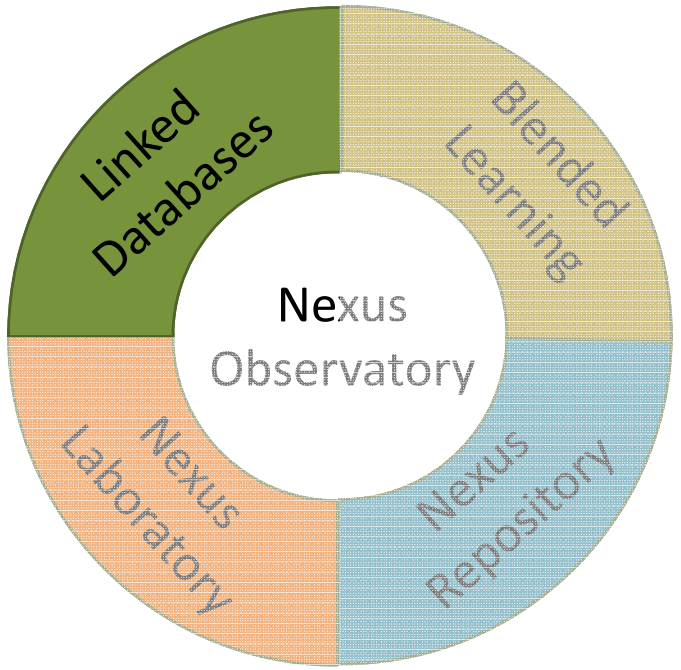
- *Linked databases*: Point, non-point , continuous data; shared access to data visualization techniques, modelling and scenario analysis tools.

Data Integration

- Data proxies
- Nexus index
- What role for *private data sets (crowd sources)*?

Data Visualization

- Spatial and non-spatial data visualization
- Scenario development based on data from *regional research consortiums*
- What role in shaping reform triggers & capacity development strategies?



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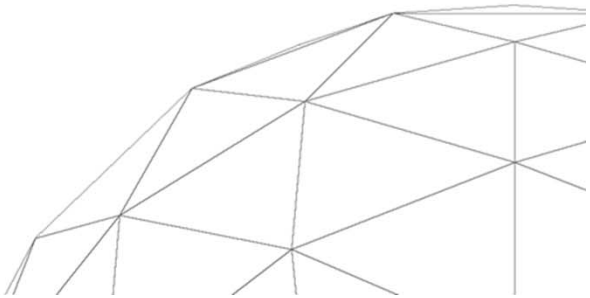
Making Use of Data
Application examples

- Risk assessment and Warning Systems
  - Drought risk, flooding, water quality
- Precision Water Management
  - Irrigation management
  - Water withdrawal management
- Monitoring
  - Climate Change impact on water availability
  - Research e.g. Soil moisture pattern
- Scenarios
  - Water-use, land-use scenarios
- Decision Support Systems (DSS)



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Example – Case Study
Water Point Mapping (WPM) in Tanzania

- Developed to address Millennium Development Goals (MDGs) (UN 2001)
  - Access to safe drinking water, basic sanitation
- Procedure
  - discrete locations water sources (e.g. wells, springs)
  - Data collection (e.g. GPS location, photography, number of people to supply) → manually
- Objective:
  - monitoring & identification of water infrastructure, functionality, water quality
  - Improvement of resource allocation

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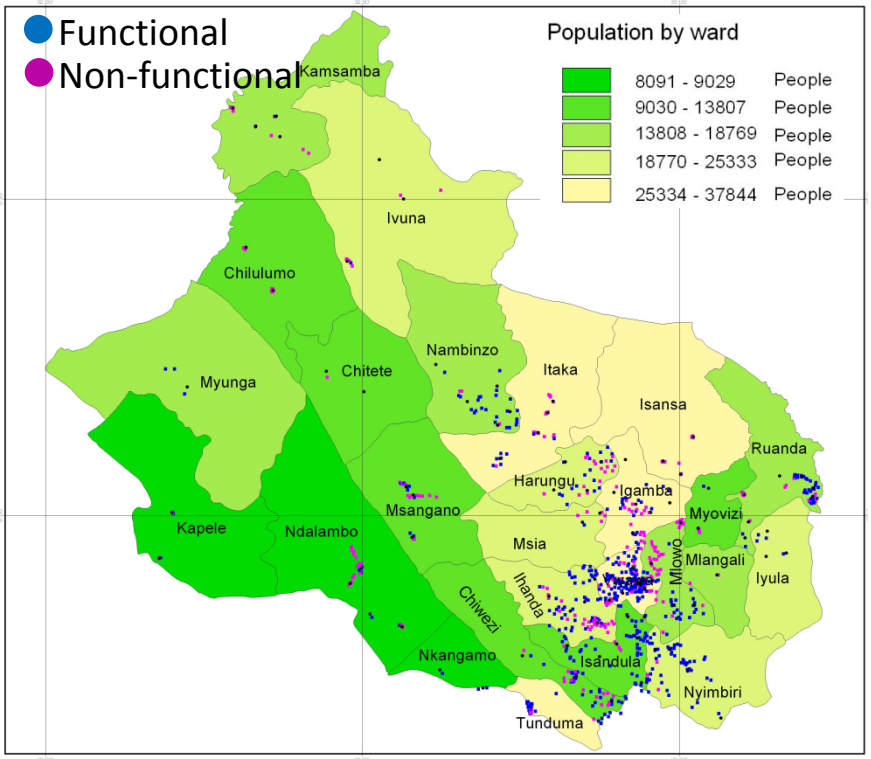

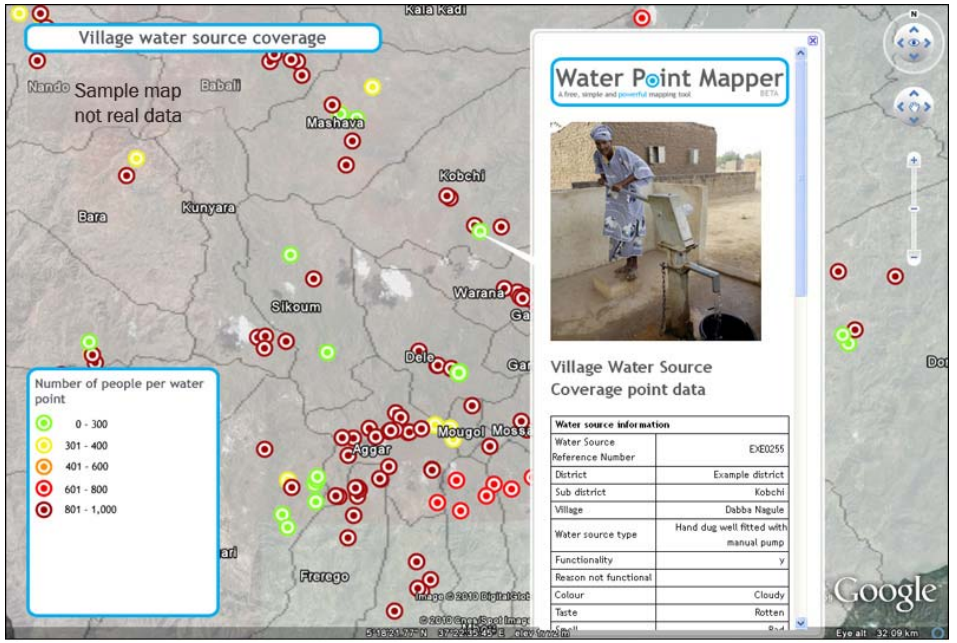

Water points in Mbozi district, Tanzania
(http://www.waterpointmapping.org/ GeoData)

Water Point Mapper
(http://www.waterpointmapper.org)

Manually to interactive real-time

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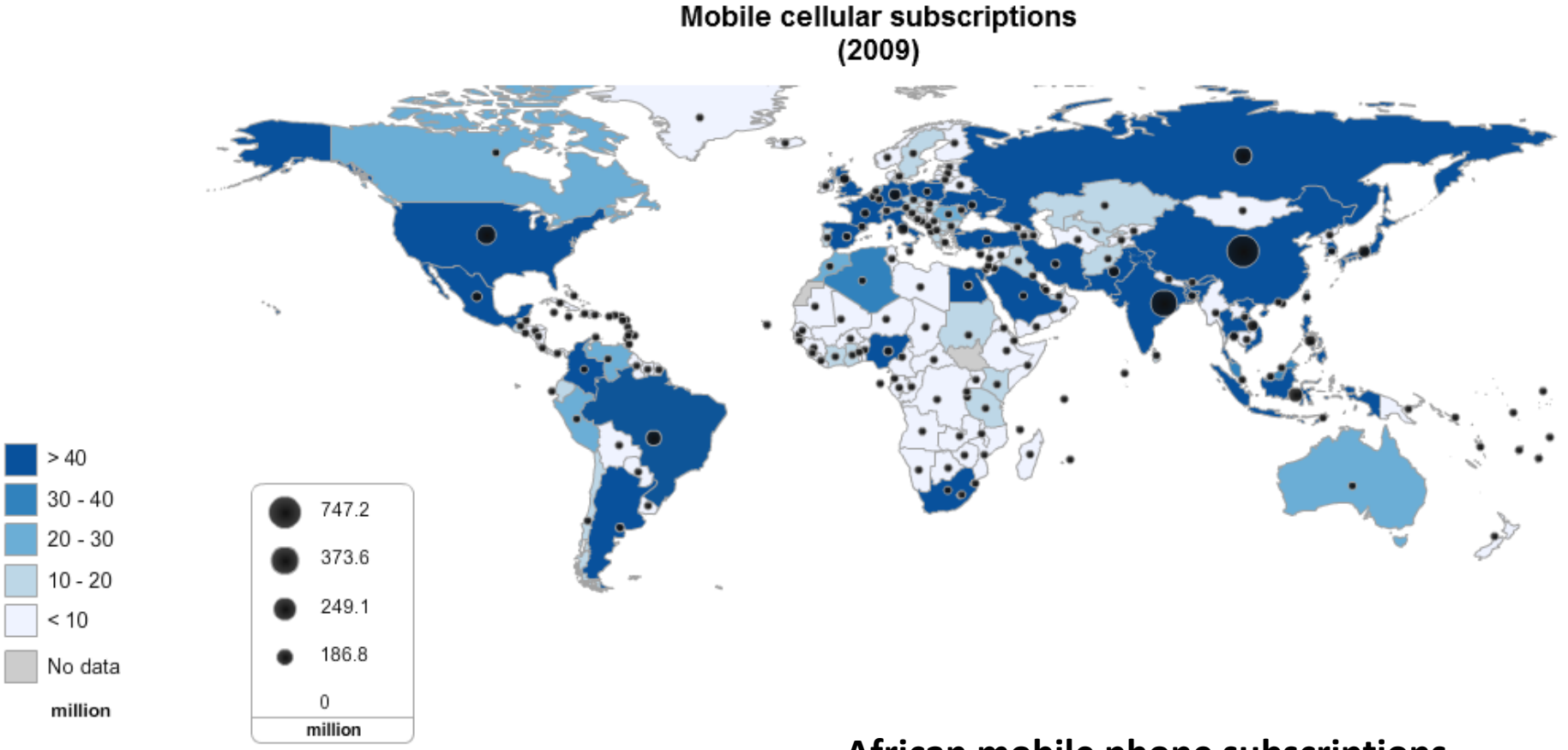
Supporting Data Assessment in Data Scarce-Regions

(Near-) Real-time Point data source



African mobile phone subscriptions

(http://www.statsilk.com/maps/world-stats-open-data, ITU 2010)

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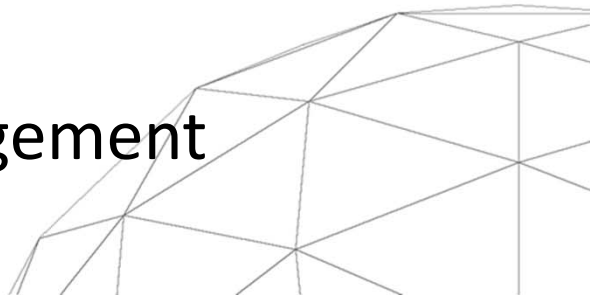
Summary & Outlook

- Need to address data-scarcity, particularly for integrated management (nexus approach)
- Combining data from various sources (linked databases, Nexus Observatory)
- WPM: promising tool for monitoring water supply
  - Spatial and temporal coverage
  - Engaging people
  - Contribution to drought risk management



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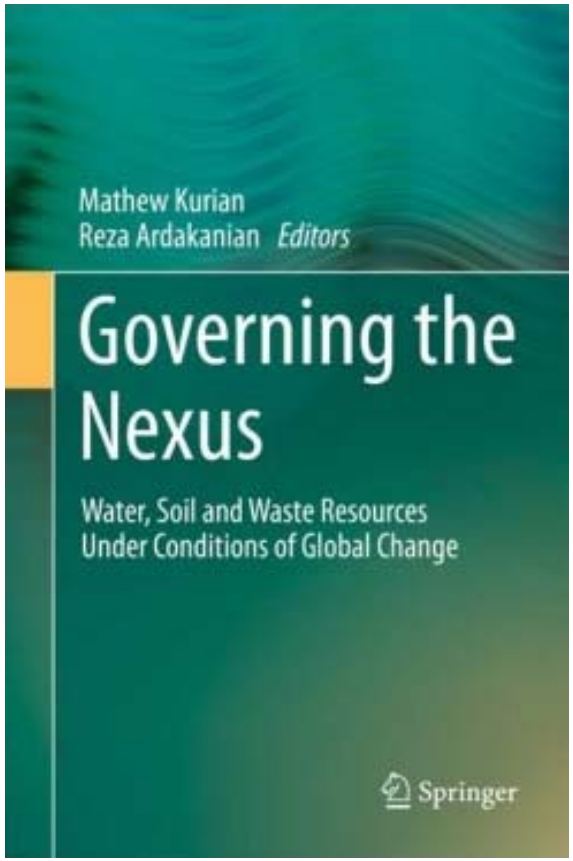
Publication & DNC 2015



November 2014

http://www.dresden-nexus-conference.org
Deadline for Abstracts: 06.10.2104

25 – 27 MARCH 2015
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Thank you

For further Information please contact us:

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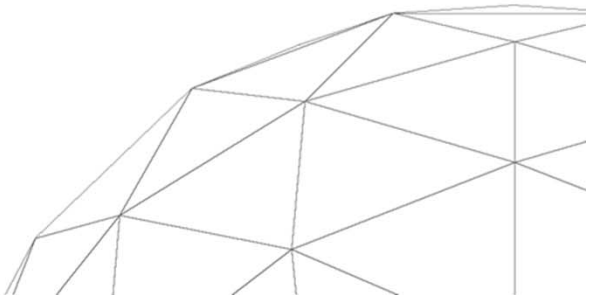

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