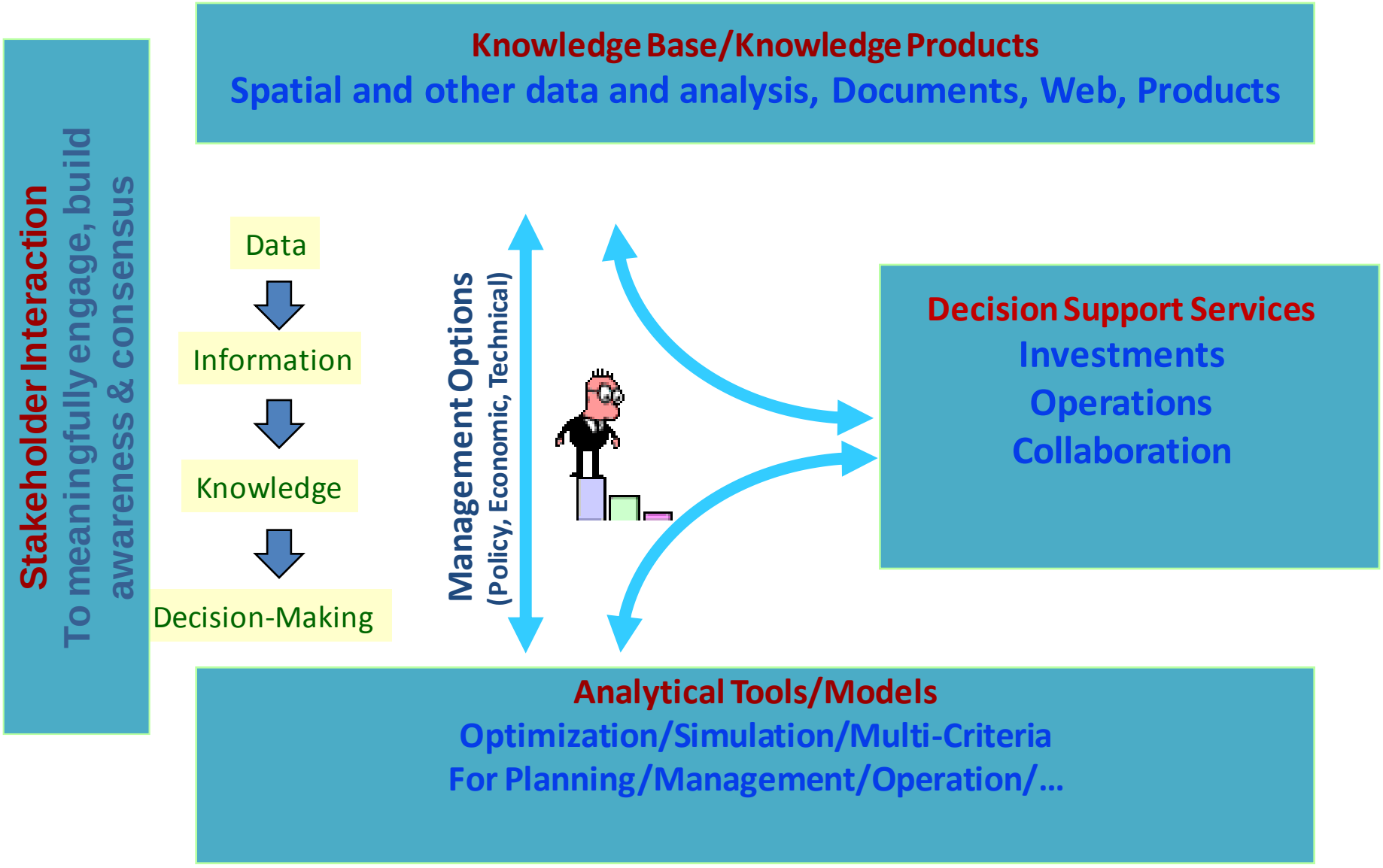
Innovative Data Access and Visualization for Central Asia

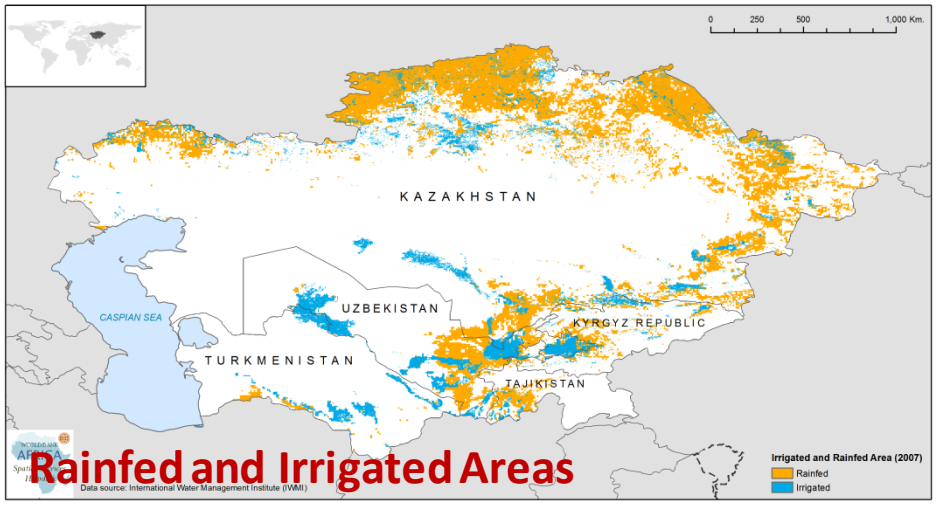
Nagaraja Rao Harshadeep
Senior Environmental Specialist
The World Bank

Session 7: Cool Data for a Warming World (Part 1)
May 14, 2014

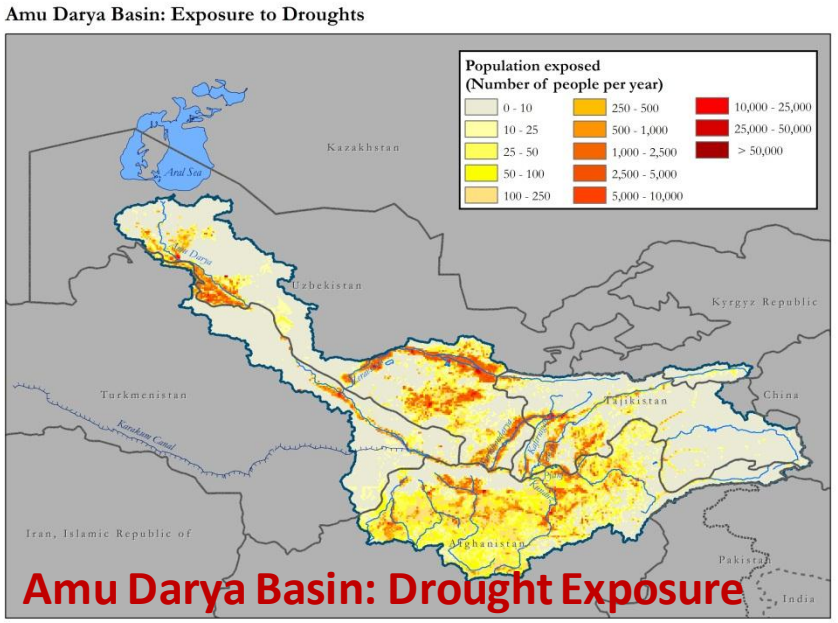
Towards Meaningful Decision Support Systems…



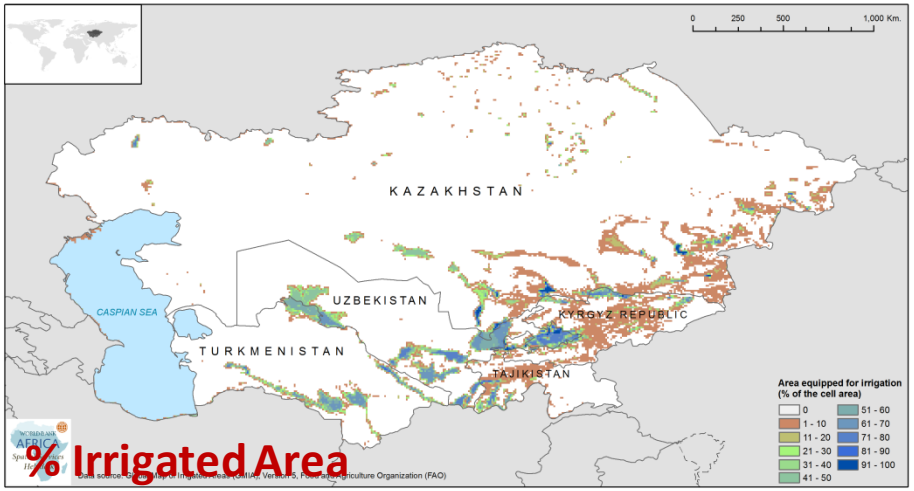
Knowledge Base Illustrations: Maps



Rainfed and Irrigated Areas



Amu Darya Basin: Drought Exposure



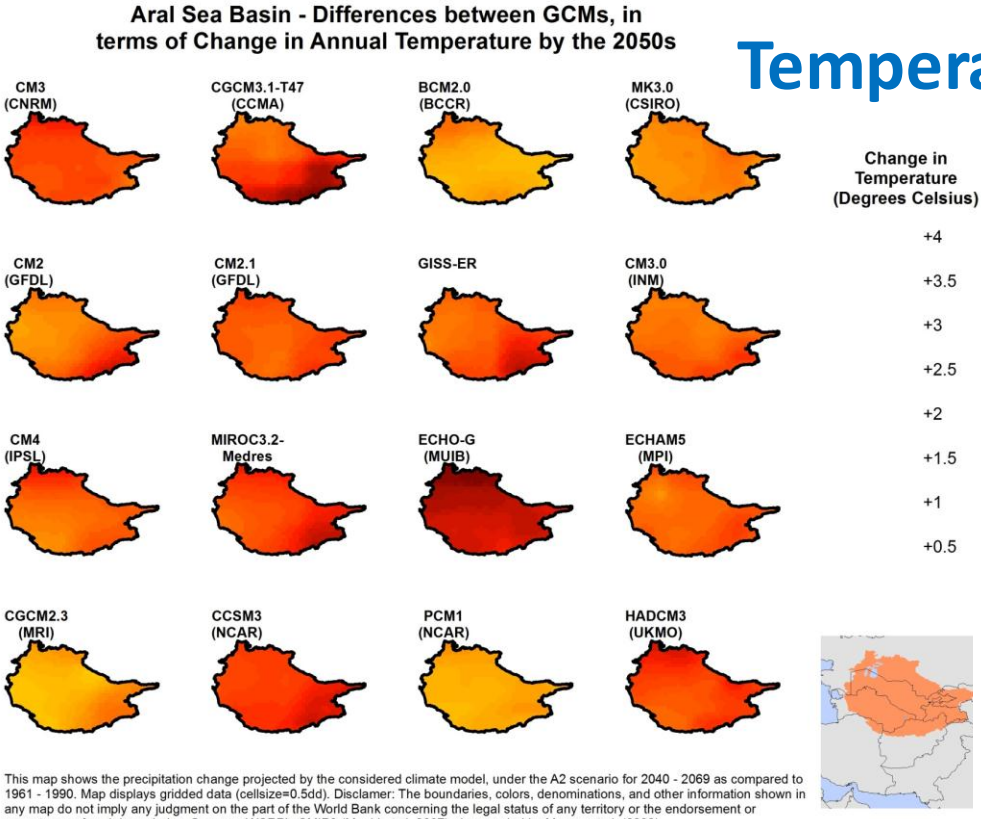
% Irrigated Area

Glacier, Ice Cap, Ice Field, Ice Shelf, Continental Ice Sheet

Glaciers

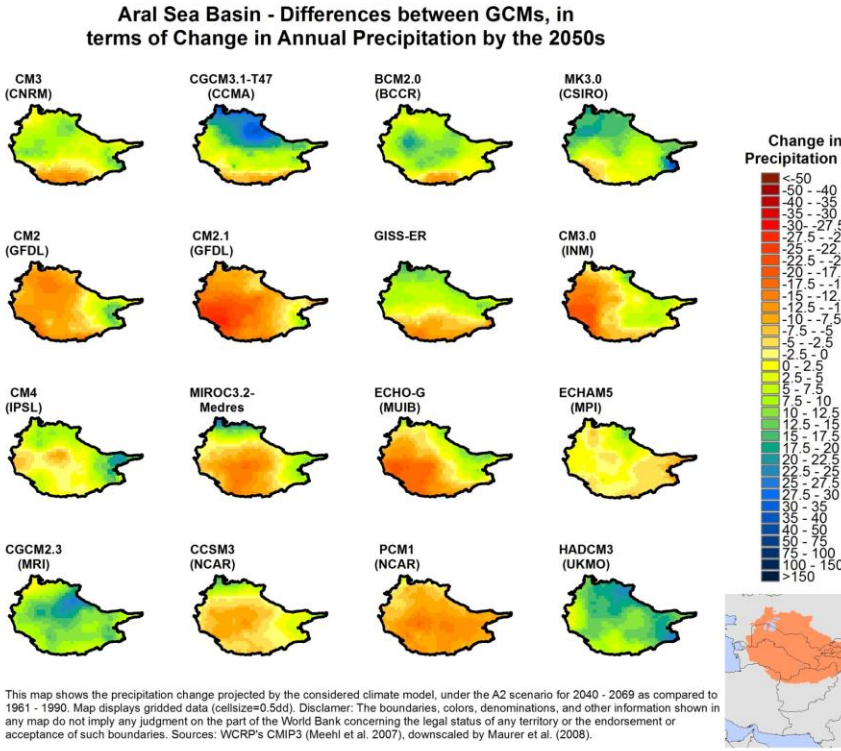
Spatial Comparisons (e.g. Climate Change Models)

Temperature



This map shows the precipitation change projected by the considered climate model, under the A2 scenario for 2040 - 2069 as compared to 1961 - 1990. Map displays gridded data (cellsize=0.5dd). Disclamer: The boundaries, colors, denominations, and other information shown in any map do not imply any judgment on the part of the World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries. Sources: WCRP's CMIP3 (Meehl et al. 2007), downscaled by Maurer et al. (2008).

Precipitation



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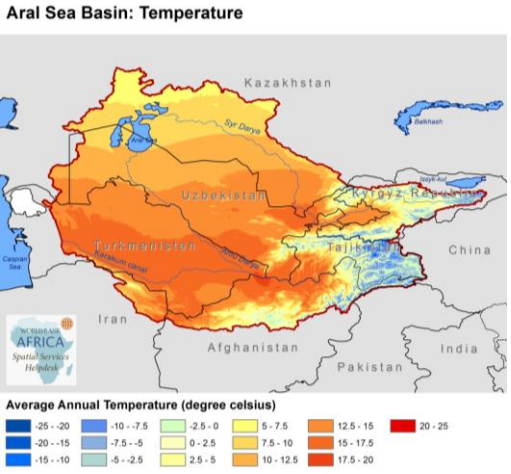
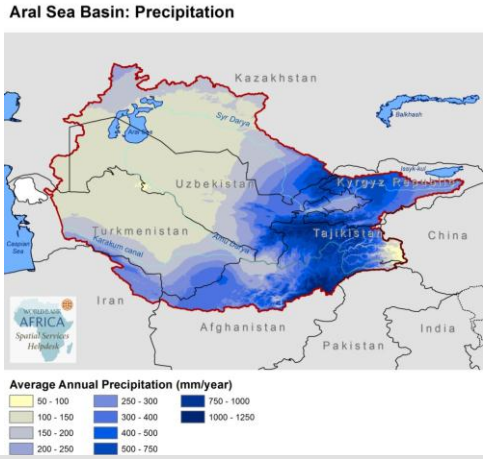
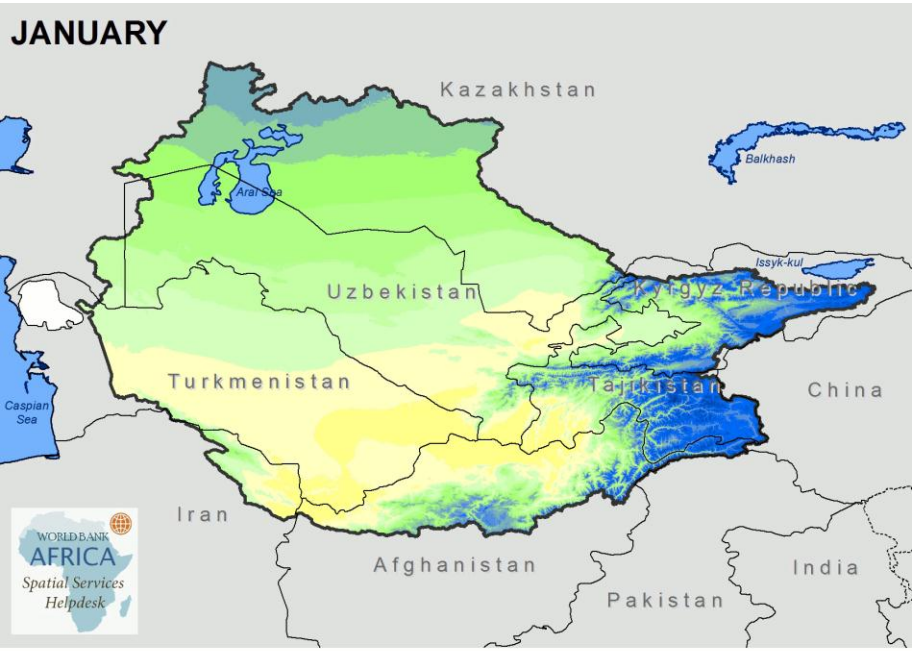
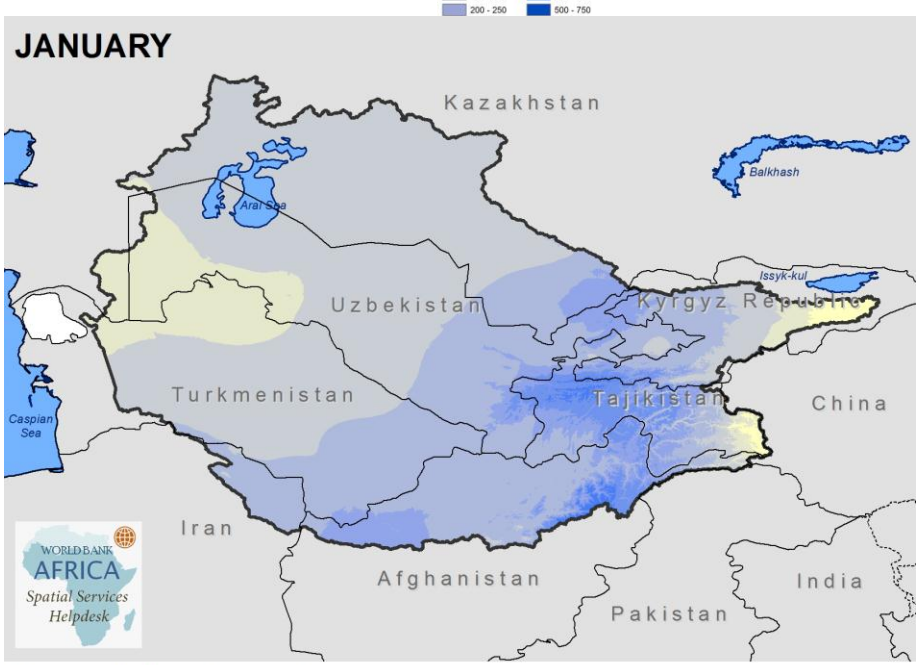
Illustrative Visualizations

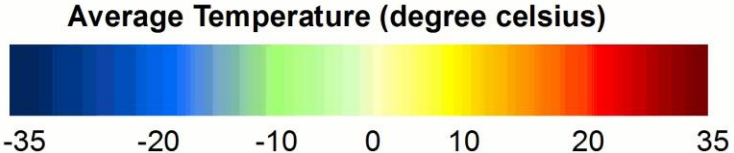
Animations

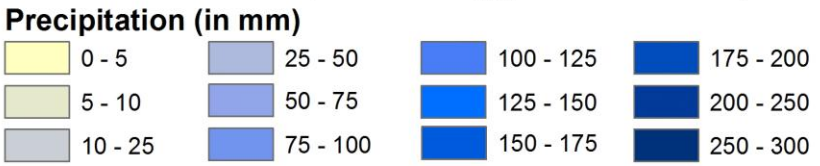






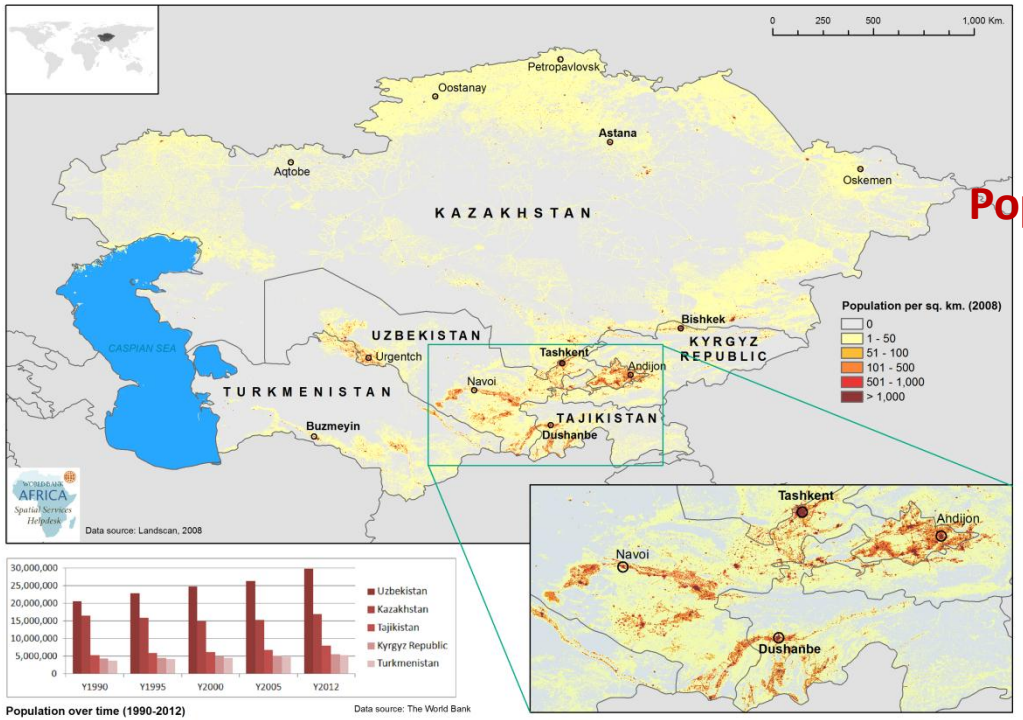






Illustrative Visualization

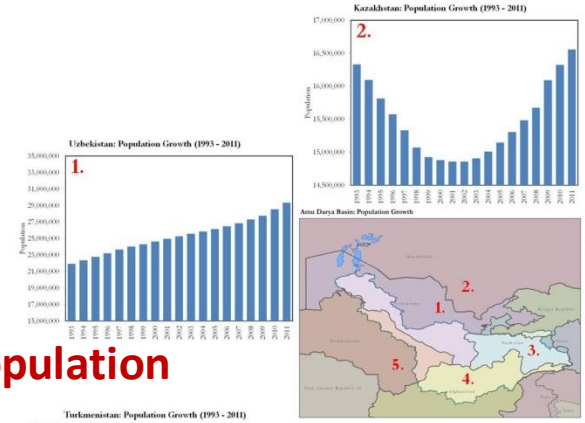
Combining Graphics



Population over time (1990-2012)

Data source: The World Bank

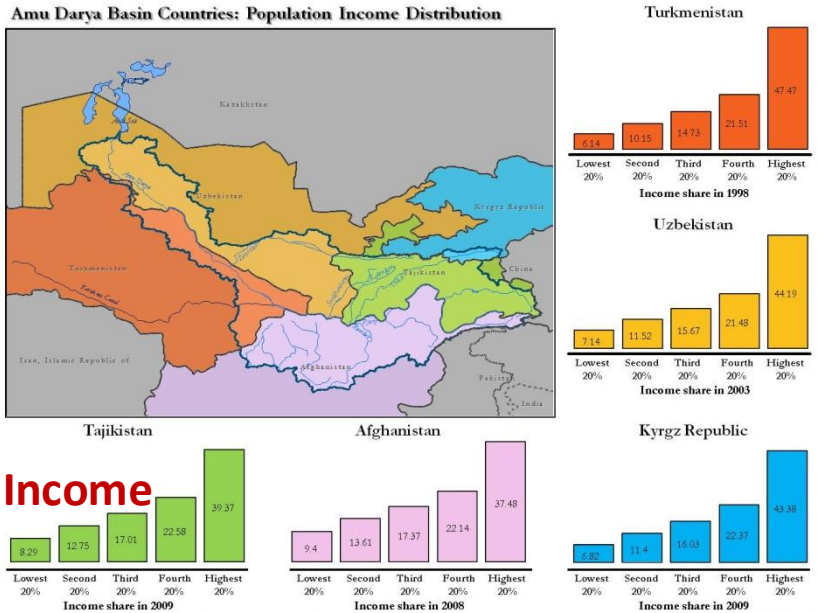
Population



Data Source: World Bank - World Development Indicators

Developed by The World Bank

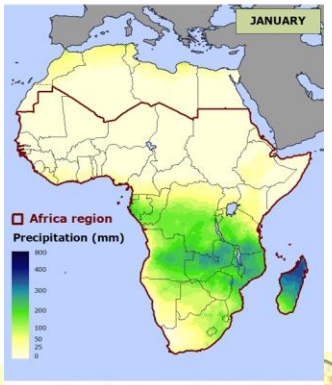
Income

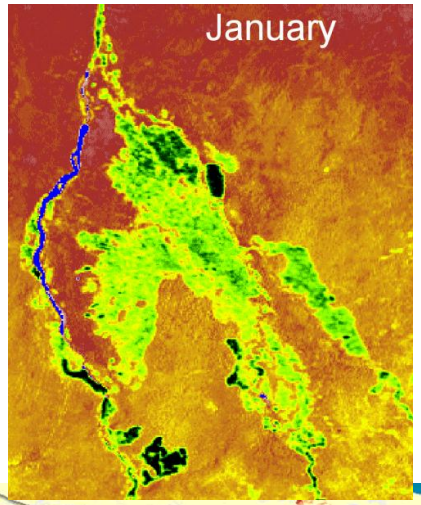


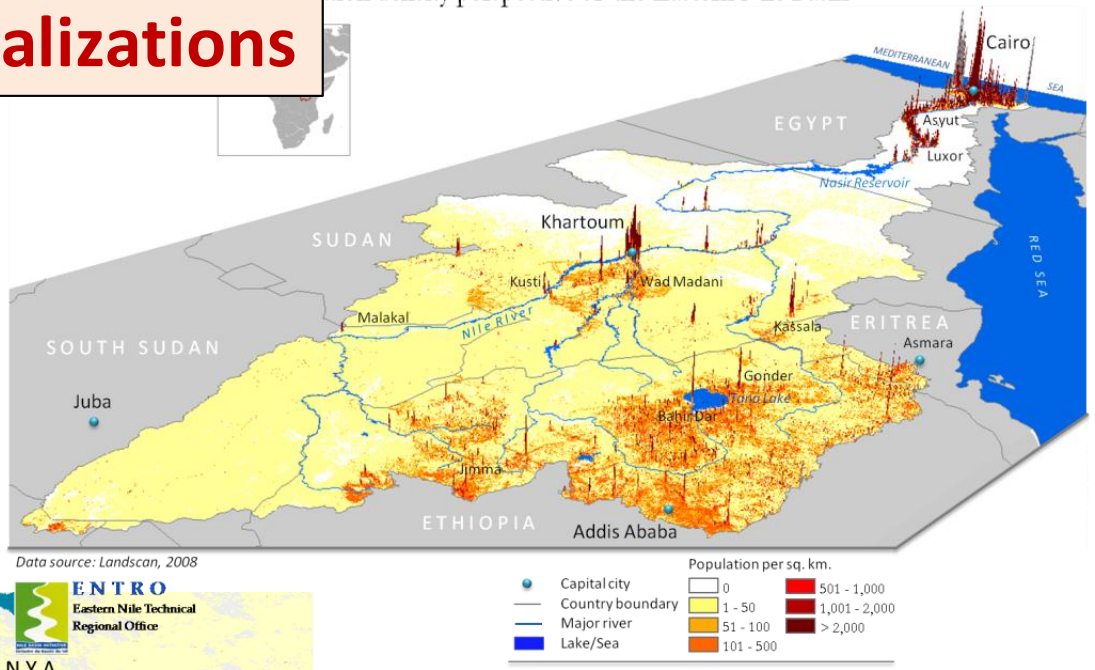
Data Source: World Bank, 2012. World Development Indicators Database

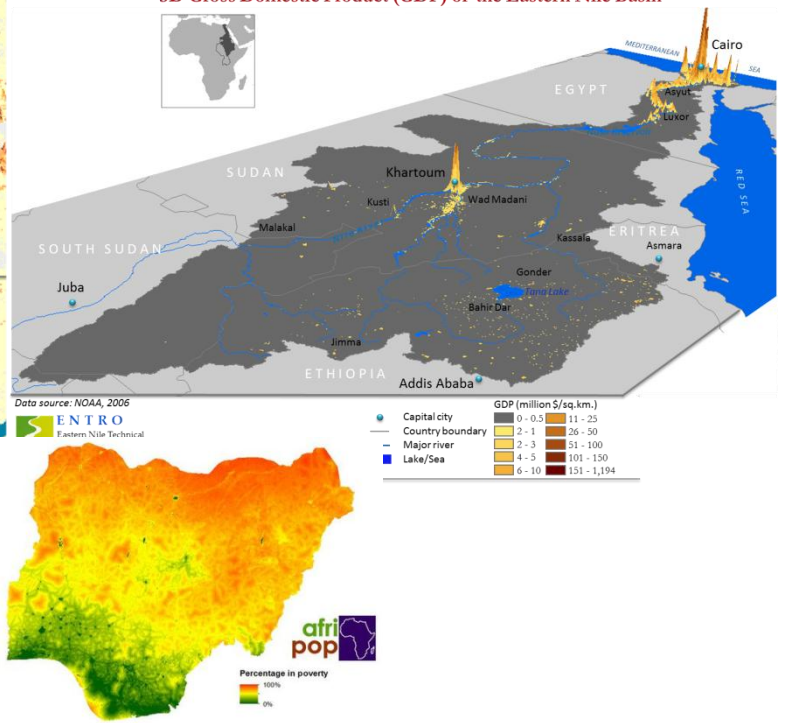
Developed by The World Bank

New Types of Data & Visualizations



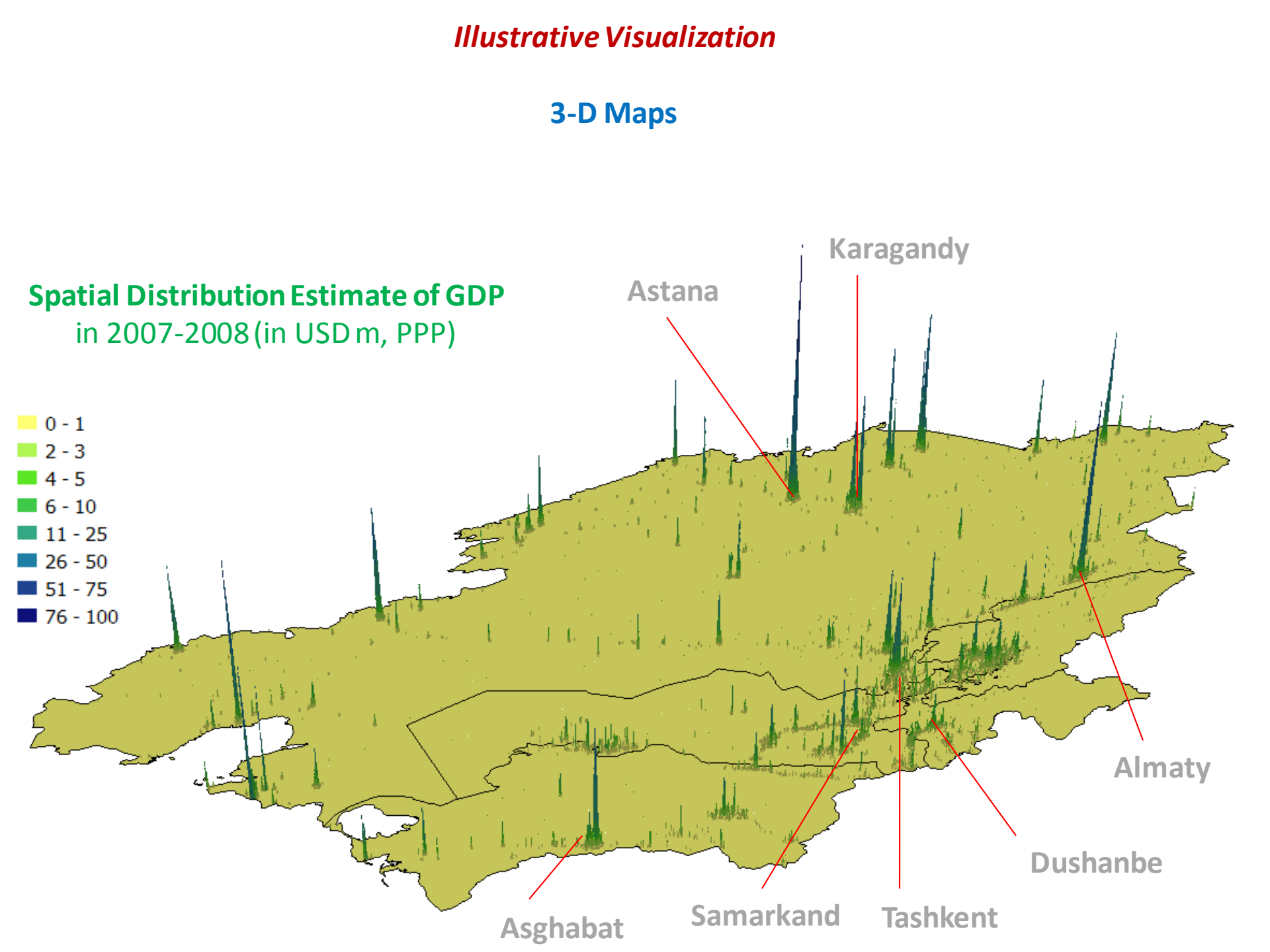


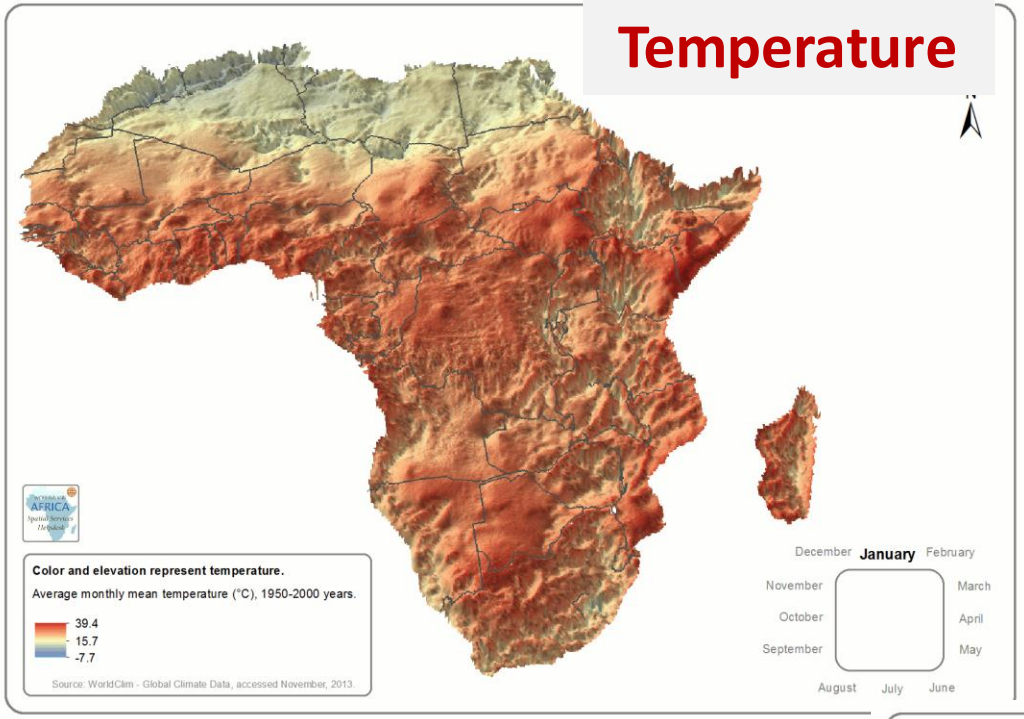




Illustrative Visualization

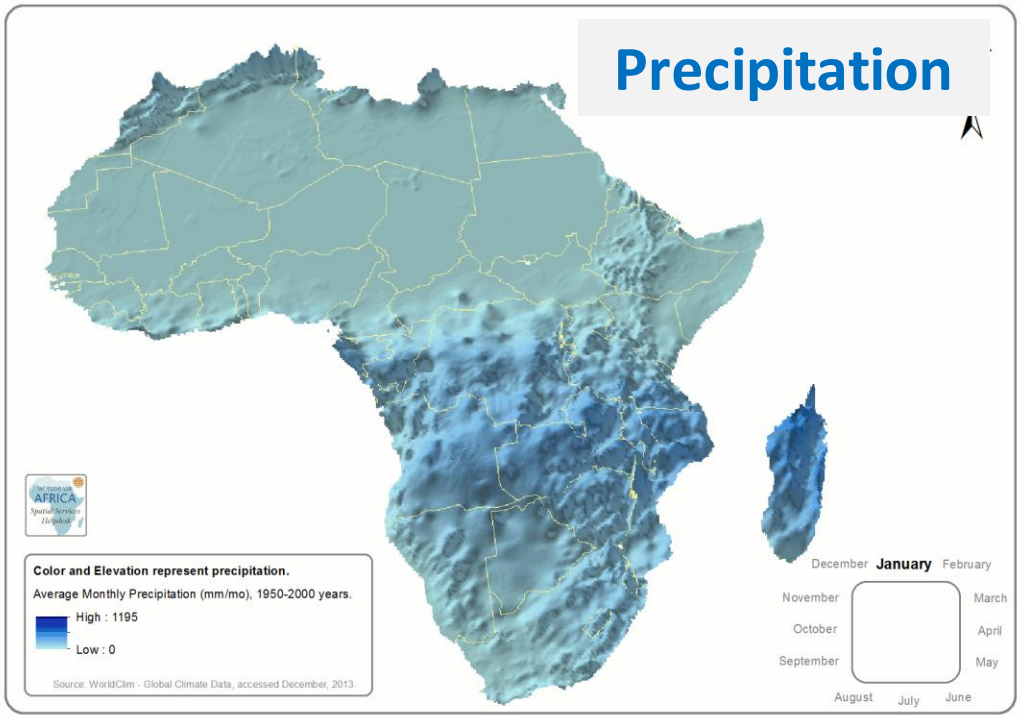
3-D Maps





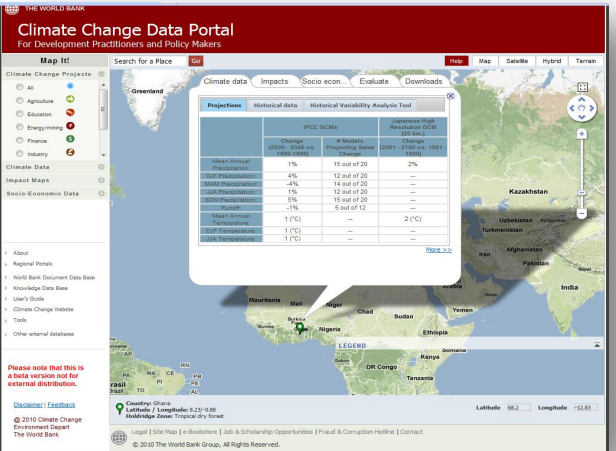
Illustrative Visualization

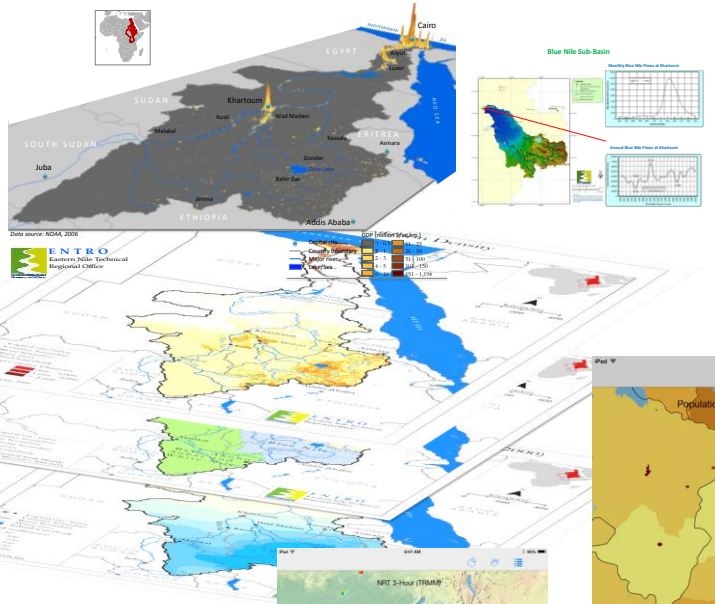
4-D Maps?
(Animated 3D Maps)

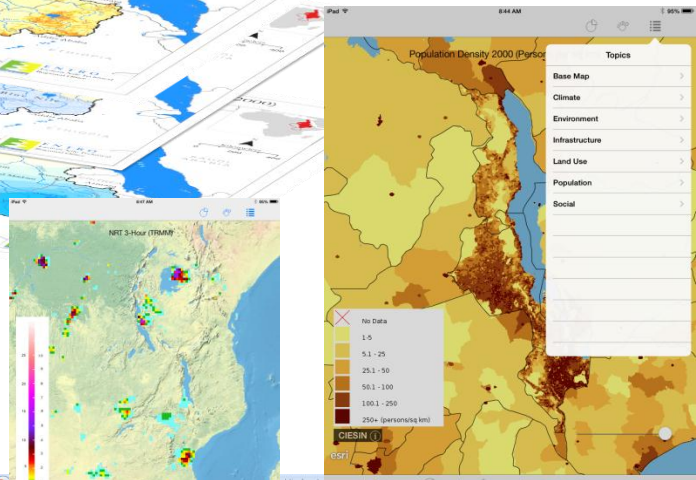


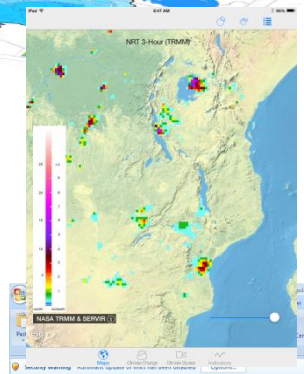
Packaging Data into Knowledge Products

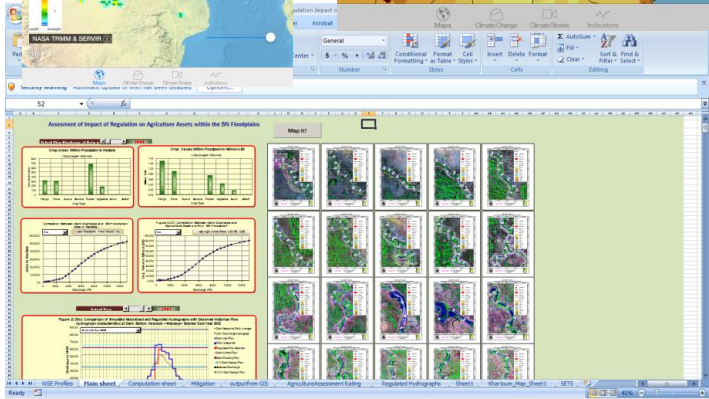
- Public Domain Datasets/Products
- Hardcopy and Interactive Atlases
- State of the Basin Reports
- Interactive Collaborative Portal/Website
- Mobile “Apps”
- Bulletins/Newsletters
- …





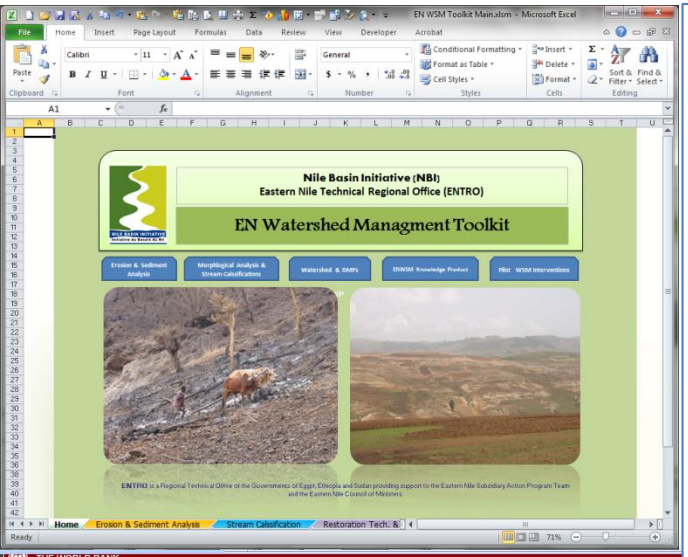


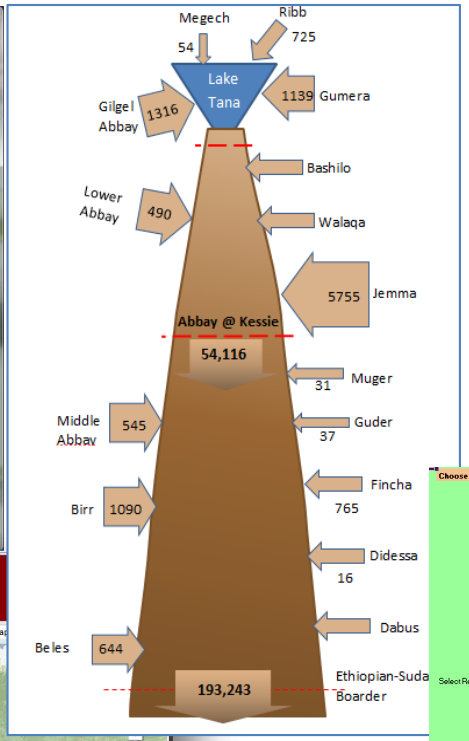


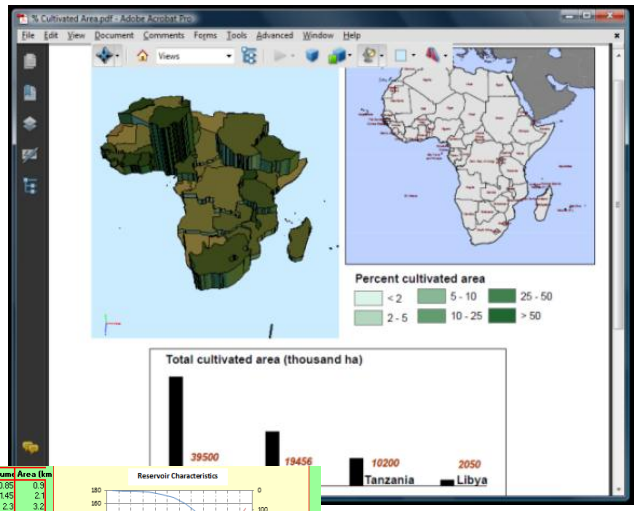


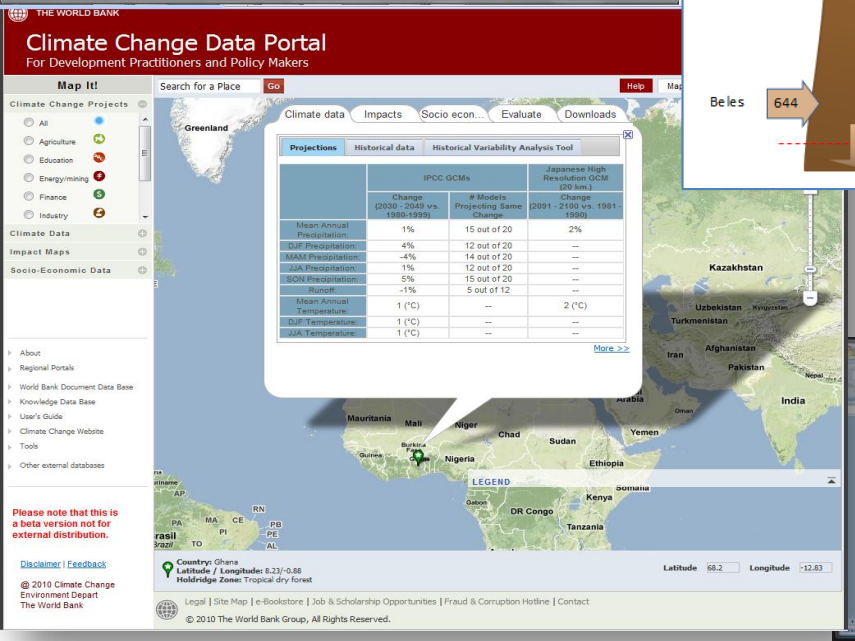
Interactive Products

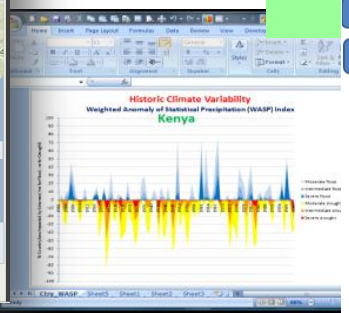
Interactive Portals & Toolkits

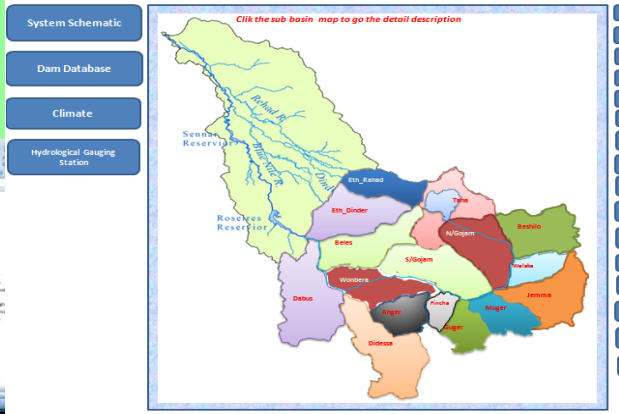












Cover Management

Soil Erodibility

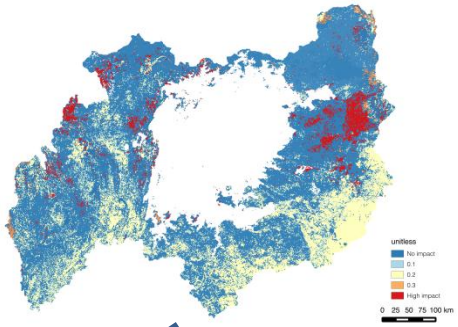
$$K = \left[2.1M^{1.14}\left(10^{-4}\right)(12 - OM) + 3.25(s-2) + 2.5(p-3)\right]/7.59$$

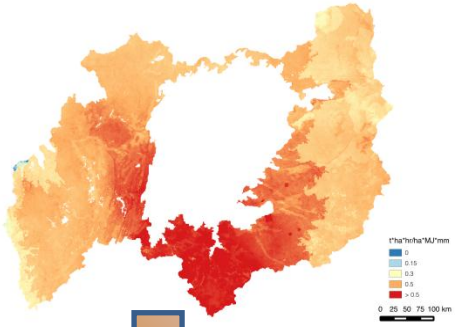
Slope Length/Steepness

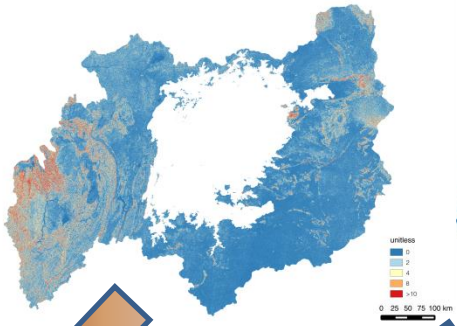
$$STCI = (m+1)\left[\frac{A_s}{22.13}\right]^m \left[\frac{\sin\beta}{0.0896}\right]$$

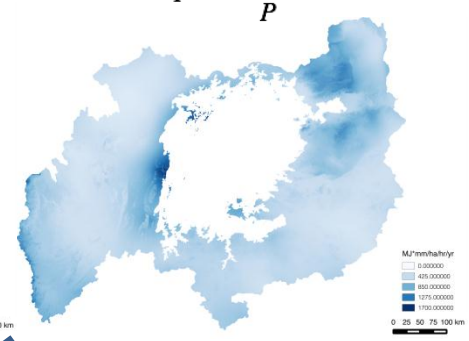
Rainfall-Runoff

$$F = \frac{\sum_{k=1}^{12}(p_i^2}{P}$$



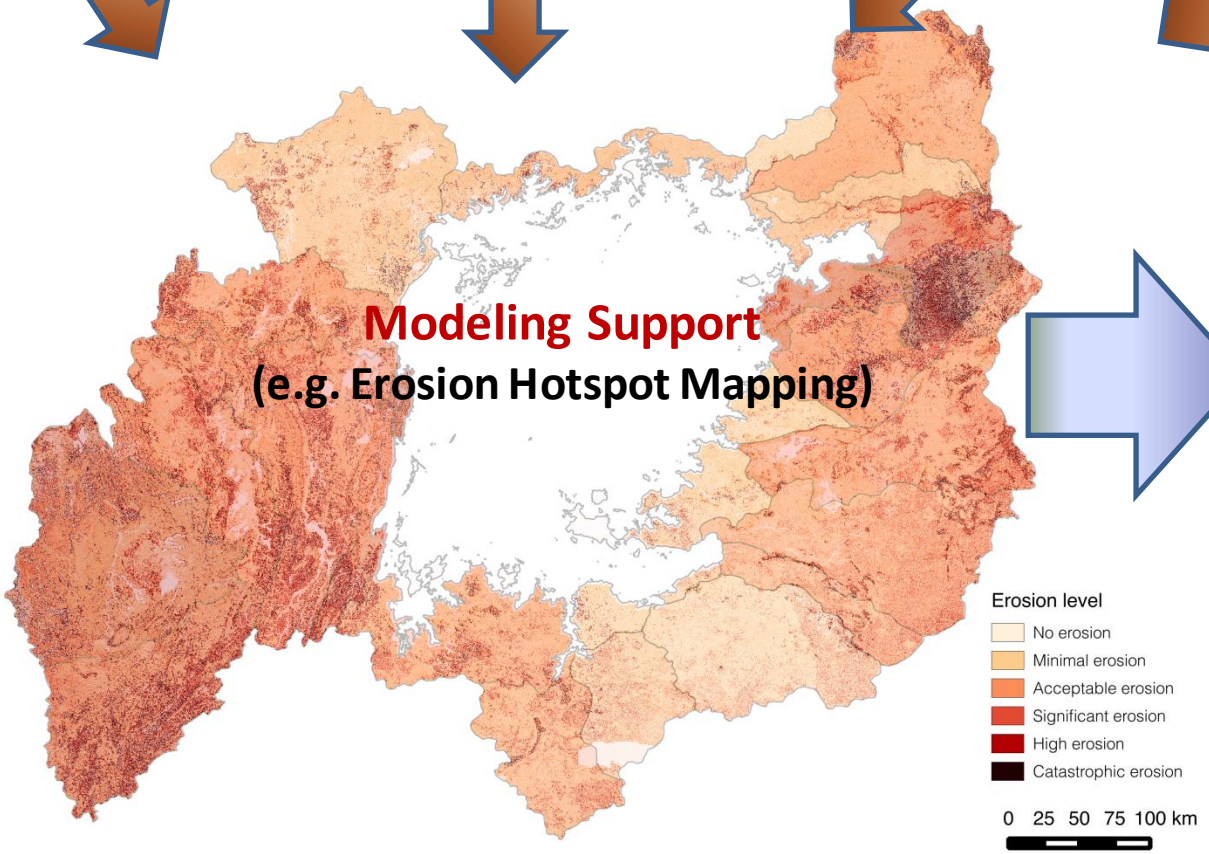


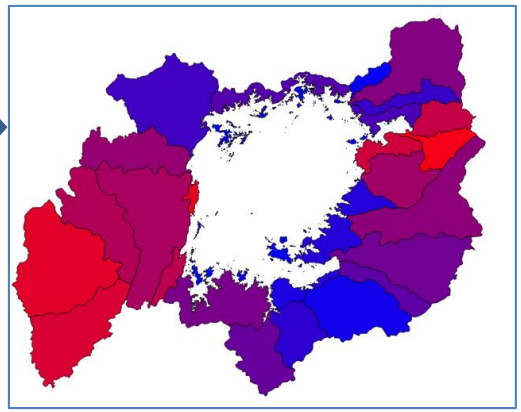




Modeling Support

(e.g. Erosion Hotspot Mapping)



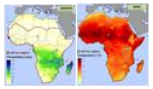


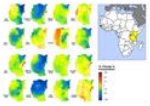
Soil Erosion estimates at watershed level

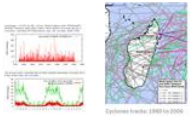
There are many new types of public-domain datasets to improve landscape monitoring services…

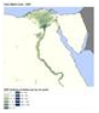
Global Spatial Datasets

Irrigated, Rainfed Areas (IWMI, FAO)

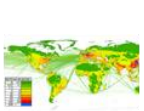
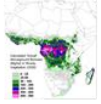

Historical Climate (CRU/UEA)


Climate Change (IPCC, TNC/WB)


Climate/Flow data (KNMI, GRDC, …)


Gridded GDP (Yale, NOAA)

DEM (SRTM, ASTER)

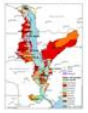


CO2 emissions (EDGAR-JRC-PBL, …)
C Biomass (Winrock)

Biodiversity (CI, WWF, IUCN…)

Flood/Drought (DFO, GDACS. UNEP…)

Landcover (ESA, USGS, …)

Population (CIESIN, Landscan, …)

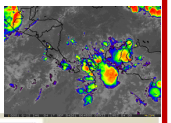

Soils (UNESCO, FAO, …)

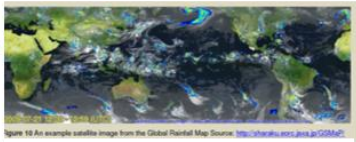
Near Real-Time "Top-down" Datasets

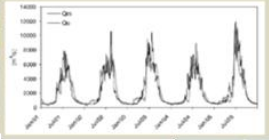
"Top-down" Approaches

"Space-based Rain Gauge" e.g. TRMM

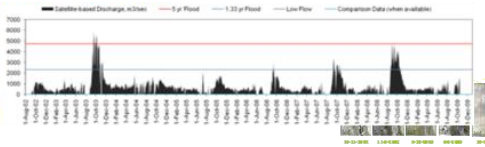
Weather Products



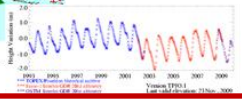




"Space-based Stream Gauge" e.g. AMSR

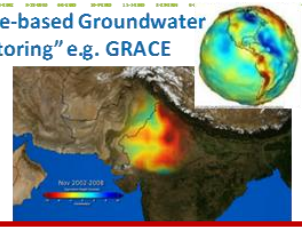


"Space-based Reservoir Levels" e.g. TOPEX/JASON1&2/ENVISAT



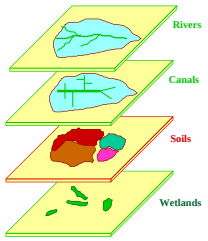
+ Snowcover, Glaciers, Soil Moisture, Temperature, Evapo-transporation, Landcover, and much more…

"Space-based Groundwater monitoring" e.g. GRACE



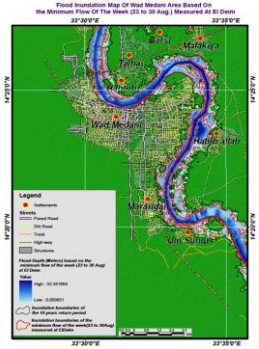
…and many modern “Bottom-up” Monitoring tools

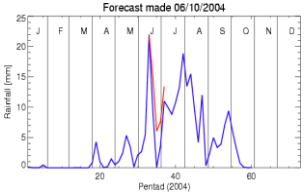
...that can be integrated into an integrated Hydromet Services System (usable at regional **and** national levels)



GIS and other datasets

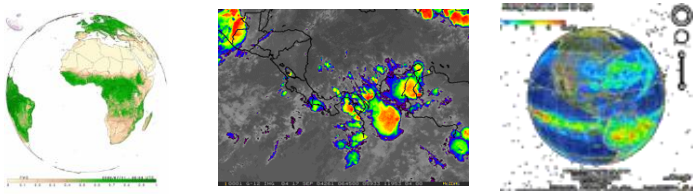
Data Rescue





Data Management & Modeling
(for weather, hydrological, inundation & other forecasts – short-term and seasonal)

"Top-Down" Data Acquisition System



Satellite Earth Observation

Earth observation data access via suitable mechanisms (e.g. Internet, GeoNetCast)

Interaction with other Knowledge Base and Analytical Systems

Data Repositories

to store and serve both raw feed and processed data (on Cloud Platform)

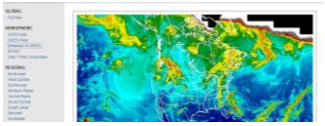
Dissemination Platforms

Crowd-sourced / Community Surveillance Data

Telemetry

Manual Monitoring **Automated Monitoring** **Radars**

"Bottom-up" Data Acquisition System



Web Portals
(e.g. integrated hydromet visualization platforms)

Stakeholder Alerts

Operational Control Rooms

Capacity-Building and Outreach

Internships

University Partnerships

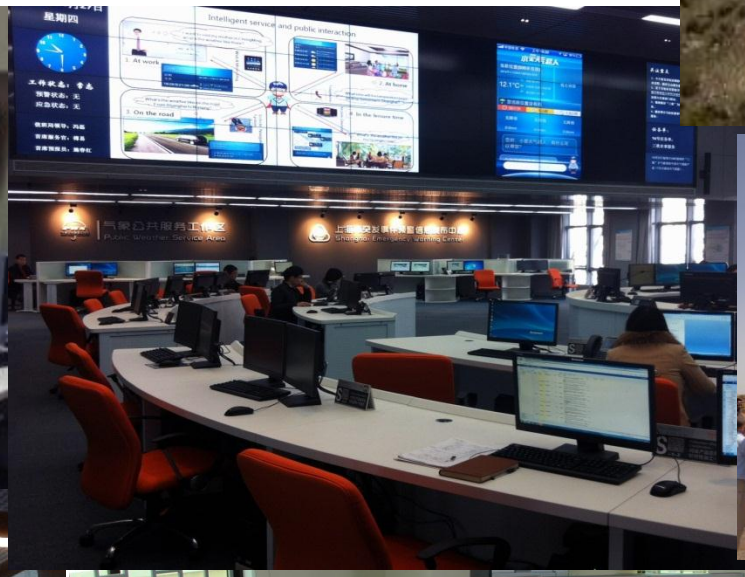
Training & Workshops

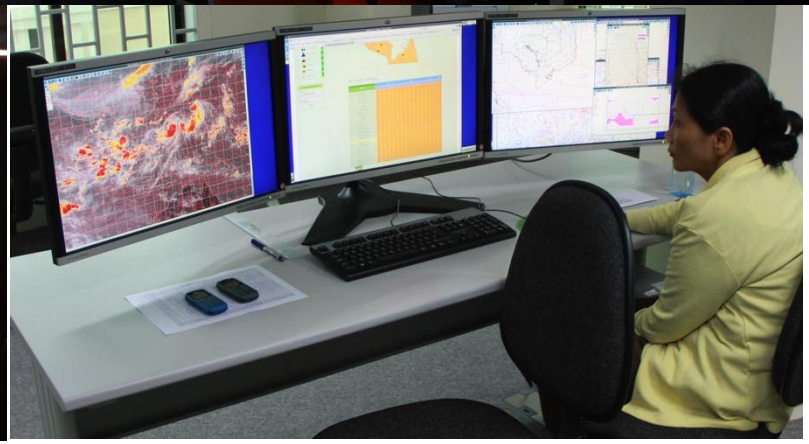
Competitions (e.g. Hackathons, Apps)

Distance Learning

Modernizing Information Infrastructure learning from Global Experiences

Can we use a Climate Platform to work together to improve public-domain information and modernize institutions through improved information-based decision support?

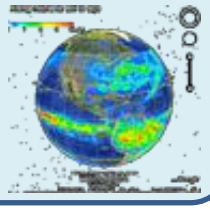




Data Access and Visualization
An Exciting New World Ahead!

Earth Observation Data

(e.g. mostly global data and knowledge products on weather, land cover, floods, discharge, groundwater, etc. from NASA, ESA, NOAA, Regional and National Space Agencies, etc.)

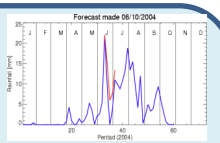


Integrated Mobile App/Portal

Datasets from Regional and Local Institutions

(e.g. information on measured or computed detailed datasets on weather, flows, agriculture, generation, etc. from regional institutions, ministries, Universities, NGOs, private sector, etc.)

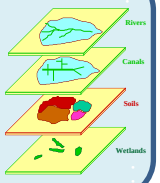
Other Datasets

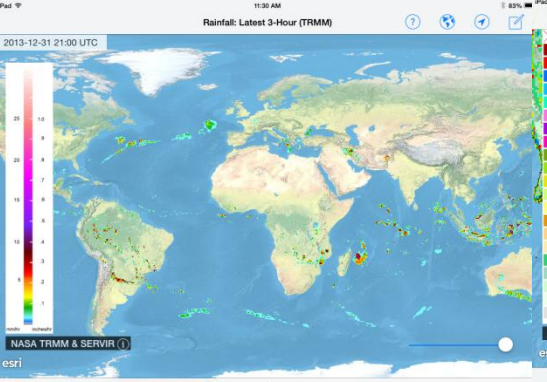


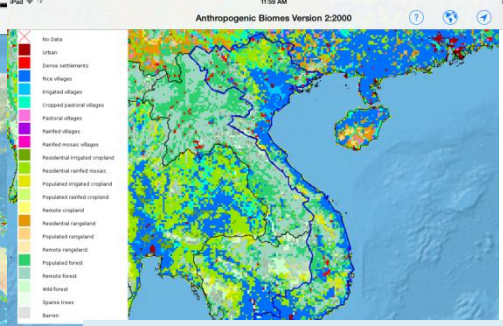
(e.g. from publications, model outputs, data rescue of legacy paper data, crowd-sourcing, research, surveys, etc.)

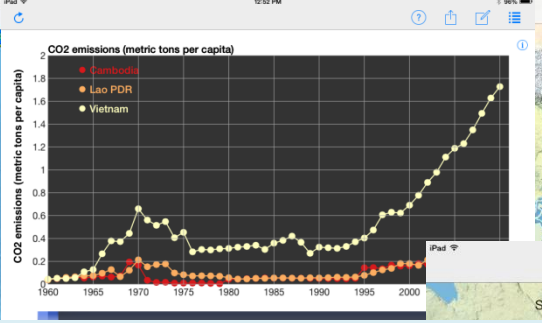
Global Spatial Datasets

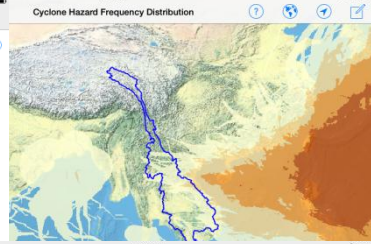
(e.g. topography, historical climate, hydrology, climate change projections, land cover, snow, population, administrative areas, gridded GDP, and a range of other social, environmental, and economic indicators)



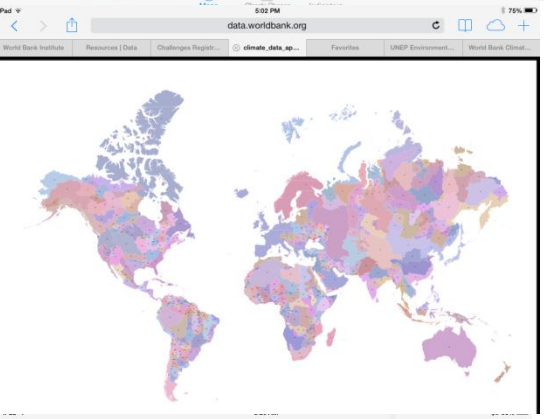


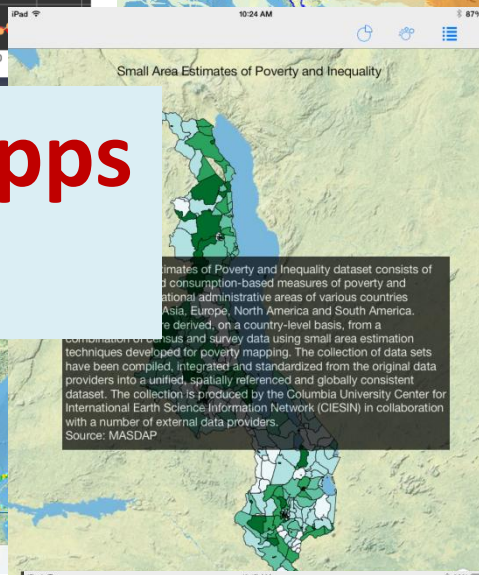


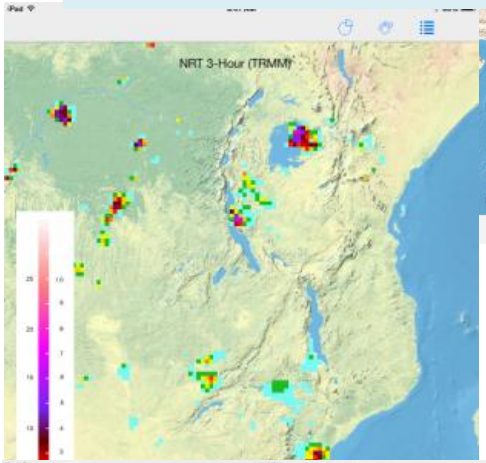


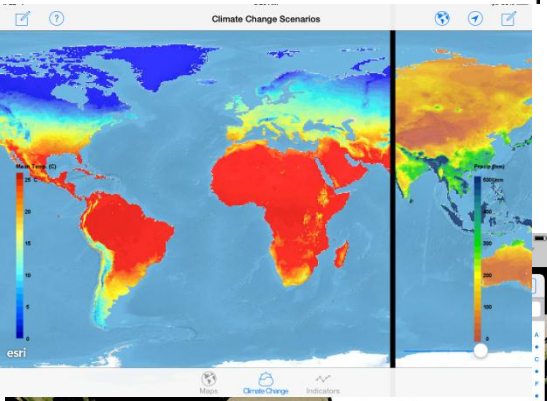


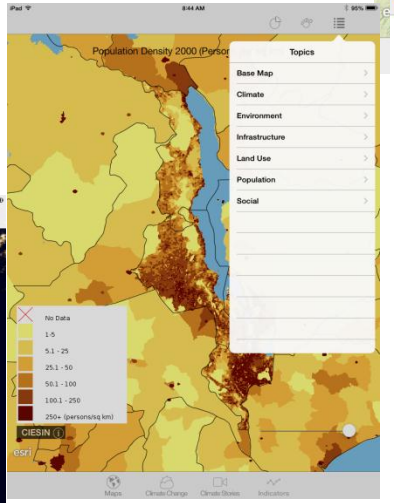
Innovative Mobile Apps
e.g. “Spatial Agent”

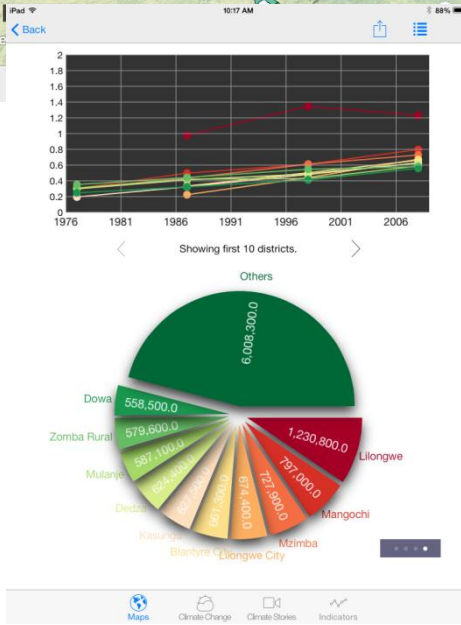


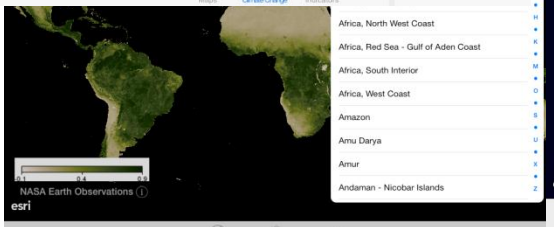












Thanks!

For more information, pls. contact:

Dr. Nagaraja Rao Harshadeep
Senior Environmental Specialist
The World Bank
1818 H St NW, Washington DC 20433
harsh@worldbank.org