

WGCV-35

Hyderabad, India



World Soil Information

H.I. Reuter & ISRIC colleagues

Capture and Capitalize



Soil maps



Soil samples
Soil data and information



Reports, literature



World Soil Information

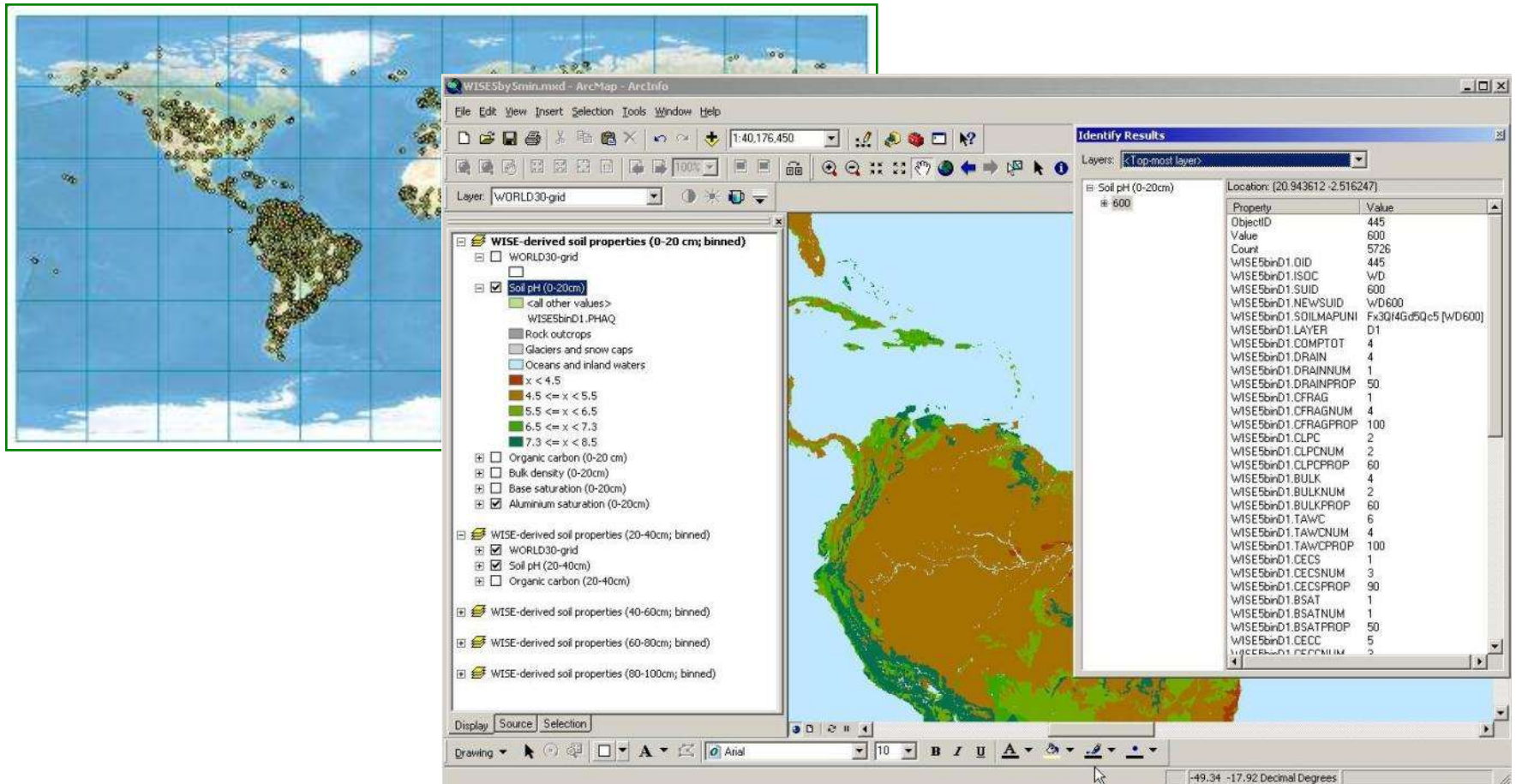
Slide Credit: A.Hartemink

ISRICs - Objectives

1. collect, maintain and develop quality-assessed soil data
2. make soil data freely available
3. maintain and develop a global collection of reference soil monoliths with samples
4. exhibit soil information in the World Soil Museum
5. use soil and auxiliary data for studies on global and topical issues
6. inform global conventions, general public and decision makers with science-based soil information
7. strengthen collaboration with (inter)national institutions



WISE Database



Slide credit: N.Batjes, 2011



World Soil Information

Batjes NH 2009. Harmonized soil profile data for applications at global and continental scales: updates to the WISE database. *Soil Use and Management* 25, 124-127 (<http://dx.doi.org/10.1111/j.1475-2743.2009.00202.x>)

Distributed System (data communication/exchange)

Soil Data Provider B

Product A: WFS, WMS, metadata

Product B: WMS, metadata

Soil Data Provider A

Product A: WMS, metadata

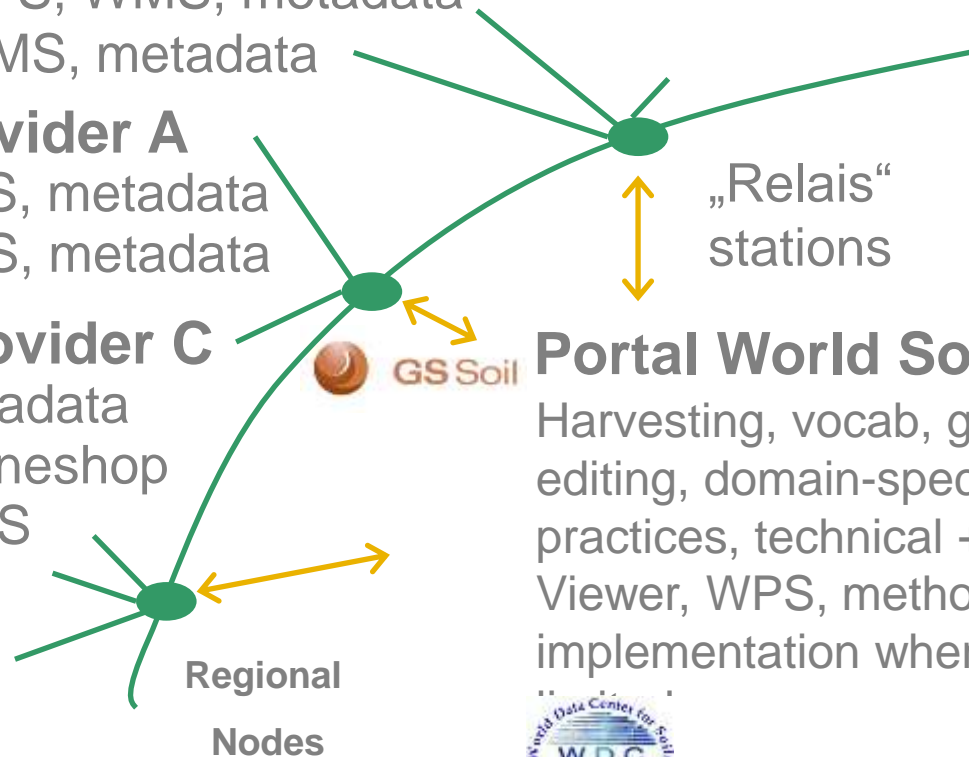
Product B: WMS, metadata

Soil Data Provider C

Product A: metadata

Product B: onlineshop

Product B: WPS



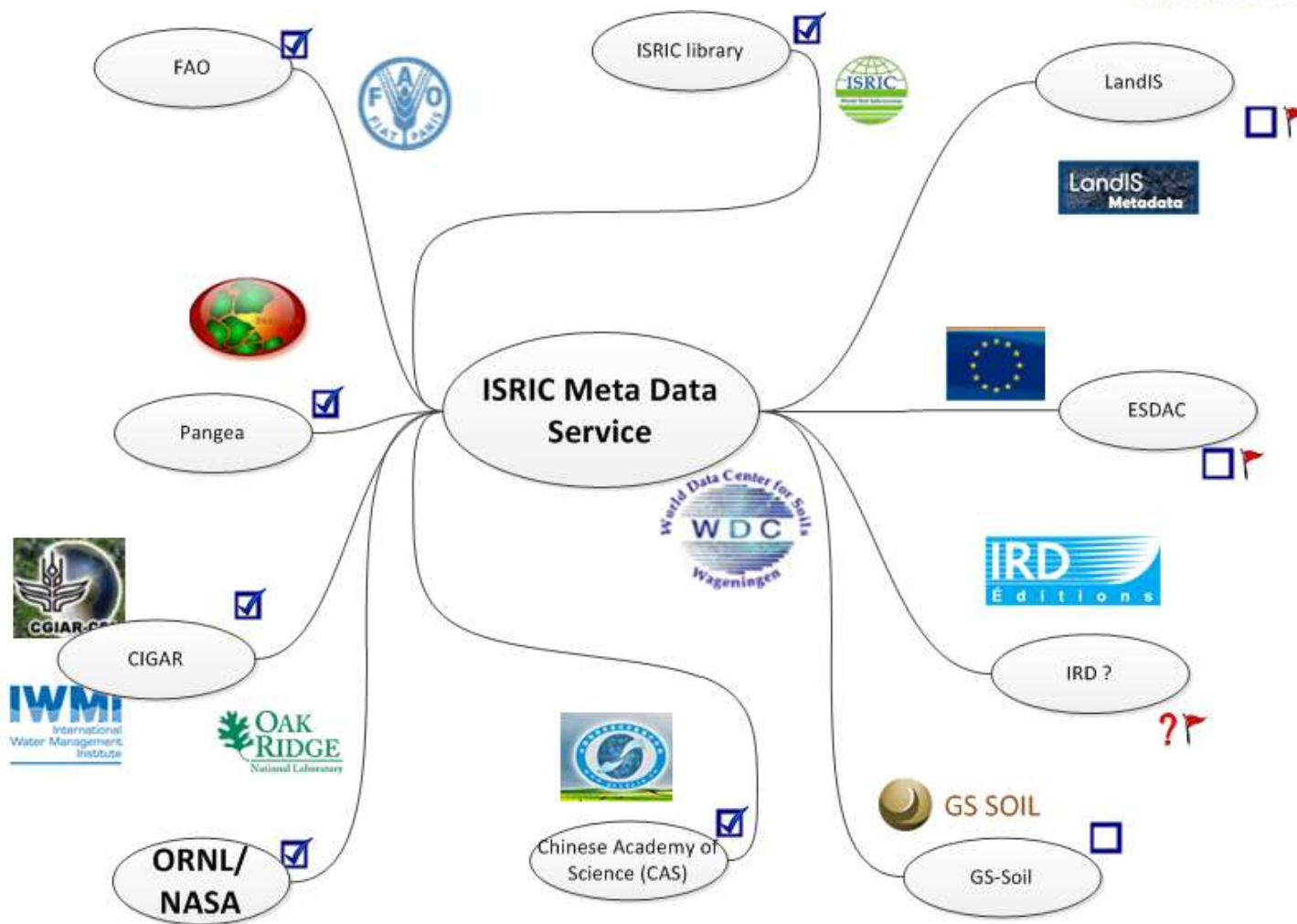
Portal World Soil Data Centre

Harvesting, vocab, guidance, metadata editing, domain-specific services (best practices, technical + semantic support), Viewer, WPS, methodologies, implementation where resources are



World Soil Information

Global MetaData Harvesting



Why now WGCV ?



World Soil Information



Applying GeoSpatial Science
for a Sustainable Future...

CGIAR-CSI SRTM 90m DEM Digital Elevation Database - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://srtm.csi.cgiar.org/Index.asp

The CGIAR Consortium for Spatial Information (CGIAR-CSI)

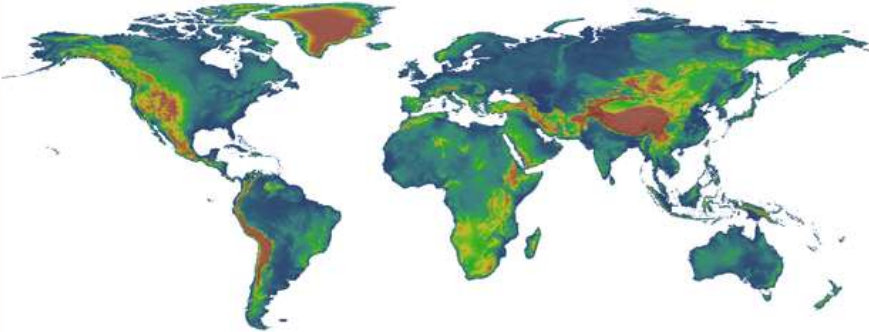
Applying GeoSpatial Science
for a Sustainable Future...

■ CGIAR-CSI HOME ■ SRTM 90m DATABASE HOME ■ DISCLAIMER ■ HELP

SRTM Content

- SRTM 90m Database
- About SRTM Imagery
- SRTM Data Processing Methodology
- How to Search for Data?
- **SRTM Data Search and Download**
- SRTM Quality Assessment
- CIAT Landuse Project
- Disclaimer
- Contact Us

SRTM 90m Digital Elevation Data



Processed SRTM 90m Digital Elevation Data (DEM) for the Entire Globe Now Available Online:

UPDATE: VERSION 2 NOW ONLINE. THIS VERSION NOW INCLUDES ALL AREAS OF THE WORLD, INCLUDING AUSTRALASIA AND SMALL ISLANDS THAT WERE NOT PREVIOUSLY AVAILABLE. THE DATASET IS ALSO INTERPOLATED USING IMPROVED INTERPOLATION METHODS, AND HAS BEEN CLIPPED AROUND SHORELINES.

The CGIAR-CSI GeoPortal is able to provide SRTM 90m Digital Elevation Data for the entire world. The SRTM digital elevation data, produced by NASA originally, is a major breakthrough in digital mapping of the world, and provides a major advance in the accessibility of high quality elevation data for large portions of the tropics and other areas of the developing world. The SRTM digital elevation data provided on this site has been processed to fill data voids, and to facilitate its ease of use by a wide group of potential users. This data is provided in an effort to promote the use of geospatial science and applications for sustainable development and resource conservation in the developing world. Digital elevation models (DEM) for the entire globe, covering all of the countries of the world, are available for download on this site. The SRTM 90m DEM's have a resolution of 90m at the equator, and are provided in mosaiced 5 deg x 5 deg tiles for easy download and use. All are produced from a seamless dataset to allow easy mosaicing. These are available in both ArcInfo ASCII and GeoTiff format to facilitate their ease of use in a variety of image processing and GIS applications. Data can be downloaded using a browser or accessed directly

Done

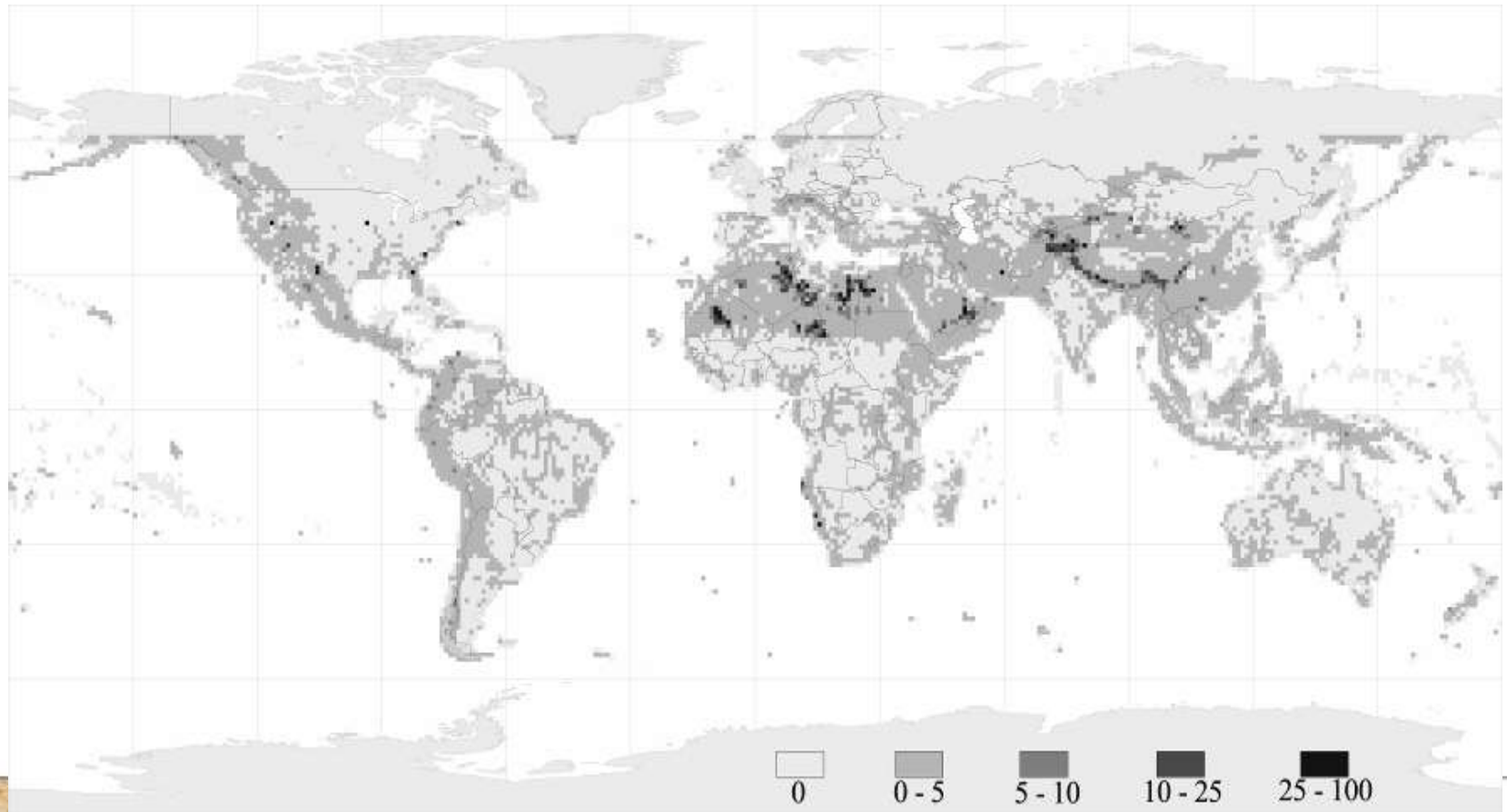
0 error / 19 warnings

AdBlock

Swansea, United Kingdom Mostly Cloudy 15° C / 15° C 83% 0 cm

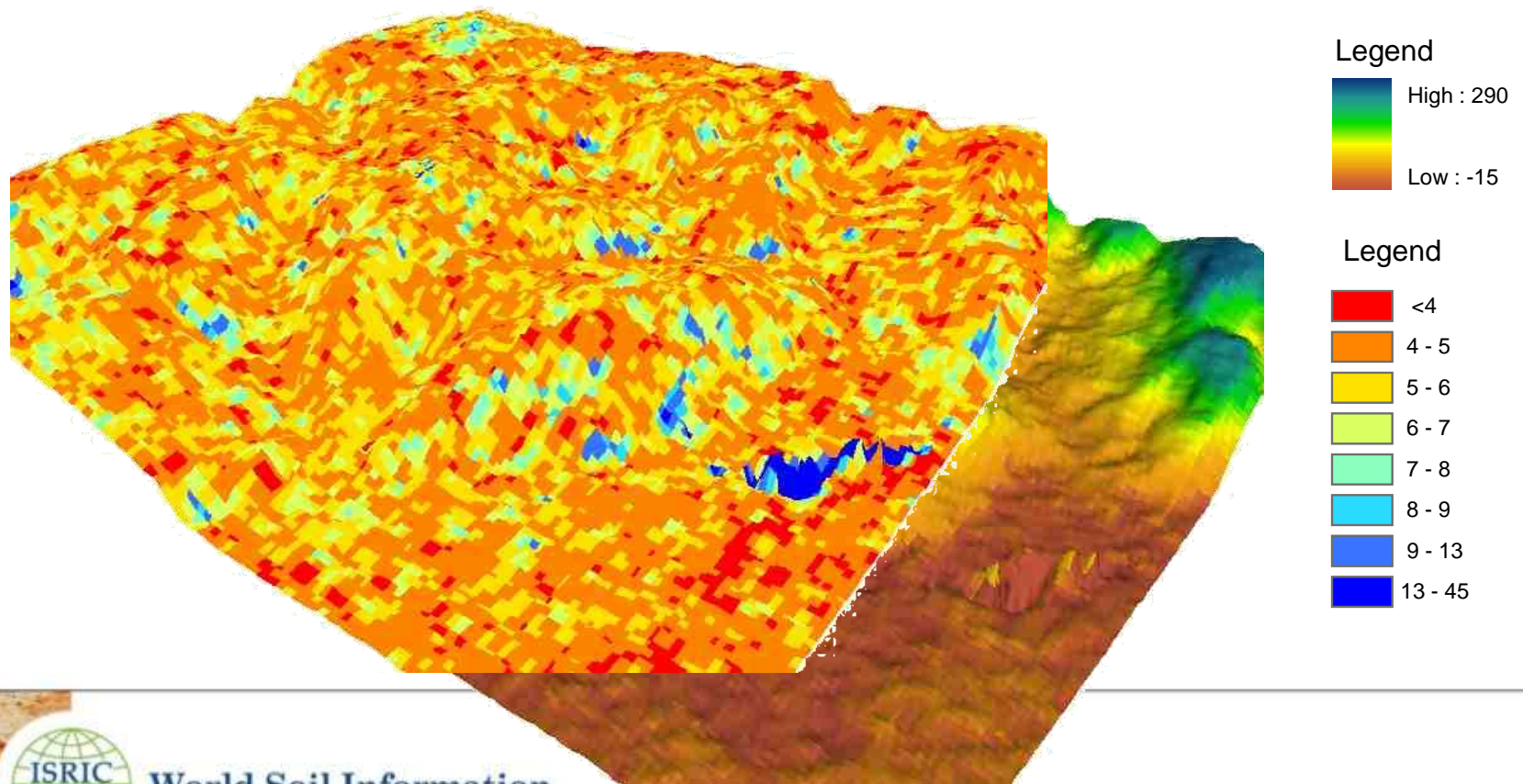
Thu 20° C 29%

Voids in SRTM

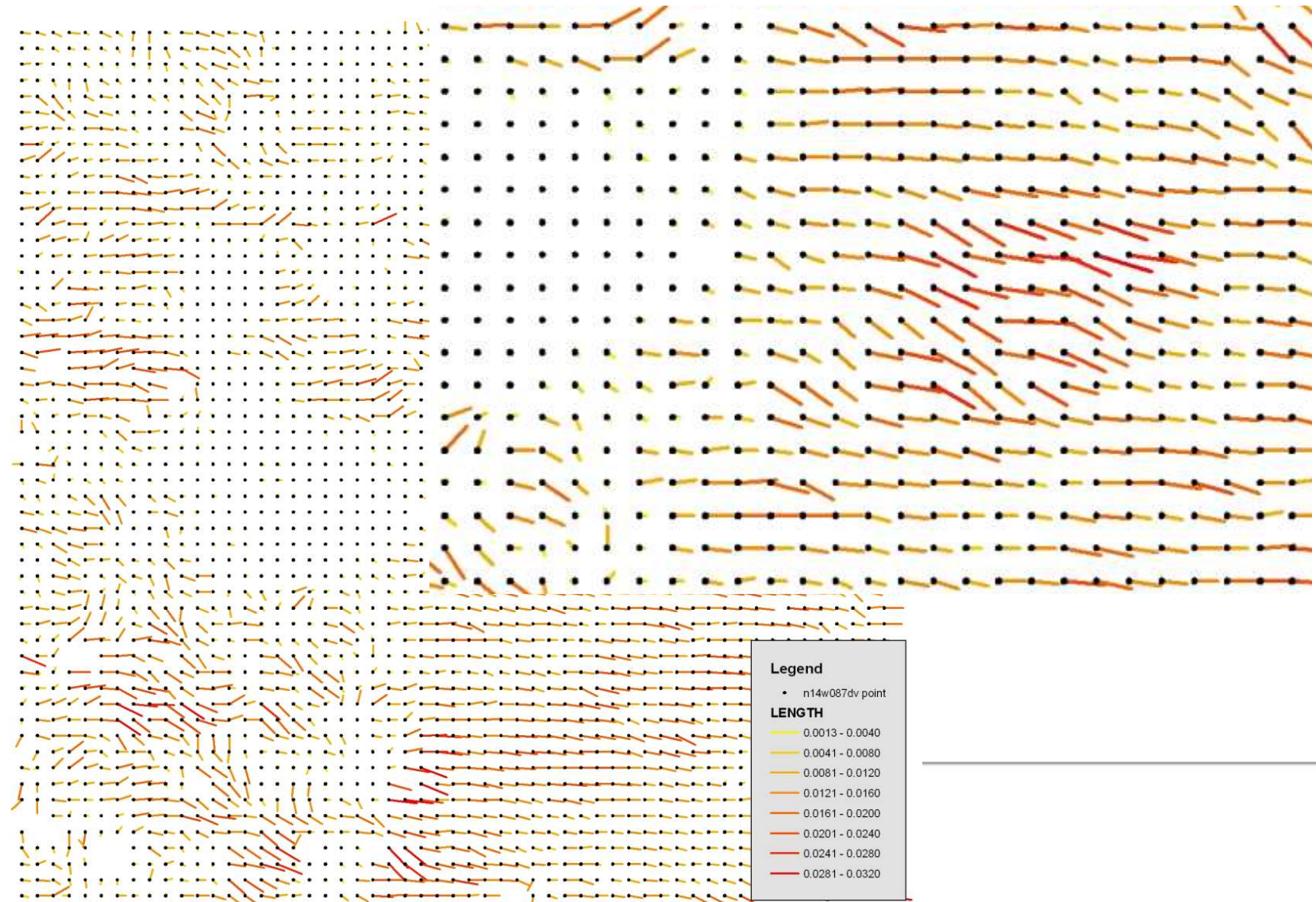


World Soil Information

XSAR - Elevation error height map



Horizontal accuracy



Why now WGCV ?

Global Soil Information Facilities (GSIF)



World Soil Information

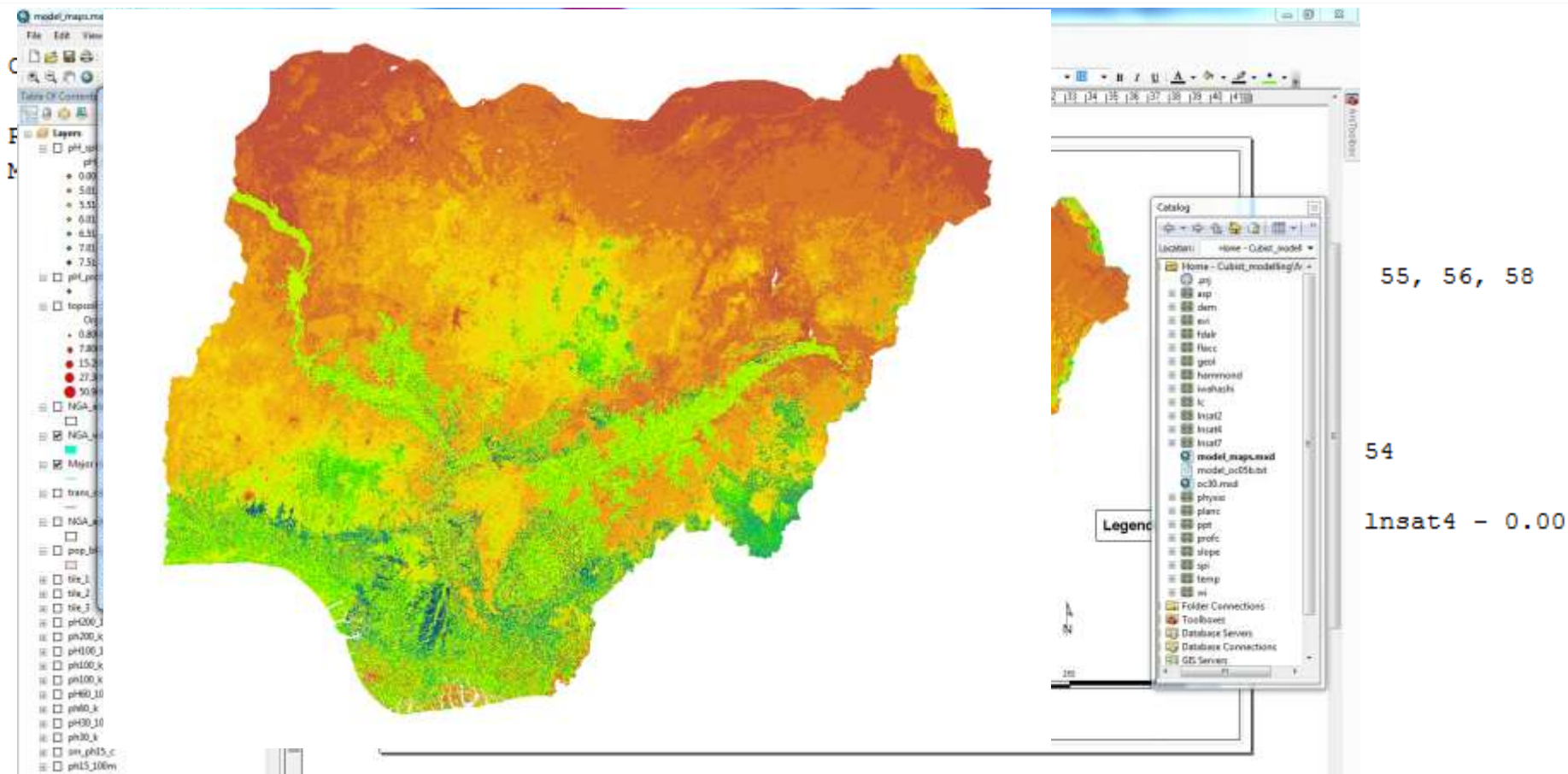
Objective:

- GSIF (Global Soil Information Facilities) is ISRIC's framework for production of open soil data.
- The main practical reason for GSIF is to build cyber-infrastructure to collate legacy (i.e., historic) soil data currently under threat of being lost forever.



Facilitating Soil Map Production - DSM

any arbitrary soil map production process - which uses auxiliary information

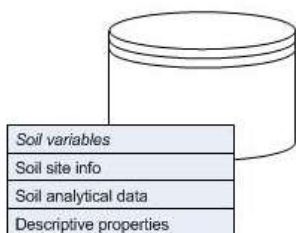


World Soil Information

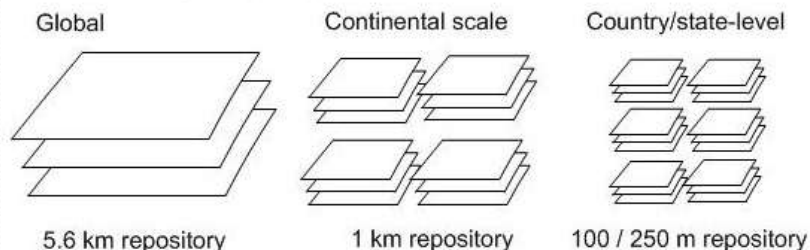
SC:Reuter, Lennars, Inakwu 2011

www.globalsoilmap.net

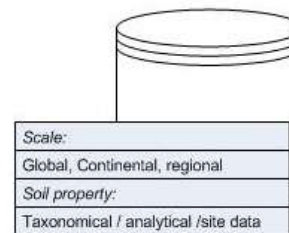
Open Soil Profiles



Soil covariates (worldgrids)



Area-class maps



GSIF Packages

- Map import module
- Data entry module
- Harmonization module
- Spline fitting
- Spatial analysis module
- plotKML
- Data conversion to R
- Data visualization
- Data export

Webmapping API

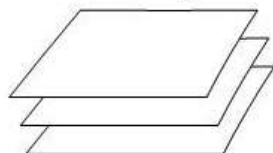
- Real-time spatial prediction (Google Maps)
- GlobalSoilMap.net functionality for web-applications
- Geo-serving and geoprocessing functionality

GlobalSoilMap.net



Derived soil property maps

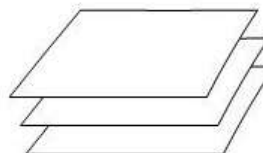
Global coverage



100 m (250 m, 1 km and 5.6 km)

- Six+four key soil parameters (organic carbon, pH, clay, silt, sand, coarse fragments)
- at six standard depths (0-5, 5-15, 15-30, 30-60, 60-100, 100-200 cm)
- and with included upper and lower 95% probability ranges

Derived area-class maps



1 : 5M, 1 : 1M, 1 : 0.5M, 1 : 0.25M

- Qualitative + quantitative soil properties
- Defined depth ranges (FAO: 0-30 and 30-100; SOTWIS: 0-20, 20-40, 40-60, 60-80, 80-100)
- Documented uncertainties



World Soil Information

www.isric.org

Worldgrids.org



World Soil Information

Why do we need global covariates ?

- Objective:

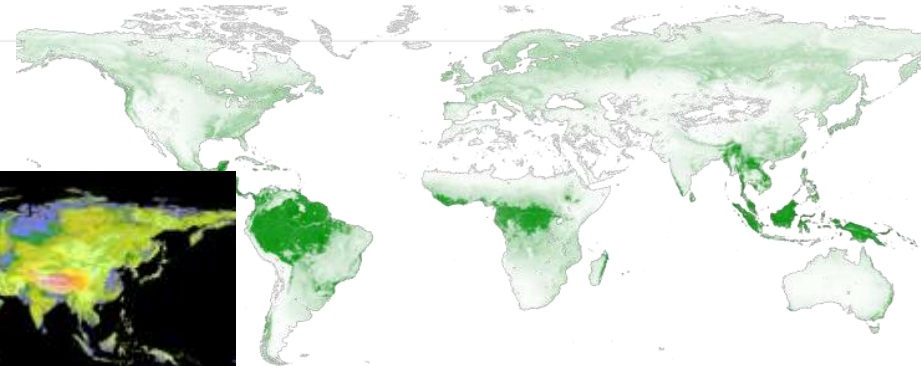
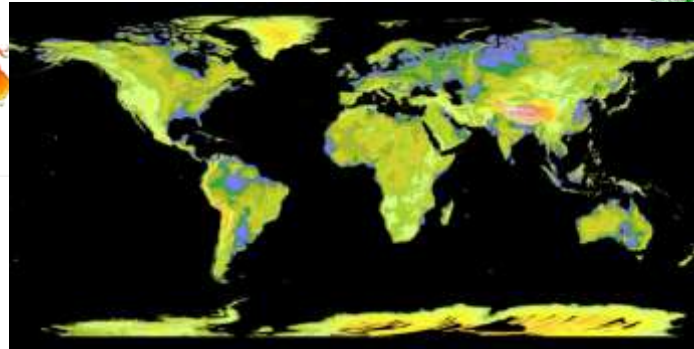
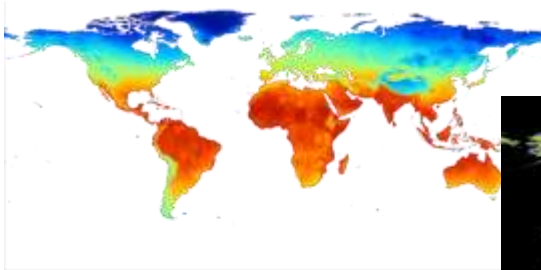
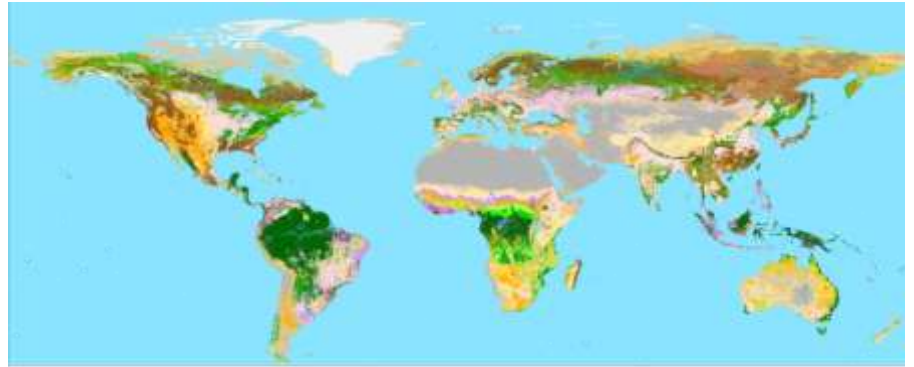
Worldgrids is a (de)-central repository for collecting, storing, accessing and interacting with gridded data sets of global covariate data

- Rationale:

Worldgrid is a part of a larger GSIF. It is the physical implementation of the expectation that ISRIC would lead and coordinate a project to assemble a core data set of global environmental covariates to (partly) support local efforts to produce global soil property maps.



Examples



World Soil Information

SC: Reuter & Hengl, 2012

<http://worldgrids.org/>

Conclusions

- Mostly missing uncertainty on a global scale as of today for elevation.
- GSIF is a framework for enhancing, collating, harmonizing, and use of soil and covariate data to:
 - storage/rescue of legacy data
 - assist production of added value global soil information at various resolutions



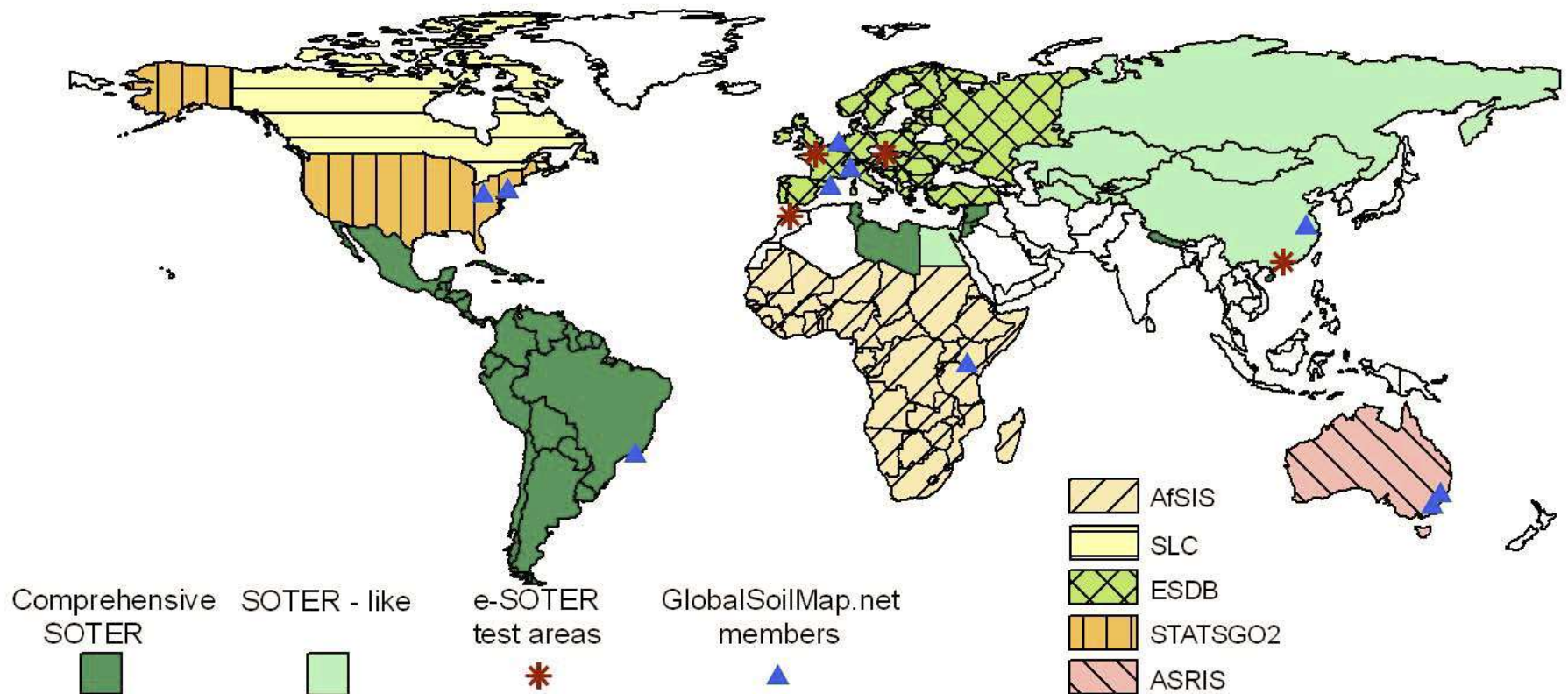
Think globally – Act locally

We can do this – through collaboration and sharing of information



World Soil Information

Current situation – “traditional”



Overview

- Datasets: multi thematic
- Restrictions:
 - Only about publicly available data
- Many more missing:
 - SPAM -> HarvestChoice.org
 - Admin Units -> GADM.org,
 - FEWS -> <http://earlywarning.usgs.gov>
 - OpenStreetMap



World Soil Information

Worldgrids.org

Key principles (III)

- GSIF is a framework for global collaborative cooperation.
- GSIF is a framework for global soil map generation at various scales.
- GSIF **requires** soil knowledge from local participants.



Worldgrids – 5 km – (I)

airports: ([airports.zip](#)) – [World airports type \(civilian/military\)](#)
airroute: ([airroute.zip](#)) – [Estimated density of airline routes](#)
anthroms: ([anthroms.zip](#)) – [Anthropogenic biomes of the World](#)
baresoil: ([baresoil.zip](#)) – [Bare soil area coverage based on the MERIS FR images](#)
biocl12: ([biocl12.zip](#)) – [Annual Precipitation](#)
biocl15: ([biocl15.zip](#)) – [Precipitation Seasonality \(Coefficient of Variation\)](#)
biocl1: ([biocl1.zip](#)) – [Annual Mean Temperature](#)
biocl2: ([biocl2.zip](#)) – [Mean Diurnal Range \(Mean of monthly \(max temp - min temp\)\)](#)
biocl4: ([biocl4.zip](#)) – [Temperature Seasonality \(standard deviation *100\)](#)
biocl5: ([biocl5.zip](#)) – [Max Temperature of Warmest Month](#)
biocl6: ([biocl6.zip](#)) – [Min Temperature of Coldest Month](#)
biodvhot: ([biodvhot.zip](#)) – [Biodiversity hotspot regions based on Conservation International](#)
burned: ([burned.zip](#)) – [Burned vegetation for years 2002-2004](#)
cforest: ([cforest.zip](#)) – [Closed forests coverage based on the Forest Resources Assessment \(FRA\) project](#)
chlom: ([CHLOm.zip](#)) – [Mean long-term chlorophyll a concentration in the sea estimated using MODIS Aqua](#)
chlos: ([CHLOs.zip](#)) – [Mean long-term chlorophyll a concentration in the sea estimated using MODIS Aqua \(standard deviation\)](#)
cloudfm: ([CLOUDFm.zip](#)) – [Mean long term Cloud fraction based on MODIS monthly images](#)
cloudfs: ([CLOUDFs.zip](#)) – [Standard deviation of the long term Cloud fraction based on MODIS monthly images](#)
countries: ([countries.zip](#)) – [World countries based on GADM level 0](#)
dcoast: ([dcoast.zip](#)) – [Distance from the sea coast line](#)
ecoflor: ([ecoflor.zip](#)) – [Ecofloristic zones](#)
fforest: ([fforest.zip](#)) – [Open or fragmented forests coverage based on the Forest Resources Assessment \(FRA\) project](#)
forestd: ([forestd.zip](#)) – [Global Forest Density based on the Forest Resources Assessment \(FRA\) project](#)
fra2000: ([FRA2000.zip](#)) – [Forest cover types based on the Forest Resources Assessment \(FRA\) project](#)



Worldgrids – 5 km - (II)

himpat: ([himpat.zip](#)) – [Areas of human impacts on the Biosphere \(roads, railways and settlement density\).](#)

hwsdmu: ([hwsdmu.zip](#)) – [Soil mapping units and number of soil attributes based on FAO HWS](#)

hwsd: ([hwsd.zip](#)) – [Soil groups based on FAO HWS](#)

hydrma: ([hydrma.zip](#)) – [Mean annual concentration of hydrogen isotopes in precipitation](#)

iflworld: ([iflworld.zip](#)) – [The world map of intact forest landscapes](#)

igbp_10m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_11m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_12m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_13m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_14m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_15m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_16m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_1m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_2m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_3m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_4m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_5m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_6m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_7m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_8m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp_9m: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)

igbp: ([IGBP.zip](#)) – [MOD12C1 17 land cover classes defined by the International Geosphere Biosphere Programme \(IGBP\)](#)



Worldgrids – 5 km - (III)

laim: ([LAIIm.zip](#)) – [Mean long term Leaf Area Index \(downscaled\)](#)
lais: ([LAIs.zip](#)) – [Mean long term Leaf Area Index \(standard deviation\)](#)
landcov: ([landcov.zip](#)) – [Land cover map of the world \(1981-1995\) based on the AVHRR images](#)
landmask: ([landmask.zip](#)) – [Land mask of the world based on the GSHHS data](#)
lisotd: ([LISOTD.zip](#)) – [Lightning combined Flash Rate](#)
lstdm: ([LSTDm.zip](#)) – [Mean Day-time MODIS Land Surface Temperature based on the monthly LST images](#)
lstds: ([LSTDs.zip](#)) – [Deviation of the Day-time MODIS Land Surface Temperature based on the monthly LST images](#)
lstnm: ([LSTNm.zip](#)) – [Mean Night-time MODIS Land Surface Temperature based on the monthly LST images](#)
lstns: ([LSTNs.zip](#)) – [Deviation of the Night-time MODIS Land Surface Temperature based on the monthly LST images](#)
mask: ([landmask.zip](#)) – [Land mask of the world based on the GSHHS data](#)
modfires: ([modfires.zip](#)) – [Year of MODIS estimated fire](#)
nlights: ([nlights.zip](#)) – [World stable lights](#)
oxygma: ([oxygma.zip](#)) – [Mean annual concentration of oxygen isotopes in precipitation](#)
pcevi1: ([PCEVI1.zip](#)) – [EVI Principal Component #1](#)
pcevi2: ([PCEVI2.zip](#)) – [EVI Principal Component #2](#)
pcevi3: ([PCEVI3.zip](#)) – [EVI Principal Component #3](#)
pcevi4: ([PCEVI4.zip](#)) – [EVI Principal Component #4](#)
pcnligh1: ([pcnligh1.zip](#)) – [PC #1 from the World stable night lights time series](#)
pcnligh2: ([pcnligh2.zip](#)) – [PC #2 from the World stable night lights time series](#)
pcpopd1: ([pcpopd1.zip](#)) – [Long-term population density map \(PC1\)](#)
pcpopd2: ([pcpopd2.zip](#)) – [Population change index \(PC2\)](#)
peatland: ([peatland.zip](#)) – [Bog, Fen, Mire \(Peatland\)](#)
phh2oreg: ([PHH2Oreg.zip](#)) – [Soil pH measured in H2O and predicted using correlation with worldmaps](#)
precm: ([PRECM.zip](#)) – [Precipitation estimated based on the GSMaP](#)
quakein: ([quakein.zip](#)) – [Kernel density of earthquake intensity \(magnitude\)](#)

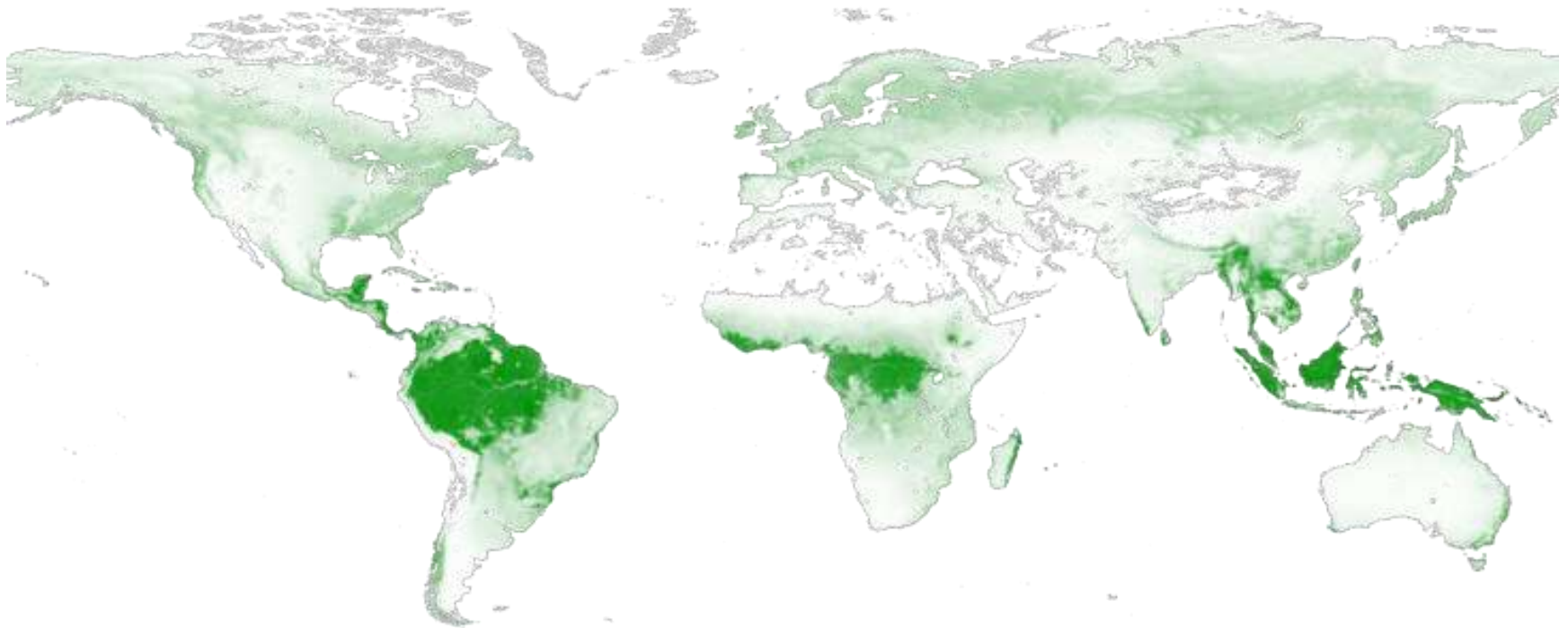


Worldgrids – 5 km – (IV)

rcrops: ([rcrops.zip](#)) – [Rainfed croplands coverage based on the MERIS FR images](#)
shipping: ([shipping.zip](#)) – [Shipping density \(commercial\)](#)
slope: ([slope.zip](#)) – [Slope map based on SRTM 30+ and ETOPO DEM](#)
snowcm: ([SNOWCm.zip](#)) – [Mean long term snow coverage fraction based on MODIS monthly images](#)
snowcs: ([SNOWCs.zip](#)) – [Standard deviation of the long term snow coverage fraction based on MODIS monthly images](#)
soc: ([SOC.zip](#)) – [Soil Organic Carbon in kg/m³ of soil](#)
soilmask: ([soilmask.zip](#)) – [Soil areas mask](#)
soiltype: ([soiltype.zip](#)) – [KST Global Soil Regions](#)
sstm: ([SSTm.zip](#)) – [Mean long-term sea surface temperature estimated using MODIS Aqua](#)
ssts: ([SSTs.zip](#)) – [Mean long-term sea surface temperature estimated using MODIS Aqua \(standard deviation\)](#)
stormtr: ([stormtr.zip](#)) – [Density of Tropical Cyclone Storm Tracks \(historical\)](#)
swamp: ([swamp.zip](#)) – [Swamp Forest, Flooded Forest](#)
treecov: ([treecov.zip](#)) – [Continuous Fields Tree Cover for 1992-1993](#)
wildness: ([wildness.zip](#)) – [World wilderness areas](#)
wooded: ([wooded.zip](#)) – [Other wooded land coverage based on the Forest Resources Assessment \(FRA\) project](#)
wwfeco: ([wwfeco.zip](#)) – [Terrestrial ecoregions](#)
gaccessm: ([gaccessm.zip](#)) – [Estimated travel time to major cities \(>50k\) in hours](#)
gcarb: ([gcarb.zip](#)) – [Global Biomass Carbon Map](#)
glc2000: ([glc2000.zip](#)) – [Land Cover classes for year 2000 based on the SPOT VEGA2000 dataset](#)
glcrop: ([glcrop.zip](#)) – [Cropland areas in 1992](#)
globcov: ([globcov.zip](#)) – [Land Cover classes based on the MERIS FR images](#)
globedem: ([globedem.zip](#)) – [Global Relief Model based on SRTM 30+ and ETOPO DEM](#)
glwd31: ([glwd31.zip](#)) – [Global Lakes and Wetlands](#)
gmia: ([gmia.zip](#)) – [Global map of area equipped for irrigation expressed as percentage of total area](#)
gshpub: ([GSH PUB.zip](#)) – [GSHAP Global Seismic Hazard Map](#)



Mean long term Leaf Area Index (downscaled) 2000-2010



Slide Credit: Reuter/Hengl, 2001



World Soil Information

<http://neo.sci.gsfc.nasa.gov>