

Introduction to GIS

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What is GIS

- A GIS is a computer system capable of capturing, assembling, manipulating, analyzing, and displaying a geographically referenced information.
- A GIS also includes the personnel that operates the system and the data that goes in to the system.



Functions of GIS

Collection

Storage

Manipulation

Analysis

Query

Visualization



Questions GIS Can Answer

Location

- Where is it?

Condition

- What is the status of a feature?

Trend

- What has changed since?

Pattern

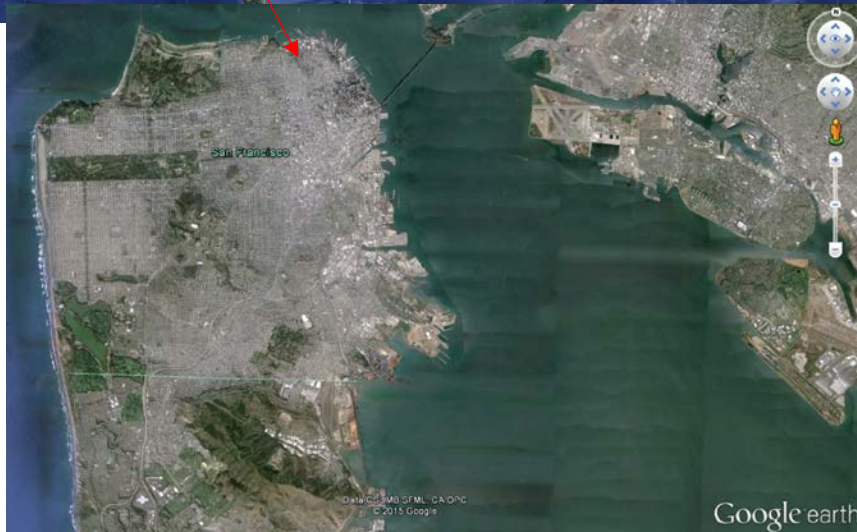
- What spatial patterns exist?

Model

- What if scenario?



Scale of GIS data



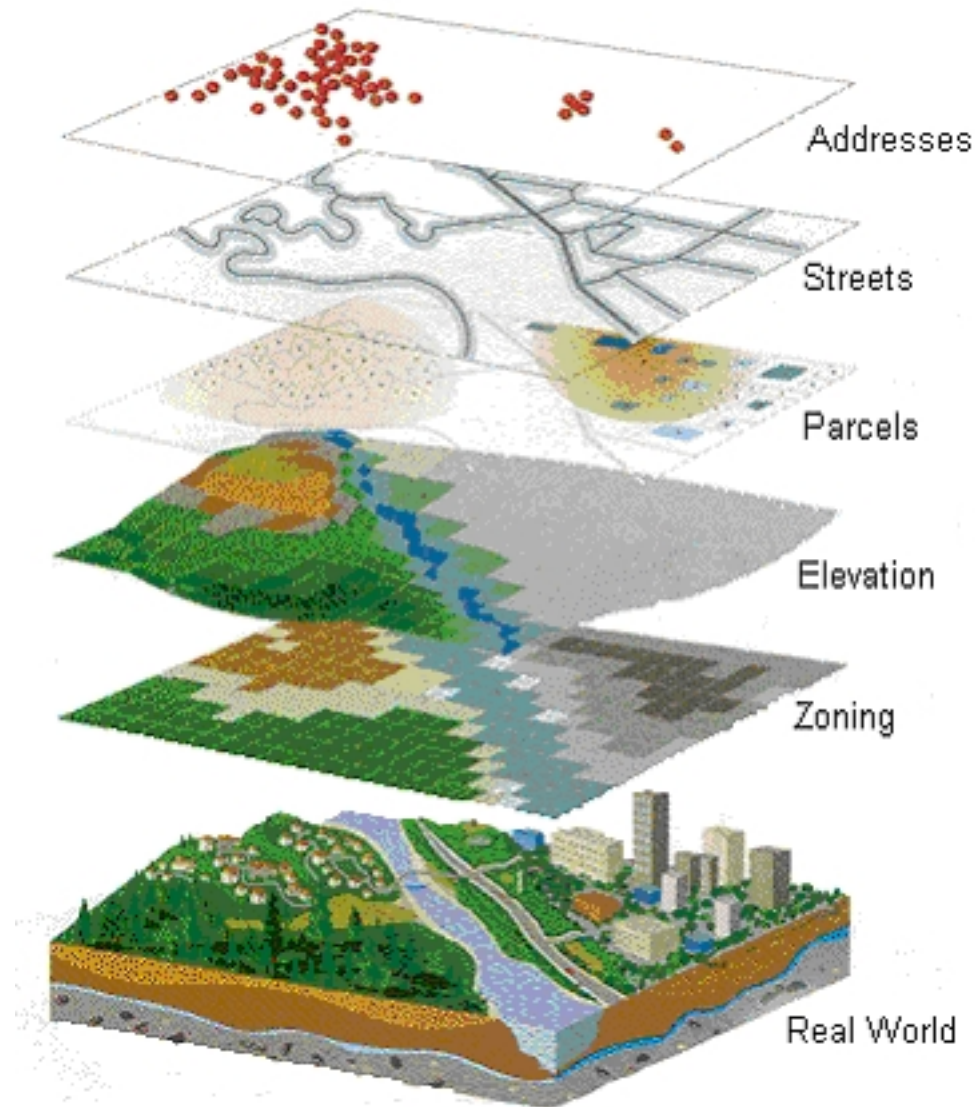
Components of GIS



The GIS Data Model

Allows the geographic features in real world locations to be digitally represented and stored in a database.

It also allows these features abstractly represent in a digital map (analogue) form.

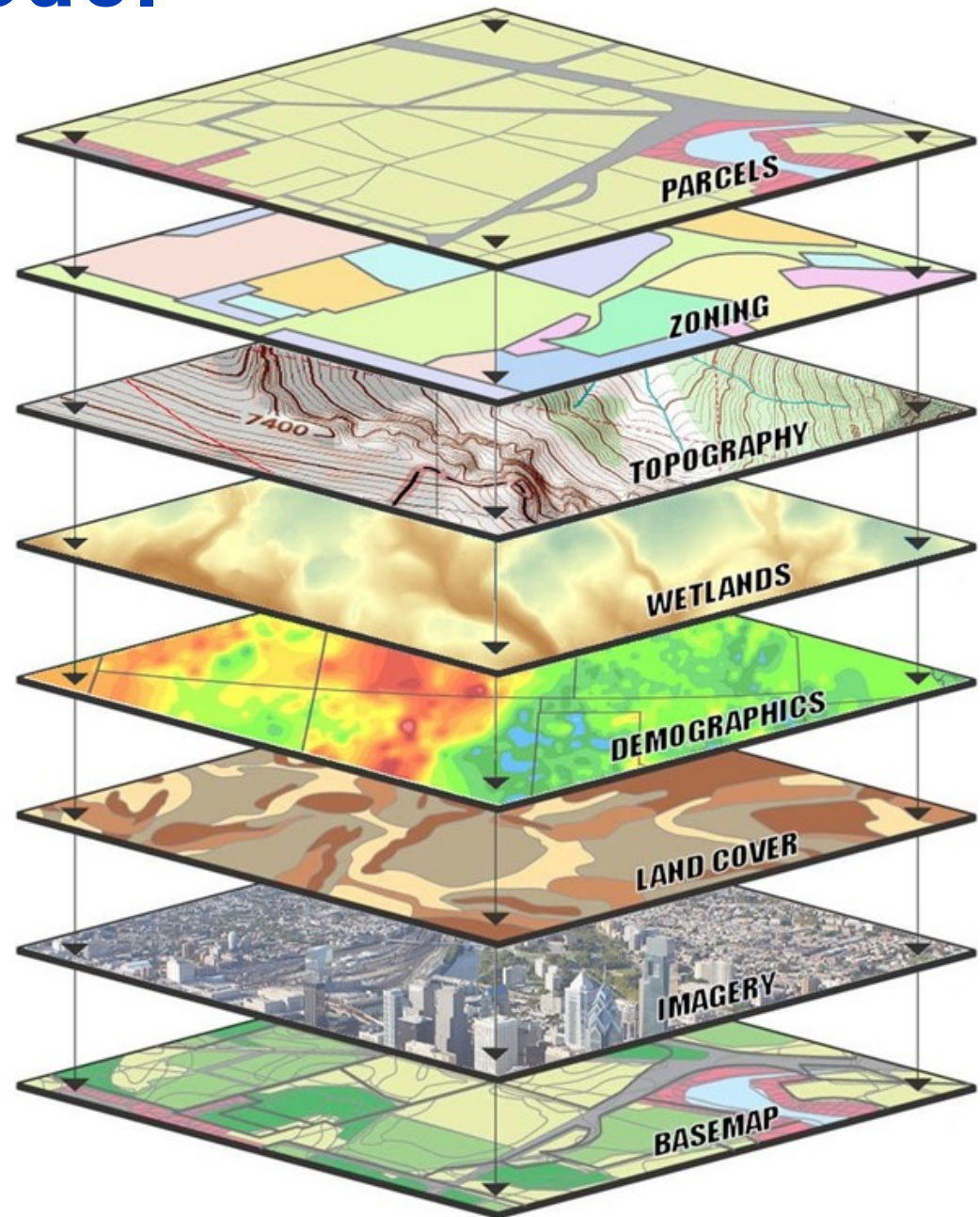


The GIS Data Model

Overlay of layers.

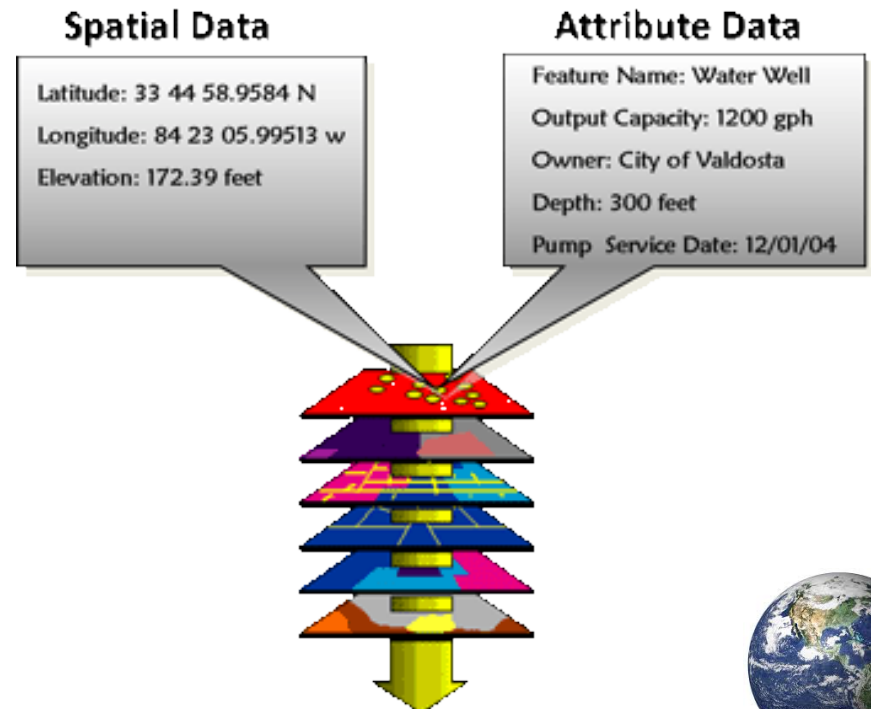
Patterns and trends are discovered.

These help us better understand the environment.



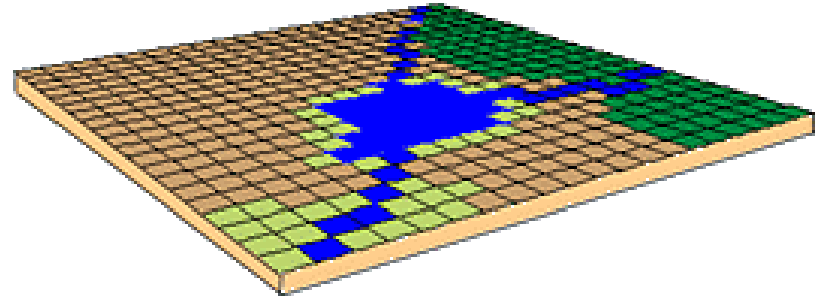
Spatial and Attribute Data

- **Spatial data** (*where*)
 - Specifies location
 - Stored in a *shape file*
- **Attribute** (*what, how much, when*)
 - Specifies characteristics
 - Stored in a database table

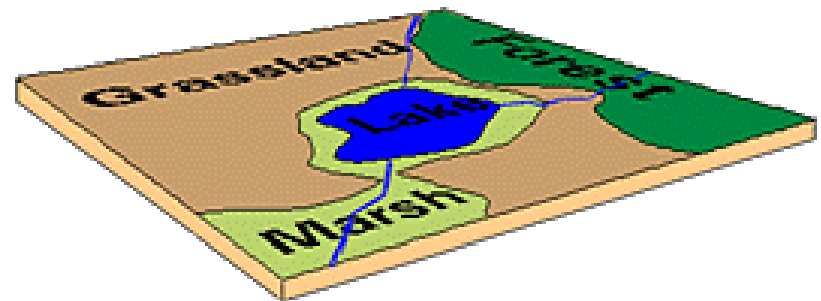


Raster and Vector Data

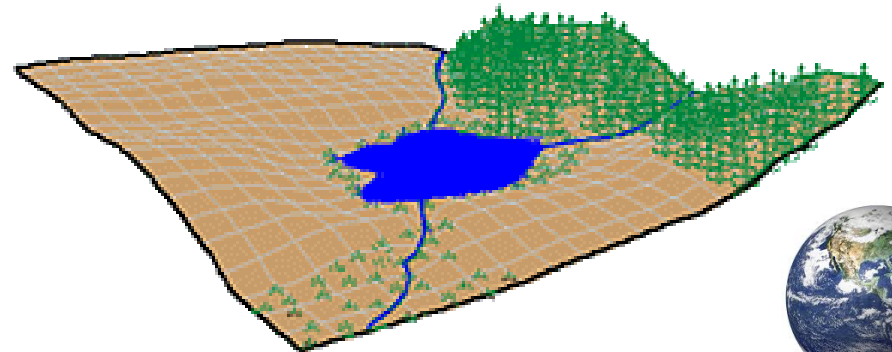
Raster



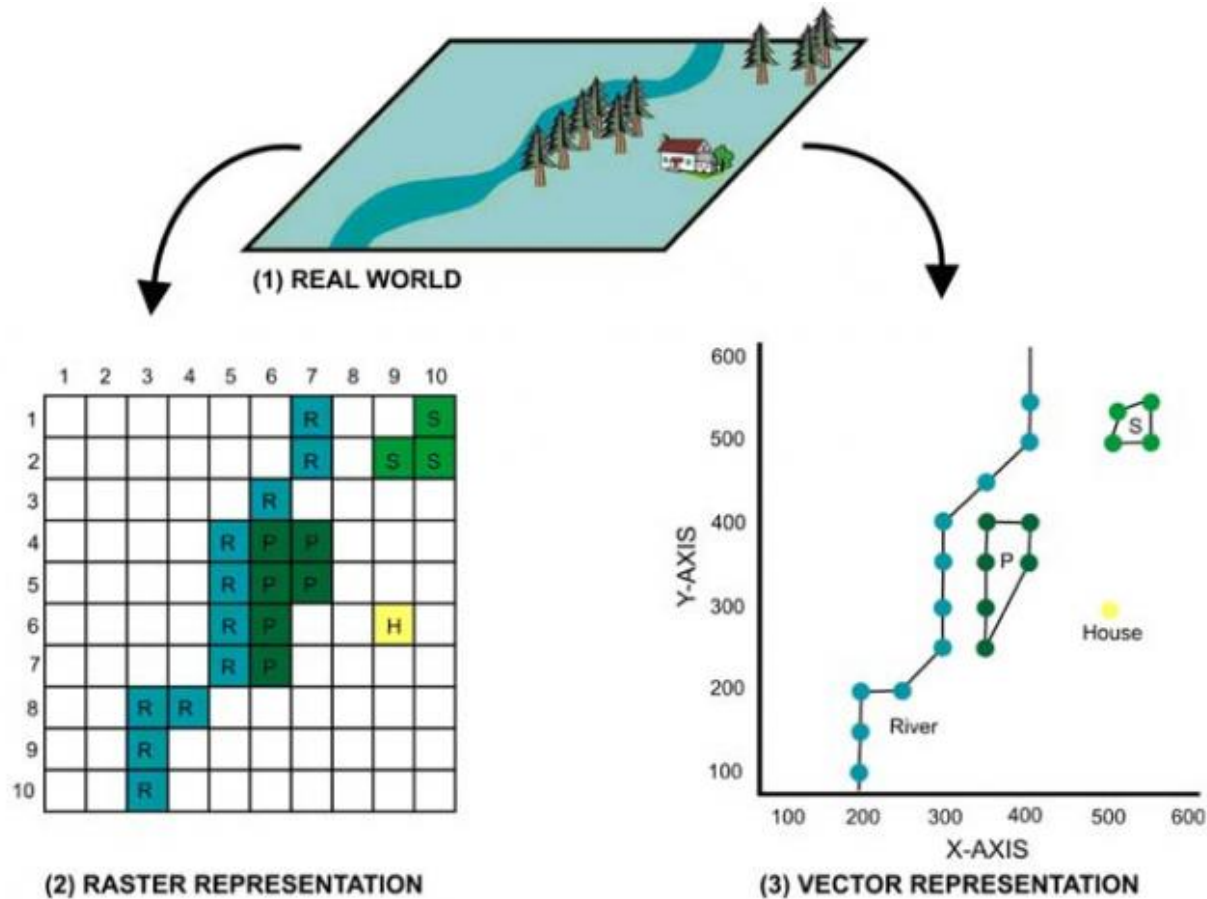
Vector



Real World



Concept of Vector and Raster



Raster and Vector Data

Raster data advantages

- The most common data format
- Easy to perform mathematical and overlay operations
- Satellite information is easily incorporated
- Better represents continuous type data

Vector data advantages

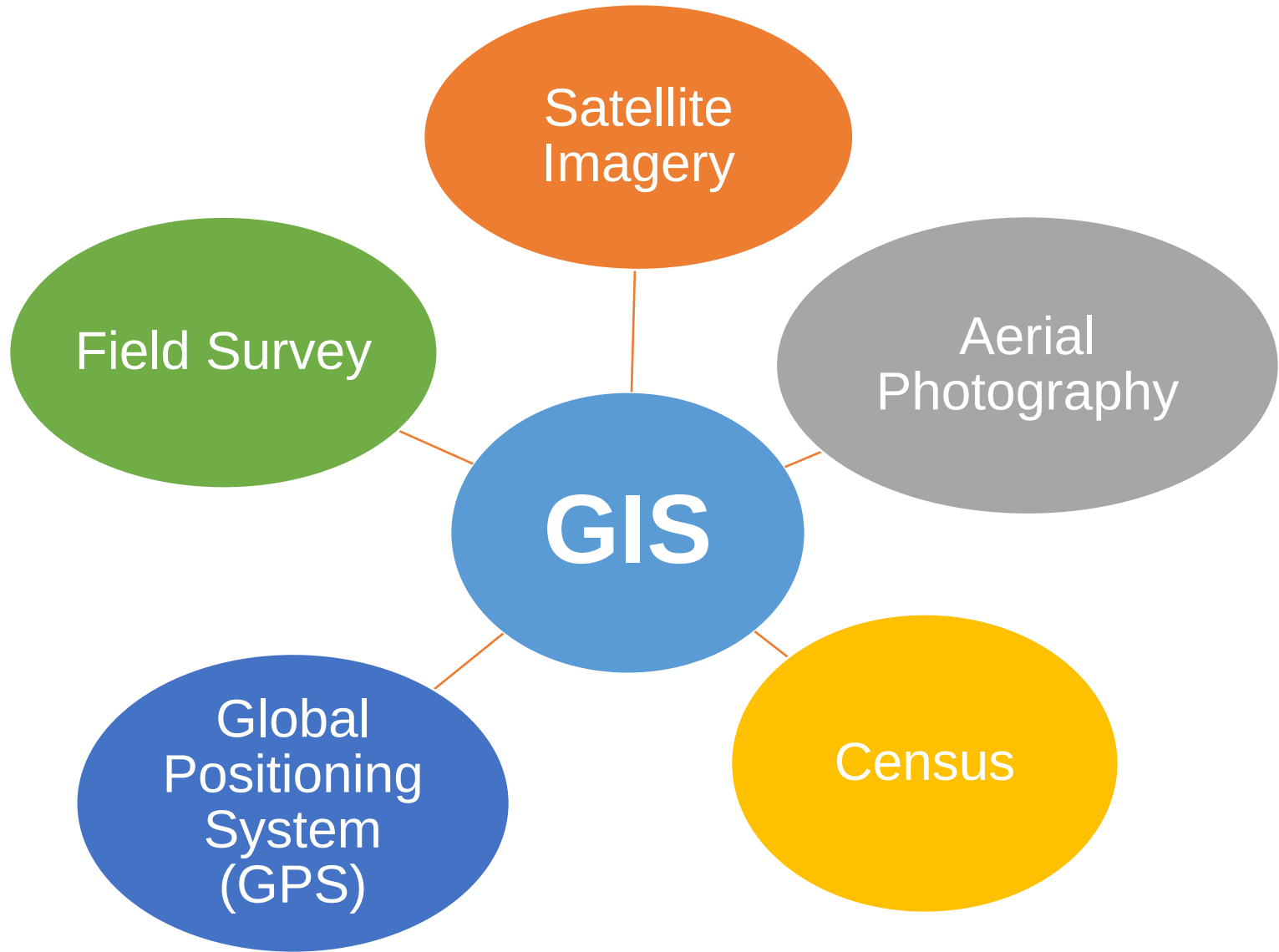
- The most common data format
- Accurate positional information for storing discrete features
- Compact data storage requirements
- Can associate attributes with specific features



GIS Applications



Sources of GIS Data



Socioeconomic Data and Applications Center (SEDAC)

Community Science Disciplines

NASA SOCIOECONOMIC DATA AND APPLICATIONS CENTER (SEDAC)
A Data Center in NASA's Earth Observing System Data and Information System (EOSDIS) — Hosted by CIESIN at Columbia University

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Theme

- Agriculture (186)
- Climate (407)
- Conservation (189)
- Framework Data (241)
- Governance (97)
- Hazards (35)
- Health (458)
- Infrastructure (30)
- Land Use (216)
- Marine and Coastal (83)
- Population (1170)
- Poverty (336)
- Remote Sensing (176)
- Sustainability (1207)
- Urban (848)
- Water (56)

Region

- Africa (409)
- Asia (397)
- Europe (344)

Featured Data Sets

Global Annual PM2.5 Grids from MODIS and SeaWiFS Aerosol Optical Depth (AOD), v1 (1998–2012)

Satellite-Derived Environmental Indicators

Overview Download Documents (7) Maps

To provide a continuous surface of concern (micrograms per meter) of fine particulate matter (PM2.5) over the globe, we have developed a global annual PM2.5 grid from MODIS and SeaWiFS Aerosol Optical Depth (AOD) data. The grid is available in a NetCDF format and can be downloaded from the SEDAC Data Catalog.

2008 Environmental Performance Index

2012 Environmental Performance Index

Ecosystem Vitality Objective, 2012 EPI

Environmental Health Objective, 2012 EPI

Hi-Resolution: PDF | PNG

2014 EPI

2014 EPI: Ecosystem Vitality Objective

2014 EPI: Ecosystem Vitality Objective - Agriculture

2014 EPI: Ecosystem Vitality Objective - Biodiversity and Habitat

Hi-Resolution: PDF | PNG

2014 EPI: Ecosystem Vitality Objective - Climate and Energy

2014 EPI: Ecosystem Vitality Objective - Fisheries

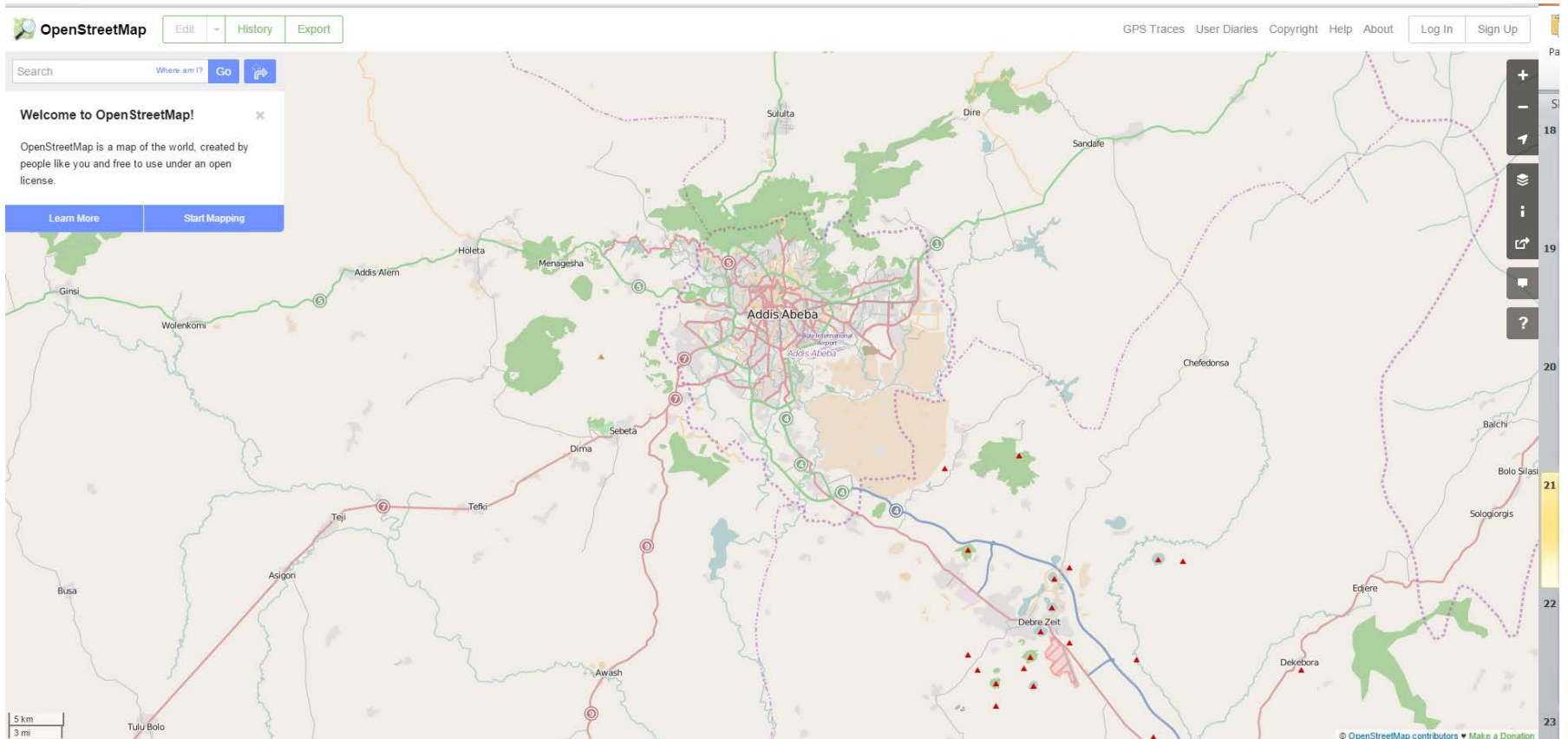
2014 EPI: Ecosystem Vitality Objective - Forests

2014 EPI: Ecosystem Vitality Objective - Water Resources

Hi-Resolution: PDF | PNG



OpenStreetMap



Global Administrative Areas

Global Administrative Areas

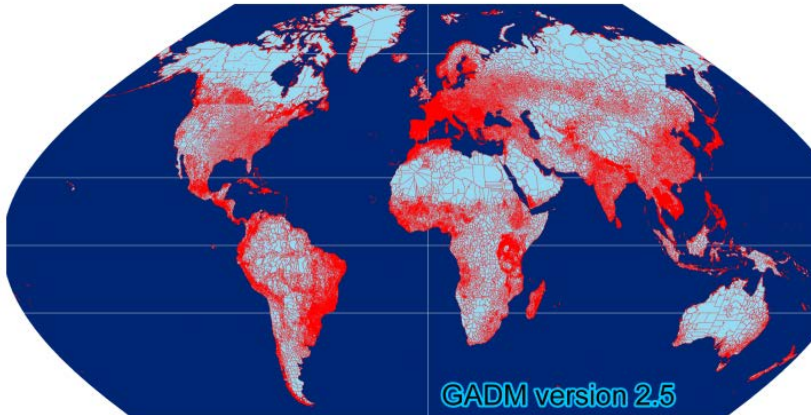
Boundaries without limits

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GADM database of Global Administrative Areas

GADM is a spatial database of the location of the world's administrative areas (or administrative boundaries) for use in GIS and similar software. Administrative areas in this database are countries and lower level subdivisions such as provinces, departments, bibhag, bundeslander, daerah istimewa, fivondronana, krong, landsvæðun, opština, sous-préfectures, counties, and thana. GADM describes where these administrative areas are (the "spatial features"), and for each area it provides some attributes, such as the name and variant names.

The current version is 2.7 (August 2015). The next version will be released in October.



Global Administrative Areas

Boundaries without limits

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Download

Country: United States

Format: shapefile



DIVA-GIS

DIVA-GIS

free, simple & effective

Download program

Documentation

Free Spatial Data

Home

Free Spatial Data

Country level

Download **country level data** for any country in the world: administrative boundaries, roads, railroads, altitude, land cover, population density.

Global level

A new file with the (2011) global **country boundaries**

Global climate data

See **WorldClim** or **diva-gis** specific data [here](#)

Species occurrence data

GBIF, **HerpNET**, **MaNIS**, **OBIS**, **ORNIS**, **REMBI**

Crop (genebank) collection data

GENESYS

Near global 90 meter resolution elevation data

[Download](#)

High resolution satellite images (LandSat)

for nearly all of the world can be downloaded [here](#). They are in the **MrSid** format that in DIVA-GIS (note: they are in UTM projections, so you will need to project your shape well).

A very good list

of data sources from the **Eden** project.

The CGIAR Consortium for Spatial Information (CGIAR-CSI)

Applying GeoSpatial Science for a Sustainable Future...

RESEARCH HOME SRTM 90m DATABASE HOME WORLDWIDE HELP

CGIAR-CSI Content

- What is CGIAR-CSI?
- CGIAR-CSI Members
- What's New?
- CRU Climate Data

SRTM Content

- SRTM Data Search and Download**
- SRTM Data Processing Methodology
- SRTM FAQ
- SRTM Quality Assessment (PDF File - 235 MB)
- About SRTM Imagery
- CIAT Landuse Project
- How to Search for Data?
- Disclaimer
- Contact Us

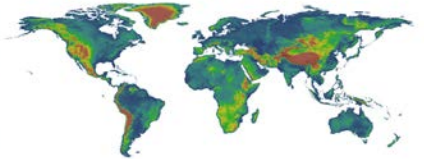
GeoNetwork Project

- CGIAR-CSI Geonetwork Nodes
- GeoNetwork Support

Visitors

See more	
85,015	21,995
83,655	19,949
57,681	15,804
25,287	15,474
25,076	15,123
23,007	14,961
24,146	12,906
23,773	11,409
Ragnews: 1,240,091	

SRTM 90m Digital Elevation Data



Resampled SRTM data to 250m resolutions for the entire globe are available <https://cibc.box.net/shared/tyslaheov> (Password: The CONFIDENT THIS IS NOW THE HIGHEST QUALITY SRTM DATASET AVAILABLE)

UPDATE - VERSION 4: THE SRTM DATA NOW AVAILABLE FROM THIS SITE HAS BEEN UPGRADED TO VERSION 4. THIS LATEST VERSION 4 CONFIDENT THIS IS NOW THE HIGHEST QUALITY SRTM DATASET AVAILABLE.

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 original areas of the developing world. The SRTM digital elevation data provided on this site has been processed to 10 data visits, and to facilitate it's ease of use by a user 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 is easy mooring. 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.

The NASA Shuttle Radar Topographic Mission (SRTM) has provided digital elevation data (DEM) for over 80% of the globe. This data is currently distributed in (approx. 90m resolution) DEMs. A 1 arc second data product was also produced, but is not available for all countries. The vertical error of the DEMs is reported elevation. These are generally small holes, which nevertheless render the data less useful, especially in fields of hydrological modeling.

Dr. Andy Jarvis and Edward Guenzler of the CIAT Agroecosystems Resilience project, Dr. Hanneke Hoek Reader (JIRC-IES-LMHR) and Dr. Andy Nielson (JIRC-IE) continue back into a raster DEM. These interpolated DEM values are then used to fill in the original no-data holes within the SRTM data. These processes were download as 5 degree x 5 degree files, in geographic coordinate system, WGS84 datum. These files are available for download in both Arc-Info ASCII format, as within each DEM which has been interpolated.

MIRROR DOWNLOAD SITE: Dr. Mark Mulligan (King's College London) mirrors the data, and has created a Google Earth interface for browsing and a **MIRROR DOWNLOAD SITE**. The SRTM V4 data is as of now available at a mirror site at the Joint Research Center in the Institute for Environmental & Earth System Science, The Chinese Academy of Sciences.

Google Link: <http://www.ambiotek.com/topoview>

Download SRTM XML file [click here](#)
Download Google Earth [click here](#)

The CGIAR-CSI has produced this website under the guidance of Dr. Robert Zomer, and the support of the International Water Management Institute (IWMI). Don't Funding for this project has been provided by the CGIAR ICT AM Program: ICT for Tomorrow's Science Initiative.



Resources

- <http://www.qgis.org/en/site/forusers/download.html>
- <https://www.google.com/earth/>
- <http://www.qgistutorials.com/en/>
- <http://fossgeo.org/2015/04/10/announcing-the-new-geo-academy/>
- <https://datause.ucsf.edu/qgis-health>

