

Overview of sources and methods

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1 Overview of sources and methods

In this lesson, you will

- get an overview of the available data sources for Geographic Information Systems.
- learn how to assess the quality and coverage of source material.
- learn how information is available in digital format through many Internet web sites

Learning Objectives

- Desirable data could have been collected by an institute, organization or individual and be available at a cost or free. These data exist as the GIS digital data sources, paper maps, remotely sensed digital data, remotely sensed satellite images and aerial photographs, Global Positioning System data and field data collection sheets, and stored on different media. These different types of sources will be introduced briefly. Moreover, you will visit several web sites that distribute Swiss National Datasets. In addition, the web pages of data agencies which distribute national, regional and global datasets are listed as the optional links for your visit.
- A proverb, Garbage In and Garbage Out applies to GIS. It is important to assess the data quality, before using the data in GIS. The positional accuracy and attribute accuracy of data is critical for producing quality results from GIS data processing and analyses. You will learn how to quantify the positional accuracy and attribute accuracy of datasets. Moreover, you will also learn key issues of data that describe data quality. At the end of this lesson, you should be able to find the necessary data and justify the quality of data for your future projects.

1.1 Types of source materials

In this unit, you will get an overview of the available sources of data for Geographic Information Systems.

Although the type of spatial and tabular data will vary greatly from project to project, you will be aware of some of the most commonly available data sources at the end of the course.

Government agencies and commercial business collect and publish spatial and tabular data, which are used quite widely. Some of the government and commercial sources will be highlighted here, for your immediate knowledge.

In the past, GIS exclusively relied upon paper map as the source of information. Present day, a great deal of spatial information is available in digital format through Internet web sites.

1.1.1 GIS Data Sources

Please note:

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Figure 1: Click on the buttons to view the complete animation.

Visit these Web Pages

1. Visit the following web pages, indicate the sources and links to GIS Data. **The first 5 links, which are mandatory links**, provide detail on data sources of Switzerland.

- Federal Office of Topography, Switzerland (www.swisstopo.ch/) The contact point of cadastral surveying, survey, maps, digital products and images of Switzerland.
- Swiss Federal Statistical Office (www.statistik.admin.ch/) The contact point of statistical data of Switzerland.
- Swiss Organization for Geographic Information (www.sogi.ch/) Information on Geographic Information Systems in Switzerland.
- COGIS (KOGIS) (www.swisstopo.admin.ch/internet/swisstopo/de/home/swisstopo/org/kogis.html) The GI (Geographic Information) & GIS (Geographic Information Systems) coordination of the Swiss federal administration is composed of the interdepartmental GIS Coordination Group as a body for control and supervision of the center of competence COGIS (KOGIS).
- National Point of Contact for Satellite Images (Switzerland) (www.npoc.ch/) The Swiss National Point of Contact for Satellite Images (NPOC) is the national information, distribution and archive center for satellite Images.

The following optional links provide global, regional and national level data sources for various applications.

- The Federal Geographic Data Committee (www.fgdc.gov)
- United States Geological Survey (USGS) (www.usgs.gov/)

- NASA (www.gsfc.nasa.gov/)
- U.S Department of Agriculture Natural Resources Conservation Services Data Clearinghouse (<https://gdg.sc.egov.usda.gov/>)
- Geography Network (www.geographynetwork.ca/website/obm/viewer.htm)
- Internet GIS Information Sites (upo.harvard.edu/Maps/gis.html)
- National Cartography and Geospatial Center (www.ncgc.nrcs.usda.gov)
- National Oceanographic Data Center (www.nodc.noaa.gov/)
- National Oceanic and Atmospheric Administration (www.noaa.gov/)
- American Society for Photogrammetry and Remote Sensing (ASPRS) (www.asprs.org)
- World Conservation Monitoring Center (www.unep-wcmc.org/)
- Global Land Cover Map from AVHRR (glcfapp.glcf.umd.edu:8080/esdi/index.jsp)
- Global Land Cover Facility (glcfapp.glcf.umd.edu/)
- Surface Temperature Analyses (data.giss.nasa.gov/gistemp/)
- Global Temperature and Precipitation Maps (www.ncdc.noaa.gov/temp-and-precip/global-maps/)
- FAO Forest Resources Assessment (www.fao.org/forestry/fo/fra/index.jsp)
- Global Land Biosphere Data and Resources (disc.sci.gsfc.nasa.gov/education-and-outreach/additional/science-focus/space/ocdst_global_biosphere.shtml)
- Vegetation Map library (www.lib.berkeley.edu/EART/vegmaps.html)
- National Climate Data Center (lwf.ncdc.noaa.gov/oa/ncdc.html)
- World Data Center for Meteorology (<https://www.ncdc.noaa.gov/wdcmnet>)
- Land Process Distributed Active Archive Center (https://lpdaac.usgs.gov/data_access)
- Topographic Map of the World (www.omnimap.com/)
- Find out the Digital Chart of the World at GIS Data Depot in Geo-community Web page (data.geocomm.com/)

- Street level detail digital data is available from Mapsharetool. (www.mapsharetool.com/external-iframe/external.jsp)
2. See the following paper map as an example of a data source.

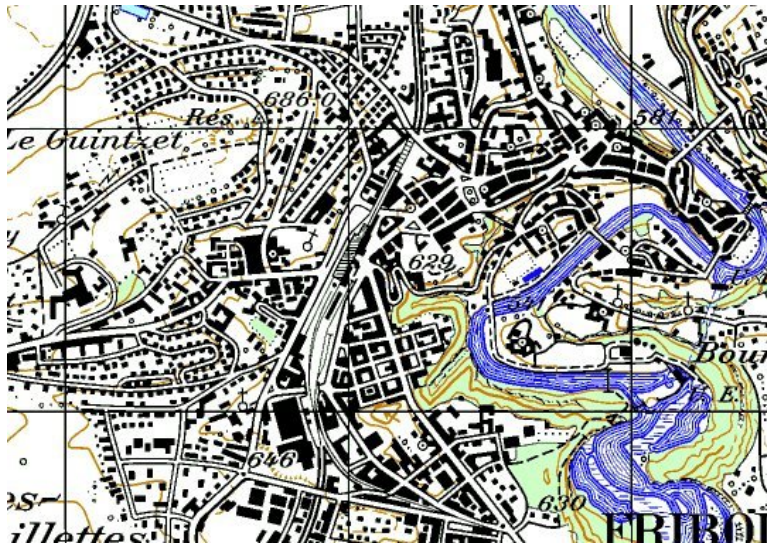


Figure 2: Part of the Fribourg Map

Data Research

1. Assuming that we want to analyze the impact of climate change to biodiversity at the global scale. According to the discussion, the following datasets are generally identified.

- i.) Elevation data or Digital Elevation Data of the World
- ii.) Vegetation Map of the World
- iii.) Global Mean Annual Temperature
- iv.) Global Mean Annual Rainfall
- v.) Global Land Cover Map
- vi.) Existing Protected Areas of the World
- vii.) Global Sea level Data

Suggest available data sources for at least two datasets mentioned above.

2. Find out the scale of available Swiss National Maps. (Hint: Swiss-

1.1.2 Share your findings

Submit your findings from data research to the discussion group in order to share among the eClass.

Question

Write down the different sources of data.

1.2 Quality and Coverage of Data Sources

Objectives

Selecting an appropriate source for each item of information to be stored in the GIS database is very important for GIS Data Capture. Selection of quality and coverage of source data is critical because a particular geographic feature is shown in multiple sources of varying quality.

In this unit, you will learn how to assess the quality and coverage of source material.

1.2.1 Key Issues Involving Data Sources

1. GIS Datasources

Download the PDF version of this unit web page here.: www.gitta.info/0ViewSources/en/multimedia/qualitycover.pdf

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Figure 3: Click on the buttons to view the complete animation.

2. Positional Accuracy

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Figure 4: Click on the buttons to view the complete animation.

The following animation calculates the acceptable error and allowable RMS based on scale. Klick on the picture to calculate

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Figure 5: Click on the image to do the Calculation of Acceptable Error and Allowable RMS

3. Attribute Accuracy

Interactively calculate the Kappa using the following animation.

The animation filled with random numbers for each pair of land use classes represented as (A, B, C, D, E) from reference data and map data. Then calculate the row and column total of the matrix. Then calculate the Kappa value. .

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Figure 6: Click on the buttons to view the complete animation.

Attribute accuracy calculation can be used to test the accuracy of a classified map from remotely sensed data or to validate the attribute accuracy of an existing map with field data or data from a map of higher accuracy.

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Figure 7: Click on the image to do the Kappa Calculation

3. Other Key Issues

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Figure 8: Click on the buttons to view the complete animation.

Practical Session

1. Fill the appropriate value on the empty raster grid based on the landuse value. Write down your rule on why you fill a particular value to a particular cell. Write down your suggestions to improve the quality in order to maintain the values of the original map as much as possible.

Animation for manual rasterization.

2. Calculate the Kappa Value based on the following table.

Landuse	A	B	C	D	E	F
A	8	0	1	0	2	0
B	0	10	0	2	0	1

Table 1: Legend missing

C	3	0	21	0	4	0
D	0	0	0	9	0	3
E	4	0	5	0	23	0
F	0	2	0	3	0	14

Table 1: Legend missing

- A = Mixed forest
- B = Paddy
- C = Plantation
- D = Corn
- E = Pine
- F = Sugarcane

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Figure 9: Click on the image

1.2.2 Questions

1. What are the key issues to be considered when using multi-source data for a project?

1.2.3 Submit your answer

1. Submit the result of the Kappa calculation to the instructor by email.
2. Submit your rule of filling the raster cells by email to the instructor.
3. Submit your suggestions in order to maintain the values of the original map as much as possible, while filling the raster cell animation exercise.
4. Submit your answer on key issues to be considered when using multi-source data. Submit your answer to the discussion group and instructor by email.