VISAYAS STATE UNIVERSITY

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VSU EXTENSION QUARTERLY REPORT OF ACCOMPLISHMENT FORM

____1st Q ______2nd Q ______ 3rd Q ___X___ 4th Q

MFO 4: Extension Services

Physical Accomplishments

Title of Training/ Seminar/ workshop/ conference/ Activities	Conducted By	Date Conducted	DURATION (# of days)	# of person attended *(pls. attached scanned attendance sheet for supporting docs.)*	PI 1 : Number of persons trained weighted by length of training (#of person trained x #weight of training) Legend for Weights: < 8 hours 0.50 8 hours (one day) 1.00 2 days 1.25 3-4 days 1.50 5 days or more 2.00	PI 2: Percentage of trainees who rated the training course as good or better *(pls. attached evaluation forms)* Number of persons who rated the training/seminar services	Number of persons who rated the training/seminar services as good or better
Preparation for the Training on GIS for Ormoc City ENRO Staff (Developed a training module and training design)	The training had not been pursued due to the election ban.	N/A					

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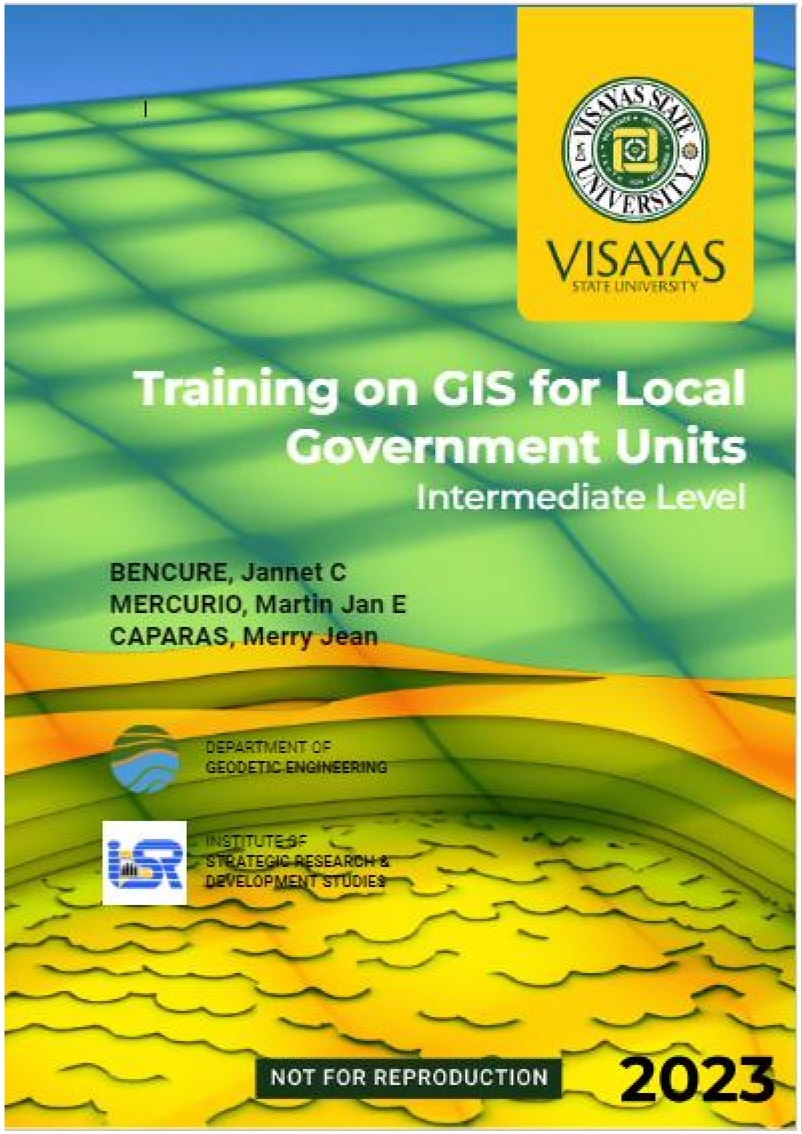
TECHNICAL ADVISORY SERVICES			
PI 3: persons provided with technical advice *(Ex. As a resource person)*		**PI 4: Percentage of clients who rated the advisory services as good or better** *(pls. attached evaluation forms)*	
Advisory services	**Number of persons provided with technical advice**	**Number of persons who rated the advisory services**	**Number of persons who rated the advisory services as good or better**

Vision: A globally competitive university for science, technology, and environmental conservation.
Mission: Development of a highly competitive human resource, cutting-edge scientific knowledge and innovative technologies for sustainable communities and environment.

OUTCOME INDICATORS	Involvement	
Active partnerships with LGUs, industries, NGOs, NGAs, SMEs, and other stakeholders as a result of extension activities. 1. Ormoc City LGU 2. __________ 3. __________ 4. __________ 5. __________		Definition of "Active partnerships and result of extension activities/programs": programs that have been duly forged with partners (thru MOAs/MOUs) and are completer and/or on-going within the year (2019) ***(please attached copy of MOAs/MOUs)***



VISAYAS
STATE UNIVERSITY

Vision

A globally competitive university for science, technology, and environmental conservation

Mission

Development of a highly competitive human resource, cutting-edge scientific knowledge and innovative technologies for sustainable communities and environment.

Quality Policy

The Visayas State University (VSU) is a higher education institution created by law to provide excellent instruction, conduct relevant research and foster community engagement that produce highly competent graduates necessary for the development of the country. Toward this end, we, at the Visayas State University, commit to:

1. produce highly competent, quality and world-class manpower in science and technology (S&T), especially for agriculture, environmental management and industry who are proficient in communication skills, critical thinking and analytical abilities,
2. generate and disseminate relevant knowledge and technology that lead to improved productivity, profitability and sustainability in agriculture, environment and industry,
3. satisfy the needs of the industry, the community and government sector who are in need of quality graduates and technology ready for commercialization through the establishment, operation, maintenance and continuous improvement of a Quality Management System which is aligned with the requirements of ISO 9001:2015.

It shall be the policy of the university that the quality policies and procedures are communicated to and understood by all faculties, staff, students and

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Training Manual on

GIS for Local Government Units
(Intermediate Level)

Table of Contents

Module 1: Fundamentals of GIS

Overview

Module Objectives:

Topic 1: Introduction to GIS

Summary

Learning Outcomes

At the end of this lesson, participants will be able to:

1.

Discussion

What is a Geographic Information System (GIS)?

GIS is a computer-based tool for mapping and analyzing things that exist and events that happen on Earth. It is a computerized system for capturing, storing, retrieving, analyzing, and displaying spatial data describing the land attributes and environmental features for a given geographic region using modern information technology (Thurgood, 1995). With its broader scope, diversity of applications, and different ways of classifying data, attributes, and features, coupled with the rapid rate of theoretical, technological, and organizational advancement in the field, GIS has become more and more difficult to define (Maguire).

More so, GIS is commonly defined based on its functionality:

"GIS can be defined as a computing application capable of creating, storing, manipulating, visualizing, and analyzing geographic information (Ershad & Ali, 2020) using advanced geo-modeling capabilities (Koshkariov et al., 1989)"

"A decision support system involving the integration of spatially referenced data in a problem-solving environment (Cowen, 1998)"

"An automated set of functions that provides professionals with advanced capabilities for the storage, retrieval, manipulation, and display of geographically located data (Ozemoy et al., 1981)"

An analysis of the three letters of the acronym GIS will help give a clear picture of what GIS is all about:

"G"-Geographic: "Where"– Implies an interest in the spatial identity or location of certain entities on, under, or above the surface of the Earth (Ershad & Ali, 2020). Many of our decisions depend on the details of our surroundings and require information about specific places on the Earth's surface. This information is called "geographical" because it helps distinguish one place from another to make appropriate decisions (Fazal, 2008).

> Example: Information about people and places is location-based. Street address, zip or area code, census block, x,y coordinates, latitude, longitude, etc.

"I" – Information: Implies the need to be informed to make decisions. Data or raw facts are interpreted to create helpful information for decision-making (Ershad & Ali, 2020). Information is derived from the interpretation of data, which is a symbolic representation of features. The value of information depends upon many things, including timeliness, the context in which it is applied, and the cost of collection, storage, manipulation, and presentation. Information is now a valuable commodity that can be bought and sold for a high price. Information and its communication is one of the key development processes and characteristics of contemporary societies (Maguire).

" What"

> Examples: Data from surveys, interviews, observations, and existing databases in a different format
> Extending the "I": Allows incorporating video, audio, photos, and text.

"When"

> Examples: Time animation, spatial-temporal analysis

Geography + Information allows us to apply general principles to specific conditions of each location, will enable us to track what is happening at any place, and help us to understand how one place differs from another. Geography and Information are essential for planning and decision-making (Fazal, 2008).

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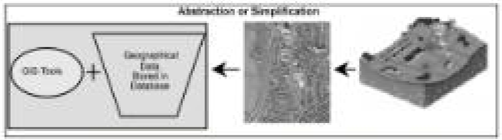

Figure 1. Data processing of real world information using GIS (Fazal, 2008)

"S": System – Implies the need for staff, computer hardware, and procedures, which can produce the information required for decision-making, that is, data collection, processing, and presentation (Ershad & Ali, 2020).

> Examples: Hardware, software, data model

Based on task performance, GIS has two types of systems: transaction processing and decision support. Transaction processing system - emphasis is placed on recording and manipulating the occurrence of operations. In decision support systems, the emphasis is on manipulation, analysis, and mainly modelling to support decision-making makers such as company managers, politicians, and government officials (Maguire).

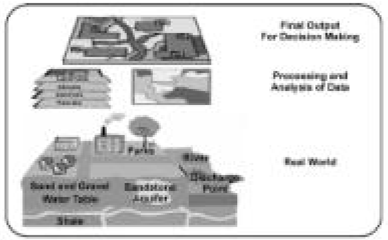

Figure 2. GIS simplifies the real world informations to bring it into a computer to be analyzed for decision making (Fazal, 2008)

Generally, GIS can be defined as the organized activity by which people measure aspects of geographic phenomena and processes, represent these measurements through a computer database to emphasize spatial themes, entities, and relationships, operate upon these representations to produce more measurements and to discover new affinities by integrating information from different sources; and transform these representations to conform to other frameworks of entities and relationships. In turn, GIS may influence the larger context of institutions and culture by which the people work (Fazal, 2008).

Data Sources

When searching for information about a particular subject, it is easy to be overwhelmed by all possible sources you are bound to encounter. How do you shift through all the data to get the necessary information?

Data refers to material that is related to the subject of interest. It is used to describe basic facts. In earth science fields, such facts may be the location of some phenomena, an elevation, or the relationship of one theme to another, covering a particular region. These phenomena or data are usually recorded digitally in GIS (Dueker, 1979). Data is considered as fuel for GIS (Balasubramanian, 2017). If used intelligently, such data can help better understand useful information in coming up with conclusions and solutions. When correctly interpreted and understood, this information can enhance knowledge in GIS and specific social, environmental, economic, and political conditions. The information refers to the element you need (Dueker, 1979).

Data sources that produce data ready for use in GIS are called **primary** data sources.

Example: Data Collected in the Field – census information, archival satellite imagery

Those that generate data that must be adapted or converted are called **secondary** data sources.

Example: Base map produced by someone else

Base Maps are layers intended to serve as starting points for more detailed mapping. It provides fundamental information relating to a particular data layer or theme. Most base map themes include the following:

- The transportation layer - may include roads, railroads, trails, canals, and/or pipelines.
- Land cover – regions are depicted by what land features are present (forest, wetlands, built-up) or by land usage (agriculture, urban, recreational).
- Boundaries include municipal, county, state, provincial, or national boundaries. Often, boundaries revealing specialized land holdings are included (parks, airports, military bases, and wildlife refuges and preserves).
- Elevation – This can include elevation contours or regularly spaced elevation points.
- Hydrography – features include surface water features, such as streams, rivers, lakes, and wetlands.

The vast data sources for GIS portray its real power not in creating pretty maps or studying a data set but in combining multiple data to obtain information for decision-making.

GIS stores information about the world as a collection of thematic layers that can be linked together by geography. These datasets contain spatially

distributed features, activities, or events that are definable in space as points, lines, or areas. A GIS manipulates data about these points, lines, and areas to retrieve data for ad hoc queries and analysis (Dueker, 1979).

Presently, many professions in core spatial-analysis fields (geology, cartography, and surveying) and other fields not immediately associated with mapping (environmental and urban planning, biology, transportation analysis, hydrology, and demographics) are using GIS.

Basic of GIS

Fundamental Types of Data

GIS deals with spatial data, their attributes and characteristics, and their relationship. The objects are stored in the database with geometric primitives (such as area, line, and points) and the relationship between them (topology). These data equate with triplex characteristics - description, reference, and time. The description is an attribute, reference is the spatial reference/data, and time is the temporal component. The time and description may change over time (Dipti, 2022).

Accordingly, GIS technology has two basic types of data – spatial and attribute data.

Attribute data – describe the absolute and relative location of geographic features. These characteristics can be quantitative or qualitative. This type of data is often referred to as tabular data. For example, characteristics of a forest land (cover group, dominant species, crown closure, and height).

Spatial data – describes the absolute and relative location of geographic features. These can either be presented as vector, raster, or image.

- Vector – consists of points, lines, and polygons. (1) Data points represent a position to which further information can be attached. Because the position, such as latitude and longitude, is stored as an attribute to the point, it is often referred to as a zero-dimension element. (2) Line connects two-endpoints, commonly referred to as nodes. It can be straight or curved. Curved lines have inflection points within, marking changes in direction. All lines can be measured in terms of length but not area. It is referred to as one-dimensional elements. (3) Polygons are enclosed two-dimensional regions that may contain or be intersected by points and lines. While it represents some boundary, it has an attribute assigned to the entire region (Decker, 2001).

  Common GIS file format: ESRI Shapefile (*.shp, *.dbf, *.prj, *.sbn, *.sbx); Geodatabase (feature class); kml (kmz) file; spreadsheet or .csv with lat/long

- Raster – consistent and organized arrays of data. Data comprises grid cells, the values recorded for a cell (picture element or pixel) in a satellite image or orthophoto. An example of data formed by a grid intersection is points in a digital elevation model (DEM) that recorded position (x, y or longitude, latitude) and elevation (the z value) (Decker, 2001). For example, elevation, slope, and surfaces

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Common GIS file format: Geotiff, geodatabase, mosaic dataset, DEM

- Image – It utilizes techniques that are very similar to raster data. However, it lacks the internal formats required for the analysis and modelling of the data. It only reflects a picture or photograph of a landscape.

  Common GIS file format: ADRG Image (.img), National Imagery Transmission Format (.ntf), Tagged image file format (.tif)

GIS Software

The GIS software market has changed remarkably in the last few years. The number of GIS software packages/tools has increased significantly, and prices have declined dramatically. Many of these packages/tools were developed to fit different user needs and were designed to execute on various hardware platforms (Eldrandaly, 2007). Moreover, open-source software has also received substantial attention as it promotes reduced licensing costs and indigenous technological development by accessing the source code of these systems. Like any commercial GIS software, all open-source software also requires a license, but free software licenses are implemented where users can access the source code and redistribute it (Maurya et al., 2015)

To encourage the use and development of open-source software for geospatial applications, the OSGeo organized a global event annually since its inception in 2006.

Today, many GIS software products and ways to configure implementations exist. Longley et al. (2005) classified GIS software into five main types in Table 1.

Table 1.

Software Type	Description
Desktop GIS Software Type	Desktop GIS software originates from the personal computer and the Microsoft Windows operating system and is considered the mainstream workhorse of GIS today. It provides personal productivity tools for various users across various industries. The desktop GIS software category includes various options, from simple viewers to desktop mapping and GIS software systems, such as ESRI ArcGIS and Quantum GIS (QGIS).
Server GIS	Server GIS runs on a computer server that can handle concurrent processing requests from various networked clients. Initially, it focused on display and query applications but now offers mapping, routing, data publishing, and suitability mapping. Third-generation server GIS offers complete GIS functionality in a multiuser server environment. Examples of server GIS include ESRI ArcGIS Server and GE Spatial Application Server.
Developer GIS	Developer GIS are toolkits of GIS functions (components) that a reasonably knowledgeable programmer can use to build a specific-purpose GIS application. They interest developers because such components can be used to create highly customized and optimized applications that can either stand-alone or be embedded with other software systems. Examples of component GIS products include ESRI ArcGIS Engine and MapInfo MapX.
Hand-held GIS	Hand-held GIS are lightweight systems designed for mobile and field use. A very recent development is the availability of hand-held software on high-end so-called 'smart phones,' which can deal with comparatively large amounts of data and sophisticated applications. These systems usually operate in a mixed connected/disconnected environment. They can actively use data and software applications held on the server and accessed over a wireless telephone network. Examples of Hand-held GIS include ESRI ArcPad.
Other types of GIS software	Many other commercial and non-commercial software types provide valuable GIS capabilities, such as public-domain, open-source, and free software—for example, Geographic Resources Analysis Support System (GRASS GIS) and Quantum GIS (QGIS).

These software types can either be commercial or open source. The table below presents the details of common GIS Software.

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Table 2.

Software/Release Year	Developed by	Source Type	Useful for Application	Development Platform/Language Support
ArcGIS, 1999	Environmental Systems Research Institute Inc. (ESRI)	Commercial	Spatial analytics and data science	Python, Visual Basic for Applications scripting, Avenue and the ARC Macro Language (AML), Arcade, C++
ArcMap Desktop Application, 1999	Environmental Systems Research Institute Inc. (ESRI)		Spatial analysis and data management	Python 2.7, large module stack .tbx (ModelBuilder, Python, +R), Python toolbox (.pyt)
ArcGIS online	Environmental Systems Research Institute Inc. (ESRI)	Commercial	Cloud computing, field mobility, monitoring, constituent engagement, sharing and collaboration	JavaScript Object Notation (JSON); Python
Google Earth, 2005	Keyhole Inc.	Open Source	Import and Export GIS data, including satellite images and aerial photography	JavaScript
ArcGIS Server, 2004	Environmental Systems Research Institute Inc. (ESRI)	Commercial	Web mapping	

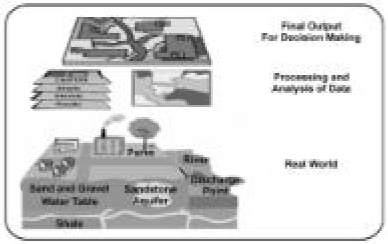
GeoServer	Universities, companies, volunteers worldwide	Open Source	Discovery, use, share, process, and edit geospatial data	JavaScript
QGIS, 2002	Universities, companies, volunteers worldwide	Open-Source	Viewing, Editing, Analysis, Grass-GUI, SAGA-GUI	C+ +, Qt4, Python
GRASS,				

According to Peuquet and Marble (1990), although several geographic information systems comprise different computer software, they all contain the following major components:

1. A data input subsystem collects and/or processes spatial data derived from existing maps, remote sensors, etc.
2. A data storage and retrieval subsystem that organizes the spatial data in a form that permits it to be quickly retrieved by the users for subsequent analysis, as well as permitting rapid and accurate updates and corrections to be made to the spatial database.
3. A data manipulation and analysis subsystem that performs a variety of tasks, such as changing the form of the data through user-defined aggregation rules or producing estimates of parameters and constraints for various space-time optimization or simulation models.
4. A data reporting subsystem that can display all or part of the original database and manipulated data and the output from spatial models in tabular or map form.

Bringing Data Into GIS

GIS is for making decisions. The way in which data is entered , stored, and analyzed within a GIS must mirror the way information will be used for specific research or decision-making task. To see GIS as merely a software or hardware system is to miss the crucial role it can play in the decision-making (Fazal, 2008).



There are four basic procedures for inputting spatial data into GIS. These are:

1. Manual digitizing - the process of converting geographic data either from a hardcopy or scanned image into vector data by tracing the features. All points that are recorded from the tracing are recorded and are registered against positional control points. The coordinates are recorded in a user defined coordinate system or map projection. The most common features to digitize are: 1) points, 2) lines, and 3) polygons.
2. Automatic Scanning - A variety of scanning devices exist for the automatic capture of spatial data. All have the advantage of being able to capture spatial features from a map at a rapid rate of speed. Scanners are generally expensive to acquire and operate. Large data capture work are done using scanning technology.
3. Entry of coordinates using coordinate geometry - A third technique for the input of spatial data involves the calculation and entry of coordinates using coordinate geometry (COGO) procedures.This involves entering, from survey data, the explicit measurement of features from some known locations.

Topic 2: Coordinate System and Projection

Summary

In a GIS project, defining spatial datasets in their correct position is essential. Since data are obtained from the real world and put into the digital format space or maps, they must be tied up and referred to a real-world reference position. Hence, the coordinate system provides a two-dimensional position of these data points and links the real-world data to the map. Since Earht's surface, where data were obtained, is a curved surface, a map projection is a process to portray this curved surface in a planar surface. Furthermore, the coordinate reference system (CRS) defines the reprojection of real-world data in a two-dimensional reprojected map.

Learning Outcomes

At the end of this module, participants will be able to:

1. Identify the different coordinate systems used in GIS.
2. Recognize different map projections.
3. Perform data

Discussion

The Needs for Georeferencing

Various spatial data come from different sources and probably have different geographical references. The differences in reference may cause confusion and misalignment of different datasets. In GIS, one of the advantages is the integration of different datasets in their common location. To be adept in GIS, the GIS user must be acquainted with the basics of coordinate systems. Coordinate systems provide unique information about each piece of data. For example, it answers where the fire hydrants are located. It can be found quickly and uniquely if this information is answered correctly. Neglecting the importance of proper positioning and tying it to a specific coordinate system, it is impossible to integrate valuable information from different data sets (McHaffie et al., 2023).

Take, for example, an identification of a location on the Earth's surface:

- Robinsons Ormoc - shopping mall, 2JG3+3VH, Palo - Carigara - Ormoc City Rd, Ormoc City, Leyte (see figure below)
- 11°01'30" N; 124°36'15" E: This is a coordinate of the same place.

Location of a building in Google Earth with address and coordinates.

Looking closely at the details of the former, it provides names and addresses of the location; however, it lacks metric information. The name and address of the location might mean other places, like the entrance of the building, the location of the parking area, or the geocentric location of the whole building. However, road names can be linked to the city's street network; generally, the location can still be located. The uncertainty of the specific location of the data points is just like two people in the same building.

The second one, in contrast to the street name, data points can be referred to through latitude and longitude. The said coordinates are termed geographic coordinates. Latitude is the direction of the north-south line, and longitude is the direction of the east-west line, just like the XY coordinates in geometry, a two-dimensional value. With the coordinates, they are referenced to a globally known and accepted reference system. In GIS, this is adopted to link and incorporate various data sources into a common system, thus providing valuable solutions and queries on the data available.

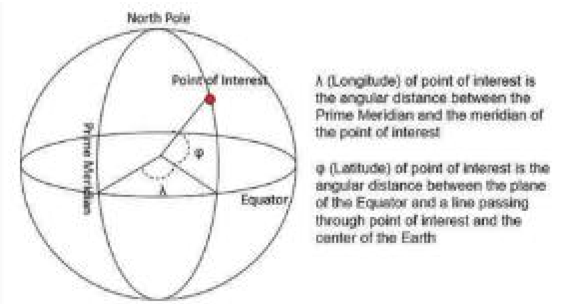
Here are some quick notes about the coordinate system and reference model:

- Position is defined as at least two or three quantities.

- These are the coordinates
- The coordinates of a certain point are referred to as a defined coordinate system
- Referring to a point of interest "with respect to what?"

Datum

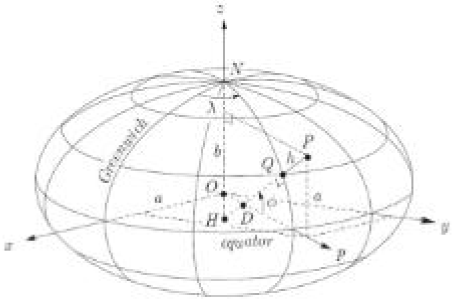
From the previous section, the geographic coordinates are measured with respect to the Earth's surface. However, heights are referred to a specific floor or datum. Presumably, the surface is flat, and the location of the specific point, say a tree, its two-dimensional position (XY) can be measured. The method is true if the surface is flat; however, the presumption changes to a curved surface in globally referenced data. Thus, a three-dimensional surface is devised to model the Earth's surface and serves as a base of the datum. Figure (Latitude and Longitude) shows the measurement of the location of the point of interest on the Earth's surface. The measure is not in metric but in angular scale or units. Latitude (φ) is an angular distance that ranges from 0° at the equator to 90° at the poles. Longitude (λ) is an angular distance ranging from 0° from the Greenwich (London, England) Prime meridian to the point of interest, at a maximum of 180°. From the previous example, the coordinates 11°01'30" N & 124°36'15" E mean 11°01'30" north of the equator and 124°36'15" east of the Greenwich meridian.



The latitude and longitude of the point of interest (McHaffie et al., 2023)

In GIS and geodetic surveying applications, the Earth model is not a perfect sphere but an oblate ellipsoid (McHaffie et al., 2023). The figure shows the ellipsoid. Hence, the position of points is referred to as geographic coordinates. However, various ellipsoids are specifically developed for a region, country, continental, or global. This is because the ellipsoid is the best-fit model for that area. For instance, in the Philippines, the

Philippine Reference System of 1992, based on Clarke's 1866 ellipsoid, is the reference system used for surveying and mapping activities in the country. The system is only applicable in the Philippines. Defining the correct reference system of a data set is essential since it will enable locating them on a map. Generally, on a global scale, the standard reference system used in mapping the entire world and GPS is the World Geodetic System of 1984 (WGS 84). In defining the ellipsoid, they are usually characterized by parameters such as the semi-major axis (a), semi-minor axis (b), flattening (f), and eccentricity (e), to name a few (see Figure). Flattening measures the compression of a circle or sphere along a diameter to form an ellipse or an ellipsoid of revolution, and eccentricity is the ratio of the distance b/n the two foci to the length of the major axis. Table __ lists the common ellipsoids used globally.

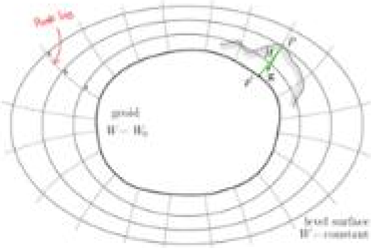


An ellipsoid and the geographic and geocentric coordinates

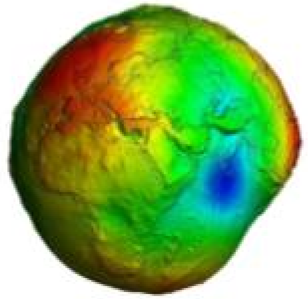
Ellipsoid	Defined by	Derived values
Clarke Spheroid 1866	a = 6,378,206.4 m	1/f = 294.978698214
	b = 6,356,583.8 m	e^2 = 0.0067686579973
Geodetic Reference System 1980	a = 6,378,137.0 m	b = 6,356,752.3141 m
	1/f = 298.257222101	e^2 = 0.0066943800229
World Geodetic System 1984	a = 6,378,137.0 m	b = 6,356,752.3142 m
	1/f = 298.257223563	e^2 = 0.0066943799902

For defining heights, it is referenced to a geoid. The geoid is an equipotential (surface) of gravity, the level surface. The equipotential surface approximately coincides with the

mean sea level (Figure __). For convenience, geodesists have commonly agreed to use a reference equipotential surface, the geoid (Figure __).



Geoid and level surfaces



Physical representation of the geoid (the scale is exaggerated)

The height of a point on the Earth's surface is geometrically defined as the distance from the point. The illustration of different heights used in determining the elevation of a point and its reference surface is shown in Figure __. Figure __ shows the geoid and the ellipsoid. Geoid = physical shape & reference ellipsoid = close approximation of geoid.

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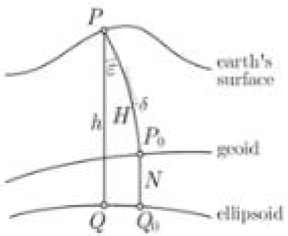
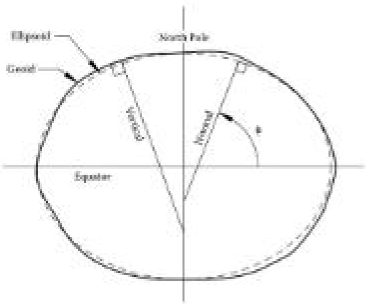


Different heights are used in defining the height of the point of interest.

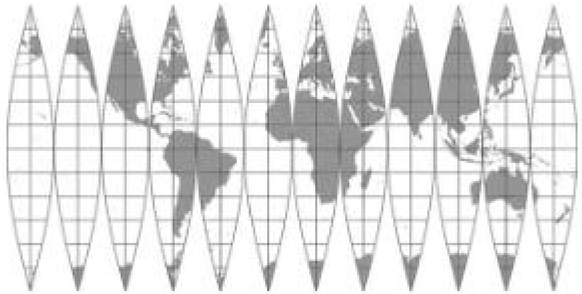


Geoid and the fitted ellipsoid

Map projection

Apart from recognizing the importance of positioning through reference systems, one key component of the coordinate system is map projection (McHaffie et al., 2023). A projection is a way to represent a curved surface, the Earth's surface, for instance, into a flat surface like a map. In a simpler sense, from a three-dimensional surface to a two-dimensional shape (QGIS, 2023). Ideally, Earth's topography and projecting its surface requires a procedure to represent the various features in a map, like a computer screen. The images and information shown on the screen are a flat representation of the Earth. Map projection is a mathematical operation that converts geographic coordinates (latitude and longitude) defined in a surface into a planar surface with x and y coordinates, a Cartesian coordinate system. Since a curved surface is forced to

be projected on a planar surface, distortions, stretching, and scaling are inevitable. Think about a globe. Peeling and deforming the globe's skin will result in a flat globe. The shape of the continents will end up differently, by shape or size, as compared to its original state (Figure).



A reprojected 3D surface of the Earth in a 2D plane surface.

Things to remember about projections:

- There is no one way of projecting the curved surface of the Earth onto a flat sheet that does not cause some distortion;
- and no one projection is suitable for all purposes for which people use maps.
- Distorted either shape or area or both
- However, for virtually every usage, some projections minimize distortions of importance for that task.

Activity 1: Exploring Metadata of Spatial data.

What is Metadata?

Prepared by JC Bencure

Metadata is data about data. It is a written document that describes the who, what, when, where, why, and how of the data

Who: describes the source of the data such as the name of the person or agency that prepared the data. They are the originator that developed the data set, publisher that assists in producing, editing, and finalizing the product or distributor that makes the data available.

What: describes the Name, Description, and some keywords that help categorizing the data. Description includes accuracy, spatial reference, entity and attributes of values and/or strings

When: states the date/time the data acquired or captured.

Where: describes

Why:

How: describes the methods, techniques, or equipment used to generate the data

There are standards of describing metadata. For GIS metadata, data provides follow the standards of Federal Geographic Data Committee, ISO 19115, EPA, Esri, Inspire, and MEDIN.

Why is metadata of GIS data important?

Activity 2: Defining and Transforming of CRS

References and Additional Resources

Topic 3: Tools and Techniques of Data Collection

Summary

Learning Outcomes

At the end of this module, participants will be able to:

1.

Discussion

Activity 3: Data Collection (handheld GPS, KoboCollect) and Processing

References and Additional Resources

Topic 4: Georeferencing and Digitizing of Raster Images

Summary

Learning Outcomes

At the end of this topic, participants will be able to:

1.

Discussion

Vision: A globally competitive university for science, technology, and environmental conservation.
Mission: Development of a highly competitive human resource, cutting-edge scientific knowledge and innovative technologies for sustainable communities and environment.

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Activity 4: Georeferencing and Digitizing of Raster Images

References and Additional Resources

Topic 5: Populating Attribute Table of Vector File

Summary

Learning Outcomes

At the end of this topic, participants will be able to:

1.

Discussion

References and Additional Resources

Topic 6: Map Layout

Summary

Learning Outcomes

At the end of this topic, participants will be able to:

1. gain a fondamental understanding of map composition
2. add ad customize different map elements
3. layout and print maps digitally

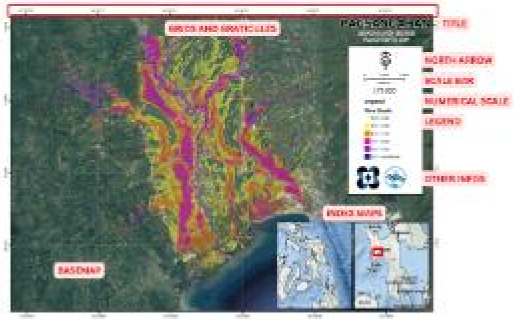
Discussion

Map layout plays a pivotal role in effectively communicating spatial information and data to your audience. QuantumGIS, a popular open-source geographic information system software, offers a range of tools and features for creating compelling and informative map layouts. In this discussion, we will explore the key aspects of map

layout in QGIS and discuss best practices for designing professional and engaging maps.

A. Map Elements

Maps are essential tools that help us understand and navigate the world around us. They are much more than just geographical representations; they are complex and multifaceted documents that convey a wide range of information.



Below are the elements of maps and their significance:

1. Map Title: The title of a map provides a quick summary of what the map represents. It gives you an idea of the area or subject matter covered, making it easier to determine if the map is relevant to your needs.
2. Map Legend (Key): A legend or key is a crucial part of a map as it explains the symbols and colors used on the map. It helps users interpret the information presented on the map, such as roads, rivers, mountains, or landmarks.
3. Map Scale: The scale of a map defines the relationship between a unit of measurement on the map and the corresponding distance on the ground. It's usually represented as a fraction (e.g., 1:10,000), a verbal scale (e.g., "1 inch equals 10 miles"), or a graphic scale (a bar with divisions representing distance).
4. Compass Rose: A compass rose indicates the cardinal directions (north, south, east, and west) and sometimes intermediate directions (northeast, northwest, southeast, southwest). This helps users orient themselves and understand the map's orientation.
5. Grid Lines and Coordinates: Grid lines, such as latitude and longitude lines or a coordinate system, provide a way to pinpoint specific locations with precision. They are especially useful for navigation and understanding a location's relative position.
6. Symbols and Icons: Maps use a variety of symbols and icons to represent different features, such as airports, train stations, parks, and more. The choice of symbols can vary from map to map, but they should always be explained in the legend.

7. Colors: Colors are used to differentiate between various map features, such as bodies of water, vegetation, urban areas, and elevation. They provide visual cues that make it easier to interpret the map's information.
8. Insets or Locator Map: Insets are small maps or additional sections of a map that provide a closer look at specific areas. They are often used to give more detail to a portion of the map that would be too small to show clearly on the main map.
9. Boundary Lines: Boundary lines, like country borders, state lines, or city limits, help define the extent of the area represented on the map. They can also be used to show administrative divisions.
10. Title and Data Credits: Maps should include information about the source of data and cartographic techniques used in their creation. This is important for transparency and to give credit to data providers and mapmakers.
11. Date of Publication: Maps can become outdated as geography changes, so the date of publication is essential to understand how current the information on the map is.
12. Cartographic Projections: This is a more technical element. Maps are flat representations of a spherical Earth, and different map projections are used to minimize distortion. Understanding the projection used is important for accurate navigation and interpretation.
13. Index or Table of Contents: In the case of maps with multiple sheets or complex information, an index or table of contents can help users quickly locate specific information.

These elements are fundamental for understanding and effectively using maps. They serve various purposes, from navigation and education to research and decision-making in fields such as geography, urban planning, and environmental science. Different types of maps, such as topographic maps, road maps, thematic maps, and geological maps, may emphasize certain elements to suit their specific purposes.

Activity 5: Map Layout

1. Layout Manager
2. Basic Map composition
3. Map Elements
    a. Title
    b. North Arrow
    c. Scale and Scale Bar
    d. Legend
    e. Grids
    f. Index maps
    g. Additional information
    h. Other elements
4. Printing of maps
5. dads
    a.

Module 2: Application of GIS Methods

Overview

Module Objectives:

Topic 1: Geoprocessing Tools and Map Overlay Analysis

Summary

Learning Outcomes

At the end of this topic, participants will be able to:

1.

Discussion

Activity 1: Map Overlay Using Simple and Complex Analysis

References and Additional Resources

Topic 2: Application of GIS Methods in Local Setting: Land Use Assessment

Summary

Learning Outcomes

At the end of this topic, participants will be able to:

1.

Discussion

References and Additional Resources

Topic 3: Application of GIS Methods in Local Setting: Disaster Risk and Social Change

Summary

Learning Outcomes

At the end of this topic, participants will be able to:

1.

Discussion

An attention to location, spatial interaction, spatial structure and spatial processes lies at the heart of research in several subdisciplines in the social sciences. Empirical studies in these fields routinely employ data for which locational attributes (the "where") are an important source of information. Such data typically consist of one or a few crossections of observations for either micro-units, such as households, store sites, settlements, or for aggregate spatial units, such as electoral districts, counties, states or even countries. Observations such as these, for which the absolute location and/or relative positioning (spatial arrangement) is taken into account are referred to as spatial data. In the social sciences, they have been utilized in a wide range of studies, such as archeological investigations of ancient settlement patterns (e.g., in Whitley and Clark, 1985, and Kvamme, 1990), sociological and anthropological studies of social networks

(e.g., in White et al., 1981, and Doreian et al., 1984), demographic analyses of geographical trends in mortality and fertility (e.g., in Cook and Pocock, 1983, and Loftin and Ward, 1983), and political models of spatial patterns in international conflict and cooperation (e.g., in O'Loughlin, 1985, and O'Loughlin and Anselin, 1991). Furthermore, in urban and regional economics and regional science, spatial data are at the core of the field and are studied to model the spatial structure for a range of socioeconomic variables, such as unemployment rates (Bronars and Jansen, 1987), household consumer demand (Case, 1991), and prices for gasoline (Haining, 1984) or housing (Dubin, 1992). The locational attributes of spatial data (i.e., for the settlements, households, regions, etc.) are formally expressed by means of the geometric features of points, lines or areal units (polygons) in a plane, or, less frequently, on a surface. This spatial referencing of observations is also the salient feature of a Geographic Information System (GIS), which makes it a natural tool to aid in the analysis of spatial data.

References and Additional Resources

Activity 2: Mini Project (by Group)

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