

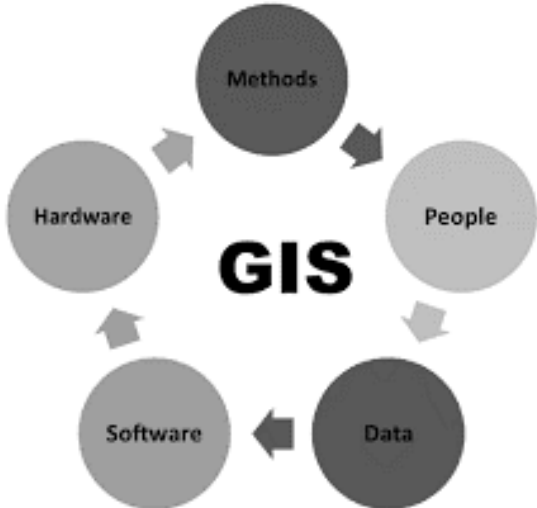


Geography:		Grade 10	
TERM 1		Week 7 Lesson 7	
TOPIC	GIS: GEOGRAPHICAL INFORMATION SYSTEMS		
AIMS OF LESSON	To understand the basic concept of GIS		
RESOURCES	Paper based resources	Digital resources	
	Refer to your textbook: Read the topic: Geographical Information Systems	What is a GIS? https://www.youtube.com/watch?v=-ZFmAAHBfOU What is remote sensing? https://www.youtube.com/watch?v=N49PzLDUIFQ CapeFarm mapper https://gis.elsenburg.com/apps/cfm/	
INTRODUCTION	<ul style="list-style-type: none"> • What is GIS? • We abbreviate Geographical Information Systems • <i>It is a way of using maps digitally to make our lives easier.</i> 		
CONCEPTS AND SKILLS	<ul style="list-style-type: none"> • Reasons for the development of GIS • Concept of remote sensing • How remote sensing works • Satellite images related to meteorology and climatology 	CAN YOU? <ul style="list-style-type: none"> • Distinguish between the three words GIS consist of? • Can you describe, at least two applications of GIS in daily life? • Distinguish between the two data formats of GIS? • Can you distinguish between active and passive remote sensing? 	
ACTIVITIES/ ASSESSMENT	<i>Complete the attached activities as well as those in your textbook.</i>		
CONSOLIDATION	<ul style="list-style-type: none"> • <i>Complete the activities.</i> • <i>Make sure that you know why GIS was developed</i> • <i>Why GIS has become an everyday tool</i> • <i>The GIS represents Data in two forms (Vector and Raster data)</i> • <i>GIS and remote sensing are not the same thing (know the Difference between GIS and remote sensing)</i> • <i>Which satellites are used in climatology and meteorology?</i> 		
VALUES	<ul style="list-style-type: none"> • GIS is a computer system that touches every part of our daily life, even if we do not realise it. (GIS is digital Geography) 		

1	What is GIS?	
	GIS stands for Geographical Information Systems	
	G-GEOGRAPHY (the real world with its spatial patterns)	
	I – INFORMATION (data that has been collected)	
	S -SYSTEMS (Computers technology and support infrastructure)	

Components of GIS

- Hardware (computer, screen, keyboard, printer, scanner, digitizing table, etc.)
- Software (specific computer application programmes, e.g. ArcView, IDRISI, QGIS, that can retrieve data and shown as maps or tables, edit and change data, capturing and storing of data, querying and analysis of data)
- Data (*spatial data* – such as town, rivers, roads, and *attribute data* – that describes the characteristics of a geographic feature such as numbers, length, area, type of building, clay content, etc.)
- People (trained specialists, data developers, system managers as well as the daily users)
- Methods (methods and techniques such as properly developed implementation plans, business rules and models true to each unique organization)



The functions of a GIS

- Collecting and capturing of data
- Storing and management of data
- Recall and processing of data
- Transforming and integration with other data
- Analyses of data
- Display data as maps and information tables

Now that we know what each concept means and what the components and functions of a GIS are, we can answer the question 'what is a GIS?'

A **Geographic Information System** is a computer system of hardware, software and methods that are designed to capture, manage, manipulate, analyse, model, and display spatial data as well as non-spatial data (attribute data) in order to solve complex planning and management problems.

2	Why is it there? –The reasons for the development of GIS	
	The technological world has changed since the development of the computer. This made the capture, manipulation, analysis and display of data easier, faster and more accurate. It became a vital and necessary planning and management tool. It is used to solve geographic problems related e.g.:	

- People
- Resource Use
- Cities
- Computers
- Transport networks
- Pollution
- Advanced electronic communication networks
- Political problems

A GIS can reconstruct the real world and produce additional information that can be used to explain and predict geographical space.

GIS helps the geographer to use the geographic information stored in the computer to identify, characterize, question, analyse, explain and use the patterns and distributions of the geographic data to solve problems.

GIS has many different uses:

- Scientific investigations
- Environmental impact assessments
- Town planning
- Infrastructure development
- Population research and planning
- Marketing
- Reference purposes
- Drawing thematic maps
- Military planning

3 **What is remote sensing?**

GIS and remote sensing is not the same thing. Remotely sensed data (information) is often used in a GIS.

Remote sensing means gathering information about an object, or a place without being in contact with that object.

Remote sensing is the creation or collecting of information about the earth's land and sea surfaces with sensors on platforms such as weather balloons, radio telescopes, airplanes and satellites, using the electromagnetic radiation reflected or radiated from the earth without being in physical contact with the earth.

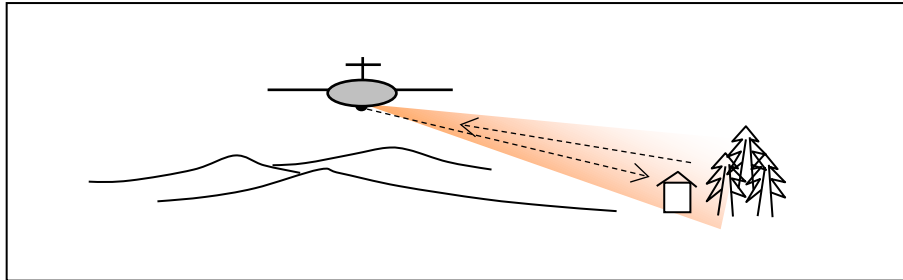
This information can be in the form of hard copy or digital aerial photographs and satellite images.

The advantage of remote sensing is that it gives geographers the ability to do research on areas without visiting the area as it is probably too far and inaccessible.

Cameras are remote sensors, and so are **satellites** which gather information from far out of space.

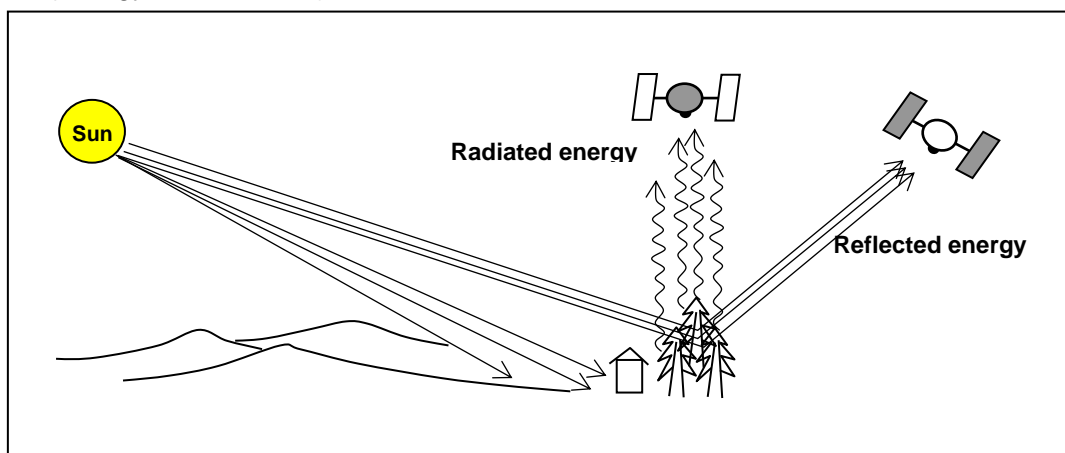
3.1 Active and Passive Sensing

- **Active systems**– the sensor creates and emits its own energy which is then detected and measured as it is reflected from objects. An example of an active system is the radar.



Active sensors send out a signal; then it is bounced or reflected by the object being sensed and the return radiation is measured. **Radar** is an example of active remote sensing.

- **Passive systems** – where the sensors detect and measure the electromagnetic energy (energy from the sun) as it is *reflected* and *radiated* from the earth's surface.



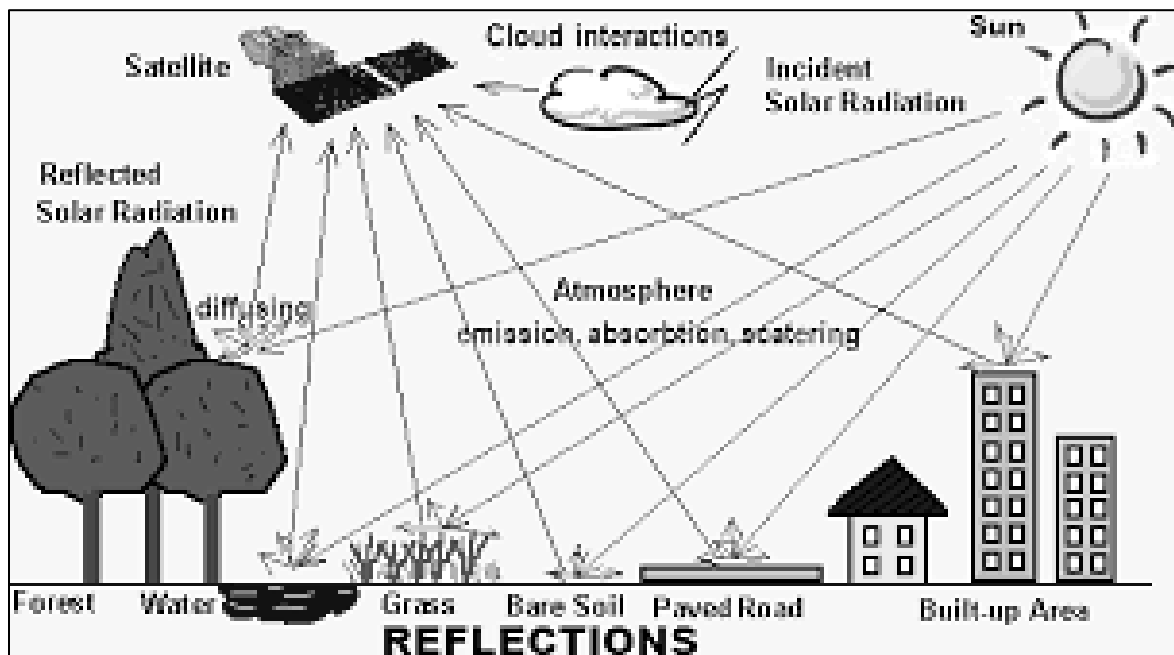
Passive sensors detect natural radiation that is emitted or reflected by an object. **Reflected sunlight** is the best-known example.

3,2 Types of satellites

We can classify satellites into two types:

- i) **Earth orbiting satellites** in a low orbit around the earth. These satellites orbit the earth a few times a day. (**Example** the International Space Station)
- ii) **Geostationary Satellites** also orbit the Earth but much further out in space. They appear to be located permanently above a geographically fixed point on the Earth's surface. (**Example** Meteosat satellites)

3.3 How remote sensing works



A satellite in orbit around the Earth has a sensor which scans the earth surface measuring the amount of light reflected or energy radiated/emitted

- One of the sensing sensors detects the green, blue and red wavelengths of the electromagnetic spectrum. This is the visible spectrum in which the human eye also detects reflected light.
- Other sensing sensors detect energy such as heat and temperature radiated/emitted from objects.
- Other sensing sensors detect water vapour, clouds and dust in the atmosphere.

The data collected about the Earth's surface is then sent to a receiving antenna at ground station.

Application of GIS

- Meteorology has been revolutionised by satellite technology and GIS. Weather forecasting is now more accurate. Before this technology it was unreliable because meteorologists did not get enough information.
- Weather satellites keep a constant watch and spot when new weather systems are born and follow them hour by hour. Meteorologists can predict with more accuracy when and in which region a weather system will reach an area. This can save many lives.
- The impact of GIS in agriculture is huge. The farmer can access data on climate, soil type and aspect of his land and integrate it with data of the requirements of the crop he wants to farm. A GIS program such as CapeFarm mapper will enable him to determine the best possible piece of land that is most suitable for the crop and from which he will get the best yield. This enables the farmer to improve the yields and quality of crops.

GIS:

Consolidation Activity 1 Term 1 Week 7 Lesson 7

1.	Answer the questions
1.1	Explain the acronym GIS.
1.2	Explain what each word in the acronym GIS.
1.3	Describe a way in which GIS is applied in your daily activities.
1.4	Explain the concept remote sensing.
1.5	What is the difference between active and passive remote sensing?
1.6	List and compare two features of Earth orbiting satellites and Geostationary satellites.
1.7	Are GIS and remote sensing identical? Explain your answer.
1.8	List FIVE professions in which you think GIS and Remote sensing could be useful. Explain your selection.
1.9	Voluntary activity: use the link https://gis.elsenburg.com/apps/cfm/ - Warning- consumes lots of data! <ol style="list-style-type: none">1. Click on <i>Base map</i> and choose <i>Google Terrain</i>2. Zoom in to where you live on the map3. Click on <i>Resource Layer</i> and<ol style="list-style-type: none">a. Click on <i>Climate Rainfall</i>b. Select <i>Mean Annual rainfall</i>c. Click on the <i>legend</i>d. Write down the rainfall of your chosen area4. Click on <i>Agri-infrastructure</i> and<ol style="list-style-type: none">a. Click on <i>Homesteads</i> – see the distribution of the homesteads <p>Congratulations you have just used a GIS program.</p>