**COURSE : DISASTER MANAGEMENT (MA/ MSc PART I)**
**Paper : IV**

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**Topic : Applications of Remote Sensing in Disaster Management**

**INTRODUCTION**

To meet the needs of different data users, there are many remote sensing systems, offering a wide range of spatial, spectral and temporal parameters. Some users may require frequent, repetitive coverage with relatively low spatial resolution (meteorology).

Others may desire the highest possible spatial resolution with repeat coverage only infrequently (mapping); while some users need both high spatial resolution and frequent coverage, plus rapid image delivery (military surveillance). Remote sensing data can be used to initialize and validate large computer models, such as Global Climate Models (GCMs), that attempt to simulate and predict the earth's environment.

The following applications of remote sensing may be useful for disaster management purposes :

**Assessment of condition of rural roads:**Rural road conditions are now possible to be assessed using various [Remote Sensing](https://grindgis.com/what-is-remote-sensing/know-basics-of-remote-sensing) techniques and [GIS](https://grindgis.com/what-is-gis/what-is-gis-definition)technique with inch to inch accuracy. It saves whole a lot time and money of transporters.

**Assessment of fuel economy:**Satellites have now become capable of measuring vehicle emissions including CO, HC, NO, etc. without much interference from the space. Governments are using this technique for putting pressure on vehicle owners to make them follow emission standards.

**Assessment of train stability:**In interferometer technology, landscape deformation is measured with sensors using phase differences. This technique is mostly used in sectors of oil and gas in order to measure train technology.

**Building base map for visual reference:**Many modern mapping technologies are based on [Remote Sensing](https://grindgis.com/what-is-remote-sensing/know-basics-of-remote-sensing) including Google [maps](https://grindgis.com/remote-sensing/10-important-applications-of-hyperspectral-image), Bing maps, open street maps, NASA’s Globe view, etc.

**Calculating snow pack:**To understand snow melt ratio, NASA uses LIDAR along with a spectrometer in order to measure the absorption of sunlight. This can be easily understood by using [Remote Sensing](https://grindgis.com/what-is-remote-sensing/know-basics-of-remote-sensing) technology.

**Collecting earth’s pictures from space:**NASA has a 75 page collection containing images of earth. Interesting patters of earth’s geometry including oceans, atmosphere, land, etc can be seen in it. EO-1, Terra and Land sat are used to collect this data.

**Complete view of real estate:**Satellite imagery and [Remote Sensing](https://grindgis.com/what-is-remote-sensing/know-basics-of-remote-sensing) technology is useful for customers planning to buy a new home. They can check nearby schools, shopping districts, parks and every other thing they are expecting to be close.

**Conserving lakes and rivers:**Wooded areas along with the waters are the final line of defense constantly protecting lakes and rivers from running off. There riparian zones also require some assistance. High resolution satellites are used to observe them since they are spread on entire globe.

**Controlling forest fires:**Data acquired by satellites using [Remote Sensing](https://grindgis.com/what-is-remote-sensing/know-basics-of-remote-sensing) enables firefighters to be dispatched on time and over accurate locations so the damage from such fires can be decreased to minimal.

**Creating automatic road networks:**Up to date data regarding to road networks are important for emergency services, urban planning and navigation systems as well. Multispectral image sensing technology and object base classification technology is used to develop automated road networks that serve useful information for groups described above.

**Delineating watersheds:**DEMs (digital elevation model) are prepared using hydrologists’ [Remote Sensing](https://grindgis.com/what-is-remote-sensing/know-basics-of-remote-sensing) technology that represents the flow and location of water body.

**Detecting land cover and land use:**[Remote Sensing](https://grindgis.com/what-is-remote-sensing/know-basics-of-remote-sensing)  technologies are used to determine various physical properties of soil (land cover) and also how it is being utilized or what it is being used for (land use). Spatial analysis laboratory is doing these activities since years now.

**Elevation and contours derivation:**[**Remote Sensing**](https://grindgis.com/what-is-remote-sensing/know-basics-of-remote-sensing) technology named [photogrammetry](https://grindgis.com/blog/basics-photogrammetry)is used in contour mapping, developing surface models, conducting volumetric surveys and developing 3d maps. This same technique is also used in crime scene mapping, archaeology and architecture.

**Finding missing bodies:**Remote sensing technology is used in operations for finding missing people since they can sense anomalies on the ground and narrow down the search area greatly so that time, money and human power is saved.

**Forecasting weather:**GOES12, 13, 14 and 15 are used to forecast and monitor weather. It is important for business, tourism and other important industries. Remote sensing is being used for forecasting weather since 1975.

**Identifying crop conditions:**Satellite imagery and normalized difference vegetation index technologies are used in order to monitor global fool supplies. Healthy crops are reflected green where other areas are red or blue otherwise.

**Improving air traffic control:**Satellite based GPS system is used to maintain the flow of air traffic. It avoids the use of ground based radar so that money is saved and routes are improved alongside with improved safety.

**Increasing precision in farming:**Health of crops is measured using [remote](https://grindgis.com/blog/vegetation-indices-arcgis) sensing applications so that almost 10 percent of fertilizer can be saved. Money and time invested on that fertilizer would also be ultimately saved.

**Managing City assets and safety:**LIDAR is used by many companies for the purpose of managing their assets and also for ensuring safety. LIDAR data and municipal data are compared to make sure that every construction is permitted and safe.

**Mapping soil types:**International soil resource and information center uses MODIS imagery remote sensing technology to map soil types for agricultural predictions and planning to improve the future results.

**Marine life and environmental preservation:**Oil slicks cause noticeable damage to marine life and surrounding environmental. With remote sensing technology, ocean and weather forecast can be obtained to locate oil spills and determine oil direction and spread ratio.

**Measuring soil moisture content:**Active and passive sensors of a satellite in the space are used in order to determine soil moisture content. Many earth sciences such as water cycle, drought, and flood are based on content of soil moisture.

**Measuring sea levels:**This is one of the most large scale applications of remote sensing technology. Remote sensing data is used by satellites in order to measure sea levels with accuracy of inches. There would be no requirement of going to the sea shore and measuring the sea level with you measure scale.

**Measuring wind speed and direction:**NASA’s Quick SCAT scatter meter and wind LIDAR make large scale wind operations for providing accurate wind information to golfers, farmers, pilots, engineers and turbine planners.

**Monitoring human impact over globe:**Landscape changes are nowadays observed quite easily and efficiently. It is considered longest observations. Records old more than 30 years old are also available. Main observation objects are oil spills, wars, chemical spills, dead zones, etc.

**Navigating ships:**With the improvement in ship navigation, GPS is not the only tool used. Along with GPS, other remote sensing technologies such as routing analysis, wind, wave information, ship proximity are used to save ships from sinking on iceberg!

**Observing climate changes:**Remote sensing satellites such as MODIS, CERES, AMSRE, TRMM and MOPITT has made it possible to observe climate changes from up above the skies. It is also possible to compare past climate situation with current one.

**Observing glacier melts and sea levels:**GRACE satellite of NASA is responsible for monitoring melting level of glacier located on Alaskan and Polar Regions since rapid melting ice is scarily causing increased sea level all around the globe.

**Observing groundwater activities in well:**Remote sensing technology observers rock types, soil, land use and rainfall, etc. This data is then used to derive well sites on zone maps.

**Observing live volcanoes:**Remote sensing technologies such as thermal sensing and mid infrared sensing are used to monitor activities of active volcanoes. AVHRR and MODIS are main satellites involved in this activity.

**Predicting famine:**Early famine signs are important for governments so that they can deliver food in areas affected with shortage. Remote sensing satellites SMAP and SMOS are capable of understanding flooding and drought.

**Predicting potential landslides:**Around the globe, landslides cause noticeable death and wealth loss. INSAR uses interferometry remote sensing technique for providing early warning regarding to potential landslides.

**Preventing spread of forest disease:**Remote sensing technologies can be useful to control disease such as mountain pine beetle. It is an important application since there are millions of billions people making their living based on forests.

**Quantifying post-earthquake damage:**Earthquake damage assessment is important for rescue workers in a quick and accurate manner. Object images of pre and post earthquake are compared using remote sensing satellites for quick assessment of earthquake damage.

**Restricting diseases from spreading in epidemiology:**Some diseases are strongly related with climate, land use and air. Remote sensing technologies are used to figure out areas where these diseases are much likely to happen. These data are useful for putting a stopover certain diseases.

**Searching crashed aircrafts:**Hundreds of satellites orbit the earth each day, monitoring various activities in their space. If they are in the right place on the time, their data may be useful in finding crashed and lost aircrafts.

**Searching road cracks:**In major cities such as California, satellite imagery is used to derive information about damaged roads so that construction team knows exact location where immediate repair is essential.

**Supplying clean drinking water:**Simple remote sensing application named base maps are used to keep an eye on where and how much water shortage exist. This information is then used as a base for building further plans.

**Tracking air quality in lower atmosphere:**Carbon monoxide is the most major pollutant in global pollution. It cannot be seen by naked eyes; however, infrared radiation can be measured using a spectrometer that is used by a satellite of NASA named MOPITT.

**Tracking and monitoring hazards:**Remote sensing technology is heavily implemented in order to figure possible damage from hazards so a proper dispatch and response can be planned. Main goal is to avoid damage as far as possible.